

February 18, 2019

The Board of Commissioners of Public Utilities  
Prince Charles Building  
120 Torbay Road, P.O. Box 21040  
St. John's, NL A1A 5B2

**Attention: Ms. Cheryl Blundon**  
**Director Corporate Services & Board Secretary**

Dear Ms. Blundon:

**Re: The Liberty Consulting Group Report – Analysis of Newfoundland Island  
Interconnected System Power Supply Adequacy for the Winter of 2018-2019 –  
Biweekly Update Report**

In its correspondence of September 19, 2018, the Board of Commissioners of Public Utilities (“Board”) requested that Newfoundland and Labrador Hydro (“Hydro”) provide a biweekly report on Hydro’s supply adequacy for winter 2018-2019, commencing October 1, 2018.

This biweekly report provides an update on the in-service of the Labrador-Island Link (“LIL”) and how it relates to winter 2018-2019 supply adequacy, as well as details on Hydro’s production facilities asset management.

### **The LIL In-Service Update**

This report contains:

- an overview of the critical path tasks required for reliable operation of the LIL for winter 2018-2019;
- an overview of the highest risks being monitored and mitigated for the LIL in-service in winter 2018-2019;
- Hydro’s updated modelled assumptions for winter 2018-2019 supply adequacy planning; and
- Hydro’s proposed contingency plan to mitigate the consequences of unavailability or unreliability of the LIL for all or part of winter 2018-2019.

Should you have any questions, please contact the undersigned.

Ms. C. Blundon  
Public Utilities Board

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Yours truly,

**NEWFOUNDLAND AND LABRADOR HYDRO**



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Senior Legal Counsel – Regulatory  
SW/kd

Enc.

cc: Gerard Hayes – Newfoundland Power  
Paul Coxworthy – Stewart McKelvey  
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ecc: Van Alexopoulos – Iron Ore Company  
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## Labrador-Island Link In-Service Update

February 18, 2019

*A Report to the Board of Commissioners of Public Utilities*



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1 **1. Introduction**

2 Newfoundland and Labrador Hydro (“Hydro”) closely monitors its supply-related assets and  
3 issues to ensure its ability to provide reliable service to customers. The availability of power  
4 over the Labrador-Island Link (“LIL”) for winter 2018-2019 was identified in previous reports to  
5 the Board by both Hydro and Liberty as contributing to supply adequacy in advance of  
6 availability of the Muskrat Falls generation supply to the Island. Hydro is working closely with  
7 Nalcor’s Power Supply leadership [Transition to Operations (“TTO”), Power Supply Transmission  
8 Operations, and the Lower Churchill Project (“LCP”) Transmission Project] to monitor and  
9 mitigate the risks associated with the timing of the in-service of the LIL to supply off-Island  
10 capacity and energy to the Island Interconnected System. In each biweekly report, Hydro will  
11 also provide an update on supply adequacy for winter 2018-2019 with the most up-to-date in-  
12 service assumptions of the LIL, as required. The information in this report is current as of  
13 February 14, 2019. It is noted that typical commissioning issues will be occurring as  
14 commissioning continues. Updates regarding those issues known to materially affect the  
15 assumptions of capacity and availability for the 2018-2019 winter season will be provided as  
16 they become known. Otherwise, any developments occurring after the preparation of the  
17 biweekly report will be included in the next biweekly report.

18  
19 **2. In-Service Activities Update**

20 The following outlines the specific critical path activities required for operation of the LIL for  
21 winter 2018-2019,<sup>1</sup> as well as schedule or constraint information for those tasks. As this report  
22 is updated on a biweekly basis, Hydro will provide information on the key activities and the  
23 associated schedule to inform the Board if any potential supply issues arise from the delivery of  
24 those activities.

25  
26 As reported in the February 4, 2019 report, biweekly leadership level meetings that were  
27 initiated in the fall of 2018 have ceased since all material efforts to place the LIL in service have

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<sup>1</sup> This report discusses operational readiness for winter 2018-2019. The final in-service review of the LIL is undertaken separately with the Board’s consultant, Liberty, on a quarterly basis with TTO.

1 been completed. The leadership level meetings that track progress will proceed if there is a  
2 material issue related to availability. The day-to-day operation of the LIL is now being  
3 communicated at the morning system meetings, with any technical items addressed similar to  
4 any other resource asset on the system – the operational teams work with project and  
5 engineering support and communicate results to the appropriate Hydro and Nalcor  
6 representatives.

7  
8 Previous reports have included a Gantt chart to show the status of all critical path activities;  
9 however, the only activities that remain incomplete are Activities 9 and 12, which are both  
10 contingent on the completion of monopole commissioning. Since these are the only ongoing  
11 activities, and details on such are included in the section that follows, the chart is no longer  
12 included in this report.

13

#### 14 **Project Delivery**

##### 15 **Activity 1 – Churchill Falls Breaker Upgrade**

16 ***Status: Completed, no further updates.***

17

##### 18 **Activities 2 and 3 – 315 kV GIS Voltage Transformer<sup>2</sup> Replacements**

19 ***Status: Completed, no further updates.***

20

#### 21 **Transitions to Operations Delivery**

##### 22 **Activity 4: Emergency Response Plan (“ERP”)/Emergency Restoration and Recovery (“ERR”):**

23 **Interim ERP/ERR in place as required at all sites/assets**

24 ***Status: Completed, no further updates.***

25

##### 26 **Activity 5 – Contracts: Support Services in Place and Resources on Board**

27 ***Status: Completed, no further updates.***

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<sup>2</sup> 315 kV instrument transformers.

1 **Activity 6 – Assets: Operationalize High Frequency Preventive Maintenance Program**

2 **Status: Completed, no further updates.**

3

4 **Activity 7 – Contracts: Operations, Maintenance, and Administrative Services for Monopole**

5 **Status: Completed, no further updates.**

6

7 **Activity 8 – Inventory: Pre-Winter 2018 Readiness**

8 **Status: Identification, inspection and verification of winter readiness spares completed,**  
9 **ongoing procurement. No change from previous update.**

- 10
- 11 • Completed the winter readiness spares inventory requirement for the overhead  
12 transmission lines and submarine cables.
  - 13 • All critical spares for the overhead transmission lines and submarine cables are in place.  
14 Deficiencies have been identified and procurement activities will continue until all items  
15 are received. Spares for HVdc assets will remain in the contractor’s care, custody and  
16 control until they are transferred to the project/operations upon completion of the bi-  
17 pole low power trial operation.
- 18

19 **Activity 9 – Newfoundland and Labrador System Operator (“NLSO”): Operational Acceptance**  
20 **Criteria Received**

21 **Status: On track with remaining item to be delivered at conclusion of Activity 12.**

- 22
- 23 • Four of the five NLSO requirements have been met. The operational readiness  
24 document has been delivered in draft and will be updated as final along with the release  
25 for service form at the conclusion of the monopole commissioning activities.

26 A description of the five NLSO requirements and status is as follows:

- 27
- 28 ○ Item 1: Ability to monitor the AC equipment associated with the converter stations  
(including filter banks) remotely from the ECC for system reliability considerations.  
29 **Status: Completed/Accepted.**

- 1           ○ Item 2: Asset owner contact details (to be responsive 24/7). **Status:**  
2           **Completed/Accepted.**
- 3           ○ Item 3: Redundant communications paths (voice, tele-protection and SCADA)  
4           between the ECC and all stations. **Status: Completed/Accepted.**
- 5           ○ Item 4: Provide a technical resource in the NLSO control room to support the Energy  
6           Control Centre during the initial start-up period. **Status: Completed/Accepted.**
- 7           ○ Item 5: Documentation including an Operational Readiness document (outlining  
8           commissioning / testing activities, operating limits / restrictions, and identified  
9           risks / plans for mitigation), and a completed/updated release for service form  
10          outlining remaining deficiencies and expected timelines for completion. **Status: In**  
11          **Progress.** The operational readiness document has been delivered in draft and will  
12          be updated as final along with the release for service form at the conclusion of the  
13          monopole commissioning activities.

14

15 **Activity 10 – People: Implement Interim 24/7 Staffing Model for Muskrat Falls**

16 **Status: Completed, no further updates.**

17

18 **Power Transfer**

19 **Activity 11 – Re-Energize Labrador Island Link**

20 **Status: Completed as planned on November 1, 2018.**

- 21           • The LIL was re-energized on November 1, 2018 at 45 MW using the existing version  
22           (version 15) of GE software. Another version (16) has been delivered to site and factory  
23           acceptance testing (“FAT”) of the next release (17) has been completed in Stafford. A  
24           decision has been made to remain on version 15 for the remainder of the winter season.  
25           The decision was based on the ongoing satisfactory performance of version 15 and the  
26           impact during the peak winter demand period of a multi-week outage to the LIL  
27           required to implement a new version, which would have to undergo additional testing.



1 **Activity 12 – Transmission Link Monopole Commissioning**

2 **Status: Initiated November 1, 2018 and ongoing.**

- 3       • As noted in the February 4, 2019 report, the LIL returned to service on January 26, 2019  
4 after resolution of the Valve Base Electronic (“VBE”) major alarm trip. The LIL operated  
5 at power transfer levels between 70 - 130 MW (measured at Muskrat Falls) until a  
6 planned outage on February 5, 2019. This one-hour outage was required to resolve the  
7 common neutral area protection issue that was identified following the trip on January  
8 16, 2019, which caused the LIL to be limited to 130 MW. As the LIL was being ramped up  
9 following this planned outage, an external fault on the AC system triggered a trip on the  
10 LIL. The cause of this was identified as an overly sensitive feature of the protection  
11 system unrelated to recent changes. This issue could not be quickly resolved, and as  
12 such the LIL was limited to 45 MW upon being re-energized on February 6, 2019. An  
13 investigation into a potential solution(s) to this protection system issue is ongoing; in  
14 the interim the LIL will remain limited to low transfer levels. Once this issue is resolved,  
15 Hydro and Nalcor will resume increasing transfer levels and assessing LIL performance  
16 to determine when higher power transfer commissioning is concluded. Hydro will  
17 inform the Board once this determination is made.  
18
- 19       • The maintenance outage planned for February 12 to 13, 2019 commenced on  
20 February 9, 2019 to accommodate additional scope. The LIL was taken out of service on  
21 the morning of February 9, 2019 to complete necessary repairs at Churchill Falls,  
22 Muskrat Falls, and Soldiers Pond. All planned maintenance was completed on February  
23 13, 2019 and the LIL was placed back into service at a reduced power flow of 45 MW.  
24
- 25       • Punch list items are continually being addressed and closed by the project team. While  
26 punch list resolution shall continue in an effort to improve system reliability, this effort  
27 is not considered critical for power transfer.

1 **3. Key Risks**

2 There has been no change in the key risks since the October 1, 2018 report. In addition to the  
3 activities described in Section 2, Hydro notes that the reliability of the current GE software  
4 implementation is being monitored on a daily basis as the LIL is now online 24 hours a day; the  
5 software's performance will inform the reliability assumptions of the LIL. Alternative software  
6 versions have been received from GE and are under consideration for future implementation.

7  
8 Dynamic commissioning with power transfer activities recommenced as scheduled on  
9 November 1, 2018 with existing software. The software issues remain unresolved in the  
10 currently installed software version; however, successful power transfer using the currently  
11 installed software continued throughout December 2018, and remains ongoing, as part of  
12 testing and commissioning activities. A further software version has been completed including  
13 testing at the vendor's facility. As installation of updated software will require a multiple week  
14 outage to the LIL, installation is currently planned to occur after the winter season to minimize  
15 the effect on power transfer during Hydro's peak loading period. However, the recent  
16 identification of the LIL's susceptibility to external AC faults, as described under Activity 12, has  
17 led to renewed discussion on the potential for implementing a newer version of software, if it  
18 had the benefit of addressing this susceptibility. These discussions, and the assessment of the  
19 potential to resolve this new issue, are recent and are in early stages. The outcome will be  
20 reported to the Board upon completion of the assessment.

21  
22 An additional risk being monitored is the Maritime Link ("ML") frequency response to the LIL  
23 initiated disturbances when the LIL is in service. The frequency controller has remained in  
24 operation using the settings that were investigated in operational studies. These settings help  
25 to avoid underfrequency load shedding and provide support to the Nova Scotia system.

26  
27 To avoid frequent operation of the frequency controller, it has been equipped with a deadband  
28 of +/- 0.5 Hz. As such, there will be a frequency controller activation if frequency drops below  
29 59.5 Hz or goes above 60.5 Hz. When the LIL is switched on, the instant injection of 45 MW to  
30 the Island triggers overfrequency controller responses. Blocking (i.e., shutting off) the LIL results

1 in an underfrequency response. To reduce the number of responses, the current operating  
2 philosophy is to disable the frequency converter just prior to LIL startups (for a period of  
3 approximately five minutes) to minimize the overall number of frequency controller activations.  
4 This is completed to satisfy Nova Scotia Power and New Brunswick Power System Operators  
5 regarding the number of activations. When the ML frequency response is turned off, the LIL  
6 contribution to the Island’s power supply is similar to a generator, and the reliability of the LIL  
7 will be the major factor in the decision on loading level. The NLSO continues to work with Nova  
8 Scotia Power and New Brunswick Power Service Operators to keep those bodies informed of  
9 testing plans so as to understand and mitigate risk from their perspective.

#### 11 **4. Modelled Assumptions**

12 There has been no significant change in the modelled assumptions since Hydro’s Reliability and  
13 Resource Adequacy study filed on November 16, 2018. These results showed increased LOLH  
14 and EUE over values previously shared as part of Hydro's analysis. The change in the LOLH and  
15 EUE is largely due to a change in the modelling methodology rather than a change in the  
16 underlying system conditions. As discussed in the November 2018 report, the new model is  
17 more conservative and, as a result, the LOLH and EUE numbers produced by the model are  
18 higher. Many factors contribute to the increase in LOLH and EUE between the two models;  
19 however, the two factors that have the largest impact are dynamic loss modelling and the  
20 inclusion of load forecast uncertainty:

- 21 1. Dynamic modelling of losses - The previous model used a fixed value for losses. The  
22 current model calculates losses based on system conditions, which has the effect of  
23 increasing losses when there are units out of service on the Avalon, thus increasing  
24 the frequency and severity of outages.
- 25 2. Load forecast uncertainty - The previous model used a fixed load shape with a 60  
26 MW adjustment on peak to represent the P90 condition. In the current model, a  
27 random variation is applied to the load shape in each hour in the model to reflect  
28 the variation in load due to weather. On average, this increases the frequency and  
29 severity of outages.

1 As a result, the model is showing violations in the LOLH criteria for Holyrood forced outage  
 2 rates above 15% combined with LIL capacity of zero. There is expected to be a significant  
 3 increase in system reliability once the first Muskrat Falls unit is available in late 2019.

4  
 5 It is important to note that, based on the performance of Hydro’s generation assets thus far for  
 6 winter 2018-2019 the analysis represents a conservative view of system conditions. The DAFOR  
 7 for Holyrood was 8.1% in November, 5.8% in December and 1.3% in January; all of which was  
 8 below the 15% DAFOR considered as the base assumption. While the Holyrood plant DAFOR is  
 9 not yet available for February 2019, continued high availability of all units for the first half of  
 10 the month indicate sustained performance.

11  
 12 A detailed description of the modelling assumptions and process for the current system model  
 13 can be found in Volumes I and II of the Reliability and Resource Adequacy Study. All results  
 14 reflect the implementation of the contingency plan as described in Section 5.

**Table 1: Supply Adequacy Modelling Results for Updated Assumptions**

Reliability Metric	LOLH	EUE	Normalized EUE
Base Load Forecast, HRD DAFOR = 15%	2.21	118	11.0
Base Load Forecast, HRD DAFOR = 18%	3.31	184	17.0
Base Load Forecast, HRD DAFOR = 20%	4.13	230	21.2

15 **5. Contingency Plan**

16 In light of the current LIL winter 2018-2019 transfer assumptions, Hydro developed and  
 17 implemented a two-phased contingency plan for the 2018-2019 winter season that includes  
 18 incremental internal and external system support. Phase I of Hydro’s contingency plan contains  
 19 items that have been secured and incorporated into Hydro’s base planning assumptions for the  
 20 2018-2019 winter operating season. Details and the status of items in Phase I of Hydro’s  
 21 contingency plan are contained in Table 2.

**Table 2: Phase I of Hydro’s Contingency Plan**

Item	Description	Incremental System Benefit	Parties Involved	Status	Notes
1	Increase of Capacity Assistance from 90 MW to 105 MW <sup>3</sup>	+15 MW	Hydro, Corner Brook Pulp and Paper (“CBPP”)	Ongoing	CBPP has indicated that up to 105 MW is available.  The proposed agreement was approved by the Board on November 22, 2018.
2	Re-instatement of Capacity Assistance Program	+7.6 MW	Hydro, Vale	Ongoing	Vale has indicated they are in agreement with Hydro’s proposed Capacity Assistance Agreements; one for diesel generation (8 MW) and one for load curtailment (6 MW).  The proposed agreement was approved by the Board on November 30, 2018.
3	Re-instatement of Load Curtailment Program	+6 MW	Hydro, Vale	Ongoing	
4	Voltage Reduction	+20 MW	Hydro, Newfoundland Power	Complete	Hydro has confirmed that it is reasonable to assume availability of 20 MW of Peak Voltage Reduction for the coming winter season. Voltage reduction is forecast on a week-ahead basis by the NLSO.
<b>Potential Incremental System Benefit on peak</b>		<b>48.6 MW</b>			

1 Hydro notes that voltage reduction is not what is publically known as "brown out". Voltage  
 2 reduction is a measured and controlled process whereby there is minimal reduction in the  
 3 delivery point voltages to customers. This process, utilized by utilities across North America as a  
 4 typical system management tool, has been used for peak demand management in almost every  
 5 year on the Island system. Customers see no impact to their service during a period of voltage  
 6 reduction (typically up to four hours) and equipment is not harmed.

<sup>3</sup> Hydro has now confirmed there is 105 MW available as compared to the 110 MW reported in the previous Biweekly Report. Given the relatively small change in magnitude of the available assistance, Hydro has not run the model for this 5 MW difference. Hydro presented the full analysis of its supply adequacy for winter 2018-2019 in its November 16, 2018 filing to the Board regarding supply adequacy.

1 In addition to the items listed in Phase I of Hydro’s contingency plan, Hydro has also identified  
 2 elements that can provide additional system benefit, but will only be enacted if absolutely  
 3 required. These items form Phase II of Hydro’s contingency plan and are detailed in Table 3.

**Table 3: Phase II of Hydro’s Contingency Plan**

Item	Description	Incremental System Benefit	Parties Involved	Status	Notes
5	Increased output of Holyrood Gas Turbine (“GT”) beyond current base assumption	+10 MW	Hydro	Complete	The ability to increase the capability of the unit is available on a temporary basis subject to atmospheric and system conditions. The GT has been previously safely demonstrated to operate to 134 MW.
6	Temporary increased output of Holyrood Diesels	+1.5 MW	Hydro, Department of Environment	Complete	Hydro met with the Department of Municipal Affairs and Environment and provided an overview of the potential upgrading requirements.
<b>Potential Incremental System Benefit on peak</b>		<b>+11.5 MW</b>			

4 **6. Conclusion**

5 Hydro is actively monitoring the availability of supply as it relates to the LIL and associated  
 6 impact on reliability of the Island Interconnected System for the 2018-2019 winter season.

7 Hydro’s contingency plans described above are in place in the event that the LIL does not meet  
 8 the current assumed capacity and reliability parameters.

9  
 10 Through its biweekly report, Hydro will keep the Board informed on developments related to  
 11 the operation of the LIL should its performance impose material changes impacting supply  
 12 adequacy for the Island Interconnected System.