

September 7, 2018

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**

In its correspondence of August 31, 2018 the Board of Commissioners of Public Utilities requested that Newfoundland and Labrador Hydro ("Hydro") provide its response to Liberty's recommendations by September 7, 2018. Please find attached Hydro's response.

Should you have any questions, please contact the undersigned.

Yours truly,

NEWFOUNDLAND AND LABRADOR HYDRO



Michael S. Ladha
Legal Counsel & Assistant Corporate Secretary
MSL/kd

cc: Gerard Hayes – Newfoundland Power
Paul Coxworthy – Stewart McKelvey
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ecc: Van Alexopoulos – Iron Ore Company
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Newfoundland and Labrador Hydro Winter 2018-2019 Supply Adequacy

Response to the Liberty Consulting Group Report

September 7, 2018



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1 **Introduction**

2 Newfoundland and Labrador Hydro (“Hydro”) acknowledges *The Analysis of Newfoundland*
3 *Island Interconnected System Power Supply Adequacy for the Winter 2018-19* report prepared
4 by The Liberty Consulting Group (“Liberty”), dated August 30, 2018. Hydro shares Liberty’s view
5 on the importance of closely monitoring supply related assets and issues to ensure reliable
6 service to customers. Hydro has been working toward enhanced reliability of the Island
7 Interconnected System (“IIS”) over the last several years, with demonstrated areas of
8 improvement. While there are ongoing challenges, many of which are characteristic of
9 operating an evolving power supply system, Hydro is committed to continuous improvement in
10 reliable supply.

11
12 This reply is provided in two parts. Part 1 provides further context on the Labrador Island Link
13 (“LIL”) capacity levels, reliability of the Holyrood Thermal Generating Station (“Holyrood”) and
14 the associated impacts of both on Hydro’s supply planning. Part 2 specifically addresses each of
15 Liberty’s recommendations.

16

17 **PART 1**

18 **1.0 Status of the LIL**

19 **1.1 LIL Current State**

20 The LIL is undergoing dynamic commissioning for Pole 1 operation with metallic return.¹ This is
21 the first phase of the LIL implementation and trial operations acceptance which will be followed
22 by additional phases with trial operation acceptance to reach final project completion with bi-
23 pole operation at high power levels up to 900 MW.

24
25 To date, Pole 1 of the LIL was placed into operation on a total of 27 days between May 31, 2018
26 and July 31, 2018. It has demonstrated it can be operated at 45 MW, with some testing

¹ In basic terms, Direct Current (DC) Electrical System requires a loop. In bi-pole operations, the two conductors form the loop. In monopole operations, the loop can be made by the sea electrode or the other conductor that is not being used. The other conductor is the metallic return – one conductor with power and one to complete the loop.

1 completed at 65 MW. Pole 1 was first energized on May 31, 2018 with a successful eight-hour
2 continuous operation at a planned level of 45 MW on June 11, 2018. The LIL and the Labrador
3 Transmission Assets (LTA) are currently off-line to address items that were not required for the
4 low power testing but are required deliverables for long-term in-service operation. The LIL and
5 LTA are scheduled to return to service in the latter part of September 2018. While the assets
6 are off-line, deficiencies identified during dynamic testing are being addressed. These items will
7 assist in preparing the facilities for future testing and winter operation.

8

9 **1.2 LIL Capacity Levels Planned for Inclusion in Hydro's Supply Planning for Winter**
10 **2018-2019**

11

12 The level of power flow to date from the LIL has been limited to the levels described in section
13 1.1 as new assets can be vulnerable to failure during early operation. Further, the control
14 software does not currently have a configuration that provides Hydro with assurance for
15 reliable operation in monopole configuration at levels above 110 MW.² Prior to the submission
16 of acceptance testing results and proven reliable operation, Hydro is planning that LIL capacity
17 shall be limited in the order of 110 MW, which is the level at which underfrequency load
18 shedding would likely occur if a trip was initiated. Recognizing this, Hydro intends to include the
19 LIL at 110 MW in its supply planning for this coming winter,³ at a forced outage rate of 7.5%. It
20 is noted that acceptance of the LIL for operation will be subject to Newfoundland and Labrador
21 System Operator approval.

22

23 **1.3 Commercial Operation and Trial Operations Acceptance Testing**

24 While the LIL can be operated and has been demonstrated to operate up to 65 MW in the
25 current configuration, the LIL does not yet meet the commercial operation threshold and

² Underfrequency events resulting from a trip of the LIL are a function of Island Generation and are being investigated as part of operational studies. It has been confirmed that a LIL transfer of 110 MW will not result in underfrequency load shedding under any operating scenario while the Maritime Link ("ML") frequency controller is in service in either a monopole or bipole mode of operation. The ML is currently in service and is taken out of service infrequently for planned maintenance purposes.

³ On September 7, 2018, Hydro filed a letter with the Board advising that the 170 MW assumed for 2019 to be available through the LIL may not be achievable. Hydro has been advised that an assumption of 110 MW is more probable.

1 therefore remains in dynamic commissioning. Further testing, working up to 110 MW, will
2 occur prior to the winter season, with testing anticipated to begin in late September 2018.
3 However, since the LIL is still in the dynamic commissioning phase, it cannot be released for
4 continuous operation over 110 MW. Nalcor continues to work with the vendor on achieving
5 reliable operation of the LIL with the required software configuration without incident for a
6 continuous 20-day period within a 70-day operating window. This is the trial operation test
7 requirement for the monopole low power phase and necessary for acceptance of this phase of
8 the work from the vendor. Hydro will be formally updated on this testing process as it occurs.

9
10 Following the successful completion of the testing for the commercial operation of the
11 monopole low power configuration, the LIL will undergo dynamic commissioning for a bipole
12 low power configuration. During that commissioning, the LIL will be thoroughly tested to prove
13 reliable operation of the bipole. Once testing is complete, another trial operation period will
14 begin to demonstrate operation without incident for a continuous 30-day period within a 90-
15 day operating window before the bipole is accepted for commercial operation at low power
16 (over 200 MW). Before final project completion of the LIL, it will undergo a third trial operation
17 test at high output. This trial operation cannot occur until the Muskrat Falls generators are
18 available to provide the required power. Final trial operation will require high power operation
19 without incident for a continuous 30-day period within a 90-day operating period. Upon
20 successful completion of this final trial operation period commissioning activities will conclude,
21 the LIL will be placed in full commercial operation, and the asset will be accepted from the
22 vendor.

23 24 **1.4 Summary LIL Status**

25 Hydro is planning that the LIL will be available to supply up to 110 MW at a forced outage rate
26 of 7.5 per cent during the coming winter. Hydro will closely monitor the continued testing to
27 110 MW and will communicate the results to the Board through future reporting as proposed in
28 Part 2 of this reply.

1 Hydro agrees that the 20 days of continuous operation is not the industry norm for full
2 acceptance of a project. However, the 20 days is for the first phase of trial operation and for the
3 full project acceptance from the vendor, there are two additional 30-day trial operations
4 periods required.

5

6 **2.0 Expected Holyrood Reliability - Winter 2018-2019**

7 Hydro is nearing the completion of the annual maintenance outage for Holyrood Unit 2, which
8 included air heater basket replacement and economizer chemical cleaning. While the
9 economizer had the least certainty of success in the actions taken to restore capacity, Hydro
10 has noted visible reduction in hard ash deposits resulting from the economizer cleaning. Actual
11 capacity restoration will be confirmed once the unit goes back in service and is load tested.
12 Hydro expects the results of this load test in the third week of September 2018, subject to
13 system conditions. Actions to restore capacity are also being undertaken on Units 1 and 3.
14 Hydro will continue to inform the Board on the load test results related to the work completed
15 on all units.

16

17 While Hydro agrees that due to age, Holyrood requires attention and is one of the higher risks
18 to system reliability, Hydro does not concur with Liberty's statement that the likelihood is high
19 that other serious problems will replace those already corrected at Holyrood resulting in
20 continued high Derated Adjusted Forced Outage Rate (DAFOR). Hydro takes management of
21 reliability risk at the Holyrood generating station seriously and proactively undertakes actions
22 to mitigate risks.

23

24 There are many systematic reviews and maintenance actions undertaken to achieve optimal
25 performance for Holyrood, recognizing its condition and age. Reliability issues are expected and
26 are reflected in planned DAFOR. For example, embedded in Hydro's planned DAFOR of 15.0%, it
27 is assumed an issue will remove a Holyrood unit from service for four weeks. Hydro does not
28 expect Holyrood to function perfectly over the coming winter operating season but it is
29 confident the air flow issues recently observed have been corrected as part of the additional
30 planned intervention completed in 2018 and will not be present this coming winter. As such, it

1 is anticipated that the reliability issues will be the normally expected concerns that may take
2 several days to address, several times a year on each unit. It is noted, however, that should
3 more material issues develop, as discussed in Hydro's response to recommendation 3 later in
4 this reply, Hydro will be positioned to respond.

5
6 Hydro feels it appropriate to offer additional insight on the DAFOR experienced to date at
7 Holyrood. In 2018, Hydro chose to utilize imports to allow for early shutting of Holyrood units.
8 This decision was economically driven and did not negatively impact reliability. Given that the
9 calculation of DAFOR considers total operating hours, and that the economic decision then
10 resulted in less operating hours for the Holyrood units, there was a resultant negative impact
11 on the calculated result. Had Hydro not shut Holyrood for economic purposes, and continued
12 with the scheduled production plan, the DAFOR at Holyrood would improve by 4.2% in the 12-
13 month period. This information is provided only to offer additional context on the DAFOR
14 witnessed to date and, in particular, since the Maritime Link became available. Hydro will
15 ensure this additional context is reflected in its future Rolling Generation reports.

16

17 **PART 2 – Response to Recommendations**

18 With respect to the specific recommendations identified by Liberty, Hydro offers the responses
19 that follow.

20

21 **Recommendation 1:**

22 *The Board should direct Hydro to implement an enhanced monitoring program of Nalcor's*
23 *activities required to place the LIL reliably in service.*

24

25 **Hydro's Response:**

26 Hydro and Nalcor ("Power Supply") have formalized bi-weekly discussions on baseline
27 expectations of supply from LIL in-service in advance of winter 2018-2019. The discussions
28 provide a formal forum for Nalcor to inform Hydro of specific issues that may affect risks of LIL
29 supply for the winter. Hydro will be documenting the discussions to capture the key outcomes
30 and factors that affect inputs to supply modelling.

1 Hydro has confirmed with Power Supply that it will be assuming the LIL will be capable of
2 delivering 110 MW to the IIS in this coming winter, with an associated forced outage rate of
3 7.5%. In addition, there is an assumed outage during the summer to facilitate other LIL
4 improvements.

5
6 Future discussions will provide for a formal update on expectations for energy and capacity. If
7 there are changes to the baseline expectations, Hydro will assess overall IIS supply risk, adjust
8 supply planning if required, and communicate to the Board any changes, including the
9 documented discussion outcomes, in a proposed monthly report commencing October 1, 2018.
10 Should a change materialize prior to a scheduled monthly report to the Board that will affect
11 supply, Hydro will inform the Board.

12
13 The discussions between Hydro and Power Supply will follow through to full commissioning of
14 the LIL.

15
16 **Recommendation 2:**

17 *The Board should require Hydro to provide all requested schedule information regarding*
18 *potential supply issues, including details associated with the drivers of TTO constraints*
19 *regarding the LIL.*

20
21 **Hydro's Response:**

22 As discussed in the response to Recommendation 1, Hydro and Power Supply have commenced
23 formal discussions to capture the risk to LIL in-service timing and capacity. These discussions
24 will be incorporated into Hydro's assessment of IIS supply risk and updates will be provided to
25 the Board for review.

26
27 This approach will maintain the accountability for understanding and assessing IIS supply risk
28 for this winter, and supply risk more generally, with Hydro. As Hydro will be updating the Board
29 monthly on any changes for the winter season, the Board will have sufficient opportunity to
30 review any supply issues, should changes materialize.

1 **Recommendation 3:**

2 *The Board should direct Hydro to develop contingency plans to mitigate the consequences*
3 *associated with the eventuality that the LIL will not be available, or will be significantly*
4 *unreliable, for all or part of the upcoming winter.*

5
6 **Hydro's Response:**

7 Hydro concurs with Liberty that the reliability of Holyrood is important to the overall system
8 security for the coming winter season, particularly in the event that the LIL is not considered
9 available and reliable. This was a major driver of Hydro's supplemental capital project to restore
10 the capacity of the Holyrood units.

11
12 Hydro also agrees that a combination of multiple contingency events will be required to
13 experience a significant loss of load this coming winter. As Liberty noted in its report, a
14 significant loss of supply event would require that two (2) units at Holyrood are unavailable at
15 the same time, the LIL is unavailable and system load is high.

16
17 In Hydro's May 22, 2018 Near-Term Generation Adequacy report, Hydro was of the
18 understanding that the LIL would be available beginning July 1, 2018. The analysis in Table 1,
19 conducted in the same format as that provided in Hydro's Near-Term Generation Adequacy
20 report, provides insight into the expected loss of load and unserved energy for cases not
21 explicitly considered at the time of the May 2018 filing.

Table 1 – Expected Unserved Energy (EUE)

		Expected Unserved Energy (EUE) ⁴			Holyrood Declining Capability ⁶		
Holyrood DAFOR	Conservative Supply Case ⁷	Holyrood Full Capability ⁵			Holyrood Declining Capability ⁶		
		LIL = 110 MW	LIL = 55 MW	No LIL ⁸	LIL = 110 MW	LIL = 55 MW	No LIL
15%	37	51	106	242	71	153	364
18%	57	77	161	359	103	219	511
20%	74	99	205	453	129	273	626

		Loss Of Load Hours (LOLH)			Holyrood Declining Capability		
Holyrood FOR	Conservative Supply Case	Holyrood Full Capability			Holyrood Declining Capability		
		LIL = 110 MW	LIL = 55 MW	No LIL	LIL = 110 MW	LIL = 55 MW	No LIL
15%	0.69	0.90	1.85	3.95	1.33	2.81	6.33
18%	1.05	1.35	2.72	5.67	1.89	3.92	8.60
20%	1.34	1.71	3.43	7.04	2.33	4.80	10.35

1 The increased EUE and LOLH between the Conservative Supply Case and the case with LIL at
 2 110 MW reflects the impact of the change in Forced Outage Rate (“FOR”) from 1% to the more
 3 conservative 7.5%. To date, the LIL has been demonstrated as available at 45 MW with testing
 4 up to 65 MW; continued testing up to 110 MW is scheduled over the coming weeks. As evident
 5 in Table 1, LIL availability at 55 MW results in a material improvement in both EUE and LOLH as
 6 compared to the case with no LIL availability. As such, even low levels of power transfer over
 7 the LIL in the coming winter season makes a considerable improvement to overall system
 8 reliability.

9
 10 Hydro is in the process of developing appropriate contingency plans to ensure that the risk of
 11 customer outages is mitigated in the event the LIL is not available as planned or that Holyrood
 12 performance is not sufficiently restored following Hydro’s ongoing pre-winter intervention. In

⁴ LIL Forced Outage Rate is 1% for the Supply Conservative Case only; all other cases include LIL Forced Outage Rate at 7.5%.

⁵ Holyrood Full Capacity is 170 MW for Units 1 and 2 and 150 MW for Unit 3.

⁶ Holyrood Declining Capacity starts at Full Capacity in December, declining through the operating season, consistent with behavior observed during the Winter 2017-18 Operating Season.

⁷ Conservative Supply Case results are reflective of those filed on May 22, 2018 in Hydro's Near-Term Generation Adequacy Assessment and are included for comparison purposes.

⁸ The variance of results for the No LIL case as compared to Hydro’s Conservative Supply Case with LIL delay, as filed in the Near-term Generation Adequacy report, results from seasonal reporting in this instance (inclusion of December) versus annual reporting in the previous filing.

1 addition to existing management plans⁹ that are triggered in the event of system constraint,
2 Hydro is investigating and pursuing additional options to provide increased reliability. Hydro
3 anticipates evaluating the feasibility of identified options and formulation of the resultant
4 contingency plan by the end of September 2018.

5
6 In addition to preparing for a level of LIL availability different than previously anticipated, the
7 activation of the contingency plan is largely dependent on the demonstrated outcome of the
8 ongoing work on the Holyrood units. That is, if Holyrood capacity is restored and operation
9 proves reliable at the start of the winter, it is expected only smaller portions of a contingency
10 plan will be pursued to mitigate LIL delay. If Holyrood does not prove as reliable as expected,
11 this will require enacting additional aspects of the contingency plan. As such, Hydro plans on
12 placing Holyrood Unit 2 in-service immediately upon completion of its annual outage
13 (estimated mid-September 2018). At that time, the unit will be load tested to determine the
14 success of the economizer cleaning and air heater basket replacement project. Hydro is also
15 investigating the ability to compress the critical path on the Holyrood Unit 1 outage, which is
16 currently scheduled to be returned to service by mid-October. Similar to Unit 2, Hydro also
17 intends to test the capability of Unit 1 as soon as possible. This will ensure Hydro has a
18 thorough understanding of the Holyrood plant capability in advance of winter and can adjust its
19 requirement for enacting various contingency actions.

20
21 Through these efforts, should it be determined that the combined anticipated availability of the
22 Holyrood units and the LIL pose sufficient risk to the IIS, Hydro will enact its contingency plan by
23 November 1, 2018. Hydro will update the Board on the contingency plan readiness as part of its
24 proposed monthly reporting.

25

26 **Recommendation 4:**

27 *The Board should direct Hydro to provide a specific plan to improve its program and its*
28 *organizational capabilities in asset management as applicable to the generation fleet.*

⁹ Such as Joint Storm/Outage Communication Plan, the Advance Notification Protocol and Operating Instruction BA-P-012 (T-001) for dispatch of resources.

1 **Hydro's Response:**

2 Hydro has commenced improvements in its asset management program, with particular focus
3 in the last several years on hydraulic assets. Hydro identified the need to do so in consideration
4 of the more material generating asset issues in this asset class.

5
6 Hydro defines asset management as the comprehensive management of asset requirements,
7 planning, procurement, operations, maintenance, and evaluation in terms of life extension,
8 rehabilitation, or retirement to achieve maximum value for stakeholders based upon the
9 required standard of service to current and future generations. It is a holistic lifecycle view of
10 asset management.

11
12 Hydro has established an asset management system which is modelled after industry best
13 practices. The framework for the asset management system is laid out and has undergone
14 revisions to ensure best practices are being utilized to the best of Hydro's ability. Using this
15 framework contributes to Hydro's progress on asset maintenance, reliability and lifecycle
16 management. A hallmark of a strong asset management system is continual improvement.
17 Hydro is committed to annually assessing its asset management capabilities and establishing
18 plans to improve process, people and equipment to improve reliability and asset management
19 capabilities.

20
21 Over the last 18 months, Hydro has implemented a number of improvements in asset
22 management. In particular, Hydro has focused on hydraulic assets, with the aim of piloting new
23 approaches and, upon success, rolling successful initiatives across other asset classes. A number
24 of these initiatives have commenced in other asset classes. Hydro intends to increase the
25 formality of the initiatives in other asset classes that are most successful in the hydraulic asset
26 group.

1 Some of these improvements include but are not limited to:

2 **2016**

3 • Hydro has undertaken a capital program to increase asset health and condition
4 monitoring information. This improves Hydro’s ability to extract data, extrapolate
5 trends, assist in the development of Long-Term Asset Management Plans, and allow
6 analysis to ensure appropriate preventive maintenance (“PM”) actions and timing. For
7 some assets, this information will enable the use of predictive maintenance or condition
8 based maintenance. Some assets have already undergone work to install various
9 components for monitoring, with other assets scheduled in the future. Examples of
10 work completed thus far include:

- 11 ○ Bay d’Espoir Unit 7 new vibration monitoring system installed as of 2016;
- 12 ○ Star Lake remote monitoring access set up as of August 2018; and
- 13 ○ Upper Salmon Unit new condition monitoring system scheduled for completion
14 in 2018.

15

16 Projects planned in the 5-year capital plan include:

- 17 ○ Bay D’Espoir replacement of condition monitoring equipment in capital plan for
18 2019-2020
- 19 ○ Bay D’Espoir, Hinds Lake, Cat Arm, Upper Salmon - replace chart recorders in
20 capital plan for 2020
- 21 ○ Hinds Lake, Cat Arm, Granite Canal - install partial discharge monitors in capital
22 plan for 2020
- 23 ○ Hinds Lake, Upper Salmon, Granite Canal, Paradise River - install dynamic air gap
24 monitoring in capital plan for 2020

25

26 **2017**

27 • Hydro has improved management of PM and corrective maintenance (“CM”) work
28 orders with respect to ensure reliability. Specifically, Hydro:

- 1 ○ Completes a review by operations management to ensure the appropriate
2 actions were taken within the work order. This is completed to ensure reliability
3 concerns were addressed and if there are resulting actions; and,
- 4 ○ Reviews on a monthly basis the annual work plan to ensure corrective
5 maintenance and preventative maintenance work orders are completed at the
6 optimal time and do not requiring repeated scheduling.
- 7
- 8 ● Hydro commenced daily review of work order priority assignment, including additional
9 rigour of flagging for Winter Readiness activities. This ensures Hydro is focused on work
10 orders that will execute the right work at the right time so as to maintain or improve
11 reliability. Hydro has expanded the review participants to ensure appropriate technical
12 review.
- 13
- 14 ● Hydro completed a thorough risk review of hydraulic operations, resulting in the
15 development of the Enterprise Risk Management System (“ERM”). In the past,
16 equipment issues were captured in work orders but transparency regarding risk to
17 reliability from a system perspective was lacking. Hydro determined formal capture of
18 these risks in a risk register provides methodical review that can be connected to the
19 corporate reliability goals and actions to address these risks can be captured and
20 planned for execution. ERM processes also capture other aspects of operation, for
21 example the potential for impact to the environment.

22

23 This evaluation is reviewed and updated on a quarterly basis to continually manage and
24 mitigate risks. As an example, through this process the Upper Salmon rim key weld
25 cracking was identified as a risk, and an appropriate mitigation plan was implemented
26 which includes monthly checks of the rotor rim keys condition and repairs to any cracks
27 or defect as found. The ERM process has allowed Hydro to maintain reliable operation
28 of the rim keys since 2017. Further, a plan was developed to execute replacement of the
29 keys in October 2018. Hydro believes this approach allowed for the right-timing and
30 right-sizing of the solution to this risk.

- 1 • Monthly generation performance meetings were improved to review hydraulic
2 production statistics as they relate to reliability and production risks. Meeting
3 attendance is mandatory for all Hydraulic Production management. Key topics include
4 DAFOR performance, outstanding remedial actions, generation reliability concerns and
5 work order management reports.

- 6
- 7 • The Forced Outage Investigation Standard was revised. The standard improves the
8 definition of roles for people involved in the investigation of equipment forced outages,
9 sets timelines for reporting of information and completion of the investigation, as well
10 as providing template documents for the various aspects of forced outage
11 investigations. Since being revised, the standard has been utilized to investigate every
12 forced hydraulic generation outage and weekly meetings are being conducted by
13 Hydraulic management to review progress on investigations and resulting actions.

14

15 **2018**

- 16 • Hydro has implemented improved collection, tracking, technical review, and follow-up
17 of key equipment indicators. An example of an item that is now tracked more vigorously
18 is the rotational seal clearances on units. If not tracked in this manner, there is increased
19 risk of unplanned and untimely interventions that, at a minimum result in temporary
20 unit unavailability, but in the extreme can cause physical damage which could result in
21 much longer unavailability and additional reliability issues.

- 22
- 23 • In response to an identified need to improve asset management and reliability, Hydro
24 reorganized its employee complement to allow focus on asset management in hydraulic
25 generation. First, a generation performance specialist with accountability of focusing on
26 asset performance is now in place. This position did not previously exist in this asset
27 class. Second, Hydro determined that a gap existed in electrical/protection and controls.
28 This role provides improved field oversight and response in this asset class.

- 1 • Work Order Management Reports were created. As part of Hydro’s ongoing effort to
2 increase visibility on reliability drivers, Hydro noted gaps in the work order management
3 of incomplete or cancelled work orders. Lack of visibility on incomplete items can result
4 in critical work orders not being complete creating a reliability issue. These new reports
5 allow for management to have visibility on outstanding work orders, determine if such
6 work orders result in a reliability risk if left incomplete, and then enable management to
7 put mitigating actions in place until completion. The new reports consist of:
- 8 ○ Work Order by Priority – Provides the total work orders not completed by
9 priority ranking. It also shows the aged distribution of the work orders.
- 10 ○ Work Order by Backlog Status Code – Provides the total work order, listed by
11 priority, for each Work Order Status code. These codes allow the reviewer to
12 determine the number of Work Orders in each step toward completion.
- 13 ○ Work Order Cancellations– Provides all cancelled work orders (PM, CM, and non-
14 maintenance) allowing the reviewer to ensure explanation for cancellation is
15 appropriate, justifiable, and not introducing a risk to reliability or other concern.
- 16
- 17 • Increased utilization of the Forced Outage Remedial Action Database. Follow up actions
18 that result from a Forced Outage Investigation are one of the most important tools
19 Hydro uses to prevent similar issues on the same unit or across the fleet of units. Hydro
20 captures these follow-up actions that are identified during a forced outage investigation
21 in a database and tracks completion of such actions. Hydro uses the database weekly to
22 review the status of each action to ensure target dates are met and critical items are
23 addressed in a timely fashion.
- 24
- 25 • Improved Management of Change (“MOC”) Process related to equipment management.
26 Hydro increased its diligence in evaluating and recording changes to its asset
27 management practices through Hydro’s MOC procedure in its Asset Management
28 Program. This procedure ensures all decisions are formally documented with
29 justification as to why the change is being made. Also, any cost or reliability impacts that
30 are business critical are filtered through multiple levels of management to ensure a

1 broader review is accomplished. An example includes changes to the capital plans to
2 include, move or cancel capital improvement projects.

3
4 The above outlines Hydro's actions in improving skills and capabilities in asset management.
5 Hydro has made significant progress to strengthen its asset management approach in the past
6 two years. Incorporating new initiatives, such as those summarized in this reply, has
7 strengthened Hydro's asset management efforts to improve asset reliability. Hydro continues to
8 seek improvements in its hydraulic generation fleet, as well as its whole fleet of assets.

9
10 As part of this summary on asset management activities, Hydro provides the following update
11 on the status of the condition of Bay d'Espoir penstocks 1, 2 and 3. Over the last three years,
12 the three penstocks that service the original Bay d'Espoir powerhouse (units 1 to 6) have all
13 undergone inspection and refurbishment of deteriorated welds. Through its work with the
14 project consultant, Hydro has determined the likely cause of failure and has since made
15 operational¹⁰, maintenance¹¹ and inspection changes to address risk of recurrence. Penstock 3
16 was inspected and refurbished in early 2018. This inspection was the first material inspection
17 completed in 2018. Additionally, Hydro completed a condition assessment on Penstock 1 in
18 summer 2018 following refurbishment in 2017 and no material issues were identified. Penstock
19 2, following refurbishment in 2017, will be inspected in September 2018 and Hydro will inform
20 the Board of the results. It is noted that Hydro has allotted sufficient time prior to the winter
21 season to complete refurbishment, if required, on Penstock 2. Hydro is confident in the
22 reliability of the penstocks for this and subsequent winters.

23
24 **Recommendation 5:**

25 *The Board should direct Hydro to provide some context and long term implications for its*
26 *analysis of the problems at the Hydraulic units, as described in the latest Near-Term Generation*
27 *Adequacy Report.*

¹⁰ Reduced rough zone operation.

¹¹ This includes non-destructive testing inspections or any other inspections as suggested by Hydro's consultant upon completion of the Level 2 Condition Assessments ongoing. As ordered in Board Order No. P.U. 23(2018), copies of the Condition Assessment will be filed with the Board by December 15, 2018.

1 **Hydro's Response:**

2 As part of its Near-Term Generation Adequacy reports, Hydro has been providing detail on
3 known issues that could impact reliability. These items were not provided as evidence of
4 unmanageable issues, but rather provided in the interest of transparency with the Board.

5
6 Hydro manages and monitors known reliability concerns and aims to take action at the right
7 time. Intervention earlier than necessary can result in increased costs, while delayed
8 intervention can be a reliability risk. Hydro has been aiming to strike the balance of timely
9 intervention while avoiding reliability risk. The updates that have been provided through the
10 Near-Term Generation Adequacy reports are reflective of the actions required for each issue to
11 strike that balance.

12
13 The highest recent DAFOR performance indicators of Hydro's hydraulic assets were in the years
14 2014 and 2016 at 5.97% and 5.51%, respectively. In 2014, the failure of the rectifying
15 transformers servicing Bay d'Espoir contributed 4.90% of the unavailability. In 2016, penstock
16 leaks on Bay d'Espoir Units 1 and 2 contributed 5.17% of the unavailability. Hydro did not
17 interpret the resolution of these issues as an indicator of the adequacy in the asset
18 management aspect of the operation. In fact, Hydro re-evaluated the asset management
19 program in the hydraulic group and commenced continuous improvement initiatives to
20 contribute to prevention of equipment reliability issues. The efforts completed to date and
21 future commitments as a result of this re-evaluation are detailed in Hydro's response to
22 Recommendation 4 of this reply.

23
24 Improvements in DAFOR are achieved through both early identification and prevention of
25 reliability issues and through improved response should a reliability issue occur. Hydro has
26 made strides in both prevention and response as is detailed in Hydro's response to
27 Recommendation 4 of this reply. As compared to the Canadian Electricity Association ("CEA")
28 performance reporting for hydraulic units, Hydro's performance has consistently ranked above
29 the CEA average (as shown in Table 2), including years 2014 and 2016 referenced previously.
30 Therefore, Hydro's experience in this asset class is that the availability is not atypical when

1 compared to industry. In 2018, Hydro's year-to-date performance is 0.2% DAFOR for hydraulic
 2 assets; this is the best year-to-date performance since 2012.

Table 2 – Hydraulic Generation Performance - DAFOR

	2012	2013	2014	2015	2016	2017
Hydro	0.95	0.56	5.97	2.66	5.51	2.29
CEA	4.95	4.95	6.40	6.59	6.51	6.51

2014 - Failures of two rectifying transformers at Bay d'Espoir contributed 4.90 to the annual DAFOR.

2015 - Vibration issue on Bay d'Espoir Unit 1 contributed 2.27 to annual DAFOR.

2016 - Leaks on Penstocks for Bay d'Espoir Units 1 and 2 contributed 5.17 to annual DAFOR.

2017 - Leak on Penstocks for Bay d'Espoir Units 1 and 2 contributed 1.64 to annual DAFOR.

3 Hydro does not interpret the 2018 year-to-date performance of 0.2% DAFOR as a signal that
 4 efforts to improve asset management in hydraulic generation can be relaxed. Hydro is aiming
 5 for multiple years of sustained improved performance and, as discussed in Hydro's response to
 6 Recommendation 4 of this reply, has commenced actions to achieve this goal.

7
 8 Hydro has assumed a 2.6% level of unavailability of its hydraulic assets in its near-term
 9 generation adequacy planning. Considering Hydro's recent performance and ability to respond,
 10 Hydro is confident the 2.6% DAFOR for the overall hydraulic asset class is appropriate for near-
 11 term planning. Further, Hydro will provide additional discussion on hydraulic availability in its
 12 Resource Adequacy Review scheduled to be submitted to the Board November 15, 2018.

13

14 **Conclusion**

15 Ensuring reliable supply for the IIS is critical. Hydro's supply planning is configured in
 16 consideration of the availability and condition of existing assets, anticipated new and alternate
 17 sources of supply and with a view to the requirement for contingencies. The evolving nature of
 18 the IIS with the introduction of the LIL and LTA assets and the associated later than anticipated
 19 in-service date brings an understandable level of uncertainty to supply adequacy. As a result,
 20 Hydro is actively monitoring the availability of supply and impact on supply planning as it
 21 relates to the LIL, as well as the IIS. In addition to the existing system contingency plans in place,
 22 Hydro is developing a specific contingency plan in the event that the LIL does not meet the
 23 current assumed capacity and reliability parameters.

- 1 Through regular reporting commencing October 1, 2018, Hydro will keep the Board informed
- 2 on developments related to the anticipated LIL in-service date and any material changes
- 3 impacting supply adequacy for the IIS.