

1 Q. **Reference: Raphals, P., Expert report regarding Hydro’s Proposed Network Addition Policy and**
2 **Transmission Expansion Study, dated April 25, 2019**

3 Citation (pp. 40-42, or pp. 44-46 pdf):

4 **Implications of changes in planning criteria**

5 The creation of the NLSO and the accompanying changes in management
6 structures has led to important changes in the standards applied to different
7 parts of the Labrador transmission system.

8 The Labrador East and West systems are not considered part of the Primary
9 Transmission System, and as a result, the n-1 criterion is not necessarily applied
10 across the board in these areas.¹

11 The Labrador West network is classified as a “local network”, and so is not
12 subject to strict application of Transmission Planning Criteria as defined in
13 “NLSO Standard Transmission Planning Criteria Doc # TP-S-007.”² The Labrador
14 East network is considered a “radial network”.

15 Hydro furthermore indicates that the Labrador West Local Network (46 kV) is
16 now classified as part the Newfoundland and Labrador Interconnected System.
17 Ratings for equipment within this jurisdiction are now calculated on the basis of
18 “NLSO Standard – Transmission Facilities Rating Guide, TP-S-001,” as opposed to
19 methodologies defined in distribution planning standards. This change in
20 methodology has resulted in a 4.9 MVA reduction in firm transformer capacity
21 at the Wabush Substation.³

22 In addition to the changes in the ratings of the 46 kV power transformers,
23 ratings of the 46 kV transmission lines were also revisited and calculated in
24 accordance with “NLSO Standard – Transmission Facilities Rating Guide, TP-S-
25 001” using an assumed 50°C operating temperature. This resulted in a
26 substantial reduction in the conductor ratings, as shown in the following table:

Table 1: Comparison of Transmission and Distribution Calculated Conductor Ratings

46 kV Transmission Line	Transmission Planning Winter Rating (MVA)	Distribution Planning Winter Rating (MVA)
L32 Sections 1 and 2	59.4	72.0
L40 Section 1	42.6	51.5
L33 and L40 Section 2	60.2	72.9
L36	36.7	44.4

¹ LAB-NLH-073 a) i), page 2 of 3.

² NP-NLH-020.

³ LAB-NLH-073 a) ii) and iii), page 2 of 3.

1 Taken together, these changes result in a substantial downgrading of the
2 capacity of the Wabush Transmission Station and the 46 kV lines connected to
3 it. As such, **it would appear that the need for at least some of the equipment**
4 **called for to meet the baseline forecast in Labrador West (Alternative 4) is**
5 **made necessary simply by changes to the ratings of the existing equipment.**

6 It is recommended that, before any transmission upgrades are approved by the
7 Board for Labrador West, the justification for these changes of ratings be
8 carefully examined in the Capital Budget Application process.

- 9 **a)** Has the Board ever explicitly approved the changes in Hydro’s planning criteria that were
10 described in the Transmission Expansion Study? If so, please provide detailed references
11 and quotations.
- 12 **b)** Has Hydro provided any additional justification for the changes described in the citation? If
13 so, please provide detailed references and quotations.
- 14 **c)** Would the proposed modifications to the Jean Lake TS have been required at this time,
15 under the planning criteria in effect before the TES? Please explain your response in detail.

16

17

- 18 A. **a)** Newfoundland and Labrador Hydro (“Hydro”) has not explicitly put forward its transmission
19 planning criteria for the Board of Commissioners of Public Utilities (“Board”) approval,
20 rather, these criteria form the basis of Hydro’s planning practices. When a requirement for
21 capital upgrades are identified as part of these planning processes, Hydro submits a formal
22 project proposal to the Board consisting of evidence to demonstrate the requirement,
23 supported by technical analyses and summaries of operational considerations. For example,
24 the Board has recently approved two projects⁴ that were based on the planning criteria as
25 described in the Transmission Expansion Study. Both projects were filed as part of Hydro’s
26 2021 Capital Budget Application (“CBA”).⁵

⁴ Wabush Terminal Station Upgrades and Additions for Load – Wabush Substation Upgrades.

⁵ “2021 Capital Budget Application,” Newfoundland and Labrador Hydro, rev. November 2, 2020 (originally filed August 2, 2020), vol. II, tab 13 and tab 16.

1 With respect to the Board-approved Wabush Terminal Station Upgrades project, the
2 following citation details the Transmission Planning criteria that were applied:

3 Hydro's prescribed Transmission Planning Criteria⁶ are applied within the
4 Newfoundland and Labrador Interconnected System. However, these criteria
5 are only strictly applied to the portion of the Newfoundland and Labrador
6 Interconnected System that is defined as the primary transmission system. The
7 primary transmission system includes the portions of the Newfoundland and
8 Labrador Interconnected System that permit the bulk flow of electricity across
9 the transmission system. This consists of the 230 kV transmission system on the
10 island of Newfoundland, the Labrador-Island Link, and the 735 kV and 315 kV
11 transmission systems in Labrador.

12 Hydro's approach to transmission planning for the Labrador Interconnected
13 System involves balancing reliability and cost for the customers within this
14 system. For example, Hydro does not rigidly apply its Transmission Planning
15 Criteria for the systems in western Labrador as it is classified as a Local Network.

16 The following criteria were defined for the transmission system in western
17 Labrador as part of the Labrador Interconnected System Expansion Study.⁷

- 18
- No loss of load for:
 - Loss of a synchronous condenser;
 - Loss of a capacitor bank; and
 - Loss of a power transformer.
 - Loss of load is permitted for:
 - Loss of a 230 kV transmission line.
- 19
20
21
22
23

24 With respect to transformer contingencies, the following Transmission Planning
25 Criteria also applies to the transmission system in western Labrador:

26 Transformer additions at all major (≥ 230 kV) terminal stations (i.e. two
27 or more transformers per voltage class) shall be planned on the basis of
28 being able to withstand the loss of the largest unit (i.e. installed spare

⁶ "NLSO Standard Transmission Planning Criteria," Doc # TP-S-007, Newfoundland and Labrador Hydro, April 13, 2020.

⁷ "Labrador Interconnected System Transmission Expansion Study," Newfoundland and Labrador Hydro, rev. April 3, 2019 (originally filed October 31, 2018).

1 transformer capacity) such that all firm⁸ loads can be supplied during
2 system peak.⁹

3 With respect to the Board-approved Additions for Load – Wabush Substation Upgrades
4 project, the following citation details the Transmission Planning criteria that were applied:

5 Power transformers in the Newfoundland and Labrador Interconnected
6 Transmission System are assessed on the basis of Transmission Planning
7 Criteria¹⁰, which include the following excerpts:

8 Transformer outages must be treated differently than outages to other
9 transmission equipment given the long lead times for repair and/or
10 replacement.

11 Transformer additions at 138/66 kV, 66/25-12.5 kV terminal stations
12 with one transformer per voltage class shall be planned on the basis of
13 being able to install the Hydro mobile transformer or one of
14 Newfoundland Power’s mobile transformers under agreement between
15 the two parties with respect to use of mobile transformer equipment.
16 These transformers are generally located on radial portions of the
17 system.

18 Transformer additions at all major (≥ 230 kV) terminal stations (i.e. two
19 or more transformers per voltage class) shall be planned on the basis of
20 being able to withstand the loss of the largest unit (i.e. installed spare
21 transformer capacity) such that all firm loads can be supplied during
22 system peak.

23 The Wabush Substation does not clearly fit in to either of the categories
24 described in these excerpts. The station contains multiple power transformers,
25 but is not classified as a “major” terminal station and does not have equipment
26 in the 230 kV voltage class. It is also not appropriate that the station “be
27 planned on the basis of being able to install the Hydro mobile transformer or
28 one of Newfoundland Power’s mobile transformers.” Logistically, the relocation
29 of a mobile transformer from the Island Interconnected System cannot
30 practically be executed in a reasonable timeframe. Further, the relocation of a
31 mobile power transformer to such a distant location would result in an exposure
32 for all Island Interconnected System terminal stations that have been planned in
33 accordance with the criteria defined above.

⁸ The firm transformation capacity is the total station capacity less the transformer with the largest rating.

⁹ “2021 Capital Budget Application,” Newfoundland and Labrador Hydro, rev. November 2, 2020 (originally filed August 2, 2020), vol. II, tab 13, att. 3, sec. 3.1, pp. 4–5.

¹⁰ “NLSO Standard Transmission Planning Criteria,” Doc # TP-S-007, Newfoundland and Labrador Hydro, April 13, 2020.

1 On this basis, it is recommended that the Wabush Substation be planned to
2 withstand the loss of the largest unit (i.e., installed spare transformer capacity)
3 such that all firm loads can be supplied during system peak.¹¹

4 **b)** Hydro has provided justification for the changes described in the citation in the following
5 locations:

- 6 • 2021 CBA, Volume II, Tab 16, Attachment 1, Pages 6–11.
- 7 • 2021 CBA, responses to requests for information PUB-NLH-035 and PUB-NLH-037,
8 provided in LAB-NLH-005, Attachment 1.

9 **c)** If the distribution planning criteria in effect before the Transmission Expansion Study was
10 applied to the Jean Lake Terminal Station, the distribution power ratings for Transformers
11 T4 and T6 would correspond to 10.3 MVA and 20.4 MVA, respectively. A sensitivity load flow
12 analysis was performed using the distribution power ratings, indicating Transformers T4 and
13 T6 would not reach 100% loading within the ten-year planning horizon.

14 As referenced in part b) of this response, the application of distribution standards is not
15 appropriate from either an operational or planning perspective. Rather, the justifications
16 and criteria considerations associated with the proposed power transformer replacement
17 project are the same as those presented in Hydro’s 2021 CBA where a power transformer
18 replacement project at this same terminal station was approved.

19 As outlined above, it is critical that transmission planning standards be applied for a power
20 transformer that is heavily loaded. This is particularly the case in light of the risk on
21 unplanned town load growth that is ancillary to potential major developments in western
22 Labrador that are being investigated as part of the Network Addition Policy.

¹¹ “2021 Capital Budget Application,” Newfoundland and Labrador Hydro, rev. November 2, 2020 (originally filed August 2, 2020), vol. II, tab 16, att. 1, sec. 3.1.2, pp. 6–7.

1 Q. **Tab 16; Volume II: Additions for Load – Wabush Substation Upgrades**

2 Hydro states on page 5, lines 7-11, that “A complicating factor in consideration of power
3 transformer capacity at the Wabush Substation is that assessments for the station have
4 historically been performed by Distribution Planning. However, in 2017, equipment operating in
5 Labrador City and Wabush at 46 kV became the responsibility of the Newfoundland and
6 Labrador System Operator (“NLSO”) and was therefore reclassified from distribution to
7 transmission.”

8 Please outline the rationale for transferring the responsibility for the Wabush 46/12.5 kV
9 substation from Hydro to the NLSO. Please identify and provide a copy of any particular
10 standards that are relevant to the decision.

11

12

13 A. Since its establishment in 2017,¹ the Newfoundland and Labrador System Operator (“NLSO”) has
14 been responsible for the operation of transmission facilities in Newfoundland and Labrador with
15 a rated voltage of 46 kV and above, including stations in western Labrador.² These activities are
16 still managed via Newfoundland and Labrador Hydro’s (“Hydro”) Energy Control Centre (“ECC”).

17 From an operational perspective, the 46 kV system in western Labrador has historically been
18 operated as a transmission system under the controlling authority of the ECC. However, from a
19 system planning perspective, the network assessments have been performed in accordance with
20 Hydro’s Transmission Planning Criteria³ since the NLSO became the system operator for
21 transmission facilities in Newfoundland and Labrador. Prior to that, planning assessments were
22 performed in accordance with Distribution Planning Criteria.

¹ *Electrical Power Control Act*, 1994 Citation: SNL 1994, c E-5.1, s 14.3.

² As an exception, Newfoundland Power is responsible for the operation of their 66 kV and 138 kV transmission facilities.

³ Please refer to Hydro’s responses to CA-NLH-019 and LAB-NLH-004 of this proceeding for further information.

1 The assessment of the 46 kV network using Transmission Planning Criteria is justified on the
2 basis that 46 kV networks in Labrador serve the same function as 66/69 kV networks on the
3 Island Interconnected System. Transmission systems in both voltage classes consist of
4 interconnected networks of terminal stations used for the regional delivery of electricity. 46 kV
5 and 66/69 kV terminal stations generally have similar designs and typically contain large
6 terminal station power transformers. Given this functional similarity, both voltage classes should
7 be held to the same standard.

8 In the specific case of the requirement for power transformer upgrades at the Wabush
9 Substation, the application of Transmission Planning Criteria is essential to ensure an acceptable
10 operational margin for station capacity. These power transformers should be classified in the
11 same manner as all other terminal station power transformers that are owned by Hydro. The
12 specification and multi-year procurement times associated with these transformers is
13 significantly different than those for standardized distribution transformers used in 25 kV, 12.5
14 kV and 4.16 kV applications which are frequently available as stock items. Maintaining an
15 acceptable level of operation margin is of particular importance in western Labrador, as the
16 region is characterized by sudden unforeseen load growth due to the cyclical nature of the iron
17 ore prices.

1 Q. **Tab 16; Volume II: Additions for Load – Wabush Substation Upgrades**

2 What steps would have to be taken by Hydro in order to have the Wabush substation
3 reclassified as distribution? Has Hydro considered taking these steps? If so, why wasn't that
4 option pursued? If not, why not given the amount of capital expenditures required to facilitate
5 the change to a transmission classification.

6

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8 A. As per Newfoundland and Labrador Hydro's ("Hydro") response to PUB-NLH-035 of this
9 proceeding, 46 kV transmission networks are held to the same standard as 66/69kV
10 transmission networks as both networks serve the same function in terms of the regional
11 delivery of electricity. From an operational standpoint, the 46 kV network has historically been
12 operated as a transmission system under the controlling authority of the Energy Control Centre.
13 From a planning perspective, Wabush Substation power transformers should be classified in the
14 same manner as all other terminal station power transformers that are owned by Hydro. This is
15 essential to ensure an acceptable operational margin for station capacity.

16 It should be noted that all other specified system upgrades including the installation of
17 Supervisory Control and Data Acquisition equipment, the replacement of the control building,
18 and distribution system upgrades are not attributable to the classification of the station. Rather,
19 these upgrades are required to address station deficiencies that impact station operation and
20 reliable customer supply.

21 On the basis of the above, the reclassification of the system as a distribution is not appropriate
22 from either an operational or planning perspective.