IN THE MATTER OF the *Labrador Interconnected System Transmission Expansion Study*

Request for information of the Iron Ore Company of Canada ("IOC")
to
Newfoundland and Labrador Hydro ("NLH")

Reference: Study, page 1

IOC – NLH – 014: Please explain the P90 methodology used by NLH. Please discriminate between the demand, climate (degree-year) and other risks. Explain if the P90 applies equally to all risks and to the demand from all consumer classes.

IOC – NLH – 015: Please provide the breakdown of the 2019 load forecast of 358 MW for Labrador West between consumers' rate classes. Provide the same for the years 2020, 2021, 2222, 2023 and 2043.

IOC – NLH – 016: Explain how customers are or would be curtailed when the load exceeds the operating limits. Are rural and industrial customers treated alike or are industrial customers curtailed ahead of rural customers?

IOC – NLH – 017: Describe the remaining steps and timeline before the synchronous condenser SC-3 at the Wabush Terminal Station can be commissioned.

IOC – NLH – 018: Provide the load curve for each hour of the past year for the Labrador West transmission systems for firm and interruptible service. Please provide the data in native Excel format. Please provide the same for the Labrador East transmission system in a separate file.

Reference: Study, page 9 - Transmission Planning Criteria TP-S-007 NLSO Standard
www.oasis.oati.com/woa/docs/NLSO/NLSOdocs/TP-S-007_Transmission_Planning_Criteria_UPDATED_05112018.pdf

IOC – NLH – 019: Please file the presentation of February 11 that explains, among other things, the limits of the Primary Transmission System and the scope of TP-S-007 NLSO Standard – Transmission Planning Criteria.

IOC – NLH – 020: Please explain the impacts of the "Local Network" classification of the Labrador West transmission system with regards to the application of the TP-S-007 NLSO Standard.

IOC – NLH – 021: According to NLSO Standard TP-S-007, thermal overload of transmission lines is calculated for ambient temperature of 30°C in summer, while low. Low temperature capacity is calculated for ambient temperature of -15°C in winter. Are these criteria based on historical data? Please indicate frequency of occurrence and duration of such temperatures.

IOC – NLH – 022: Are the conductor temperature limits used for transmission lines (230 kV, 138 kV or 46 kV) for the thermal overloading calculations based on actual design of the lines or based on conservative assumptions? Please explain.

IOC – NLH – 023: In post-contingency scenario, transformers are not allowed to be loaded above their 25°C ratings, despite the overloading capability of transformers for lower ambient temperatures. Does this also apply to 46 kV "distribution" transformers? Since peak demands occur mainly during the winter season, what are the reasons for not considering this overloading capability for transformers in post-contingency/ emergency scenarios? Has Hydro ever experienced transformer failures due to transformer loading above 25°C rating at low ambient temperatures?

IOC – NLH – 024: Considering the steady-state voltage criteria sets the post-contingency limits to 0.9 to 1.1 pu for all bus voltages (TP-S-007, section 5.4.1), why is the voltage limited to 1.05 pu at the synchronous condensers terminals in such scenarios? *See Appendix B, page 6.*

Reference: Study, section 3

IOC – NLH – 025: Please provide a copy or a reference to the Load forecast released in July 2018.

IOC – NLH – 026: Please provide the historical Labrador East and Labrador West Coincident Peaks from 2010 to 2018.

IOC – NLH – 027: Please provide the load duration curve for the rural customers load alone on the Labrador West transmission system for the years 2010 to 2018.

Reference: Study, section 3, page 13, lines 1-5

Preamble: *"For the purposes of this investigation, the baseline load forecast includes load increases associated with Tacora operations at the Wabush Mines site. Hydro currently receives monthly power on order requests to accommodate the ramp up of this operation. The transmission system expansion plans developed in this report are designed to accommodate the full operation of this facility."*

IOC – NLH – 028: Provide the monthly power on order requests received from Tacora.

Reference: Study, section 3, page 13, table 4

Preamble: The fuel price forecast in Table 4 is largely above market prices and IOC's forecast. Diesel delivered in Labrador in 2019 is estimated by IOC between $1 and 1.05 per liter.

IOC – NLH – 029: Please explain how the fuel price forecast was obtained or determined by NLH.

Reference: Study, Section 4

IOC – NLH – 030: Please quantify the impact load attrition, energy efficiency programs and load management initiatives on the Labrador East and Labrador West load forecasts.

Reference: Study, Sections 5 and 6 – Projects valuation

IOC – NLH – 031: Define the concept of "Cumulative Net Present Value ("CPV")" used in the study. Please compare this concept to the generally accepted concepts of Net Present Value ("NPV") or Net Present Cost ("NPC").

IOC – NLH – 032: Provide in native Excel format with formulas the detailed calculation of Capital costs and Net Present Cost of the alternative 1: Offload L1301 / L1302.

IOC – NLH – 033: Provide in native Excel format with formulas the detailed calculation of Capital costs and Net Present Cost of the alternative 2: Muskrat Falls to Happy Valley Interconnection.

IOC – NLH – 034: Provide in native Excel format with formulas the detailed calculation of Capital costs and Net Present Cost of the project described in section 5.2.1.

IOC – NLH – 035: Provide in native Excel format with formulas the detailed calculation of Capital costs and Net Present Cost of what NL Hydro assesses to be the most probable option(s) to be implemented, including Synchronous Condenser No. 3.

IOC – NLH – 036: Provide in native Excel format with formulas the detailed calculation of Capital costs and Net Present Cost of each alternative described in section 6.

Reference: Study, Section 5, page 22, lines 5-10

Preamble: *"[...] Unused power in Labrador may also be utilized on the island or exported to external markets."*

IOC – NLH – 037: Please provide the determination or the assumption used by NLH to determine the value of the reduction of power losses and additional exports to the Island and external markets over the life of the asset. Is it always the amount of 35 $\$_{CAD}$/MWh mentioned in Appendix B, page 12, line 17 regardless of time and duration?

Reference: Study, Section 5, page 23, lines 7-10

Preamble: "The upgrades include the commissioning of the third synchronous condenser at Wabush Terminal Station, the installation of an additional 23 MVAR of shunt compensation ..."

IOC – NLH – 038: Does the 23 MVar shunt compensation act as backup to SC-3?

IOC – NLH – 039: What is the use and link to the replacement of transformers T4 and T5 with MBA units as well as the installation of an additional 23 MVar? Are the two investments separate?

IOC – NLH – 040: Does the addition of synchronous condenser SC-3 improve the transmission lines losses? If so, please quantify this improvement (in MW).

Reference: Study, Section 7, page 30, lines 2-5

IOC – NLH – 041: Provide the different load growth scenarios considered by NLH (high, median, low).

Reference: Study, Section 7.2, page 31, table 11

Preamble: "Thermal Upgrade of L23/L24 to 75°C conductor temperature".

IOC – NLH – 042: Provide in native Excel format with formulas the detailed calculation of Capital costs and Net Present Cost of each alternative considered to service the incremental Labrador West Load Levels.

IOC – NLH – 043: Do the Capital cost estimates of 31.66 m$ and 153.15 m$ respectively include the cost of SC-3 or only of its commissioning?

IOC – NLH – 044: What is the current maximum operating temperature for the L23 and L24 conductors? Is the limitation due to the conductors sag or other factors? If it is the conductors sag, what is the solution proposed by NLH for thermally upgrading those lines?

Reference: Study, Section 7.2, page 31, table 11 (alternative 5)

Preamble: According to the single line diagram on page B2, a shunt compensation of 72 MVar is added to the existing 50 MVar (C1 and C2 capacitor banks). IOC believes that the proposed addition of shunt compensation may lead to severe resonance constraints.

IOC – NLH – 045: Was any preliminary harmonic study performed to confirm the feasibility of this proposed solution?

Reference: Study, Section 7.2.1, page 32, lines 11-14

IOC – NLH – 046: Please provide a copy of the preliminary study performed by Hydro-Québec for NLH.

IOC – NLH – 047: To IOC's knowledge, Hydro-Quebec does not have a substation called "Bloom Lake", unless it refers to the 315 kV that is privately owned by Quebec Iron Ore. Has Hydro-

Quebec provided further details on this substation? Is it existing or would it have to be built and, if the latter, who will assume the construction costs (not included in the class 5 estimates)?

Reference: Study, Section 9, page 34, figure 6

IOC – NLH – 048: Please provide figure 6 in "$/kW-month" instead of "% increase" for Industrial customers.

Reference: Study, Appendix B, Section 2.1, page 3, lines 20-25

Preamble: "- *Two, 230 kV transmission lines from Churchill Falls to Wabush, a distance of 217 km;*
- *each transmission line consists of steel structures with a single 636 kcmil, 26/7, ACSR "GROSBEAK" conductor per phase; and*
- *each transmission line has thermal limits of 439 A @ 30°C, 650 A @ 15oC, and 934 A @ -15°C ambient based upon a 50°C conductor temperature."*

IOC – NLH – 049: Does the transmission line between Twin Falls and Wabush Terminal Station consist of 636 kcmil "Grossbeak" conductors and 795 kcmil for the section between Twin Falls and Churchill Falls?

IOC – NLH – 050: Has NLH considered the option to upgrade only the Twin Falls to Wabush Terminal Station conductors? Please indicate cost and the transmission limit of this option.

IOC – NLH – 051: What is the conductor temperature limit considered in the calculation of the admissible current for thermal limits at different ambient temperatures? Is it related to admissible sag of the overhead conductors or to other factors? Please describe.

Reference: Study, Appendix B, page 13

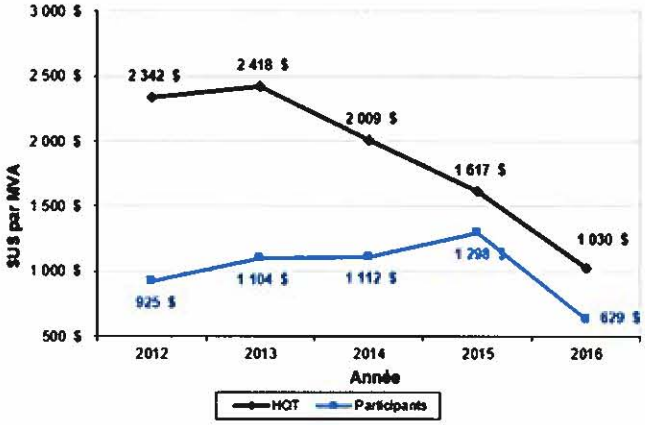
Preamble: "*For the purpose of this study, the operating and maintenance ("O&M") costs were calculated using the April 2018 Transmission O&M Cost Benchmark Study, prepared by Christensen Associates Energy.*"

Table 3: Fixed O&M Benchmark Template

Category	Fixed O&M Costs	Comments
230 kV AC Transmission Line	$4,611/km	
315 kV AC Transmission Line	$5,489/km	Common Route Factor of 0.6 applied if on common ROW[13]
315 kV Terminal Station Facilities	$4,060/MW	Based on Surge Impedance Loading of Line (328 MW for 315 kV)
DC Transmission Line	$5,003/km	
DC Converter Facilities	$13,228/MW	

Hydro-Québec TransEnergy (HQT) benchmarks annually similar expenses but reports industry benchmarks from P.A. Consulting and the Canadian Electricity Association (CEA) of a different order of magnitude:

Expenditure in O&M per MVA – Substations



Docket R-4058-2018, exhibit HQT-3, document 3, Figure 11, p.15 (http://publicsde.regie-energie.qc.ca/projets/471/DocPri/R-4058-2018-B-0010-Demande-Piece-2018_07_27.pdf)

IOC – NLH – 052: Please provide the other O&M benchmarking studies NLH has participated in, acquired or has access to.

Reference: Study, Appendix B, page 16, lines 4 and 9

Preamble: "Labrador West load exceeds 383 MW, up to 434 MW: […]
- thermal upgrade of L23/L24 to 75°C conductor temperature; […]"

IOC – NLH – 053: Describe the work done by NLH on the thermal upgrade of lines L23 and L24 to 75°C.

St. John's, Newfoundland and Labrador, February 21, 2019.

Iron Ore Company of Canada
(By its counsel, Stewart McKelvey)

Per: **GREGORY A.C. MOORES**

To: PUB and List of participants