

1 Q. **Re: CBA, Rev. 1, vol. II, Wabush Terminal Station Upgrades, page 2 (p. 428 pdf)**

2 Citation 1:

3 The customer load in western Labrador is forecast to reach 379.9 MW by winter
4 2020–2021 and 383.3 MW by the end of the 25-year study period. The transfer
5 capability of the existing Labrador West transmission system in winter is 350
6 MW under normal operating conditions with all of Hydro’s assets in service.
7 Under existing system conditions, power supplied to IOC and Wabush Mines
8 must be limited such that the total coincident peak for the system does not
9 exceed 350 MW. As such, Hydro does not recommend deferring this project
10 another year.

11 To increase the transmission capability of the system beyond 350 MW, new
12 transmission infrastructure is required. In the absence of such upgrades, Hydro
13 must establish specific operating limits and procedures for curtailing industrial
14 customers.

15 If upgrades to the Wabush Terminal Station are not implemented and SC3 is not
16 available for long-term operation, supply to industrial customers must be
17 curtailed when the Labrador West transmission system peak load exceeds 350
18 MW under normal operations. Additionally, there is no capacity available to
19 supply potential future developments.

20 Further, if a transformer at the Wabush Terminal Station was to fail, there is
21 insufficient power transformer capacity to meet the forecast peak load. In this
22 case, there would be a number of potential customer impacts. As the Wabush
23 Terminal Station does not have spare transformers or access to mobile
24 transformer units, it would take a minimum of two years to source and install a
25 new transformer due to the long unit lead times and the short construction
26 season in western Labrador.

27 Citation 2 (p. 8-9, 454-455 pdf):

28 A projected load review of the curtailment and interruptible requirements in
29 Labrador West concluded that with the existing system capacity of 350 MW,
30 industrial customers could be interrupted between to 50 times a year during the
31 winter months. Interruptions were predicted to range from 4 hours up to 122
32 hours in the winter months.

33 a. Please provide a copy of the cited load review, and indicate for which years the quoted
34 results apply.

- 1 **b.** Please estimate the year-by-year curtailment that has been and would be required by IOC
2 and Wabush Mines in order to respect the 350 MW limit, in the event that the proposed
3 project is deferred.
- 4 **c.** Please explain how that curtailment has been and would be allocated between the two
5 companies, with and without the assumption that IOC retains ownership of SC3.
- 6 **d.** Please provide an estimate of the annual likelihood of failure of one of the Wabush Terminal
7 Station transformers.
- 8 **e.** Please describe the cost of making a spare or mobile transformer available to the Wabush
9 Terminal Station.

10

11

12 A.

13 **a.** Please refer to LAB-NLH-002, Attachment 1 for the cited load review. The projected load
14 review was for the period from 2018 to 2043.

15 **b.** Please refer to Table 3 in LAB-NLH-002, Attachment 1 for a year-by-year summary of
16 expected interruptions in Labrador West.

17 **c.** When allocating capacity between Iron Ore Company of Canada (“IOC”) and Tacora
18 Resources (“Tacora”) the additional capacity enabled by SC3 will be treated differently if
19 Newfoundland and Labrador Hydro (“Hydro”) were to purchase the asset from IOC than if
20 IOC retains the ownership of SC3 and Hydro operates the asset.

21 If Hydro were to purchase SC3 from IOC, then the asset would be considered a common
22 asset and the overall capacity of the Wabush Terminal Station is increased. If any
23 curtailments are required, then both IOC and Tacora are curtailed on a pro rata basis based
24 on the percentage of their Power on Order.

25 If IOC continues to retain ownership of SC3 and Hydro operates the asset in a manner
26 similar to the 2019–2020 winter season, the incremental transfer capability provided by the

1 operation of SC3 is exclusively available to IOC when SC3 is in operation. If any curtailments
2 are required both IOC and Tacora are curtailed on a pro rata basis. This is determined as the
3 percentage of their Power on Order, as above; however, IOCs curtailment requirements are
4 then lessened by the amount of incremental transfer capability provided by SC3.

5 **d.** The Canadian Electricity Association’s 2018 annual equipment reliability report for Hydro
6 indicates that the frequency of forced outages for transformers between 200–299 kV is
7 0.0397 times per year. The mean duration of such an outage is 2447.0 hours.

8 **e.** The cost to procure a spare 125 MVA 230/46 kV transformer for the Wabush Terminal
9 Station would exceed \$2 million including the cost of the transformer and a concrete
10 pad. It is noted that a mobile power transformer would not be a practical alternative in
11 this application due to the high voltage and rating requirements for the unit. For
12 context, the mobile transformers currently in use by Newfoundland and Labrador Hydro
13 and Newfoundland Power are limited to 138 kV or less and have top nameplate ratings
14 that range from 10 MVA to 50 MVA.

15 As per to NLSO¹ Standard “Transmission Planning Criteria Doc # TP-S-007,”² the use of
16 spare transformers and mobile transformers in 230 kV terminal stations would be
17 contrary to Hydro’s recommended practice of having installed spare transformer
18 capacity such that all loads can be supplied during system peak on a firm basis.

¹ Newfoundland and Labrador System Operator (“NLSO”).

² NLSO Standard “Transmission Planning Criteria – Doc # TP-S-007,” Newfoundland and Labrador Hydro, October 2, 2020, included as Attachment 3 to Hydro’s response to CA-NLH-019 of this proceeding.



TP-TN-054

Lab West Industrial Customer Curtailment/Interruptible Assessment

Purpose

The purpose of this technical note is to assess the curtailment and interruptible opportunities available in Labrador West with respect to industrial customers. The assessment includes a review of projected loads in Labrador West from 2018 to 2043, with the objective to define the expected number of interruptions, as well as the duration of those interruptions.

Overview

Under existing system conditions, the total peak capacity on the system is limited to 350 MW at the Wabush Terminal Station (WTS) 46 kV buses. If WTS Synchronous Condenser #3 (SC3) were to be put in service, the total peak capacity would increase to 387 MW. This assessment will examine both of these scenarios.

The expected peak forecasts for Labrador West for the study period were derived from the baseline peak load forecast¹ which includes the loads for Hydro Rural, Iron Ore Company of Canada (IOC) and Tacora. This load forecast is provided in Table 1.

Table 1: Labrador West Load Forecast (MW)

Year	Baseline Peak (MW)
2018	342.4
2019	358.4
2020	369.0
2021	377.1
2022	377.3
2023	377.6
2024	377.9
2025	378.2
2026	378.5
2027	378.8

¹ Labrador Interconnected System Peak Demand Forecast transmittal - July 16, 2018.

2028	379.1
2029	379.4
2030	379.6
2031	379.9
2032	380.2
2033	380.5
2034	380.7
2035	381.0
2036	381.2
2037	381.4
2038	381.7
2039	381.9
2040	382.2
2041	382.4
2042	382.7
2043	382.9

Projected load profiles were developed for each year of the study period to estimate the total number of hours that the Labrador West industrial load is expected to exceed specified thresholds, as summarized in Table 2.

Table 2: Summary of Labrador West Total Hours Exceeding System Demand Level

Year	Total Number of Hours Exceeding System Demand Level	
	> 350 MW (Existing System)	> 387 MW (System with SC3)
2018	0	0
2019	24	0
2020	73	0
2021	196	0
2022	198	0
2023	203	0
2024	214	0

2025	226	0
2026	233	0
2027	242	0
2028	250	0
2029	261	0
2030	267	0
2031	275	0
2032	286	0
2033	296	0
2034	305	0
2035	313	0
2036	314	0
2037	317	0
2038	326	0
2039	332	0
2040	343	0
2041	349	0
2042	362	0
2043	372	0

The projected load profiles were analyzed to estimate the total number of expected interruptions and the duration of those interruptions for a subset of the study period, as summarized in Table 3. It was assumed that there would be a minimum interruption duration of four hours due to operational protocols.

Table 3: Labrador West Expected Interruption Summary

Year	Interruptions Exceeding System Demand Level			
	> 350 MW (Existing System)		> 387 MW (System with SC3)	
	Total # of Interruptions	Duration of Interruptions (hours)	Total # of Interruptions	Duration of Interruptions (hours)
2018	0	0	0	0
2019	1	24	0	0

2020	8	Min: 4 / Max: 49	0	0
2021	27	Min: 4 / Max: 59	0	0
2022	29	Min: 4 / Max: 98	0	0
2023	33	Min: 4 / Max: 98	0	0
2030	32	Min: 4 / Max: 98	0	0
2035	38	Min: 4 / Max: 111	0	0
2040	44	Min: 4 / Max: 111	0	0
2043	51	Min: 4 / Max: 122	0	0

Figure 1 is a plot of the projected Labrador West demand for 2019, which shows that it is during this timeframe that the load is first expected to exceed the existing system capacity of 350 MW. Analysis estimates this to consist of a single interruption with a duration of approximately 24 hours in the month of December.

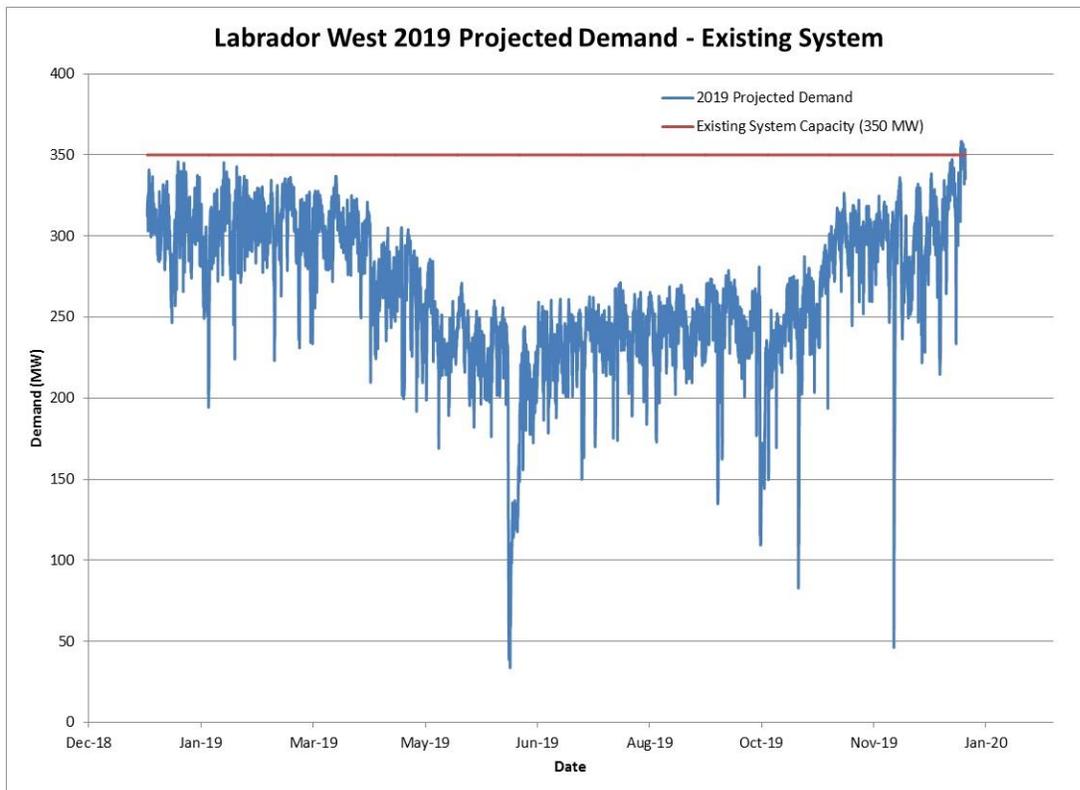


Figure 1 – Labrador West Projected Load Profile for 2019 – Existing System

In comparison, Figure 2 is a plot of the projected Labrador West demand for 2043. The plot illustrates that the projected load is expected to exceed system capacity throughout the winter months of January,

February and March, as well as December. Analysis estimates this to consist of approximately fifty interruptions, with a minimum duration of four hours, and a maximum duration of approximately 122 hours.

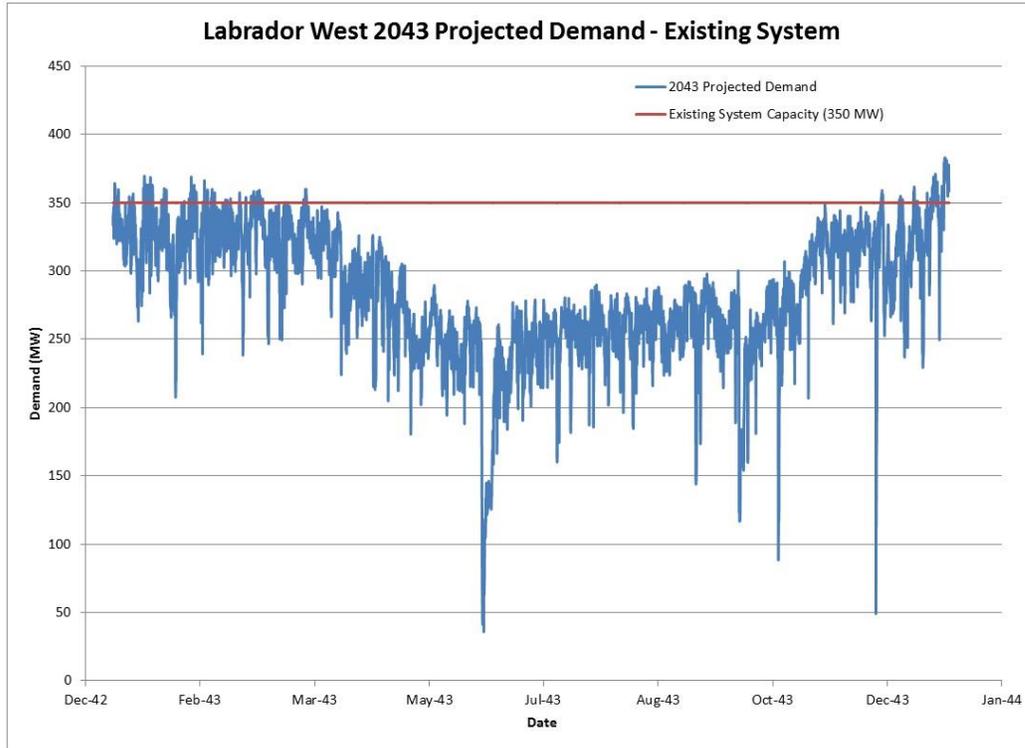


Figure 2 – Labrador West Projected Load Profile for 2043 – Existing System

Figure 3 is a plot of the projected Labrador West demand for 2043, in the scenario where WTS synchronous condenser #3 has been commissioned. The plot illustrates that the projected load is not expected to exceed the system capacity of 387 MW in the twenty five year study period.

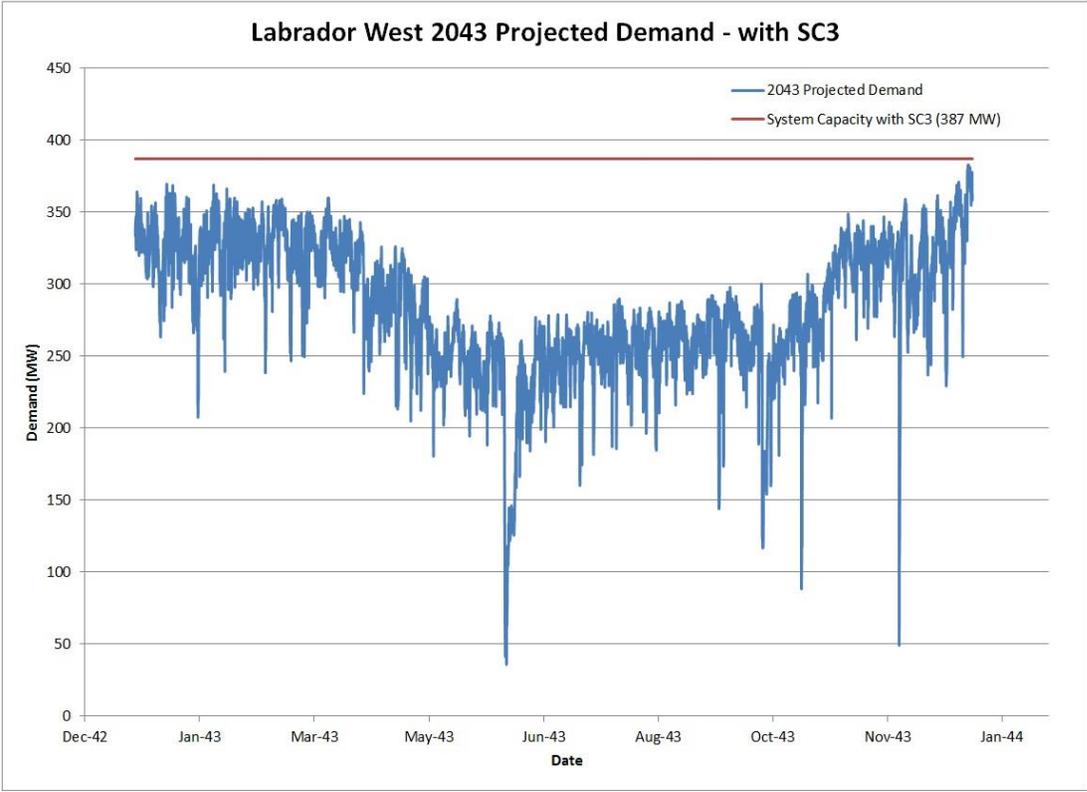


Figure 3 – Labrador West Projected Load Profile for 2043 – System with SC3

Conclusions

A projected load review has been performed for Labrador West for the period from 2018 to 2043. The projected loads were assessed with respect to two system capacity thresholds:

- 1) Existing system capacity of 350 MW
- 2) System capacity with SC3 of 387 MW

The following has been concluded from this review:

- Existing system capacity of 350 MW
 - With the existing system capacity of 350 MW, once Tacora is fully in operation in 2022, industrial customers could expect to be interrupted between thirty to fifty times a year during the winter months.
 - Interruptions would be a minimum of four hours in duration, due to operational protocols.
 - Maximum interruption durations of up to 122 hours could be expected in the winter months.
- System capacity with SC3 of 387 MW
 - No interruptions would be expected during the study period.

Document Summary

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Revision History

Revision	Prepared by	Reason for change	Effective Date
1	C. Penney	Initial Release	2019/02/08

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