

May 2, 2014

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

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

Dear Ms. Blundon:

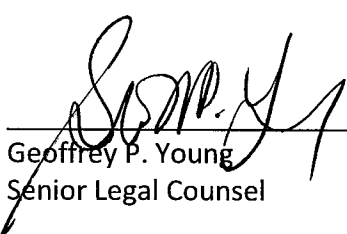
**Re: The Board's Investigation and Hearing into Supply Issues and Power Outages on the
Island Interconnected System**

Please find enclosed the original plus 12 copies of Hydro's response to The Liberty Consulting Group Interim Report of April 24, 2014 and a table containing Hydro's responses to Liberty's recommendations.

Should you have any questions, please contact the undersigned.

Yours truly,

NEWFOUNDLAND AND LABRADOR HYDRO



Geoffrey P. Young
Senior Legal Counsel

GPY/jc

cc: Gerard Hayes – Newfoundland Power
Paul Coxworthy – Stewart McKelvey Stirling Scales
Roberta Frampton Benefiel – Grand Riverkeeper Labrador
Sheryl Nisenbaum – Praxair Canada Inc.

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*Investigation and Hearing into Supply Issues and Power Outages on the
Island Interconnected System*

NEWFOUNDLAND AND LABRADOR HYDRO

RESPONSE TO THE LIBERTY CONSULTING GROUP

INTERIM REPORT OF APRIL 24, 2014



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1.0 GENERAL COMMENTS

1.1 Introduction

This is a response by Newfoundland and Labrador Hydro (Hydro) to the Interim Report presented by The Liberty Consulting Group (Liberty) to the Board of Commissioners of Public Utilities of Newfoundland and Labrador (the PUB) in relation to the supply issues and power outages which occurred on the Newfoundland integrated island power system over the period January 2-8, 2014.

Hydro appreciates the impact that power outages have on customers and the general public, especially any which extend and rotate over a period of time. Hydro's commitment to identify and address the factors which caused or contributed to the January, 2014 supply disruptions was a key reason why the Company quickly initiated an in-depth internal review of these events on January 10th. Hydro's review involved both internal and external experts, and our internal review report was filed with the PUB on March 24, 2014. This report identified many actions to be taken by Hydro, and most of these actions are in progress.

Liberty's key findings are broadly consistent with the findings of Hydro's internal review, and with very few exceptions or qualifications, Hydro agrees with Liberty's recommendations. Stakeholders can have a high level of confidence that the required actions identified by Hydro through its extensive analysis of all relevant focus areas, supplemented by those recommended by Liberty, will serve them well.

Hydro places a strong focus on continuous improvement, and the Company is acting on these findings to help ensure that similar electricity supply issues are avoided in the future. Hydro acknowledges the review completed by Liberty and the input they have provided, and looks forward to continuing an open and collaborative working relationship with the PUB and with Liberty as we work together over the coming months in follow-up to both their review and Hydro's internal review.

1.2 Hydro's Integrated Action Plan and Liberty's Interim Report

All actions identified by Hydro through its internal review have been consolidated into an integrated action plan. This integrated plan will incorporate Liberty's recommendations, and where appropriate, linkages to actions already planned by Hydro will be indicated. Hydro's action plan and Hydro's review of Liberty's recommendations are provided to the PUB separately from this response.

Hydro's internal review included a detailed evaluation of factors which contributed or potentially contributed to the January, 2014 supply issues and power outages. This was done in eight different focus areas, and separate reports were produced for each of these. In addition to the high priority actions identified below, various other actions were identified and recommended in these reports.

Tables 1 and 2 below indicate the highest priority actions identified by Hydro -- those that were identified as either "Key Actions" or "Other Priority Actions". Cross-references to Liberty recommendations which are related to Hydro's indicated actions are included as well.

Table 1 – Key Actions From Hydro's Internal Review	
Action/Focus Area	Related Liberty Recommendations
Generation Planning: Expand the level of sensitivity testing for alternate weather and generation availability scenarios into the generation expansion planning process.	#s 3 and 4
Gas Turbines: a) Implement recommendations identified through the internal review relating to gas turbine availability, including: <ul style="list-style-type: none">- review of gas turbine maintenance practices- assess the effects of test starts and run-ups prior to severe weather- identify repeat failure events and address the root causes	#s 10 and 11

Table 1 – Key Actions From Hydro’s Internal Review	
Action/Focus Area	Related Liberty Recommendations
<ul style="list-style-type: none"> - identify plan required for additional plant and equipment refurbishment not already completed - review fuel storage processes and procedures <p>b) Create a senior position reporting to the Vice-President for Hydro whose accountability includes the oversight of asset management plans, maintenance standards, and capital submissions related to gas turbines.</p>	
<p>230 kV Breakers:</p> <p>a) Review the current 230 kV breaker replacement plan and revise for accelerated replacement, with a priority on identifying the activities and areas to be completed during the 2014 maintenance season.</p> <p>b) Review the existing preventative maintenance program for 230 kV breakers and identify any changes required, including the PM cycle, and consider breaker seal risks associated with cold weather effects.</p> <p>c) Revise the Work Methods pertaining to the repair of 230 kV breakers.</p>	#s 20, 21, 22, 23, 33
<p>Asset Management – Critical Spares:</p> <p>Complete the planned initiatives in Hydro’s Integrated Critical Spares Strategy as well as implement improvements identified by the Critical Spares Council in 2013. In the process, revisit the Company’s critical spares philosophy for Holyrood and other generation assets within Hydro’s system, and implement any changes in time for the 2014/15 winter season.</p>	#14

Table 2 –Other Priority Actions From Hydro’s Internal Review	
Action/Focus Area	Related Liberty Recommendations
<p>Short Term Load Forecasting:</p> <p>Review the updated version of the short term, seven day operating forecast to determine if it provides an improved correlation in extreme cold weather situations. If not, investigate alternative models and</p>	#1

Table 2 –Other Priority Actions From Hydro’s Internal Review	
Action/Focus Area	Related Liberty Recommendations
implement available enhancements prior to the 2014/15 winter season.	
Winter Readiness: Review current winter readiness program in reference to industry best practices and formally implement/document for Hydro operations.	#12
Work Planning and Scheduling: Continue evaluation and implementation of work planning, scheduling and execution improvements.	#s 18, 21, 28, 35
Transformers, Breakers, and Relays: Finalize evaluation of high priority recommendations by Henville Consulting and the Root Cause Analysis Team.	#s 17, 18, 24, 25, 29, 31, 32
Customer Notifications: Implement a formal protocol for notifying customers, end users and the general public in relation to pending supply issues and conservation requests.	#s 37, 38, 39, 41, 42, 44, 45, 46
Backup Power at Hydro Place: Identify and address the factors which caused under-frequency/synchronization and over-heating issues on the back-up diesels at Hydro Place in early January.	#40

1.3 Generation and Transmission Performance

Hydro has been investing significantly in the Company’s thermal generating units at Holyrood and its combustion turbines in Hardwoods and Stephenville in recognition of the need for greater reliability in these areas, and these will continue to be priority areas of focus. Similarly, the reviews completed by both Hydro and Liberty have identified improvement actions that will further enhance transmission system reliability as well.

It is important, however, that the needed go-forward focus on Hydro’s execution of its action plan is assessed in a wider context, and with an understanding that, on an overall basis, Hydro’s generation and transmission systems have performed well and to a high standard.

1 The performance of Hydro's hydroelectric generation assets has consistently exceeded the
2 Canadian industry five year average, and the performance of its oil-fired generation assets
3 has historically tracked closely with the Canadian five year average – 2013 was a notable
4 exception because of the catastrophic failure of Unit #1 at Holyrood.

5
6 On the transmission side, Hydro has out-performed comparable Canadian utilities on a five
7 year rolling average basis in relation to the performance of 230 kV transformers and
8 breakers, both in terms of outage frequency and duration. Transmission line performance
9 has been more variable in comparison to Canadian benchmarks. Over the last ten years,
10 outage frequency has closely tracked the Canadian utility average in some years, but has
11 been above in others. However, the average duration of line outages when they do occur
12 was more consistently below the Canadian utility average over the same period.

14 **1.4 Asset Management at Hydro**

15 Liberty's interim report confirms that the January, 2014 supply issues and power outages
16 were related to two separate series of events: a) unplanned generation outages which
17 initiated in the latter part of December, 2013; and b) issues with the operation and
18 availability of key transmission system equipment starting on January 4, 2014. It is not
19 surprising, therefore, that the majority of the recommendations and actions flowing from
20 both Hydro's internal review and Liberty's interim report are focused on equipment
21 availability and reliability, and the management and maintenance of aging generation and
22 transmission assets.

23
24 Hydro recognizes the implications of an aging asset base, and has acted aggressively to
25 address these. The associated requirements for asset refurbishment and renewal and
26 increased maintenance were the main reasons that Hydro recognized the need for a more
27 aggressive program in these areas in 2006, and started the process to implement an
28 expanded, more formal asset management strategy in 2009. Numerous asset condition

1 assessments and transmission system studies have been completed over the last several
2 years to identify the work required to increase and sustain a focus on Hydro's asset
3 management and reliability. Hydro's investment in asset renewal has substantially
4 increased as well. The Company's capital spending has more than doubled since 2005, and
5 it will increase further in 2014 and beyond. The majority of this increased investment has
6 been directed towards the renewal of existing assets to ensure that necessary equipment
7 performance and reliability is achieved.

8
9 During their independent review of Hydro's asset management practices (as part of Hydro's
10 internal review), AMEC Americas stated that Hydro's asset management strategy is
11 comprehensive and consistent with industry best practice. Liberty has indicated concerns
12 with Hydro's execution of its asset management program from an inspection and
13 maintenance perspective. However, they did conclude that "Hydro has moved towards the
14 industry best-practice of adopting an asset management program, which is the industry's
15 common term for optimizing infrastructure performance and costs, including structured,
16 comprehensive maintenance".

17 18 **1.4.2 Preventative Maintenance**

19 As noted in Hydro's RFI response to PUB-NLH-155, the effective execution of its
20 preventative maintenance (PM) program is a cornerstone of Hydro's asset management
21 strategy. The PM program consists of planned, proactive maintenance activities and
22 inspections to ensure that assets will operate safely and reliably, for the least cost. The
23 execution of this annual program is tracked and measured by area of operation.

24
25 In 2013, Hydro's PM completion rate target was 80%. This target was exceeded in several
26 areas, but not in all. Areas requiring improvement will be particular areas of focus in 2014,
27 with a view to also identifying those specific locations or sub-areas which require the
28 greatest attention. Preliminary indications are that the eastern/Avalon area of TRO and
29 work scope related to protection and control may fall into this category, but this analysis is

1 being finalized. Various actions identified in both Hydro's internal review and Liberty's
2 interim report pertaining to preventative maintenance will be incorporated into Hydro's
3 integrated action plan.

5 **1.5 Generation Planning and Winter Readiness 2014-17**

6 Hydro's most recent generation capacity plan (2012) indicated the need for a new
7 generation source in 2015 to meet growing load demand, and plans have been ongoing to
8 secure this. In view of the outage events experienced in the last two winters, and having
9 done a more comprehensive assessment of possible load scenarios using a wider array of
10 assumptions related to extreme cold weather conditions and generation availability (as
11 recommended by Hydro's external consultant, Ventyx, and supported by Liberty), Hydro has
12 decided to accelerate its plans for the addition of new generation.

13
14 An application to acquire a 100 MW combustion turbine, for installation at the Holyrood
15 thermal generating site with a target in-service of December, 2014, was submitted to the
16 PUB for approval on April 10, 2014. Hydro has requested an expedited approval process
17 from the PUB which will be a key factor in Hydro's ability to secure an available turbine at a
18 competitive price, and to mobilize the contractors and project execution plan needed to
19 ensure this new equipment is available as we go into the 2014-15 winter period. This action
20 is consistent with Liberty's interim report recommendation #15. Hydro has also initiated
21 discussions with Industrial Customers to formalize interruptible power arrangements for the
22 winter of 2014-15. Hydro is confident that these arrangements, combined with a new
23 generation source at Holyrood, will provide an adequate reserve of generation supply
24 through to 2017/18, when new generation will be available from Muskrat Falls.

1.6 Cost Versus Reliability

In their interim report, Liberty acknowledges that Newfoundland's current island interconnected system is unique in comparison to most other electricity systems in North America. Newfoundland's electricity grid is an isolated system with no capacity to enhance system reliability, or to access additional generation if needed, through an inter-connection with the North American grid. Liberty also acknowledges that system reliability comes at a cost, and that striking the right balance between system reliability, and the costs involved in maintaining that reliability, requires a unique answer in the Newfoundland context. In the meantime, Liberty also notes this is more of a short term concern given that Muskrat Falls will be coming on line.

Hydro's statutory mandate is to deliver safe, least cost, reliable power to customers throughout the province. Hydro has always strived to ensure the right balance between reliability and cost for the benefit of the rate payer.

In the meantime, Hydro cannot operate in isolation of the views and needs of its stakeholders. Customers and end users; the PUB as Hydro's regulator; and the provincial government all play a role in determining reliability standards, as well as Hydro's capacity to meet these expectations through adequate and timely capital investments and the rates that are charged for electricity. Hydro believes the time is right for a dialogue on reliability expectations and system affordability, which involves all affected stakeholders in the province. Among other possibilities, the Province's planned review of the provincial electricity system will likely create a forum for this to happen, and Hydro looks forward to being an active participant in this important conversation.

1.7 Hydro's Culture of Service and Safety

On page 18 of their interim report, Liberty states the following:

1 “We did not find a careless utility attitude about reliability. The personnel with
2 whom we spent time in producing this report fully share the North American
3 industry’s healthy priority on “keeping the lights on”. That priority shows in the
4 extraordinary efforts of those charged with responding to emergencies, when
5 service must be restored under the worst conditions. We observed no
6 difference between electric utility service workers in this region, as compared
7 with what we have seen elsewhere, when it comes to a sense of urgency,
8 dedication, and personal responsibility”.
9

10 Hydro takes pride in its people and their strong loyalty to our customers, and the Company
11 is pleased that Liberty’s independent review validated this sense of commitment. “Keeping
12 the lights on” is very much a part of Hydro’s service culture, and Liberty’s comments to that
13 effect are appreciated. At Hydro, this is complemented by a very strong focus on the safety
14 of our employees and the general public, as our first and most important priority.
15

16 **2.0 RESPONSE TO LIBERTY RECOMMENDATIONS**

17 With only a very few exceptions or qualifications, which are discussed in more detail in later
18 sections, Hydro accepts the recommendations made by Liberty in their Interim Report, and
19 the actions required to address these recommendations are underway. With this in mind,
20 and to ensure that the focus remains on actions going forward, this response minimizes any
21 detailed discussion of issues and related findings. Instead, we comment generally on
22 Liberty’s recommendations as they are grouped in relation to each of the following
23 categories:
24

- 25 1. Load Forecasting;
- 26 2. Generation Capacity Planning;
- 27 3. Generation Availability and Asset Management;
- 28 4. Transmission Availability and Asset Management; and
- 29 5. Customer Service and Communications.
30

31 **2.1 Load Forecasting**

32 The first series of Liberty recommendations (#s 1-6) relate generally to load forecasting, and
33 Hydro agrees with these recommendations. Actions have already been initiated or are

1 planned under some of these recommendations based on the results of Hydro's internal
2 review and the recommendations of its external consultant, Ventyx (see Key Actions and
3 Other Priority Actions in Section 1.2). Other recommendations not falling into this category
4 will be incorporated into the Company's integrated action plan.

5
6 Enhancements to Hydro's load forecasting and capacity planning processes that are
7 indicated in several of these recommendations were factored into Hydro's decision to
8 accelerate its plan for new generation and its recent application to the PUB for the
9 acquisition of a new 100 MW combustion turbine.

11 **2.2 Generation Capacity Planning**

12 Recommendations 7 through 9 in Liberty's interim report relate to generation planning.
13 Hydro agrees with recommendation #7 that future reliability analyses should incorporate a
14 focus on the total island system, and not just Hydro's system. Hydro also agrees with
15 recommendation #9, to the extent that a review and update of the generation planning
16 criterion to be used post-Muskrat Falls is warranted. However, this should not presume
17 that the criterion would not continue to be LOLH-based (Loss of Load Hours).

19 **2.2.1 Generation Planning Criterion**

20 Recommendation #8 suggests that, in the near term, Hydro should abandon its LOLH
21 planning criterion in favor of an "as low as practical" objective. Hydro agrees that current
22 generation planning assumptions may result in generation reserve margins that are too low,
23 and that measures need to be taken to ensure a more robust reserve margin during the
24 period leading up to the in-service of Muskrat Falls. However, Hydro feels that maintaining
25 the current LOLH criterion of 2.8 hours and more closely evaluating low probability/high
26 impact scenarios through the use of more conservative assumptions related to generation
27 reliability and extreme weather, is a more practical approach to generation planning in the
28 interim period leading up to Muskrat Falls. Hydro's considerations include the following:

- a) Establishing a new interim LOLH target, or something less defined such “as low as practical” would be somewhat arbitrary and difficult to substantiate.
- b) The LOLH criterion is appropriately sensitive to variations in the key factors which influence LOLH, including assumptions made relative to the availability/reliability of thermal and hydro generation units, as well as load forecasting assumptions related to weather severity. Hydro’s recent application to the PUB illustrates this, and indicates in 2014 alone that a range of LOLH between 2.48 hours and 7.75 hours was possible depending on assumption changes related to generation reliability; weather severity; and both variables combined.

LOLH and generation reserve margin are related, with the reserve margin being impacted by load and generation availability assumptions. Table 3 below shows the anticipated generation reserve margins for the period 2014-2017 based on the addition of a 100 MW combustion turbine and a 60 MW interruptible load arrangement in 2014. This analysis shows reserve margins for both P90¹ and P50 load expectations.

Table 3 – Generation Reserve Margins		
Year	100 MW CT + 60 MW Interruptible Arrangement With Industrial Customers	
	P90 Forecast	P50 Forecast
2014	16.5%	19.7%
2015	14.5%	17.6%
2016	13.5%	16.5%
2017	12.3%	15.2%

Hydro’s “stress case” approach has evaluated LOLH and the generation reserve margin based on more conservative generation reliability assumptions for the Holyrood units and the existing gas turbines, as well as a P90 standard for weather severity on the load forecasting side. This analysis has demonstrated that Hydro can maintain a LOLH below 2.8 hours and a generation reserve margin of 12%, or approximately 215 MW, for what would

¹ P90 and P50 are indicators of probability. P90 implies there is a 90% probability that the actual load will be lower than the forecast, and only a 10% probability that it will be higher, while for P50 there is an equal 50% probability that the actual load will be above or below the forecast value.

1 be considered an extreme operating scenario. For the more probable, less extreme
2 operating scenarios the LOLH would be lower and the available generation reserve higher.
3 Hydro believes that, during the period leading up to Muskrat Falls, planning its system
4 based on “stress case” load and generation availability assumptions which ensure a LOLH
5 below 2.8 hours and a generation reserve margin of at least 12% would constitute a “low as
6 practical objective”. With this proposed methodology, in any given year there would be a
7 90% probability that actual generation reserves would be higher than the “stress case”
8 predictions.

9
10 This approach benchmarks favorably with the Canadian electric utility industry where,
11 based on similar probabilistic analyses, generation reserve margins in predominantly
12 hydroelectric systems are typically around 10%, and in predominantly thermal systems are
13 normally in the 15-20% range. Hydro’s system is a mixture of hydroelectric and thermal
14 generation, with hydro comprising 60-70% of the generation mix in any given year. In the
15 analysis shown above, the expected reserve margins between 2014 and in-service for
16 Muskrat Falls are well within these ranges.

18 **2.3 Generation Availability and Asset Management**

19 Recommendations 10 through 16 in Liberty’s interim report relate generally to generation
20 availability and asset management. Hydro agrees with these recommendations and they
21 will be incorporated into the Company’s integrated action plan.

22
23 As in other areas, there is significant alignment between Liberty’s recommendations and
24 the actions identified by Hydro through its internal review. As a result, actions are already
25 complete or ongoing in some areas. With respect to recommendation #15 in particular, and
26 as noted in an earlier section of this response, Hydro has indeed been treating the addition
27 of a new generation source as a first priority. Similarly, with respect to recommendation
28 #16, Hydro has been actively working on the formalization of interruptible power
29 arrangements with industrial customers, to be in place for the 2014-15 winter season.

2.4 Transmission Availability and Asset Management

Recommendations 17 through 36 in Liberty's interim report relate generally to transmission availability and asset management. These 20 recommendations can be allocated into one of the following categories: a) terminal station transformers; b) air blast circuit breakers; c) protection and control and relay design; and d) other recommendations.

2.4.1 Terminal Station Transformers

Recommendations 17, 18, 19, 29, 30, and 35 in Liberty's interim report relate generally to critical, high voltage terminal station transformers. Except as noted or qualified below, Hydro agrees with these recommendations, and they will be incorporated into Hydro's integrated action plan.

Dissolved Gas Analysis

Recommendation #17 states that Hydro should intensify dissolved gas analysis (DGA) testing of its critical transformers exhibiting questionable levels of combustible gases, and take actions necessary to minimize failures. On page 44 of their interim report, Liberty discusses the elevated level of acetylene gas that was identified in the Sunnyside T1 transformer in September, 2013, and then observes that Hydro did not pursue investigative sampling, intensified DGA testing, or an investigation of whether acetylene might be leaking into the transformer oil from the tap changer compartment. Liberty also observed that Hydro deferred preventative maintenance and testing scheduled for that transformer in 2013.

Hydro acknowledges that preventative maintenance and testing on the Sunnyside T1 transformer in 2013 may have identified abnormal internal conditions. However, there is no assurance that they would have, or that the transformer would have been taken out of service for corrective work. Variations in acetylene gas content in this particular transformer design (there are three sister transformers in Hydro's system) have been seen

1 dating back to the early 1990s. Based on Hydro's long experience with this equipment and
2 the expert input of the Original Equipment Manufacturer (OEM), there is a basis for
3 believing that periodic acetylene readings in the transformer oil compartment are linked to
4 gas migration from a separate tap changer compartment, where high acetylene readings
5 are common. Even though Hydro believes that acetylene levels are linked to gas migration,
6 Hydro plans to complete pressure testing of the tap changer diverter switch compartments
7 of these transformers to confirm the extent to which this is the case. Further discussions
8 are planned with the OEM to assist in the development of a procedure and a schedule for
9 this testing.

10
11 The guidance received thus far from the OEM (ABB) is that the failure of the T1 transformer
12 in Sunnyside was most likely related to a bushing failure, and not to any components
13 housed in the main body of the transformer. Such a failure would not necessarily be related
14 to, or predicted by, dissolved gas levels inside the transformer. Hydro's in-depth analysis of
15 the T1 failure was unable to identify a definitive root cause, and as Liberty indicates, the
16 exact cause of the Sunnyside transformer failure remains unknown.

17
18 Hydro agrees that a more regular monitoring of dissolved gases in its critical transformers is
19 warranted. The Root Cause Analysis Team which investigated the T1 transformer failure
20 during Hydro's internal review recommended the installation of continuous on-line gas
21 monitors on existing critical transformers in Hydro's fleet (new Generator Step-Up
22 transformers are equipped with this capability). Hydro is developing a plan, and a budget
23 for submission to the PUB, to accomplish this. In the interim, Hydro's priority will be to
24 complete any outstanding preventative maintenance (PM) work, as well as any others
25 changes that are appropriate.

26 27 Completion of Transformer Projects and Scheduled Maintenance

28 Recommendation #35 recommends that Hydro should use qualified substation contractor
29 personnel, specializing in substation testing and maintenance, to provide the skilled

1 manpower required to assist with the transformer projects and to catch up with regular
2 scheduled maintenance on transformers and circuit breakers, while (Hydro) crews conduct
3 the air-blast circuit breaker operational tests.

4
5 Hydro agrees that a priority near-term focus must be placed on completing the various
6 initiatives identified relative to critical transformers, and addressing any existing
7 maintenance backlogs. In developing its resourcing plan for executing this work,
8 consideration will certainly be given to the utilization of available specialized contractors in
9 a campaign maintenance fashion. Other potential options include the possible utilization of
10 internal forces as well. Hydro personnel are knowledgeable of the equipment they operate
11 and maintain and are qualified to perform much if not most of the work required, and the
12 Company will seek to leverage this from a cost and expediency standpoint where it makes
13 sense to do so. In any event, Hydro is committed to obtaining the right amount and quality
14 of resources to get the necessary work done, and in a timely manner.

15 16 **2.4.2 Air Blast Circuit Breakers**

17 Recommendations 20, 21, 22, 23, and 33 in Liberty's interim report relate generally to air
18 blast circuit breakers. The actions outlined in these recommendations are consistent with
19 the "Key Actions" identified in Hydro's internal review report relative to 230 kV air blast
20 breakers, and they will be incorporated into Hydro's integrated action plan.

21 22 **Preventative Maintenance on Air Blast Breakers**

23 Hydro completed a comprehensive review of the outage incident in Holyrood on January
24 11, 2013, and this review resulted in 56 recommendations. Following that assessment,
25 Hydro reviewed its preventative maintenance program for air blast breakers, and the
26 addition of breaker exercising as part of the Company's annual breaker maintenance cycle
27 was one of the changes implemented as a result. In the period March 1, 2013 and March
28 31, 2014 most of Hydro's breakers were exercised, and these included the breakers that
29 experienced problems in January, 2014. In 2014, all breakers will be exercised, and as

1 noted earlier, an additional review of the breaker program is being undertaken. See
2 Hydro's response to PUB-NLH-159 for a more detailed overview of Hydro's breaker exercise
3 activities.

4
5 Liberty has recommended (#22) that the maintenance cycle for air blast breakers be
6 reduced from six years to four years, until the retirement of these breakers. Hydro
7 identified the need to review this maintenance cycle during its internal review and agrees
8 with Liberty's recommendation, subject to a review of the impact on resources, and an
9 execution plan will be presented as requested.

11 **2.4.3 Protection and Control/Relays**

12 Recommendations 24, 25, 31, 32, and 34 in Liberty's interim report relate generally to
13 protection and control processes and relays. The actions outlined in these
14 recommendations are consistent with those identified during Hydro's internal review by the
15 Root Cause Analysis Team (RCAT) and by the Company's external protection and control
16 consultants, Henville Consulting. These actions will be incorporated into Hydro's integrated
17 action plan, and will be complemented by other actions Hydro may identify as being
18 necessary during its evaluation of the RCAT and Henville Consulting recommendations (see
19 Other Priority Actions in Section 1.2).

21 **2.4.4 Other Recommendations**

22 The remaining four recommendations made by Liberty under the general heading of
23 Transmission Availability and Asset Management relate to ECC backup power at Hydro
24 Place; transformer alarms; the repair of a digital fault recorder; and incorporating lessons
25 learned from Newfoundland Power's service restoration issues, including those related to
26 cold load pickup. Hydro agrees with these recommendations, and they will be incorporated
27 into Hydro's integrated action plan.

2.5 Customer Service and Communications

Recommendations 37 through 46 in Liberty's interim report relate generally to customer service and communications. As Liberty notes, Hydro's direct contact with electricity customers at the retail or end user level is limited compared to Newfoundland Power's. The focus of Liberty's recommendations as they relate to Hydro, therefore, is in those areas which require close coordination between Hydro and Newfoundland Power to ensure that customers are well informed during a supply disruption situation, using all available channels of communication, and that they are notified of possible or pending outages in a timely and informative manner.

Hydro and Newfoundland Power have many existing processes and protocols in place in these areas, and the recommended actions will involve a review and update of these. Hydro acknowledges, however, that there is room for improvement in some areas, particularly with respect to the protocols to be followed for notifying Hydro customers, end users, and the general public in relation to pending supply issues and conservation requests (see Other Priority Actions in Section 1.2). Work has been ongoing on this particular action item since the submission of Hydro's internal review report in March.

Hydro agrees with Liberty's recommendations, and they will be incorporated into Hydro's integrated action plan.

3.0 FINAL REMARKS

Hydro feels it has made good progress to date in documenting a plan which incorporates and integrates the actions identified during its internal review and those associated with Liberty's recommendations. Some actions have been completed and many are in progress. Some actions will require a high level of effort and time, while others will be easier to implement and complete quickly.

1 Hydro is aware of the importance of ensuring that its integrated plan is properly
2 prioritized, but also adequately resourced. It is important to ensure as well that the
3 linkages between Hydro's internal review actions and Liberty's recommendations are
4 identified and well understood so that plan execution can be carried out as effectively
5 and as efficiently as possible. Internal work is ongoing in this regard, and Hydro looks
6 forward to working with Liberty in this regard on a go-forward basis.

7

8 Some of the actions in Hydro's integrated plan will involve unplanned capital and
9 other costs which are at a level that will require PUB approval for cost recovery.
10 Hydro expects to develop greater clarity on this over the coming weeks, and any
11 required application(s) will be presented to the PUB at the appropriate time.

LIBERTY RECOMMENDATIONS

No.	Recommendation	Hydro Response
1	Hydro should complete the modifications or replacement of Nostradamus by December 1, 2014 in order to enable improvements in the accuracy of short-term forecasts under extreme weather conditions.	Agreed. Discussions have been initiated with Ventyx to work toward a solution
2	By December 1, 2014, Hydro should incorporate into its short-term forecasting process any significant load changes, from losses or otherwise, resulting from varying system configurations.	Agreed. Being addressed with recommendation #1
3	In the interim, Hydro should implement the Ventyx recommendation to consider weather extremes via sensitivity analysis in all forecasting and supply planning evaluations and decisions.	Agreed. Will be incorporated in next load forecasting cycle and has already been applied in the Combustion Turbine application
4	By September 1, 2014, Hydro should: (a) evaluate and reach resolution on a formal change to the planning process to use a greater than 50 percent probability weather variable, (b) propose that criterion to the Board for use in future capacity decisions, and (c) continue to conduct sensitivity analysis for extreme weather, but around the new weather variable.	Agreed. Concepts have already been applied in the combustion turbine application and will be formalized as part of the generation planning process by September 1
5	Before December 1, 2014, Hydro should: (a) re-evaluate the deviations between its forecasted winter peak and the multiple times it was exceeded during the winter of 2014, and (b) determine what, if any, common factors were responsible and what changes, if any, they suggest for the forecasting process.	Agreed. This will be completed as part of the next load forecasting cycle prior to Fall 2014
6	Before September 1, 2014, Hydro should: (a) strengthen its ability to reconstruct the peak load when peaks have been significantly affected by artificial means such as those employed by the generation shortage protocol, and (b) use those improved techniques in the recommended evaluation of 2014 forecast deviations.	Agreed. This will be completed as part of the next load forecasting cycle prior to Fall 2014
7	Hydro should follow through on its plans to assure consistency in future reliability analyses by focusing on the IIS, as opposed to the Hydro system alone.	Agreed. This will be incorporated in the reliability analyses by Fall 2014. Implications for other aspects of the business may fall over into 2015
8	For the near-term, Hydro should abandon the LOLH of 2.8 criterion, and the associated low reserve requirements, in favor of an "as low as practical" objective.	Please see response in the letter of May 2, 2014.

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No.	Recommendation	Hydro Response
9	For the long-term, Hydro should evaluate, taking account of stakeholder input a new supply reliability criterion with a logically associated level of reserves, and seek Board concurrence to use that criterion as a basis for long-term supply planning.	Agreed. The evaluation will be initiated in 2015.
10	By June 15, 2014, Hydro should formalize its established plan to implement an aggressive availability improvement program focused on all generating assets, especially focusing on the Holyrood units and the two CTs.	Agreed.
11	Hydro should formalize its maintenance program for Holyrood generating station and the CTs in a submittal to the Board by June 15, 2014, covering the period through November 30, 2014, with the submittal to include, at least: (a) a listing of all key maintenance activities planned for each unit, (b) a critical path schedule for each planned outage of a unit including major work items, (c) a sequencing plan for planned outages showing the relationships among planned outages and how, if at all, an outage at one unit restrains an outage at another, and (d) bulk production curves for maintenance activities at each unit by number of work orders or whatever measure Hydro finds preferable.	Agreed.
12	Hydro should formalize by June 15, 2014, a generation master plan for winter preparation, including the above availability improvement activities and tasks addressing emergency preparedness.	Agreed. Hydro will complete a master plan with emergency preparedness tasks and those activities in 10 and 11 above.
13	Hydro should, on a monthly basis, and starting no later than June 30, 2014, formally provide updates of the plans under the three preceding recommendations, and meet with the Board Staff to review and observe progress.	Agreed.
14	No later than June 15, 2014, Hydro should provide to the Board a detailed report on decisions and pending actions regarding spare parts for Holyrood generating station and the CTs, including: (a) a listing of all critical plant components, (b) the results of risk analyses of such critical components, (c) the decisions on which parts should have spares, either on site or at a vendor, and (d) the action plan to procure any unsecured such parts before November 30, 2014.	Agreed. As per Hydro's Asset Management Strategy review, Hydro will provide a report on its ongoing critical spare activities for the Holyrood plant with a focus on the points provided and the 4kV motors in the plant.

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No.	Recommendation	Hydro Response
15	Hydro should treat the securing of new generation as a first priority; reach a prompt decision on a preferred option and proceed expeditiously towards an in-service date of December 1, 2014 or, if not possible, by December 1, 2015 at the latest.	Agreed. Hydro has filed an application for a Combustion Turbine with the Public Utilities Board.
16	Hydro should continue discussions with appropriate industrial customers who might make a material contribution to interruptible load with a goal of securing economically available interruptible loads.	Agreed. Discussions with industrial customers for interruptible arrangements are ongoing.
17	Hydro should intensify DGA testing of its critical transformers exhibiting questionable levels of combustible gases, and take actions necessary to minimize failures, beginning with preparation by June 15, 2014 of a detailed plan and schedule for doing so.	Agreed. Please refer to Hydro's response in the letter of May 2, 2014.
18	Hydro should catch up on overdue testing and maintenance on its critical transformers, beginning with preparation by June 15, 2014 of a detailed plan and schedule for doing so.	Agreed. Hydro is addressing overdue maintenance on its critical transformers.
19	Hydro should complete system studies to verify that its plan to relocate the repaired T5 transformer from Western Avalon terminal station to replace the failed Sunnyside T1 transformer will not unduly reduce the reliability of the Western Avalon terminal station and of the transmission system as a whole, beginning with preparation by June 15, 2014 of a detailed plan and schedule for doing so.	Agreed. Hydro has completed studies and is completing plans to secure reliable service to the affected areas.
20	Hydro should conduct operation tests (exercise) all air-blast circuit breakers in 2014, preferably in cold weather, and continue exercising them on an annual basis, beginning with preparation by June 15, 2014 of a detailed plan and schedule for doing so.	Agreed, Hydro has established a schedule for exercising these breakers.
21	Hydro should catch up on overdue testing and maintenance on its critical air-blast circuit breakers, beginning with preparation by June 15, 2014 of a detailed plan and schedule for doing so.	Agreed. Hydro is addressing overdue maintenance on its critical breakers.

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No.	Recommendation	Hydro Response
22	Hydro should change its air-blast circuit breaker proactive maintenance program cycle from six to four years, until retirement of these breakers, beginning with preparation by June 15, 2014 of a detailed plan and schedule for doing so.	Agree to review existing PM cycle and evaluate impact on resources and will provide an execution plan as requested.
23	Hydro should periodically operate each of its circuit breakers from protective relays, beginning with preparation by June 15, 2014 of a detailed plan and schedule for doing so.	Agree to review to include such operations in the routine maintenance cycle to ensure it is carried out in a manner to not impact service reliability.
24	Hydro should redesign its existing breaker failure relay protection schemes to provide that breaker failure will be activated whenever a transformer fails coincidentally with either a 138kV or a 230kV breaker malfunction, beginning with preparation by June 15, 2014 of a detailed plan and schedule for doing so.	Agreed.
25	Hydro should formally examine the installation of breaker failure relay protection for transformers in terminal stations where breaker failure relay protection is not in place, beginning with preparation by June 15, 2014 of a detailed plan and schedule for doing so.	Agreed.
26	Hydro should prepare on a high priority basis a documented analysis of ECC emergency generator availability risk, and maintenance procedures that address regular inspection and repair commensurate with the risks identified, beginning with preparation by June 15, 2014 of a detailed plan and schedule for doing so.	Agreed.
27	Hydro should update its event and data recording devices and systems to give each type of transformer alarm its own alarm point, beginning with preparation by June 15, 2014 of a detailed plan and schedule for doing so.	Agreed. Hydro will evaluate and prioritize alarm points.
28	Hydro should develop a priority procedure to repair immediately a malfunctioning digital fault recorder (DFR), beginning with preparation by June 15, 2014 of a detailed plan and schedule for doing so.	Agreed.

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No.	Recommendation	Hydro Response
29	Hydro should complete the studies being conducted to determine whether abnormal system disturbances could have caused the T5 transformer failure at Western Avalon terminal station, and report whether any changes need to be made in systems operations or configuration as a result of these studies, beginning with preparation by June 15, 2014 of a detailed plan and schedule for doing so.	Agreed. In progress completion targeted by May 31, 2014.
30	Hydro should seek to locate for Western Avalon T5 a replacement transformer that can be purchased in case: (a) the field repairs are not successful, (b) the repaired transformer fails again later, or (c) the transformer is moved to Sunnyside terminal station, beginning with preparation by June 15, 2014 of a detailed plan and schedule for doing so.	Agreed. Hydro will be assessing this as part of repair plan.
31	Hydro should include experienced protection and control technologists with its response teams when addressing Hydro termination station events involving investigating and modifying complicated protective relay schemes, beginning with preparation by June 15, 2014 of a detailed plan and schedule for doing so.	Agreed.
32	Hydro should not employ any “slow trip” coils, where used by backup relay tripping in its air blast circuit breakers, beginning with preparation by June 15, 2014 of a detailed plan and schedule for doing so.	Agreed.
33	Hydro should prepare a maintenance practices document addressing the new procedure for applying the protective coating to its air-blast circuit breakers and describing how the new procedure will prevent moisture contamination, beginning with preparation by June 15, 2014 of a detailed plan and schedule for doing so.	Agreed. As per Hydro’s finding in its Root Cause review of the breaker failure.
34	Hydro should review its substation and protection and control (P&C) staffing needs for the future, in light of the more intense maintenance needs on its aged transformers and circuit breakers, its protective relay replacement and modification work, and upcoming construction work on the new DC lines, beginning with preparation by June 15, 2014 of a detailed plan and schedule for doing so.	Hydro will provide its plan as requested.

LIBERTY RECOMMENDATIONS

No.	Recommendation	Hydro Response
35	Hydro should use qualified substation contractor personnel, specializing in substation equipment testing and maintenance, to provide the skilled manpower required to assist with the transformer projects and to catch up with regular scheduled maintenance on transformers and circuit breakers, while crews conduct the air-blast circuit breaker operational tests (exercising), beginning with preparation by June 15, 2014 of a detailed plan and schedule for doing so.	Agreed. Hydro uses qualified specialized contractors where necessary and is assessing this to ensure completion of the 2014 activities.
36	Formally incorporate by June 15, 2014 lessons learned about Newfoundland Power's service restoration issues, such as cold load pickup, into emergency response procedures and training of employees.	This is an action of Newfoundland Power. Hydro will assist as requested by Newfoundland Power.
37	As a first step, Newfoundland Power and Hydro should develop a joint Outage Communications Strategy to prioritize opportunities and guide near- and longer-term improvements to customer contact technologies and telephony, beginning with preparation by June 15, 2014 of a detailed plan and schedule for doing so.	Agreed.
38	Hydro and Newfoundland Power should conduct customer research (primarily on a joint basis), in order better to understand customer outage-related informational needs and expectations, including requests for conservation, and incorporate results into the Outage Communications Strategies, beginning with preparation by June 15, 2014 of a detailed plan and schedule for doing so.	Agreed
39	As Newfoundland Power and Hydro move forward with enhancements to any customer facing outage support systems, each should stress test the technologies well prior to the winter season; this element should comprise a key component of their implementation processes.	Agreed.
40	Hydro should review and refresh business continuity plans and contingencies to ensure continual operation and availability of critical outage response support systems, beginning with preparation by June 15, 2014 of a detailed plan and schedule for doing so.	Agreed.

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No.	Recommendation	Hydro Response
41	Newfoundland Power and Hydro should pursue (primarily on a joint basis) other multichannel communication options, such as two-way SMS Text messaging or Broadcasting options, for delivering Outage Status Updates, beginning with preparation by June 15, 2014 of a detailed plan and schedule for doing so.	Agreed.
42	Newfoundland Power and Hydro should aggressively pursue a joint process for delivering advance notification for planned rotating outages, in order to facilitate good initial communications with customers during an outage event, beginning with preparation by June 15, 2014 of a detailed plan and schedule for doing so.	Agreed
43	Newfoundland Power should implement goals to communicate better with stakeholders in the aftermath of outages. If conservation requests have been made of the public, Newfoundland Power should provide feedback following the event to indicate the amount of conservation achieved, and encourage future conservation, beginning with preparation by June 15, 2014 of a detailed plan and schedule for doing so.	This is a Newfoundland Power action.
44	Hydro and Newfoundland Power should jointly develop a coordinated, robust, well-tested and up-to-date Storm/Outage Communications Plan documenting protocols, plans, and templates to guide communications during major events, beginning with preparation by June 15, 2014 of a detailed plan and schedule for doing so.	Agreed.
45	Newfoundland Power and Hydro should conduct a joint “lessons learned” exercise including both their Communications Teams, beginning with preparation by June 15, 2014 of a detailed plan and schedule for doing so.	Agreed.
46	Hydro and Newfoundland Power should commit to a formal effort, sponsored at their most senior executive levels, to work together in formulating joint efforts to identify goals, protocols, programs, and activities that will improve operational and customer information and communications coordination, leading to the development, by June 15, 2014, of identified membership on joint teams, operating under senior executive direction and according to clear objectives, plans, and schedules.	Agreed. A senior executive meeting was convened and this is underway.