

March 2, 2015

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 of Corporate Services & Board Secretary**

Dear Ms. Blundon:

**Re: Newfoundland and Labrador Hydro - the Board's Investigation and Hearing into Supply Issues and Power Outages on the Island Interconnected System – Hydro's Submission in Relation to Recommendations 2.5 and 2.6 in the Phase I Report by Liberty Consulting Regarding Forecast Exceedances in the 2013/14 Winter Period**

In its Reply Submission presented to the Board on February 5, 2015, Hydro indicated its agreement with the following recommendations by Liberty Consulting (Liberty) in their Phase I Report (the Report) dated December 17, 2014:

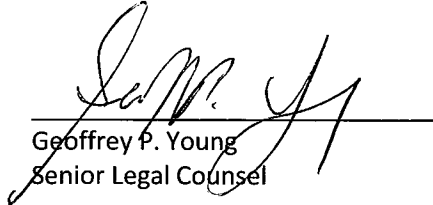
- 2.5 By March 1, 2015 provide data relating the actual values of the weather variable on the 2013-14 winter days on which the annual peak forecast was exceeded.
- 2.6 By March 1, 2015: 1) clarify Hydro's proposed reconstruction of the winter 2013-14 peak; 2) provide a specific value for the reconstructed peak; and 3) report on the impact of the reconstructed peak on the analysis of 2013-14 forecast exceedances.

Please find enclosed Hydro's report in relation to these items.

We trust the foregoing is satisfactory. If you have any questions or comments, please contact the undersigned.

Yours truly,

**NEWFOUNDLAND AND LABRADOR HYDRO**

  
\_\_\_\_\_  
Geoffrey P. Young  
Senior Legal Counsel

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

Thomas Johnson – Consumer Advocate  
Thomas O' Reilly – Cox & Palmer  
Danny Dumaresque

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

**A Report to the Board of Commissioners of Public Utilities  
Regarding Peak Forecast Exceedances in the  
2013/14 Winter Period**

Newfoundland and Labrador Hydro

March 2, 2015



## TABLE OF CONTENTS

1.0	INTRODUCTION .....	1
2.0	EXCEEDANCES OF THE ANNUAL PEAK WEATHER FORECAST .....	2
3.0	RECONSTRUCTION OF 2013-14 WINTER PEAK .....	3
3.1	Hydro’s Reconstruction of the Winter Peak .....	3
3.2	Assessment of Forecast Exceedances .....	5

### Appendices:

Appendix A	NLH Model for Newfoundland Power Winter Peak Demand
Appendix B	Variance Analysis of Peak Demand Forecast Exceedances for Winter 2013/14, NLH System

1 **1.0 INTRODUCTION**

2 In its Reply Submission presented to the Board of Commissioners of Public Utilities (the  
3 Board) on February 5, 2015 Newfoundland and Labrador Hydro (Hydro/NLH) indicated its  
4 agreement with the following recommendations made by Liberty Consulting (Liberty) in their  
5 Phase I Report (the Report) dated December 17, 2014:

6 2.5 By March 1, 2015 provide data relating the actual values of the weather  
7 variable on the 2013-14 winter days on which the annual peak forecast was  
8 exceeded.

9 2.6 By March 1, 2015: 1) clarify Hydro's proposed reconstruction of the winter  
10 2013-14 peak; 2) provide a specific value for the reconstructed peak; and 3)  
11 report on the impact of the reconstructed peak on the analysis of 2013-14  
12 forecast exceedances.

13

14 This is Hydro's submission in relation to these recommendations.

## 1 2.0 EXCEEDANCES OF THE ANNUAL PEAK WEATHER FORECAST

2 Hydro has reviewed its record of daily peak demands for the 2013-14 winter period  
 3 (December 1, 2013 to March 31, 2014) for both the NLH and Island Interconnected systems.  
 4 Forecast exceedances for the NLH system were determined on the basis of the winter peak  
 5 demand forecast of 1,478 MW as reported in Hydro's response to PUB-NLH-011. Forecast  
 6 exceedances for the Island Interconnected System (IIS) were determined on the basis of  
 7 NLH's planning load forecast of 1,691 MW.

8 Table 2.1 below provides the list of winter days on which the peak forecasts were exceeded  
 9 or would have been exceeded had any of the demand interruptions associated with the  
 10 capacity assistance arrangements with Corner Brook Pulp and Paper not occurred. Hydro's  
 11 review confirms there were a total of seven exceedances of the NLH System peak demand  
 12 forecast and five exceedances of the NLH Island peak demand forecast. The weather  
 13 conditions reported are consistent with Hydro's weather variable used in its long term  
 14 planning model and reflect the range of wind chills measured between the hours of 7:30 AM  
 15 and 8:30 PM on the day of the exceedance.

16

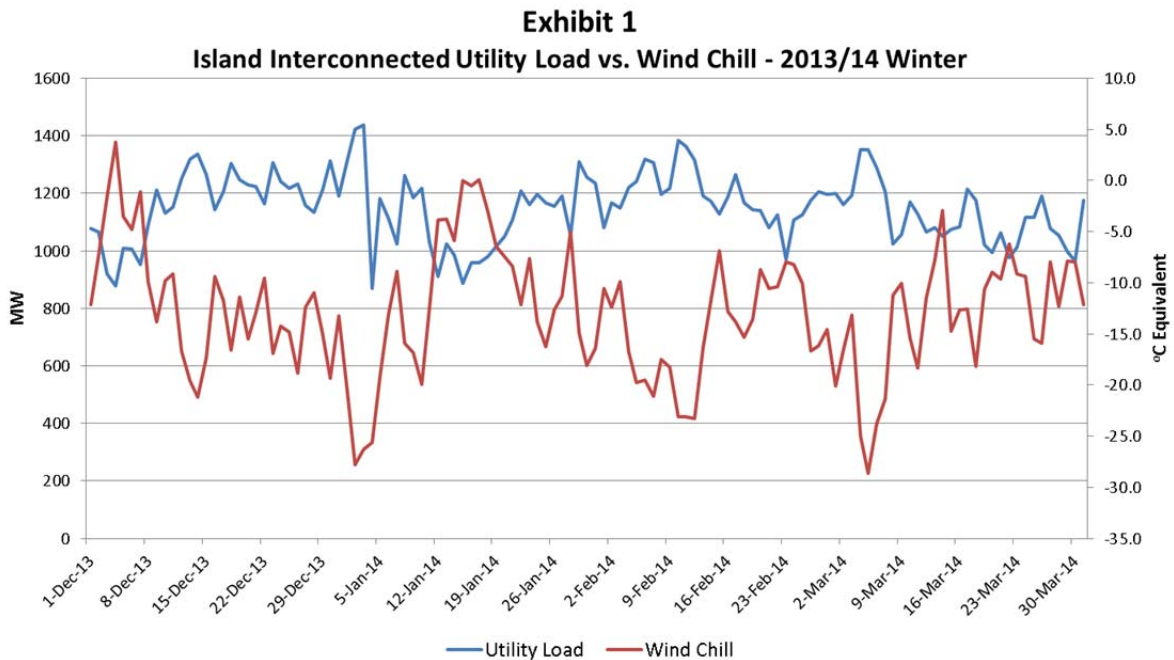
<b>Date of Exceedance</b>	<b>System</b>	<b>Weather (C°)</b>
December 14, 2013	NLH	-20.2 to -21.8
January 2, 2014	NLH and Island	-26.6 to -29.3
January 3, 2014	NLH and Island	-25.2 to -28.3
January 4, 2014	NLH and Island	-24.8 to -26.7
February 10, 2014	NLH and Island	-22.0 to -23.9
February 11, 2014	NLH	-22.1 to -23.8
March 5, 2014	NLH and Island	-26.5 to -30.0

1 **3.0 RECONSTRUCTION OF 2013-14 WINTER PEAK**

2 **3.1 Hydro’s Reconstruction of the Winter Peak**

3 An estimate of the 2013-14 peak demand on both the Island and NLH systems was provided  
 4 in Hydro’s Report to the Board on Load Forecasting Improvements dated October 31, 2014  
 5 (see Section 4.2, Tables 2 and 3). In completing its review at that time, Hydro considered  
 6 January 2, 2014 for reconstruction based on the following factors:

- 7 1. Both the NLH and Island interconnected system winter peaks are a function of  
 8 prevailing winter weather conditions given the significant penetration of electric  
 9 heating in the residential and commercial end-use customer base. This is more  
 10 relevant today than a decade ago as the Island system has much lower industrial load  
 11 and a higher number of commercial and residential electric heat customers. Exhibit 1  
 12 below provides a graphical display of the correlation between Island utility demand  
 13 requirements and weather conditions during the winter of 2013/14.



14

15 The weighted island wind chill was more severe on January 2, 2014 than at any other  
 16 time over the January 2-8, 2014 outage period. It would be expected that the

1 maximum system peak occurred on this day assuming industrial load was constant  
2 and ignoring abnormal system impacts associated with system transmission losses;  
3 cold load pick-up linked to the rotating outages; and customer behavior responses.  
4 While weather conditions measured by wind chill for March 5, 2014 were equally as  
5 cold, loads on January 2 would have been positively influenced by Christmas season  
6 loads pushing load higher than was experienced on March 5, 2014.

7 2. The Newfoundland Power component of the IIS represents the largest share of  
8 system peak load requirements. In estimating this component of the reconstructed  
9 system peaks, Hydro used its peak demand forecasting equation for the  
10 Newfoundland Power native load. This peak demand model has been reviewed by  
11 external consultants<sup>1</sup> and its weather adjustment component has been accepted by  
12 the Public Utilities Board for weather adjusting Newfoundland Power's native load  
13 for billing purposes. See Appendix A for a description of Hydro's current peak  
14 demand model used for input to the weather adjustment procedures for  
15 Newfoundland Power's native load.<sup>2</sup>

16 3. A revised and validated version of the hourly peak demand forecasting model  
17 (Nostradamus) was not available in October for the purpose of recreating the hourly  
18 loads during the outage period. Hydro therefore relied on other methods for  
19 reconstructing the winter peaks.

20 The reconstructed winter peaks provided by Hydro in October, 2014 reflected estimates of  
21 transmission loss that were somewhat lower than those more recently determined by  
22 system transmission planning analysis<sup>3</sup>. Based on a review of customer loads and system  
23 peaks during the high demand periods during the winter 2013/14 period, and validated by  
24 Hydro's recently completed analysis of system losses and transmission line contingencies,

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<sup>1</sup> See the reviews completed by Ventyx as part of Hydro's internal review of the January, 2014 power outages and by Manitoba Hydro International as part of the Muskrat Falls review by the Public Utilities Board.

<sup>2</sup> Note that Hydro's peak demand model for Newfoundland Power native load was not used to predict the Newfoundland Power component of the system winter peak demand of 1478 MW provided in PUB-NLH-011.

<sup>3</sup> See Hydro's report "Transmission Losses for Abnormal Generation\Transmission" dated January 2015.

1 the combined transmission losses and station service loads have been recalculated to be  
2 between 88 to 90 MW.

3 Table 3.1 below provides the reconstructed winter peak for the Island and NLH systems for  
4 the winter of 2013/2014 that would have occurred on January 2, 2014. Had no loss of load  
5 been experienced on January 2, 2014 Hydro would have experienced an Island peak demand  
6 of 1,763 MW.<sup>4</sup>

<b>TABLE 3.1</b>		
<b>Customer/System Peak Demand Estimates for January 2, 2014 (Revised)</b>		
	<b>Island Interconnected</b>	<b>NLH System</b>
Newfoundland Power	1,411	1,321
Hydro Rural	100	100
Industrial	162	48
Transmission Losses	66	66
Station Service	24	24
<b>System Total</b>	<b>1,763</b>	<b>1,559</b>
<b>Note:</b> Customer demand estimates are for actual weather conditions during the peak period of 5:00 to 6:00 p.m. on January 2, 2014.		

7

### 8 **3.2 Assessment of Forecast Exceedances**

9 Appendix B presents a variance analysis of the winter 2013/14 forecast exceedances relative  
10 to the NLH system peak demand forecast. The table shown there includes the reconstructed  
11 load for the January 2, 2014 peak and the actual loads for the daily system peaks for those  
12 days in which utility loads were not artificially impacted by rolling outages. The customer  
13 loads and system peaks associated with January 3 and 4, 2014 have not been reconstructed  
14 and are therefore not included.

15 Based on these variances the following observation can be made:

<sup>4</sup> The Island and NLH system peaks previously indicated by Hydro on October 31, 2014 for January 2, 2014 were 1,748 MW and 1,544 MW respectively.



- 1 a) Industrial loads at all peak exceedances were lower than had been forecast. The  
2 lower loads were associated with lower demand requirements for the nickel refining  
3 operations in Long Harbour and lower demand requirements for Corner Brook Pulp  
4 and Paper;
- 5 b) Hydro's supply to Newfoundland Power at all peak exceedances was higher than had  
6 been forecast. The December supply variance was influenced by the lower than  
7 assumed Newfoundland Power generation level. The January supply variance was  
8 influenced by colder than average weather conditions coinciding with Christmas  
9 season loads. The March supply variance was influenced by colder than average  
10 weather conditions. The February supply variances were partially influenced by  
11 Newfoundland Power generation levels;
- 12 c) Total Newfoundland Power load (NLH to Newfoundland Power + Newfoundland  
13 Power generation) was modestly higher than forecast on both February 10 and  
14 February 11 with weather conditions milder than average historical peak weather  
15 conditions;
- 16 d) Hydro's rural customer loads were higher than forecast for the peak exceedances  
17 occurring in the pre-Christmas and Christmas period and lower than forecast for the  
18 February and March system peak exceedances; and
- 19 e) Losses and station service requirements at all of the peak exceedances were higher  
20 than had been forecast but are in line with Hydro's current system transmission loss  
21 analysis and varying station service requirement configurations. The losses and  
22 station service requirements on March 5 were lower as a result of high  
23 Newfoundland Power generation levels on the Avalon Peninsula.

24 Based on the preceding analysis Hydro concludes that weather, system losses and customer  
25 generation were all contributing factors in explaining the peak exceedances that occurred in  
26 the winter of 2013/14. Hydro continues to view the weather as having played a significant  
27 contributory role in many of these exceedances.

1 The weather conditions that drove the Newfoundland Power and Hydro Rural loads during  
2 the first week of January were colder than, or close to, average peak weather conditions, but  
3 the weather conditions occurred earlier than normally experienced for that time of the year  
4 (as indicated in Appendices B and D of the October 2014 Load Forecasting report). The  
5 weather condition that existed on March 5 was colder than average and would have driven  
6 the Newfoundland Power peak higher than had been forecast. Newfoundland Power's  
7 December peak deviation is explained by customer generation, but the weather condition  
8 was consistent with historical annual peaks occurring in December, and therefore weather  
9 can be viewed as a contributing factor.

10 The Newfoundland Power loads during the February 10 and 11 peaks were higher than had  
11 been forecast despite weather conditions being somewhat milder than average historical  
12 peak weather conditions, and therefore weather does not explain these exceedances.

## APPENDIX A

### NLH Model for Newfoundland Power Winter Peak Demand

Dependent Variable: NPWPEAK

Method: Least Squares

Sample: 1968 2013

Included observations: 46

<u>Variable</u>	<u>Coefficient</u>	<u>Std. Error</u>	<u>t-Statistic</u>	<u>Prob.</u>
NPRDCUST	0.001504	0.0004	3.72	0.001
NPAEDCUST	0.006721	0.0010	6.41	0.000
WIND CHILL <sup>2</sup>	0.165798	0.0148	11.17	0.000
AAEHTMPAT(-1)	-18.74086	3.4395	-5.45	0.000
NPTOTGSWA(-1)	0.229576	0.0595	3.86	0.000
TECHCGE90	-7.600414	1.5862	-4.79	0.000
DECPEAK	32.42917	6.9831	4.64	0.000
NST	-10.10592	8.7877	-1.15	0.257
R-squared	0.998	Mean dependent var		873.5
Adjusted R-squared	0.997	S.D. dependent var		329.6
S.E. of regression	17.8	Durbin-Watson stat		1.96
Sum squared resid	12066.3			

#### Variable Description

NPWPEAK	- Newfoundland Power native winter peak (MW)
NPRDCUST	- Newfoundland Power year end regular domestic customers
NPAEDCUST	- Newfoundland Power year end electric heat domestic customers
WIND CHILL <sup>2</sup>	- Weighted Island wind chill (°C Equivalent)
AAEHTMPAT(-1)	- Lagged residential electricity price (\$/kWh)
NPTOTGSWA(-1)	- Lagged weather normal Newfoundland Power general service sales (GWh)
TECHCGE90	- Technical change trend variable beginning in 1990
DECPEAK	- indicator variable for winter peaks occurring in December
NST	- indicator variable for winter peaks occurring outside supper time period.

## **APPENDIX B**

Variance Analysis of Peak Demand Forecast Exceedances for  
Winter 2013/14 – NLH System

### Variance Report of Peak Demand Forecast Exceedances for Winter 2013/14 - NLH System

Date of Exceedance	December 14, 2013			January 2, 2014		February 10, 2014		February 11, 2014		March 5, 2014	
Weather Condition <sup>1</sup>	-20.2 °C to -21.8 °C			-26.6 °C to -29.3 °C		-22.0 °C to -23.9 °C		-22.1 °C to -23.8 °C		-26.5 °C to -30.0 °C	
Demand (MW)	<u>Forecast</u> <sup>2</sup>	<u>Actual</u>	<u>Variance</u>	<u>Re construction</u>	<u>Variance</u>	<u>Actual</u>	<u>Variance</u>	<u>Actual</u>	<u>Variance</u>	<u>Actual</u>	<u>Variance</u>
NLH Industrial <sup>3</sup>	66	44	(22)	48	(18)	46	(20)	32	(34)	40	(26)
NLH Newfoundland Power	1,255	1,272	17	1,321	66	1,293	38	1,283	27	1,290	34
NLH Rural Customers	89	94	6	100	11	82	(6)	79	(10)	76	(12)
Total Customer Demand	<u>1,410</u>	<u>1,410</u>	0	<u>1,469</u>	59	<u>1,421</u>	11	<u>1,393</u>	(17)	<u>1,406</u>	(4)
Losses and Station Service	68	91	23	90	22	92	24	92	24	80	12
NLH System Peak Demand	<u>1,478</u>	<u>1,501</u>	23	<u>1,559</u>	81	<u>1,513</u>	35	<u>1,486</u>	8	<u>1,486</u>	8
Newfoundland Power Generation at NLH System Peak	85	61	(23)	90	6	69	(15)	79	(5)	109	24

- Notes:
1. Weather condition is the range of wind chill between the hours of 7:30 AM to 8:30 PM and expressed in °C equivalent.
  2. Forecast is NLH System winter peak forecast reported in PUB-NLH-011.
  3. Actual industrial demand for March 5, 2014 was reduced by Corner Brook Pulp and Paper capacity assistance request.