

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

2 Please refer to Hydro's "2024 Resource Adequacy Plan: Technical Conference #4: Expansion
3 Plan, Insights, and Next Steps," dated October 29, 2024, at slide 33. For each "model run" and
4 "sensitivity" identified on this slide, please provide the data listed below for all assets available
5 to PLEXOS (including existing Hydro assets by generating unit and potential expansion assets).
6 Please provide the data in Excel format, with all units of measurement clearly indicated, for the
7 entire study period.

- 8 a) Capacity (MW) (by season, if applicable)
- 9 b) Firm Capacity (MW)
- 10 c) Maximum Generation (MW)
- 11 d) Minimum Stable Generation (MW)
- 12 e) Heat rate (GJ/MWh or MMBtu/MWh)
- 13 f) Minimum up time
- 14 g) Minimum down time
- 15 h) Failure parameters (such as rate, frequency)
- 16 i) Maintenance parameters (such as rate, frequency)
- 17 j) Ramp rate (MW/minute)
- 18 k) Hourly dependable capacity shape (by season, if applicable, such as for wind resources¹)
- 19 l) Capital cost
- 20 m) Sustaining capital cost (\$/year)
- 21 n) Variable O&M cost (\$/MWh)
- 22 o) Fixed O&M cost (\$/MW or \$/kW)
- 23 p) Marginal loss factor (%)
- 24 q) Retirement/decommissioning cost (\$)

¹ See 2024 Resource Adequacy Plan, Filed July 9, 2024, Appendix B, page 31 of 57, lines 17 to 19.

- 1 **r)** Terminal/salvage value (\$)
- 2 **s)** Asset life (years/date)
- 3 **t)** Fuel type
- 4 **u)** Fuel cost (by year)
- 5 **v)** Marginal cost (\$/MWh)
- 6 **w)** Start-up costs (\$/start) (please distinguish between hot/warm/cold starts, if applicable)
- 7 **x)** Cycling costs
- 8 **y)** Emissions rates
- 9 **z)** Emissions costs
- 10 **aa)** Round trip efficiency (for battery energy storage projects)
- 11 **bb)** Duration (for battery energy storage projects)

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14 A. The characteristics of existing generating resources are summarized in PUB-NLH-324,
15 Attachment 1 as detailed below. The characteristics of expansion resources are summarized in
16 the “Expansion Options” tab.

- 17 **a)** Firm Capacity – Please refer to the tab labelled “Capacity.”
- 18 **b)** Firm Capacity – Please refer to the tab labelled “Capacity.”
- 19 **c)** Maximum Generation – In all cases this is equal to the Capacity.
- 20 **d)** Minimum Stable Generation – Please refer to the tab labelled “Unit Characteristics.”
- 21 **e)** Heat rate – Please refer to the tab labelled “Unit Characteristics.”
- 22 **f)** Minimum up time – Please refer to the tab labelled “Unit Characteristics.”
- 23 **g)** Minimum down time – Please refer to the tab labelled “Unit Characteristics.”
- 24 **h)** Failure parameters – Please refer to the tab labelled “Outage and Maintenance.”

- 1 **i)** Maintenance parameters – Please refer to the tab labelled “Outage and Maintenance.”
- 2 **j)** Ramp rate – This is not modelled explicitly as all Hydro’s units, with the exception of
3 Holyrood Thermal Generating Station (“Holyrood TGS”), can reach maximum generation
4 within an hour. The contribution to 10-minute reserves has been reduced in the model in
5 cases where it is limited by ramp rates.
- 6 **k)** Hourly dependable capacity shape – There are no hourly variations in unit capacity for most
7 of the modelled units. The one exception is the Holyrood diesel generators, which are
8 limited to 6 MW in off-peak hours due to environmental regulations.
- 9 **l)** Capital cost – Please refer to the tab labelled “Expansion Options.”
- 10 **m)** Sustaining capital cost – The model includes sustaining capital in its Fixed O&M costs.
- 11 **n)** Variable O&M cost – Please refer to the tab labelled “Expansion Options.”
- 12 **o)** Fixed O&M cost – Please refer to the tab labelled “Expansion Options.”
- 13 **p)** Marginal loss factor – System losses are modelled using quadratic loss equations rather than
14 a Marginal Loss Factor. The loss equations can be found in the attached spreadsheet in the
15 tab labelled “Loss Equations.”
- 16 **q)** Retirement/decommissioning cost – End of life costs or benefits are not included in the
17 model. End of life costs are important in making a decision to retire units. However, Hydro
18 has previously determined the Holyrood TGS and the Hardwoods and Stephenville Gas
19 Turbines will be retired once there is sufficient new capacity in service to maintain system
20 reliability. There are no other units that would be candidates to be retired in the study
21 period.
- 22 **r)** Terminal/salvage value – please refer to part q).
- 23 **s)** Asset life – Please refer to the tab labelled “Expansion Options.”
- 24 **t)** Fuel type – Please refer to the tab labelled “Unit Characteristics.”
- 25 **u)** Fuel cost – Please refer to the tabs labelled “#2 Fuel Price” and “#6 Fuel Price.”
- 26 **v)** Marginal cost – Marginal costs are not an input to the model.

- 1 **w)** Start-up costs (\$/start) – The only modelled unit with significant start-up costs was the
2 Holyrood Combustion Turbine, which was assigned a start-up cost of \$33,000 per start in
3 the model.
- 4 **x)** Cycling costs – Cycling costs are not considered in the model.
- 5 **y)** Emissions rates – Hydro does not directly model emission rates. An assumption of
6 72.73 kg/GJ is used for #2 Diesel and an assumption of 76.81 kg/GJ is used for #6 Fuel. Unit
7 emissions are calculated in the model based on these assumptions combined with unit
8 generation and unit efficiency.
- 9 **z)** Emissions costs – There are currently no costs associated with emissions on Hydro’s system.
- 10 **aa)** Round trip efficiency – Please refer to the tab labelled “Expansion Options.”
- 11 **bb)** Duration – Please refer to the tab labelled “Expansion Options.”