Q. **Reference: 2026 GRA – Volume 1, s. 1.3.1, p.1.7**

Citation #1:

"On the Labrador Interconnected System, Hydro supplies customers in Labrador East and Labrador West with Recapture Energy and TwinCo Block Energy purchased from Churchill Falls."

Citation #2:

Labrador Interconnected System Transmission Expansion Study (Revised April 3, 2019), s.4 System Deficiencies

"The main focus of this report is to assess the system deficiencies driven by load growth on the LIS and develop least-cost, reliable transmission system expansion plans for ranges of loading conditions. The following system deficiencies were identified during this Expansion Study:

- Transmission Line Transfer Limits to Labrador East;
- Transmission Line Transfer Limits to Labrador West;
- Transformation Capacity – Wabush Substation; and
- Transmission Line Thermal Limits – 46 kV System."

Citation #3:

Labrador Interconnected System Network Additions Policy, page 18 of 23

"Hydro performs an annual assessment of the previous Transmission Expansion Plan for the LIS based on its current demand forecast. This assessment allows for the determination of the timing of transmission system additions and modifications necessary to ensure safe, reliable, and economical long-term operation. On this basis, a new Transmission Expansion Plan is developed.

Hydro filed its initial Transmission Expansion Plan for the LIS on October 31, 2018."

Citation #4:

Restriction on Load Additions on the Labrador Interconnected System – Update (April 7, 2021)

"It is Hydro's position, at this time, that the load restrictions for both Labrador East and Labrador West should remain in place; however, Hydro believes some modification may be appropriate in the future under specific circumstances, as detailed within." (p.1)

Preamble:

Considerable time has elapsed since the identification of these deficiencies and submission by Hydro of its revisions to the first Transmission Expansion Study for the LIS. It appears that Hydro has not revised the Transmission Expansion Study for the LIS since April 3, 2019, and provided only a single update to the Board on April 7, 2021, respecting its annual assessments of that study.

a) Please provide, in relation to each of these four deficiencies described in the Transmission Expansion Study a description of the status of each deficiency, including the extent to which the deficiency has been addressed to date or will be addressed by funds for which the Board has already issued approvals.

b) Please provide a description of any new alternatives to address these deficiencies that were not considered in the Transmission Expansion Study and that are currently under consideration or being implemented by Hydro.

c) Please provide a description of any new system deficiencies on the LIS that have been identified since the Transmission Expansion Study, Hydro's plans to address these deficiencies, and any consideration of alternatives.

d) Please confirm that no Transmission Expansion Study for the LIS has been prepared by Hydro since that submitted to the Board on April 3, 2019. If not confirmed, please provide copies of all transmission expansion studies or plans for the LIS prepared since that date.

e) Please provide all annual assessments of the previous Transmission Expansion Study, or subsequent studies (if any). If an annual assessment has not been prepared and

submitted to the Board the year prior to submission of the 2026 GRA, please explain why, and prepare and submit such an assessment.

f) If not in this proceeding, in which proceeding will these issues be addressed by NLH and the Board?

A. **a)** An update of each system deficiency is provided within the 2026 Newfoundland and Labrador System Operator ("NLSO") Annual Planning Assessment available on Newfoundland and Labrador Hydro's ("Hydro") OASIS website at the following link: NLSO 2026 Annual Planning Assessment.

The NLSO also performs, on behalf of Hydro, an assessment of all other transmission system facilities with a rated voltage of 46 kV and above that are under its operational control. This assessment is also conducted annually. The most recent assessment is provided as LAB-NLH-030, Attachment 1.

b) Please refer to Hydro's response to part a).

c) There have been no new system deficiencies identified on the Labrador Interconnected System since the completion of the Transmission Expansion Study.

d) A comprehensive Transmission Expansion Study encompassing the entire Labrador Interconnected System has not been completed by Hydro since the study filed with the Board of Commissioners of Public Utilities ("Board") on April 3, 2019.

Hydro is currently working with proponents and assessing transmission expansion options in both western and eastern Labrador. Hydro remains in the feasibility stage of developing a long-term plan to address the significant volume of load requests. The scope and content of any future applications have not yet been fully established and will be informed by the results of the transmission feasibility studies currently underway. Any future applications do

not have implications for the proposals within Hydro's 2026 General Rate Application ("GRA") regarding the 2027 Test Year.

Hydro assesses its plan to meet resource adequacy and system reliability requirements within the ongoing *Reliability and Resource Adequacy Study Review* proceeding ("*RRA Study Review*") before the Board. Hydro will address expansion requirements on the Labrador Interconnected System in a future filing as part of the *RRA Study Review.* It is Hydro's opinion that the information requested is not necessary for a satisfactory understanding of the matters to be considered in the 2026 GRA as required by the *Board of Commissioners of Public Utilities Regulations, 1996.*

e) Please refer to part a) for the most recent NLSO Annual Planning Assessments.

NL Hydro Report - 2026 Annual Planning Assessment

Doc # TP-R-106

Date: 2026/06/18

newfoundland labrador hydro

Executive Summary

Newfoundland and Labrador Hydro ("Hydro") ensures the coordinated development of a safe, reliable and economical transmission system for the benefit of users within the Province of Newfoundland and Labrador ("NL"). The Hydro transmission planning process involves the execution of power system studies to ensure compliance with Transmission Planning Criteria and to determine the timing of system additions and modifications.

The annual assessment of the NL Transmission System is performed by the Newfoundland and Labrador System Operator ("NLSO") and is summarized in a separate document.[1] The NL Transmission system is comprised of transmission facilities located in NL operating at a voltage level of 230 kV or higher within the Island Interconnected System ("IIS") and Labrador Interconnected System ("LIS") including the Labrador-Island Link ("LIL") and the Labrador Transmission Assets ("LTA"). This document provides an overview of Hydro's assessment, which addresses all other transmission system facilities with a rated voltage of 46 kV and above that are under the operational control of Hydro. The 2026 Annual Planning Assessment revealed the following:

- Steady state analyses were performed and the following violations were identified for the long-term planning horizon:
    - There were three contingency transmission equipment overloads:
        - **Loss of transmission line L32 (46 kV) to Labrador City results in an overload on line L33 by 2028/2029.**
        - **Loss of transmission line L33 (46 kV) to Labrador City results in an overload on line L32 by 2026/2027.**

          Hydro is currently advancing a plan to confirm the operational ratings of the 46 kV transmission lines in Labrador West. Once the ratings are confirmed, Hydro will reassess these line out contingencies. If the violations are confirmed, low-cost options to increase the thermal rating of L32 and L33 will be investigated, with a plan to address provided as part of the 2027 Annual Assessment.
        - **Loss of either transformer T1 or T2 at the Western Avalon Terminal Station will result in an overload on the remaining transformer by 2032/2033.** Hydro will perform further analysis with a more detailed load forecast to confirm the timing of the violation.
- There were no voltage violations identified as part of the pre-contingency and contingency analysis summarized in Section 5.
- The key takeaways from the Newfoundland Power ("NP") Loop Assessment include:
    - **Sunnyside/Stony Brook ("SSD/STB") 138 kV Loop:** The loss of SSD T4 results in an overload on SSD T1. This is mitigated by dispatching NP gas turbines at Wesleyville ("WES") (8 MW) and Greenhill ("GRH") (20 MW). In addition, transmission line 124L was opened at Clarenville to limit power flow from SSD toward Central Newfoundland, thereby further offloading SSD T1.

[1] NLSO Annual Transmission Assessment (2026) – TP-R-105.

The loss of STB T2 results in an overload on STB T1. This is mitigated by dispatching NP gas turbines at WES (8 MW) and GRH (20 MW). In addition, transmission line TL245 was opened at Howley, all local hydraulic generation was dispatched at their full ratings, and NP mobile gas turbine #2 ("MG2") was dispatched at Cobb's Pond ("COB").

Under the status quo scenario, and without consideration of several potential new industrial loads, the STB/SSD Loop can support forecast load growth to 2036, provided WES and GRH can supply at least 8 MW and 20 MW, respectively, and MG2 is available at COB.

Taking the large industrial load additions into account, NP's proposed replacement units at WES (15 MW) and GRH (30 MW) along with a third 125 MVA transformer at STB were found to resolve all planning violations.

Hydro and NP will continue to work together to evaluate the STB/SSD Loop system across a range of load and generation scenarios. The study will identify the least cost solution to accommodate the various scenarios.

- **Holyrood/Hardwoods/Oxen Pond ("HWD/OPD") 66 kV Loop:** The loss of either HRD T5, HWD T1 or OPD T1 results in various transformer overloads in HRD, HWD and OPD at normal operating voltages. The HRD and HWD overloads can be mitigated by implementing some combination of: a voltage management scheme at OPD, HWD and HRD; a 22 MW load curtailment of the electric boiler at Memorial University; the dispatch of all local NP generation; the dispatch of the HRD diesel units; and/or the dispatch of the HWD gas turbine. The OPD contingency could be mitigated by similar methods until 2030. However, commencing in 2031, the overload condition was unable to be mitigated.

  Hydro and NP will continue coordinated planning efforts to assess holistic, least-cost transmission supply options for the St. John's area, considering both 230 kV and 66 kV contingencies.

- **Stephenville/Bottom Brook ("SVL/BBK") 66 kV Loop:** An overload to BBK T2 was observed following the loss of either SVL T3 or TL209. This could be mitigated by dispatching the SVL Gas Turbine at 35 MW, which would also require closing a normally open ("N/O") point between transmission lines 400L and 404L. Further analysis would be required to implement a contingency protection scheme to avoid mis-coordination events if the N/O point were to be closed.

- The short circuit analyses were performed and it was confirmed that there are no issues with circuit breaker ratings in the near-term or long-term planning horizons.
- Transient stability analysis has been assessed as part of the operational studies in support of the Lower Churchill Project ("LCP") integration effort. The final operational study entitled "LCP Operational Study: Final LCP Operational Study ("Stage 4F") Report" was completed in June 2025.[2] The NLSO will also provide a plan for future transient stability analysis, as it is expected it may not be required on an annual basis, or will be triggered based on material changes to the IIS or LIS.

[2]http://www.pub.nl.ca/applications/NLH2025AvalonCombustionMarch/report/From%20NLH%20-%20Final%20Lower%20Churchill%20Project%20Operational%20(Stage%204F)%20Study%20-%202025-08-12.PDF

Table of Contents

1 Introduction

The Hydro Transmission Planning Process involves the execution of power system studies to ensure compliance with Transmission Planning Criteria and to determine the timing of system additions and modifications. The 2026 Annual Planning Assessment covers the period extending to the winter of 2035/36. Cases are assessed to investigate the capability of the transmission system to meet peak load and to meet firm Maritime Link export commitments of 250 MW during non-peak load conditions, and the Emera block commitment of 158 MW during peak load conditions.[3]

This report addresses the NL Interconnected Transmission Systems, which are comprised of transmission facilities located in NL, operating at a voltage level of 46 kV or higher, but less than 230 kV. It is noted that NL Transmission System facilities, operating at a voltage level of 230 kV or higher, are addressed separately as part of the NLSO 2026 Annual Planning Assessment.[4] Analysis is performed to ensure compliance with appropriate criteria, including those defined in TP-S-007 - NLSO Standard – "Transmission Planning Criteria".

Maps of the IIS and LIS are provided in Appendix A.

2 Selection of Study Cases

System models have been developed to reflect the latest load forecast with completed system changes including proposed additions/modifications for future years ranging to 2035. The following system additions are included in the 2035/36 study cases:

- The Final Under Frequency Load Shedding ("UFLS") Scheme is implemented to allow for increased power transfer over the LIL
- The LIL is operating in Bipole Mode up to its rated capacity of 900 MW (Rdc = 19.29 ohm)
    - All filter banks are available at each of Muskrat Falls and Soldiers Pond Converter Stations
    - Electrode lines and electrode sites are in service
- Churchill Falls recall power (less Labrador loads) is available to send to the Island
- There are two 60 MVAr line reactors installed on the Muskrat Falls end of 315 kV lines L3101 and L3102
- There are two Soldiers Pond 175 MVAr synchronous condensers in service for analysis (the third unit is available)
- The ML exports at Bottom Brook Terminal Station 2 ("BBKTS2") are set to 250 MW in the light load cases. They are set to meet the firm export commitment of 158 MW Emera block in the peak load cases, in alignment with Resource Planning assumptions.
- Holyrood Thermal Generating Station is out of service (including Unit 3 operating as a synchronous condenser)
- Holyrood gas turbine G4 is in service

[3] In alignment with Resource Planning assumptions.

[4] The NLSO 2026 Annual Planning Assessment addresses the NL Transmission System, which is comprised of transmission facilities located within the IIS and LIS, operating at a voltage level of 230 kV or higher, including, the LIL, and LTA.

- Proposed new Holyrood Gas Turbine #2 Plant (3 x 50 MW) is in service in order to meet forecasted load growth
- 100 MW of additional future generation expansion, modelled as a negative load at the Bay d'Espoir 230 kV bus, was added in order to meet forecasted load growth and maintain reserves
- Stephenville ("SVL") gas turbine is in service as a generator in peak load cases (in-service as synchronous condenser in light load cases)
- Hardwoods ("HWD") gas turbine is in service as a generator in peak load cases (in-service as a synchronous condenser in light load cases)
- Newfoundland Power's new 138 kV transmission line 148L between Lewisporte and Boyd's Cove Substations is in service
- Newfoundland Power's 138 kV transmission line 100L between Clarenville and Sunnyside Substations has been upgraded
- A new curtailable electric boiler load has been installed at Memorial University (both Light and Peak load cases), which is curtailed in Peak load cases
- Valentine Terminal Station is in service
- Wabush Substation has been renamed to Jean Lake Terminal Station with bus B4 being renamed to bus B1 and bus B5 being renamed to bus B2. Upgrades include:
    - Transformers T4 and T6 have been removed from service
    - A new 20/26.7/33.3 MVA transformer T2 has been connected to bus B3
    - A bus tie has been added to connect buses B2 and B3, which is normally open

The following load flow plots for the Year Ten (2035/36) cases are provided in Appendix B:

- 2035/36 Peak Load Conditions
- 2035 Light Load Conditions

3 Special Considerations

Special considerations for this study period are discussed in the sections below.

3.1 Operational Studies

Over the past several years, Hydro has been completing a set of operational studies as part of the integration effort of the LCP assets into the NL Transmission System. The objective of these studies was to identify operating limits or guidelines to allow for the development of instructions to be used by the NLSO. These operational studies included assessments of the transient stability of the IIS and LIS with all LCP assets fully integrated. The final study entitled "LCP Operational Study: Final LCP Operational Study ("Stage 4F") Report" was completed in June 2025.[5]

[5]http://www.pub.nl.ca/applications/NLH2025AvalonCombustionMarch/report/From%20NLH%20-%20Final%20Lower%20Churchill%20Project%20Operational%20(Stage%204F)%20Study%20-%202025-08-12.PDF

3.2 Labrador Incremental Load

Hydro is currently undertaking a process to investigate large incremental customer load requests in Labrador. These incremental requests are beyond the baseline forecast and outside of the scope of any Annual Assessment.

In 2024, Hydro received a number of formal written large load requests in Western Labrador to support existing operations and future critical mineral projects. To assess the feasibility of serving this load, Hydro undertook a Transmission Feasibility Study. The study was funded by participating customers and The Government of Canada through the Smart Renewables and Electrification Pathways Program ("SREPs").

From the study, a single 735 kV transmission line was the identified solution to support Labrador West load growth. In 2026, Hydro will continue to work with participating customers to advance Front-End Engineering Design for the proposed transmission project.

The proposed project consists of a single circuit 735kV transmission line; connection to the existing Churchill Falls facility; and a new high-voltage alternating current ("HVac") Terminal Station at Flora Lake in Labrador West. The line and station would initially operate at a lower voltage, transitioning to higher operating voltages as long-term industrial demand grows.

An objective of the upcoming Front-End Engineering Design work will be to determine the necessary station equipment at Flora Lake and the amount of load that can be served for each proposed operating level (230 kV, 315 kV and 735 kV) and thereby determining thresholds for progression through operating stages.

Hydro continues to work with Hydro Quebec ("HQ") to assess potential solutions involving an interconnection between Labrador West and the HQ transmission system.

Hydro continues to assess the availability of non-firm supply to Labrador East and West for potential customers willing to be interruptible.

4 Load Forecast

The 2026 Annual Planning Assessment is based upon the following load forecasts prepared by the Market Analysis and Load Forecasting Section, Resource and Production Planning Department of Newfoundland and Labrador Hydro:

- IIS Peak Demand Forecast System – prepared in June 2025; and
- LIS Long Term Load Forecast – prepared in June 2025.

The IIS and LIS P90 forecasted peaks are summarized in Table 1.

Table 1 – Peak Load Forecasts (P90) - IIS and LIS

Forecasted Demand (MW)[6]			
Year[7]	Island Interconnected System (IIS)	Labrador Interconnected System (LIS)	
		Lab East	Lab West
2025/26	1,804	81.1	382.1
2026/27	1,819	82.5	382.7
2027/28	1,833	84.2	383.1
2028/29	1,856	84.8	383.5
2029/30	1,874	103.2	384.0
2030/31	1,899	103.9	384.5
2031/32	1,917	104.6	385.2
2032/33	1,938	105.5	385.9
2033/34	1,961	106.4	386.7
2034/35	1,987	107.5	387.7
2035/36	2,015	108.7	388.8

5 Steady State Analysis

The steady state analysis consists of pre-contingency and contingency analysis. The pre-contingency analysis is performed to ensure that with all equipment in service under normal operation, power flows in all elements are at or below normal rating and voltages are within acceptable limits. The contingency analysis performs the same checks, but with each major transmission element removed from service. The ratings are defined as per TP-S-001 - NLSO Facilities Rating Guide. The results of the steady state analysis are described in the sections below.

Load flow plots during normal operation of the NL Transmission System for Year Ten (2035/36) are provided in Appendix B.

5.1 Pre-Contingency Transmission Line Loadings

A review of the pre-contingency peak cases for long-term planning horizons indicates that no transmission line overloads are expected over the next 10 years.

5.2 Summary of Pre-Contingency Transformer Peak Loads

Table 2 provides a summary of the pre-contingency transformer loading levels in Year Ten (2035/36). A review of the pre-contingency peak cases for long-term horizons indicates that there are no transformer overloads.

[6] These forecasts do not include NLH system transmission losses or station service load requirements.

[7] The peak is assumed to occur sometime between December and March of the following year.

Table 2 – Pre Contingency Transformer Load Levels[1]				
Station	**Unit**	**Rating (MVA)**	**2035/36**	
			MVA	**%**
Barachoix	T1	10/13.3/16.7	7.67	45.9%
Bay d'Espoir	T10	15/20/25	10.17	40.7%
	T11	10/13.3/16.7	6.41	38.4%
	T12	15/20/25	10.10	40.4%
Bear Cove	T1	10/13.3/16.7	5.11	30.6%
Berry Hill	T1	15/20/25	2.15	8.6%
Bottom Brook[2]	T1	25/33.3/41.7	34.40	88.1%
	T3	25/33.3/41.7	8.26	19.8%
Bottom Waters	T1	10/13.3/16.7	8.88	53.2%
Buchans	T1[3]	40/53.3/66.6	6.02	9.2%
	T2	5/6.6/8.3	3.12	37.6%
Coney Arm	T1	2.5/3.3/4	0.10	2.6%
Conne River	T1	2.5/3.3	2.79	84.4%
Corner Brook Frequency Converter	T1	21/28	9.00	32.2%
	T2	21/28	9.19	32.8%
Cow Head	T1	5/6.7/8.3	2.08	25.1%
Daniel's Harbour	T1	1/1.3	0.58	44.4%
	T2	1/1.3	0.57	44.0%
Deer Lake	T1	25/33.3/41.7	10.69	25.7%
	T2	45/60/75	28.69	38.2%
Doyles	T1	25/33.3/41.7	32.34	77.6%
English Harbour West	T1	5/6.7	2.99	44.6%
Farewell Head	T1	10/13.3/16.7	7.51	45.0%
Glenburnie	T1	2.5/3.3	3.09	93.5%
Grand Falls Frequency Converter	T1	30/40/50	23.12	46.2%
	T2	30/40/50	24.03	48.1%
	T3	30/40/50	20.43	40.9%
Grandy Brook	T1	7.5/10/12.5	4.91	39.2%
Hampden	T1	2.5/3.3/4	1.85	46.3%
Happy Valley	T1	30/40/50	35.34	70.7%
	T2	15/20/25//28	19.71	70.4%
	T4	15/20/25//28	19.71	70.4%
	T5	30/40/50	34.54	69.1%
Hardwoods	T1	75/100/125	107.50	86.0%
	T2[3]	40/53.3/66.6	54.86	84.5%
	T3[3]	40/53.3/66.6	59.23	91.2%
	T4[3]	75/100/125	106.65	87.5%
Hawke's Bay[4]	T1	5/6.7	***NOTE 4***	
	T2	2.5/3.3		
Holyrood	T5	15/20/25	20.63	82.5%
	T10	15/20/25	20.09	80.4%
	T6[3]	25/33.3/41.7	10.12	24.6%
	T7	75/100/125	28.59	22.9%
	T8	75/100/125	29.38	23.5%
Howley[5]	T2	7.5/10/12.5	3.71	29.7%
Jackson's Arm	T1	5/6.6/8.3	1.41	17.0%

Main Brook	T1	1.5	0.74	49.5%
Massey Drive	T1[3]	75/100/125	58.63	47.6%
	T2[3]	40/53.3/66.7	39.09	61.1%
	T3	75/100/125	69.28	55.4%
Muskrat Falls TS1	T1	2	0.07	3.7%
Muskrat Falls TS2	T5	75/100/125	58.97	47.2%
	T6	75/100/125	58.83	47.1%
Oxen Pond	T1	150/200/250	180.61	72.2%
	T2	75/100/125	87.10	69.7%
	T3	150/200/250	180.61	72.2%
Parson's Pond	T1	1/1.3	0.75	57.9%
Peter's Barren	T1	15/20/25	2.31	9.2%
Plum Point	T1	10/13.3/16.7	3.91	23.4%
Quartzite	T1	15/20/25	18.63	74.5%
	T2	15/20/25	18.51	74.0%
Rocky Harbour	T2	5/6.6/8.3	5.05	60.8%
Roddickton Woodchip	T2	5	2.86	57.3%
South Brook[6]	T1	5/6.6/8.3	8.28	99.7%
Stephenville[7]	T3	40/53.3/66.7	31.51	47.2%
Stony Brook	T1[3]	75/100/125	103.24	84.7%
	T2[3]	75/100/125	102.00	83.6%
St. Anthony Airport[8]	T1	15/20/25	7.79	31.2%
St. Anthony Diesel Plant[8]	T1	15/20/25	4.05	16.2%
Sunnyside	T1	75/100/125	76.33	61.1%
	T4	75/100/125	76.85	61.5%
	T5	15/20/25	10.47	41.9%
Vanier	T1	15/20/25	14.30	57.2%
	T2	15/20/25	14.52	58.1%
Wabush Terminal Station	T1	35/47/65	37.49	57.7%
	T2	35/47/65	38.66	59.5%
	T3	35/47/65	38.05	58.5%
	T4	75/100/125	81.32	65.1%
	T5	75/100/125	81.70	65.4%
	T6	35/47/65	37.81	58.2%
	T7	50/66.6/83.3	54.78	65.8%
	T8	50/66.6/83.3	53.27	64.0%
Wabush Substation (AKA Jean Lake Terminal Station)[9]	T1	20/26.7/33.3	14.53	43.6%
	T2	20/26.7/33.3	13.41	40.3%
Western Avalon	T1[3]	15/20/25	16.84	70.8%
	T2[3]	15/20/25	17.15	72.2%
	T3[3]	25/33.3/41.7	17.98	44.2%
	T4[3]	25/33.3/41.7	17.88	44.0%
	T5	75/100/125	52.58	42.1%
Wiltondale	T1	1.5	0.08	5.2%

Notes:

1. Generator step up transformers and converter transformers are not included as these units have been sized for the full unit capability.
2. Bottom Brook Terminal Station #1 configuration has been updated to supply the Emera Station Service load from transformer T1 only.
3. There are a few transformers which must be derated due to their active tap position.
4. The Hawke's Bay system has a transformer peak of 6.44 MW and is typically supplied by the 15 MVA mobile transformer during the winter season.
5. Rattle Brook hydro generator G1 is not in-service, but is available for capacity support at 4 MW.
6. South Brook T1 loading based on Distribution System Peak forecast (Spring 2025).
7. Stephenville Gas Turbine is in-service for 25 MW.
8. St. Anthony Diesel Plant is in-service for 9.7 MW.
9. An additional 33.3 MVA transformer (Jean Lake Terminal Station T2) will be installed prior to Year 10 (2035/36).

5.3 Review of Radial Systems

Radial systems that are impacted by loss of a transmission line are summarized in Table 3.

Table 3 – Radial Transmission Systems and Impact of Line Loss

TL #	kV	From	To	Impact
214	138	Bottom Brook	Doyles	Loss of load in Doyles/Port-aux-Basques area. Newfoundland Power owns mobile gas turbine and mobile diesel located at Grand Bay as well as Rose Blanche hydro site which can supply limited load in area.
215	66	Doyles	Grand Bay	Loss of load in Port-aux-Basques area. Newfoundland Power owns mobile gas turbine and mobile diesel located at Grand Bay as well as Rose Blanche hydro site which can supply limited load in area.
220	69	Bay d'Espoir	Barachoix	Loss of load on the Connaigre Peninsula.
221	66	Peter's Barren	Hawke's Bay	Loss of load in the Hawke's Bay/Port Saunders area. Hydro maintains a 5 MW diesel plant at Hawke's Bay that provides limited back up.
226	66	Deer Lake	Berry Hill	Loss of load in the area known as Bonne Bay.[8] TL226 can be isolated in various locations such that Bonne Bay area loads can be supplied from Berry Hill following line switching.
227	66	Berry Hill	Daniel's Harbour	Loss of load from Sally's Cove to Parson's Pond. TL227 can be isolated in various locations such that loads from Sally's Cove to Daniel's Harbour can be supplied from either Berry Hill or Peter's Barren following line switching.
229	66	Wiltondale	Glenburnie	Loss of load on the western arm of Bonne Bay to the community of Woody Point.
239	138	Deer Lake	Berry Hill	Loss of load on Great Northern Peninsula north of Bonne Bay. Hydro maintains 5 MW diesel plant at Hawke's Bay and 9.7 MW diesel plant at St. Anthony. With TL239 out switching on the 66 kV will permit up to 25 MVA to be supplied from Deer Lake on the 66 kV TL226 to Berry Hill and then through the Berry Hill 138/66 kV transformer to the 138 kV system via TL259.
241	138	Peter's Barren	Plum Point	Loss of load on Great Northern Peninsula north of Peter's Barren. Hydro maintains 9.7 MW diesel plant at St. Anthony that provides limited back up.
244	138	Plum Point	Bear Cove	Loss of load on Great Northern Peninsula Bear Cove and north. Hydro maintains 9.7 MW diesel plant at St. Anthony that provides limited back up.
250	138	Bottom Brook	Grandy Brook	Loss of load in Burgeo.
251	69	Howley	Hampden	Loss of load in White Bay.[9]
252	69	Hampden	Jackson's Arm	Loss of load in Jackson's Arm area of White Bay.
254	66	Boyd's Cove	Farewell Head	Loss of load in Fogo and Change Islands.
256	138	Bear Cove	St. Anthony Airport	Loss of load in St. Anthony – Roddickton area. Hydro maintains 9.7 MW diesel plant at St. Anthony that provides limited back up.
257	69	St. Anthony Airport	Roddickton	Loss of load in Main Brook and Roddickton.
259	138	Berry Hill	Peter's Barren	Loss of load on Great Northern Peninsula north of Parson's Pond. Hydro maintains 5 MW diesel plant at Hawke's Bay and 9.7 MW diesel plant at St. Anthony. With TL259 out switching on the 66 kV will permit up to 25 MVA to be supplied from Berry Hill on the 66 kV TL227 to Peter's Barren and then through the Peter's Barren 138/66 kV transformer to the 138 kV system via TL241.
260	138	Seal Cove	Bottom Waters	Loss of load on the Baie Verte Peninsula.
261	69	St. Anthony Airport	St. Anthony Diesel	Loss of load in the St. Anthony area. Hydro maintains 9.7 MW diesel plant at St. Anthony that provides limited back up.
262	66	Peter's Barren	Daniel's Harbour	Loss of load in Daniel's Harbour area. Switching on the 66 kV results in supply of Daniel's harbour via TL227.
264	66	Buchans	Duck Pond	Loss of industrial customer load.
271	69	Star Lake	Valentine	Loss of industrial customer load.

[8] The area known as Bonne Bay includes the following terminal stations: Rocky Harbour, Wiltondale and Glenburnie.

[9] The area known as White Bay includes the following terminal stations: Jackson's Arm, Hampden, Coney Arm and Taylor's Pond.

L1303	138	Muskrat Falls	Happy Valley	The system has been reconfigured as part of the Muskrat Falls – Happy Valley interconnection, but remains a radial system. Loss of load Upper Lake Melville area. Hydro maintains a 25 MW gas turbine in Happy Valley Terminal Station that provides limited back up.

5.4 Review of Steady State Contingencies

5.4.1 Line Out Contingencies

A review of the steady state line out contingency analysis concluded that there are two violations to the Transmission Planning Criteria following the loss of the following Hydro owned equipment:

- All transmission lines (46 kV to 138 kV)
- All Shunt Device (Capacitor Banks and Reactors)
- All generation units

Violations:

Table 4 – Line Out Contingencies – Violations		
Contingency	**Violation**	**Year of Violation**
Loss of L32 (46 kV)	Overload of L33 (46 kV)	2028/2029
Loss of L33 (46 kV)	Overload of L32 (46 kV)	2026/2027

Transmission L32 and L33 are both 46 kV lines that supply the Quartzite ("QTZ") and Vanier ("VAN") Terminal Stations in Labrador City. The QTZ and VAN Terminal Stations are also connected, forming a 46 kV loop. The advancement of these violations is due to load growth in the Labrador City Area.

Hydro is currently advancing a plan to confirm the operational ratings of the 46 kV transmission lines in Labrador West.[10] Once the ratings are confirmed, Hydro will reassess these line out contingencies. If the violations are confirmed, low-cost options to increase the thermal rating of L32 and L33 will be investigated, with a plan to address provided as part of the 2027 Annual Assessment.

5.4.2 Summary of Multi Transformer Station Contingency Loading

Table 5 provides the transformer loading for each multi transformer station with the largest transformer out of service.

[10] Due to limited supporting documentation for the 46 kV transmission line assets in Labrador West, the models for the lines were developed based on conservative assumptions. Prior to recommending capital upgrades, Hydro is working to confirm these assumptions via the execution of a LiDAR survey, and the development of a PLS Cadd model.

Table 5 – Multi Transformer Contingency Load Levels[1]

Station	Unit	Rating MVA	2035/2036	
			MVA	%
Bay d'Espoir	T10	15/20/25	*Out-of-Service*	
	T12	15/20/25	20.27	81.1%
Bottom Brook[2,3]	T1	25/33.3/41.7	39.22	99.1%
	T3	25/33.3/41.7	*Out-of-Service*	
Daniel's Harbour	T1	1/1.3	*Out-of-Service*	
	T2	1/1.3	1.15	88.4%
Grand Falls Frequency Converter	T1	30/40/50	*Out-of-Service*	
	T2	30/40/50	30.69	61.4%
	T3	30/40/50	34.62	69.2%
Happy Valley[4]	T1	30/40/50	*Out-of-Service*	
	T2	15/20/25//28	22.49	80.32%
	T4	15/20/25//28	22.49	80.32%
	T5	30/40/50	39.41	78.81%
Hawke's Bay[5]	T1	5/6.7	*Note 5*	
	T2	2.5/3.3		
Holyrood[6]	T5	15/20/25	6.28	25.1%
	T10	15/20/25	*Out-of-Service*	
Massey Drive[2,7]	T1	75/100/125	*Out-of-Service*	
	T2	40/53.3/66.7	55.22	87.4%
	T3	75/100/125	97.87	78.4%
Muskrat Falls TS2[8]	T5	75/100/125	*Out-of-Service*	
	T6	75/100/125	118.00	94.4%
Wabush Terminal Station[9]	T1 (bus B3)	35/47/65	54.98	84.6%
	T2 (bus B3)	35/47/65	56.68	87.2%
	T3 (bus B3)	35/47/65	55.80	85.8%
	T8 (bus B3)	50/66.6/83.3	*Out-of-Service*	
	T4 (bus B4)	75/100/125	*Out-of-Service*	
	T5 (bus B4)	75/100/125	120.70	96.6%
	T6 (bus B4)	35/47/65	55.87	86.0%
	T7 (bus B4)	50/66.6/83.3	80.94	97.2%
Wabush Substation (AKA Jean Lake Terminal Station)[10]	T1	20/26.7/33.3	*Out-of-Service*	
	T2	20/26.7/33.3	27.94	83.9%
Western Avalon[2,11]	T1	15/20/25	*Out-of-Service*	
	T2	15/20/25	**25.38**	**106.8%**

Notes:

1. The loading provided is with the largest transformer in the station removed from service and backup generation online where applicable.
2. There are a few transformers which must be derated due to their active tap position.
3. Bottom Brook 138 kV bus tie switch B2B3 closed. Bottom Brook Terminal Station #1 configuration has been updated to supply the Emera Station Service load from transformer T1 only.
4. The Happy Valley GT is in-service as a generator, providing 25 MW of capacity support.
5. The Hawke's Bay system is typically supplied by 15 MVA mobile transformer during the winter season.
6. The 66kV loop between Holyrood and Hardwoods must be opened at 52L to avoid the overload of transformer T5. It is noted that opening the loop leads to Hardwoods transformer T3 being loaded to 95.5%.
7. MDR 66 kV bus tie B2B4-1 closed.
8. MFATS2 25 kV bus tie B1B2 closed.
9. Due to the split bus configuration of the WABTS, the transformer capacity is evaluated on a per-bus basis (i.e. bus tie B3B4 remains open).

10. Jean Lake Terminal Station 46 kV bus tie B2B3 closed.
11. The Hardwoods Gas Turbine is in-service as a generator, providing 50 MW of capacity support.

Violation:

The loss of either transformer T1 or T2 at the Western Avalon Terminal Station will result in an overload on the remaining transformer by 2032/2033. Hydro will perform further analysis with a more detailed load forecast to confirm the timing of the transformer overload.

5.4.3 Summary of Looped System Transformer Contingency Loading

Island Looped Systems

Newfoundland Power executed a 10-year assessment (2027-2036) of Island looped systems that are supplied by Hydro's power transformers (Appendix C).[11] The area modelling was based on Hydro's 2036 P90 Forecast, which served as a scaling factor for NP's standard 2030 P90 Infeed Forecast. The following are the key takeaways for the NP Loop Assessment:

- **Sunnyside/Stony Brook ("SSD/STB") 138 kV Loop:**[12] The loss of SSD T4 results in an overload on SSD T1. This is mitigated by dispatching NP gas turbines at Wesleyville ("WES") (8 MW) and Greenhill ("GRH") (20 MW).[13] In addition, transmission line 124L was opened at Clarenville to limit power flow from SSD toward Central Newfoundland, thereby further offloading SSD T1.

  The loss of STB T2 results in an overload on STB T1. This is mitigated by dispatching NP gas turbines at WES (8 MW) and GRH (20 MW). In addition, transmission line TL245 was opened at Howley, all local hydraulic generation was dispatched at their full ratings, and NP mobile gas turbine MG2 was dispatched at Cobb's Pond ("COB").

  Under the status quo scenario, and without consideration of several potential new industrial loads,[14] the STB/SSD Loop can support forecast load growth to 2036, provided WES and GRH can supply at least 8 MW and 20 MW, respectively, and MG2 is available at COB.

  Taking the large industrial load additions into account, NP's proposed replacement units at WES (15 MW) and GRH (30 MW) along with a third 125 MVA transformer at STB were found to resolve all planning violations.

  Hydro and NP will continue to work together evaluate the STB/SSD Loop system across a range of load and generation scenarios. The study will identify the least cost solution to accommodate the various scenarios.

- **Holyrood/Hardwoods/Oxen Pond ("HWD/OPD") 66 kV Loop:** The loss of either HRD T5, HWD T1 or OPD T1 results in various transformer overloads in HRD, HWD and OPD at normal operating voltages. The HRD and HWD overloads can be mitigated by implementing some combination of: a voltage management scheme at OPD, HWD and HRD; a 22 MW load curtailment of the electric

[11] NP 138kV & 66kV Loop Assessments: 2027-2036.

[12] This assumes the construction of a new 138kV transmission line 148L between Lewisporte and Boyd's Cove in 2027 to mitigate existing 66 kV voltage violations at Boyd's Cove, Summerford and Twillingate.

[13] These two gas turbines are approaching their end of life.

[14] There are approximately 90-100 MW of proposed industrial loads currently under evaluation in the SSD/STB 138 kV Loop.

boiler at MUN; the dispatch of all local NP generation; the dispatch of the HRD diesel units; and/or the dispatch of the HWD gas turbine. The OPD contingency could be mitigated by similar methods until 2030. However, commencing in 2031, the overload condition was unable to be mitigated.

Hydro and NP will continue coordinated planning efforts to assess holistic, least-cost transmission supply options for the St. John's area, including both 230 kV and 66 kV contingencies.

- **Stephenville/Bottom Brook ("SVL/BBK") 66 kV Loop:** An overload to BBK T2 was observed following the loss of either SVL T3 or TL209. This could be mitigated by dispatching the SVL Gas Turbine at 35 MW, which would also require closing a normally open ("N/O") point between transmission lines 400L and 404L. Further analysis would be required to implement a contingency protection scheme to avoid mis-coordination events if the N/O point were to be closed.

Labrador City Looped System

The Labrador City ("Lab City") loop is comprised of 46 kV sub-transmission between the Quartzite and Vanier Terminal Stations. There are tie switches on the 25 kV distribution system which allows for the load to be transferred between these two stations.

Table 6: Transformer Capacity – Lab City Loop

Transformer	Transformer Rating (MVA)
QTZ T1	25
QTZ T2	25
VAN T1	25
VAN T2	25
Transformer Capacity (N-0)	**100**
Firm Transformer Capacity (N-1)	**75**

The total Labrador City load for 2035/2036 is 67.7 MVA, or 90.3% of the firm transformer capacity of the looped system.

5.4.4 Generator and Synchronous Condenser Contingency Analysis

There are no violations to the Transmission Planning Criteria following the loss of any single generator or synchronous condenser. The NLSO has developed maximum generator unit guidelines to prevent under frequency load shedding ("UFLS") for loss of a unit. These limits have become less restrictive with the addition of the LIL and ML frequency controllers.

5.4.5 Shunt Contingency Analysis

There are no violations to the Transmission Planning Criteria following the loss of any other shunt device.

6 Short Circuit Analysis

Short circuit analysis is required to ensure that the prospective short circuits for equipment locations do not exceed the interrupting capacity of the circuit breakers used to protect the equipment. All circuit breakers with known asset information were assessed.[15] Short circuit analysis was performed, and the results indicate that there are no circuit breaker rating violations.

7 Stability Analysis

As discussed in previous sections, Hydro has been undertaking operational studies to assess the transient stability of the NL Transmission System. During this time, the dynamic analysis of the NL Transmission System has remained outside of the scope of the annual assessment process. The final operational study entitled "LCP Operational Study: Final LCP Operational Study ("Stage 4F") Report" was completed in June 2025.[16] The NLSO will provide a plan for future transient stability analysis, as it is expected it may not be required on annual basis or will be triggered based on material changes to the IIS or LIS.

8 Conclusions

The conclusions for the 2026 Annual Planning Assessment are stated as follows:

- Steady state analyses were performed and the following violations were identified for the long-term planning horizon:
    - There were three contingency transmission equipment overloads:
        - **Loss of transmission line L32 (46 kV) to Labrador City results in an overload on line L33 in the year 2028/2029.**
        - **Loss of transmission line L33 (46 kV) to Labrador City results in an overload on line L32 in the year 2026/2027.**

          Hydro is currently advancing a plan to confirm the operational ratings of the 46 kV transmission lines in Labrador West. Once the ratings are confirmed, Hydro will reassess these line out contingencies. If the violations are confirmed, low-cost options to increase the thermal rating of L32 and L33 will be investigated, with a plan to address provided as part of the 2027 Annual Assessment.
        - **Loss of either transformer T1 or T2 at the Western Avalon Terminal Station will result in an overload on the remaining transformer by 2032/2033.** Hydro will perform further analysis with a more detailed load forecast to confirm the timing of the violation.

[15] Planned outages are required to gather the unknown asset information, but will be collected during scheduled maintenance to avoid any unnecessary customer impact.

[16] http://www.pub.nl.ca/applications/NLH2025AvalonCombustionMarch/report/From%20NLH%20-%20Final%20Lower%20Churchill%20Project%20Operational%20(Stage%204F)%20Study%20-%202025-08-12.PDF

- There were no voltage violations identified as part of the pre-contingency and contingency analysis summarized in Section 5.
- The key takeaways from the Newfoundland Power Loop Assessment include:
    - **Sunnyside/Stony Brook ("SSD/STB") 138 kV Loop:** The loss of SSD T4 results in an overload on SSD T1. This is mitigated by dispatching NP gas turbines at WES (8 MW) and GRH (20 MW). In addition, transmission line 124L was opened at Clarenville to limit power flow from SSD toward Central Newfoundland, thereby further offloading SSD T1.

      The loss of STB T2 results in an overload on STB T1. This is mitigated by dispatching NP gas turbines at WES (8 MW) and GRH (20 MW). In addition, transmission line TL245 was opened at Howley, all local hydraulic generation was dispatched at their full ratings, and NP mobile gas turbine MG2 was dispatched at COB.

      Under the status quo scenario, and without consideration of several potential new industrial loads, the STB/SSD Loop can support forecast load growth to 2036, provided WES and GRH can supply at least 8 MW and 20 MW, respectively, and MG2 is available at COB.

      Taking the large industrial load additions into account, NP's proposed replacement units at WES (15 MW) and GRH (30 MW) along with a third 125 MVA transformer at STB were found to resolve all planning violations.

      Hydro and NP will continue to work together evaluate the STB/SSD Loop system across a range of load and generation scenarios. The study will identify the least-cost solution to accommodate the various scenarios.
    - **Holyrood/Hardwoods/Oxen Pond ("HWD/OPD") 66 kV Loop:** The loss of either HRD T5, HWD T1 or OPD T1 results in various transformer overloads in HRD, HWD and OPD at normal operating voltages. The HRD and HWD overloads can be mitigated by implementing some combination of: a voltage management scheme at OPD, HWD and HRD; a 22 MW load curtailment of the electric boiler at Memorial University; the dispatch of all local NP generation; the dispatch of the HRD diesel units; and/or the dispatch of the HWD gas turbine. The OPD contingency could be mitigated by similar methods until 2030. However, commencing in 2031, the overload condition was unable to be mitigated.

      Hydro and NP will continue coordinated planning efforts to assess holistic, least-cost transmission supply options for the St. John's area, including both 230 kV and 66 kV contingencies.
    - **Stephenville/Bottom Brook ("SVL/BBK") 66 kV Loop:** An overload to BBK T2 was observed following the loss of either SVL T3 or TL209. This could be mitigated by dispatching the SVL Gas Turbine at 35 MW, which would also require closing a normally open ("N/O") point between transmission lines 400L and 404L. Further analysis would be required to implement a contingency protection scheme to avoid mis-coordination events if the N/O point were to be closed.
- The short circuit analyses were performed and it was confirmed that there are no issues with circuit breaker ratings in the near-term or long-term planning horizons.

- Transient stability analysis has been assessed as part of the operational studies in support of the LCP integration effort. The final operational study entitled "LCP Operational Study: Final LCP Operational Study ("Stage 4F") Report" was completed in June 2025. The NLSO will also provide a plan for future transient stability analysis, as it is expected it may not be required on an annual basis, or will be triggered based on material changes to the IIS or LIS.

9 Reference Documents

1. 2026 NLSO Annual Assessment (TP-R-105)
2. Operational Study – Stage 4C: Labrador Transfer Analysis (TP-R-034)
3. Operational Study – Stage 4F: Final LCP Operational Study (TP-R-097)
4. Labrador Interconnected System - Expansion Study (TP-R-019)
5. NLSO Standard – Transmission Facilities Rating Guide (TP-S-001)
6. NLSO Standard – Annual Planning Assessment (TP-S-003)
7. NLSO Standard – Transmission Planning Criteria (TP-S-007)
8. Newfoundland Power 138 kV & 66 kV Loop Assessments: 2027 – 2036 (Rev. 4)

APPENDIX A

Island and Labrador Interconnected Systems

Figure 1 – Island Interconnected System

Figure 2 – Labrador Interconnected System

APPENDIX B

Load Flow Plots Primary Transmission System Year Ten (2035/36) – Peak and Light Case

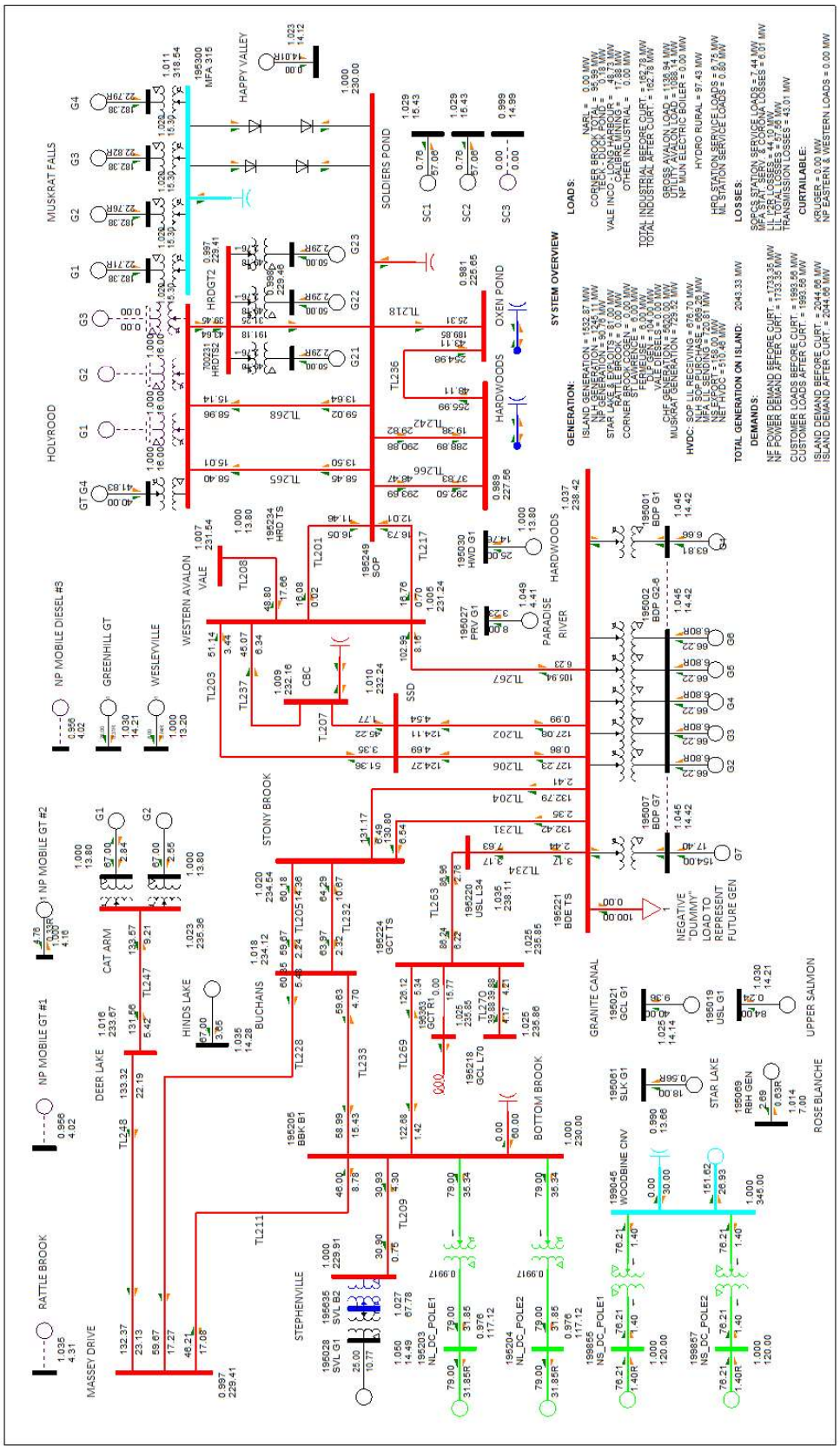

Figure 3 – IIS (2035/36 Peak Conditions – ML Exports (Emera Block – 158 MW))

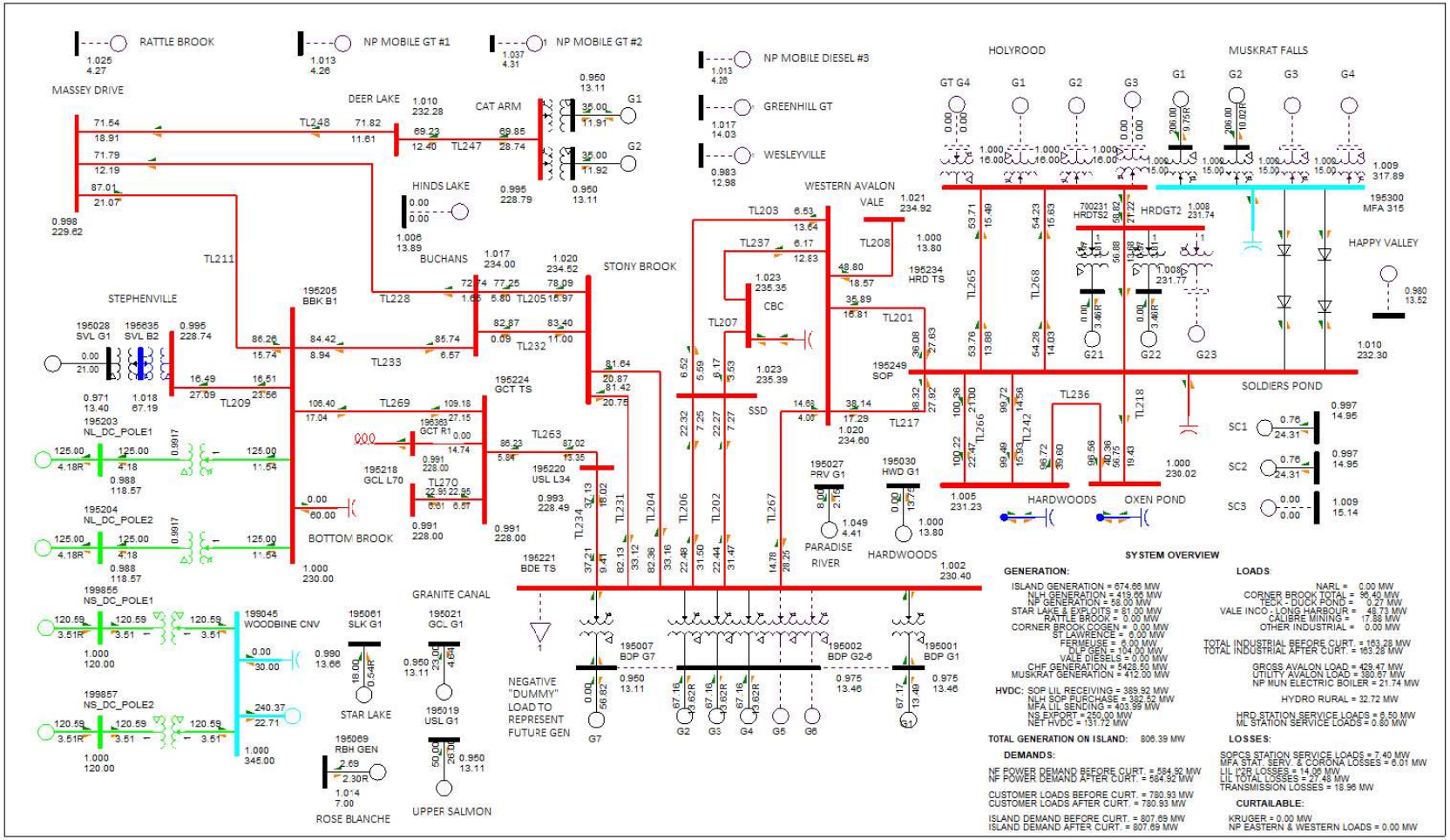

Figure 4 – IIS (2035 Light Conditions – ML Firm Exports (250 MW))

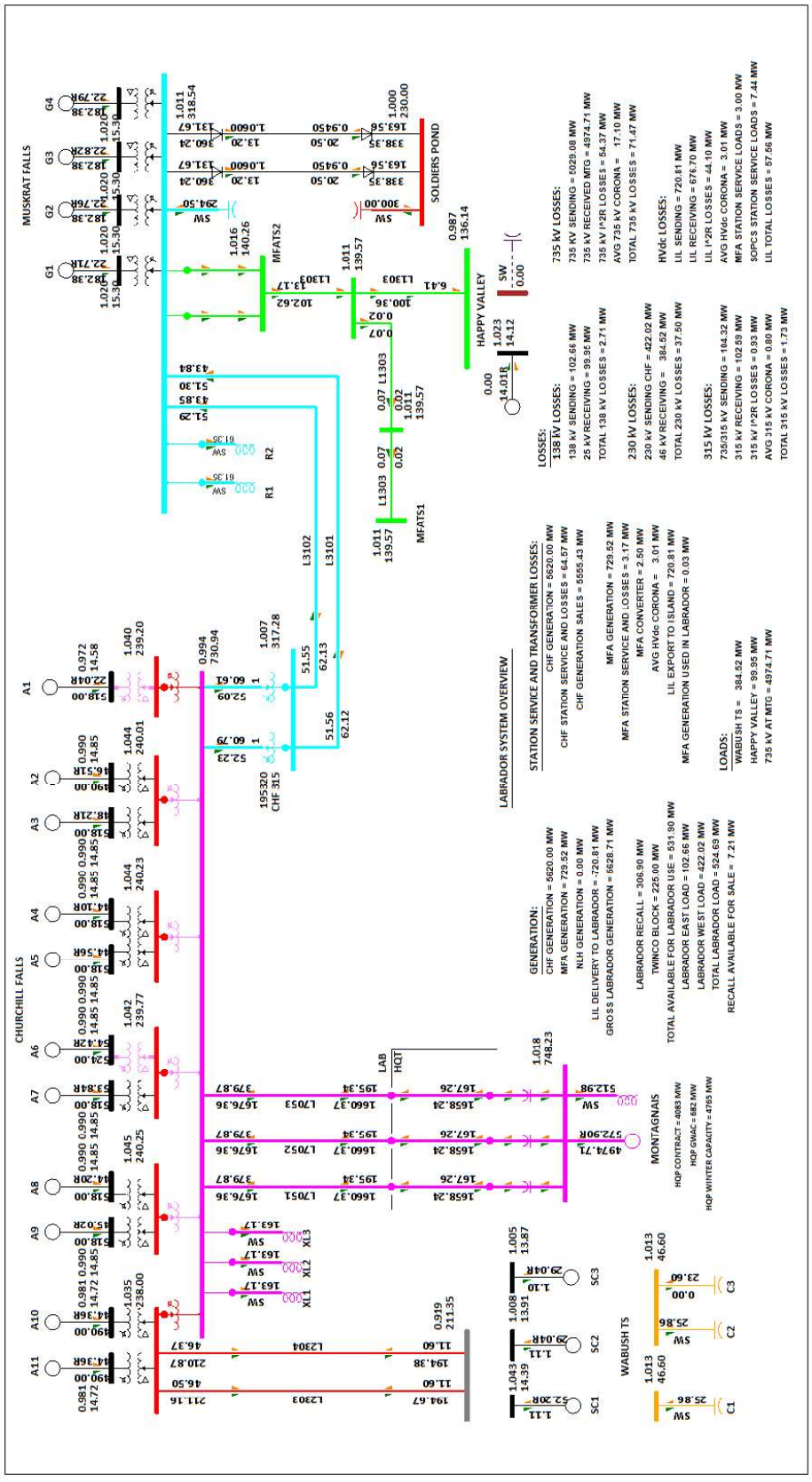

Figure 5 – LIS (2035/36 Peak Conditions)

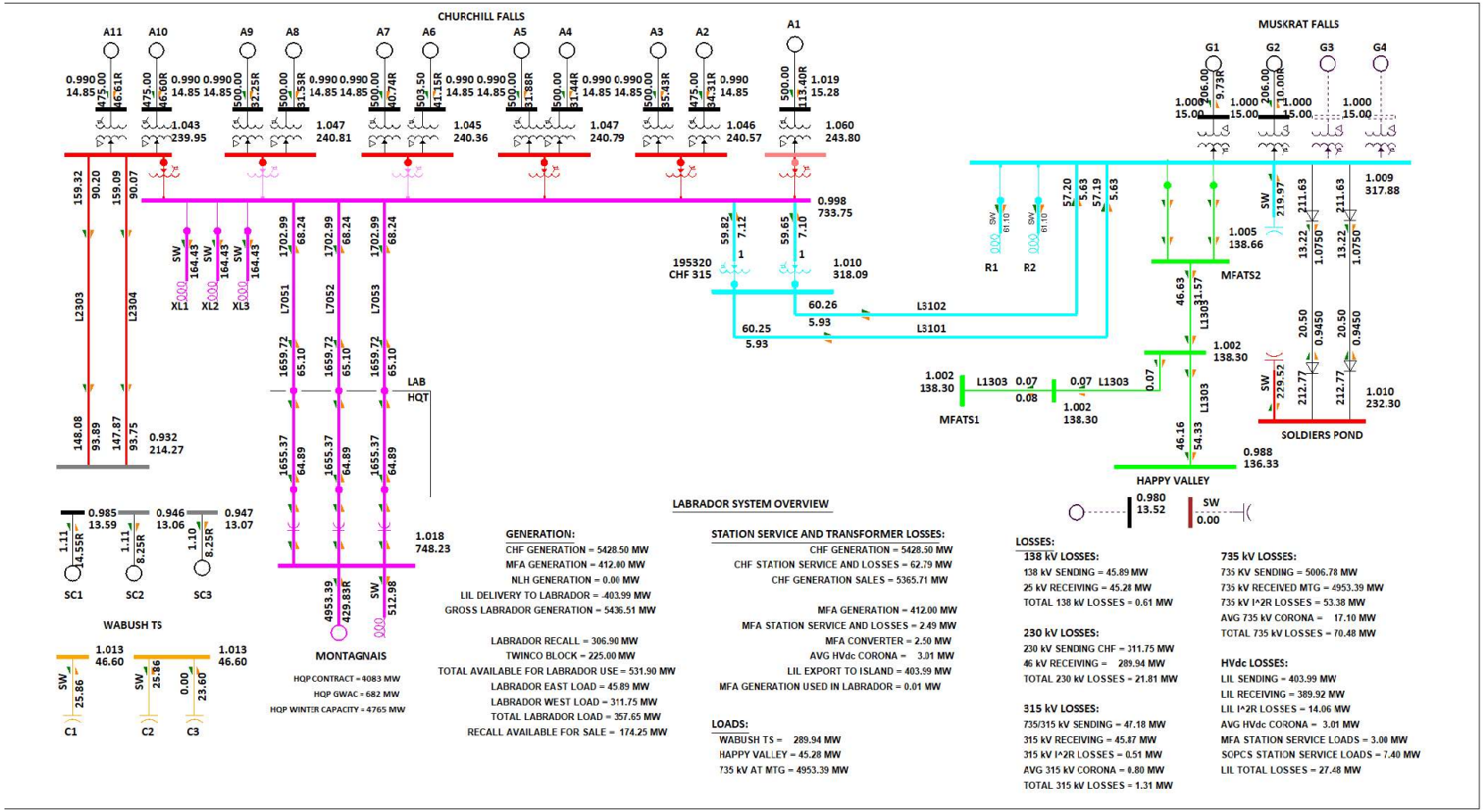

Figure 6 – LIS (2035 Light Conditions)[17]

[17] The Labrador West industrial customer load was set as per the summer load forecast presented in Operating Load Forecast for the NLH Interconnected System - June 2025. The IOC coincident load was set to 216.5 MW and the Tacora coincident load was set to 42.4 MW.

APPENDIX C

Newfoundland Power's 138 & 66 kV Loop Assessments 2027-2036 (Rev 4)

Document Summary

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Document Distribution:	Newfoundland and Labrador Hydro

Revision History

Revision	Prepared by	Reason for change	Effective Date
0	Transmission Planning	Original Issue	2026/06/18

Document Approvers

Position	Signature	Approval Date
Sr. Manager of Transmission and Rural Planning		2026/06/18

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