

1 Q. **Reference: 2024 Resource Adequacy Plan**

2 With respect to model results related to reliability statistics – i.e., loss-of-load hours, loss-of-
3 load-expectation, and unserved energy – and considering the fact that system commitment and
4 dispatch simulations typically report quantities of unserved energy that may not reflect any
5 reliability deficiency, but rather inherent limitations of the simulation:

6 a) Please describe how such reliability-related statistics are extracted or derived from
7 model outputs.

8 b) Does Hydro monitor or benchmark such reliability-related model outputs against
9 expectations? For example, our understanding is that a 2.8 LOLH target is used to derive
10 a planning reserve margin that is then incorporated in the system modeling. Does Hydro
11 evaluate whether loss of load hours explicit or implicit in the system model outputs
12 correspond appropriately to the 2.8 LOLH target?

13 c) Does Hydro consider there to be a base level of unserved energy inherent to model
14 limitations, with higher levels relevant to true reliability issues? Please explain.

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17 A. a) In order to assess system reliability Newfoundland and Labrador Hydro (“Hydro”) uses its
18 Reliability Model. The Reliability Model is a system model built in Plexos that uses Monte
19 Carlo analysis to assess Loss of Load Events (“LOLE”) by varying outage profiles, load
20 forecast uncertainty, and wind generation, across thousands of samples. This model is
21 primarily used to determine the reserve margin required to meet the reliability criterion of
22 2.8 LOLH¹ and is also used to examine other reliability statistics such as LOLE and EUE.² LOLH
23 and EUE are extracted directly from the model output using the properties “Unserved
24 Energy Hours” and “Unserved Energy.” Depending on the application, the monthly mean or
25 annual mean of all samples is used for reporting. LOLE is not natively supported by Plexos

¹ Loss of Load Hours (“LOLH”).

² Expected Unserved Energy (“EUE”).

1 and is calculated in a spreadsheet using the hourly mean “Load” and “Unserved Energy”
2 properties from the Reliability Model.

3 LOLE occurs in the reliability model when the available generation is less than the total
4 demand.³ A generation shortfall can occur due to insufficient capacity in a particular hour,
5 or insufficient energy over a period of time. Due to the characteristics of the generators on
6 Hydro’s system, capacity constraints are the primary driver of LOLE.

7 LOLE can be quantified using several metrics. Hydro typically uses LOLH and EUE as its
8 measure of system reliability and has used LOLE on a limited basis in the 2024 Resource
9 Adequacy Plan. Each reliability metric considers different aspects of system outages. LOLH
10 and LOLE measure the frequency of outages but do not measure the depth of outages,
11 whereas EUE measures the depth of outages but not the frequency. Using multiple outage
12 statistics is important to provide a fulsome picture of potential outages.

13 **b)** Hydro does not benchmark projected LOLH against system events. This is due to the nature
14 of generation shortfall events. The projected LOLE show a constant level of generation
15 shortfall in each year, due to the averaging effect of the Monte Carlo analysis. In reality,
16 generation outages are fairly rare, and there could be several years with no generation
17 shortfall events, even when the system is near criteria. So, there is no way to get a
18 statistically meaningful sample of LOLE on our system for benchmarking purposes.

19 No model is a perfect representation of how a system will operate and all models contain
20 simplifications. Hydro regularly evaluates its modelling assumptions against operational
21 realities and updates them as required. Where there is uncertainty, Hydro tends to be
22 conservative in its assumptions. For example, under some circumstances, units can be run
23 above their rated capacity for a period of time. However, since this is not guaranteed, units
24 are generally modelled at their rated capacity.

25 **c)** Hydro has not observed any base level of unserved energy due to model limitations in its
26 Reliability Model. To confirm this, Hydro regularly tests the output of its Reliability Model to

³ Total demand in any hour is the sum of native load, transmission losses, firm exports, and minimum spinning reserve.

1 ensure that all LOLE can be explained by unit or transmission line (namely the Labrador-
2 Island Link) outages in the model.

3 In Hydro's response to PUB-NLH-339 of this proceeding, limitations are noted for the
4 simulated hourly dispatches for the days and weeks of an emergency shortfall scenario.
5 During these intervals, models cannot fully represent real-time operational aspects and
6 decision making. While these limitations do not impact the effectiveness of Plexos analysis
7 for long-term system planning, utility experience must be considered when reviewing
8 simulation results for such a scenario.