Q. **Newfoundland and Labrador Hydro – Near-Term Reliability Report, May 15, 2020**

Hydro Electric Energy Storage

Refer to the Section 5.0, System Energy Capability, Near-Term Reliability Report, May 15, 2020, statement that, "Hydro is establishing minimum storage limits to April 30, 2021 in consideration of potential delays in the availability of the LIL to deliver energy to the IIS." Please describe: the modeling process and how it accounts for and produces differences based on assumptions about LIL availability and what difference those assumptions make.

A. To meet system energy requirements, Newfoundland and Labrador Hydro ("Hydro") uses a planning methodology which balances hydraulic and thermal production and is continually monitored and adjusted in consideration of system energy in storage, weather forecasts, thermal and hydraulic asset health, forecast purchases, and forecast system requirements. Hydro has a strong focus on ensuring the economic dispatch of its generation and specifically focuses on maximizing generation from hydraulic sources and minimizing generation from thermal sources to manage the resultant cost to customers while satisfying the established minimum storage limits. This methodology balances cost and reliability by minimizing the amount of thermal generation to the extent possible while ensuring sufficient energy in storage to reliably operate the system in consideration of the historic hydraulic record.

The system wide monthly storage limits are developed with consideration of historic inflow sequences, hydroelectric and thermal plant availability, and system load forecasts; they are recalculated in the event of demand and/or supply side changes which can result from modifications to load forecasts or the addition of new generating sources to the system. While it has been necessary to modify the assumptions used to determine the minimum storage limits over the last 20 years, the methodology has always been designed to strike an appropriate balance between the cost of operating the system with providing reliable service to customers.

The steps of the methodology to derive the 2020 minimum storage limits are as follows:

1) Island hydrological sequences are simulated in Vista.

2) For each trial hydrologic sequence, storage volumes in each of the main reservoirs for each time step are output to an Excel spreadsheet. The volumes are used to calculate live storage in equivalent GWh for each reservoir and time step and the volume change from time period to time period is calculated to determine the system storage used in each period for meeting load.

3) For each trial hydrologic sequence, Holyrood generation used in each time step is also output to Excel and the spare thermal is calculated as the assumed available maximum Holyrood Thermal Generating Station ("Holyrood TGS") minus the actual use simulated by Vista and any excess net power.

4) For each trial hydrologic sequence, the spare thermal is added to the volume change calculated in step 3 to represent how much (less) hydraulic energy would have been required in each time step had maximum thermal generation been used.

5) For each trial hydrologic sequence, the absolute volume of storage required in each time step so that the storage is at the minimum criteria level of 220 GWh in April 2021 is determined.

6) The maximum storage from each hydrologic scenario and each time period interpolated to the last day of each month defines the minimum storage limit for the period.

The storage limits are a function of all of the information and assumptions which represent the system in the Vista model, including:

- Unit characteristics and operating constraints (both hydro and thermal) including Exploits, Newfoundland Power, Corner Brook Pulp and Paper, and the wind plants;
- Load forecasts;
- Reservoir characteristics and operating constraints;

- The current generation outage schedule; and
- Historic system inflows.

The methodology for deriving the minimum storage limits uses a minimum storage in the reservoirs of 220 GWh. This minimum provides a level of conservatism to protect against uncertainties in the analysis and in operation, for example:

- Inflows could be below the minimum historic.
- It may not be possible to get the full rated capacity at all generating units (hydraulic or thermal) for the full planning period.
- Generation from non-Hydro owned sources (e.g., Corner Brook Pulp and Paper, Newfoundland Power, Exploits and the wind plants) varies and could be lower than modelled by Vista.
- Variation in island climate and reservoir inflows means that it is very difficult to bring all reservoirs down to empty while maintaining rated capacity at all units.

The resulting minimum storage limits are virtually identical to the 2019 minimums derived in the August 2019 minimum storage limit update. That analysis assumed similar maximum generation at the Holyrood TGS and more importantly, that the Labrador-Island Link ("LIL") is also offline until spring of next year. The 2020 and 2019 May to July minimums differ because the 2019 minimum limits for those months were the results of an earlier analysis that had assumed some energy delivered to the Island by the LIL in 2019. Overall, the 2020 minimum storage limits are well aligned with previous isolated island scenarios.

If the LIL had been assumed to be providing energy to the system in advance of April 2021, additional energy could be provided to the system in months where the LIL is in-service, reducing the minimum storage limits.