O'DEA EARLE

June 17, 2016

Ms. G. Cheryl Blundon
Board of Commissioners of Public Utilities
120 Torbay Road, P.O. Box 12040
St. John's, NL A1A 5B2

Dear Ms. Blundon:

**Re: Investigation and Hearing into Supply Issues and Power Outages on the Island Consumer Advocate's Requests for Information CA-NLH-145 to CA-NLH-168 (Teshmont Report)**

In relation to the above noted application please find enclosed the original and twelve (12) copies of the Consumer Advocate's Requests for Information numbered CA-NLH-145 to CA-NLH-168 in relation to the Teshmont Report.

A copy of the letter, together with enclosures, has been forwarded directly to the parties listed below.

If you have any questions regarding the filing, please contact the undersigned at your convenience.

Yours very truly,

O'DEA, EARLE

THOMAS JOHNSON, Q.C.

TJ/cel
Encl.

cc: Newfoundland and Labrador Hydro
Attention: Geoffrey P. Young

Newfoundland Power Inc.
Attention: Gerard Hayes

Stewart McKelvey Stirling Scales

Attention: Mr. Paul Coxworthy

Grand Riverkeeper Labrador Inc.
Attention: Ms. Roberta Frampton Benefiel

Mr. Danny Dumaresque

**IN THE MATTER OF**
the *Electrical Power Control Act*, 1994, SNL 1994, Chapter E-5.1 (the *"EPCA"*) and the *Public Utilities Act*, RSNL 1990, Chapter P-47 (the "*Act*"), as amended;

**AND**

**IN THE MATTER OF**
the Board's Investigation and Hearing into Supply Issues and Power Outages on the Island Interconnected System.

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**CONSUMER ADVOCATE**
**REQUESTS FOR INFORMATION**
**CA-NLH-145 to CA-NLH-168**
**Issued: June 17, 2016**

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CA-NLH-145 **Reference: Summary Report of Probabilistic Based Transmission Reliabilities Assessment - Island Interconnected System:**

***"Hydro's current deterministic based Transmission Planning Criteria are similar to North American Electric Reliability Corporation (NERC) Transmission Planning standards; however, deviations from the NERC standards have been applied due to the isolated nature of the IIS and the potential cost impact of full compliance on the limited customer base."*** **(pg 1-2)**

Has Hydro determined whether it will be required to implement full compliance with NERC Transmission Planning standards upon interconnection? Please provide any operating restrictions that will be required until Hydro is in full compliance with NERC Transmission Planning standards and provide the completion date for Hydro to be in full compliance with NERC Transmission Planning standards.

CA-NLH-146 **Reference: Summary Report of Probabilistic Based Transmission Reliabilities Assessment - Island Interconnected System:**

***"Hydro's current deterministic based Transmission Planning Criteria are similar to North American Electric Reliability Corporation (NERC) Transmission Planning standards; however, deviations from the NERC standards have been applied due to the isolated nature of the IIS and the potential cost impact of full compliance on the limited customer base." (pg 1-2)***

What are the deviations from NERC standards applied by Hydro?

CA-NLH-147 **Reference: Summary Report of Probabilistic Based Transmission Reliabilities Assessment - Island Interconnected System:**

*"Hydro's current deterministic based Transmission Planning Criteria are similar to North American Electric Reliability Corporation (NERC) Transmission Planning standards; however, deviations from the NERC standards have been applied due to the isolated nature of the IIS and the potential cost impact of full compliance on the limited customer base."* **(pg 1-2)**

What does Hydro anticipate to be the cost impact of full compliance with NERC standards?

CA-NLH-148 **Reference: Summary Report of Probabilistic Based Transmission Reliabilities Assessment - Island Interconnected System:**

***"Based on CIGRE data, the expected pole failure rate for the LIL is approximately 1.9 failures per year with an average duration of approximately 19.8 hours. These values are comparable to Hydro's assessment which included an expectation of 2.0 failures per year with an average pole outage duration of 21hours. HVdc system design ensures that failure of one pole, as documented here, does not translate to customer outage"*(pg 5)**

Which CIGRE data is being referred to? Why is this data different than that in 5.3.1. Line Commutated Converters (page 23-24) and 5.3.3. HVDC Overhead Lines (page 25 to 27) of the Teshmont Report?

CA-NLH-149 **Reference: Summary Report of Probabilistic Based Transmission Reliabilities Assessment - Island Interconnected System:**

*"An overhead HVdc line failure rate of 0.19 outages/year/100 km with a duration of 1.78 hours per outage was used in previous Hydro analysis. These values were compared against Canadian Electricity Association (CEA) and CIGRE data. CEA and CIGRE data indicated that expected outage durations may be longer than the value proposed by Hydro. However, the overall forced outage rate of 0.00294% predicted by Hydro is comparable to the CIGRE value of 0.00388%."* (pg 5)

Why was the failure rate data not compared against other North America data such as NERC? Please explain why North American data values were not considered more relevant than CIGRE.

CA-NLH-150 **Reference: Nalcor Energy Probabilistic Based Transmission Reliability Assessment– Island Interconnected System ("Teshmont Report") pg (i):**

*"A comparison was made between Pre-HVDC and Post-HVDC systems in terms of expected unserved energy to loads due to transmission and generation outages using PSS®E software. System security, i.e. the ability of the system to transition between each pre- and post-contingency operating condition and remain stable, was not assessed in this study. That is to say, the analysis does not include transient outages, but focuses on sustained outages only."*

Please explain why the assessment completed by Teshmont did not include a review of system security.

CA-NLH-151 **Reference: Teshmont Report: pg (i):**

***"A comparison was made between Pre-HVDC and Post-HVDC systems in terms of expected unserved energy to loads due to transmission and generation outages using PSS®E software. System security, i.e. the ability of the system to transition between each pre- and post-contingency operating condition and remain stable, was not assessed in this study. That is to say, the analysis does not include transient outages, but focuses on sustained outages only."***

Please provide the date when the studies will be completed to demonstrate the stability of the system when transitioning from pre- to post- contingency. Please provide the outline of the cases that will be modeled and simulated in the stability study.

CA-NLH-152 **Reference: Teshmont Report: pg (iii):**

Referring to the table outlining revisions for the Teshmont Report, the initial draft was completed on September 17, 2014. In 2015 minor editorial changes were made (February 12, 2015). Nalcor provided final comments more than a year later on May 24, 2016. Why was there such a delay in finalizing and filing the Teshmont Report?

CA-NLH-153 **Reference: Teshmont Report - Section 4.3.3 – 230 KV Transmission Lines (pg 16):**

***"Based on a total of 59 sustained outages over 23 transmission lines with a total length of 1510 km, an average failure frequency of 0.781 outages per 100 km per year was calculated. This frequency was then multiplied by the length of each line and divided by 100 to determine the average failure rate in outages per year for line. This approach was considered valid because five years of data***

*was considered insufficient to provide statistically meaningful data for individual lines, but it would be meaningful for the entirety of the 230 kV system."*

Why were the average failure frequency of 0.781 outages per 100 km per year and an average outage duration of 4.784 hours used instead of other (higher) values?

CA-NLH-154 **Reference: Teshmont Report - Section 4.3.3 – 230 KV Transmission Lines (pg 16):**

***"Outages due to ac terminal station equipment such as circuit breaker failures or misoperations are not included in this analysis."***

Hydro provided Teshmont with detailed outage data for the transmission lines. Please provide the outage data (failure frequency, failure rate and average outage duration) for the terminal stations for the same five-year period as the transmission lines.

CA-NLH-155 **Reference: Teshmont Report - Section 4.3.3 – 230 KV Transmission Lines (pg 16):**

*"The average failure rates and average outage duration for the 230 kV transmission lines were calculated based on the data shown in Table 4. However, Nalcor advised that the outages for TL201 and TL208 should be excluded from the calculations. It was explained that TL201 <u>had insulator issues that were recently discovered</u> and that have affected its reliability in the past five years, and that TL208 had no customers for a prolonged period of time and failures were repaired at a lower priority."* (emphasis added)

Please provide details about the TL201 insulator issues that were recently discovered.

CA-NLH-156 **Reference: Teshmont Report - Section 5 – HVDC Reliability Data (Part 5.2) Data Provided by Nalcor Energy (pg 21):**

*5.2. Data Provided by Nalcor Energy*

*"The forced outage rates and availability of the HVDC systems are highly dependent on their design, installation, and location (for example availability of a spare converter transformers and/or submarine cables can significantly improve the reliability of the overall system). Therefore, unless details of a specific system are available, an accurate estimate of its forced outage rates and availability cannot be calculated. For the purpose of this study, Teshmont is planning to use the following values, which are based on the information that was provided to Teshmont by Nalcor Energy."*

What details of this specific system as regards its design installation or location were not made available to Teshmont?

CA-NLH-157 **Reference: Teshmont Report - Section 5 – HVDC Reliability Data (Part 5.2) Data Provided by Nalcor Energy (pg 21):**

*5.2. Data Provided by Nalcor Energy*

*"The forced outage rates and availability of the HVDC systems are highly dependent on their design, installation, and location (for example availability of a spare converter transformers and/or submarine cables can significantly improve the reliability of the overall system). Therefore, unless details of a specific system are available, an accurate estimate of its forced outage rates and availability cannot be calculated. For the purpose of this study, Teshmont is planning to use the following values, which are based on the information that was provided to Teshmont by Nalcor Energy."*

Further to the previous question, please provide Teshmonts' assessment of the impact of the unavailability of these details on its conclusions.

CA-NLH-158 **Reference: Teshmont Report - Section 5 – HVDC Reliability Data (Part 5.2) Data Provided by Nalcor Energy (pg 21):**

*5.2. Data Provided by Nalcor Energy*

***"The forced outage rates and availability of the HVDC systems are highly dependent on their design, installation, and location (for example availability of a spare converter transformers and/or submarine cables can significantly improve the reliability of the overall system). Therefore, unless details of a specific system are available, an accurate estimate of its forced outage rates and availability cannot be calculated. For the purpose of this study, Teshmont is planning to use the following values, which are based on the information that was provided to Teshmont by Nalcor Energy."***

Did Teshmont request any verification or background information/documents used by Nalcor in completing its "Reliability and Availability Assessment of the HVDC Island Link" dated April 10, 2012? If so, what verification/background/documents were provided and please provide the same. If Teshmont did not request any additional information, why not?

CA-NLH-159 **Reference: Teshmont Report - Section 5 – HVDC Reliability Data (Part 5.2) Data Provided by Nalcor Energy (pg 21):**

*5.2. Data Provided by Nalcor Energy*

***"The forced outage rates and availability of the HVDC systems are highly***

*dependent on their design, installation, and location (for example availability of a spare converter transformers and/or submarine cables can significantly improve the reliability of the overall system). Therefore, unless details of a specific system are available, an accurate estimate of its forced outage rates and availability cannot be calculated. For the purpose of this study, Teshmont is planning to use the following values, which are based on the information that was provided to Teshmont by Nalcor Energy."*

Did Teshmont seek verification for any of the values provided by Nalcor Energy in section 14.6.1 of the Lower Churchill project performance requirements? If so, what verification/background/documents were provided and please provide the same. If Teshmont did not request any additional information, why not?

CA-NLH-160 **Reference: Teshmont Report - Section 5 – HVDC Reliability Data (Part 5.2) Data Provided by Nalcor Energy (pg 21):**

*5.2. Data Provided by Nalcor Energy*

*"The forced outage rates and availability of the HVDC systems are highly dependent on their design, installation, and location (for example availability of a spare converter transformers and/or submarine cables can significantly improve the reliability of the overall system). Therefore, unless details of a specific system are available, an accurate estimate of its forced outage rates and availability cannot be calculated. For the purpose of this study, Teshmont is planning to use the following values, which are based on the information that was provided to Teshmont by Nalcor Energy."*

In providing a probabilistic reliability assessment, what information would Teshmont typically request to complete a full and accurate review?

CA-NLH-161 **Reference: Teshmont Report - Section 5 – HVDC Reliability Data (Part 5.2) Data Provided by Nalcor Energy (pg 21):**

*5.2. Data Provided by Nalcor Energy*

*"The forced outage rates and availability of the HVDC systems are highly dependent on their design, installation, and location (for example availability of a spare converter transformers and/or submarine cables can significantly improve the reliability of the overall system). Therefore, unless details of a specific system are available, an accurate estimate of its forced outage rates and availability cannot be calculated. For the purpose of this study, Teshmont is planning to use the following values, which are based on the information that was provided to Teshmont by Nalcor Energy."*

Are there industry standards regarding the level of specificity required when providing an accurate probabilistic assessment? If so, what information is typically required to complete an assessment?

CA-NLH-162 **Reference: Teshmont Report - Section 5 – HVDC Reliability Data (Part 5.2) Data Provided by Nalcor Energy (pg 21):**

*5.2.1.2. HVDC Overhead Lines*

*"Based on the Nalcor study the following are the expected failure rates and repair times for the HVDC overhead lines.*

*Average failure rate per pole (based on 1100km length): 2.101/year*

*Average repair time: 1.78 hours*

*Average common mode failure rate: 0.02/year/100km*

*Average common mode repair time: 24 hours"*

*5.2.1.4. Electrode Lines*

*"In addition, and in agreement with what was stated in the study, the above analysis would be considered only if the electrode lines will be constructed on a separate wood-pole line. As the electrode lines will be installed on the main dc line towers, the reliability of the electrode lines is expected to be included in the common mode failure of the dc line. Given that the electrode line in Labrador will be constructed on the main dc line towers for much of its length, it is not anticipated that the LIL's relatively long electrode line will impact or have a major influence on LIL overall reliability."*

**Reference:** *NP-NLH-038, page 2, paragraph (f) states:*

*"Anti-cascade requirements dictated that a maximum of 20 suspension 10 structures would be permitted between full-tension deadends."*

Please explain the relationship between these data points.

CA-NLH-163 **Reference: Teshmont Report - Section 5 – HVDC Reliability Data (Part 5.2) Data Provided by Nalcor Energy (pg 21):**

Please refer to sections 5.2.1.1 (HVDC Converters), 5.2.1.2 (HVDC Overhead Lines), 5.2.1.3 (HVDC Submarine Cables), and 5.2.1.4 (Electrode Lines) of the Teshmont Report. Are these outage criteria included in the performance guarantees in the contracts for these items? If not, please provide the outage criteria that were used in the contracts for each of these items.

CA-NLH-164 **Reference: Teshmont Report - Section 7 – Conclusion (pg 38):**

*"The voltage source converter outage data was used to determine an overall energy availability of a bipole system to equal approximately 97.3% not including the impacts of transmission line and bipole failures. This is consistent with the stated availability of Maritime Link at 95% to 97%."*

Please provide the availability that was assumed for the Maritime Link (a) overhead transmission line, (b) submarine cable system and (c) grounding electrode (due to any time restriction that does not allow rated current). Please also confirm if these availability numbers are included as guarantees in the contracts for the (a) converter stations, (b) overhead transmission line, (c) submarine cable system and (d) grounding electrodes.

CA-NLH-165 **Reference: Teshmont Report - Section 7 – Conclusion (pg 39):**

*"Analysis of 230 kV transmission line outages on the Island Interconnected System delivered a comparison between ac transmission system reliability in the Pre- and Post-HVDC cases. The expected unserved energy due to 230 kV transmission line contingencies in the Pre-HVDC case were calculated to equal 100.8 MWh/year. Of that total 41.43 MWh/year is attributed to the loss of TL208, and 58.03 MWh/year attributed to the loss of TL242. With approved transmission system upgrades, including the replacement of TL266, the expected unserved energy due to 230 kV transmission line contingencies in the Post-HVDC case is reduced to 41.94 MWh/year attributed to the loss of TL208. The analysis concludes that based on a probabilistic reliability assessment, the reliability of the 230 kV transmission system on the Island Interconnected System is improved in the Post-HVDC case compared to the Pre-HVDC case."*

Referencing IEC 60826 at page 127 which states:

*60826 © IEC:2003*

*"It is suggested to use a reliability level characterized by return periods of 150 years for lines above 230 kV. The same is suggested for lines below 230 kV which constitute the principal or perhaps the only source of supply to a particular electric load (level 2).*

***Finally, it is suggested to use a reliability level characterised by return periods of 500 years for lines, mainly above 230 kV which constitute the principal or perhaps the only source of supply to a particular electric load. Their failure would have serious consequences to the power supply."***

If a 1:50 year return period was used for comparison, yet IEC recommends using 1:150 return period (IEC 60826 Page 127), isn't this analysis inconsistent from a reliability perspective?

CA-NLH-166 Recent media reports indicate Muskrat Falls may not be ready for first power until 1-2 years after the Labrador Island and Maritime Link HVDC transmission systems are ready for commissioning. Does Hydro plan to commission and operate the HVDC transmission systems at an intermediate power level until Muskrat Falls is ready for test power? If yes, will Hydro request Teshmont to review the reliability of this intermediate operation of the HVDC transmission systems?

CA-NLH-167 Recent media reports indicate Muskrat Falls may not be ready for first power until 1-2 years after the Labrador Island and Maritime Link HVDC transmission systems are ready for commissioning. Does Hydro plan to commission and operate the HVDC transmission systems until Muskrat Falls is ready for test power, and if so, will Hydro purchase lower cost energy from points south to displace high cost energy produced at Holyrood during this period?

CA-NLH-168 The expected unserved energy calculations compare Holyrood outages pre-HVDC to HVDC transmission outages post-HVDC. Were outages of Hardwoods and Stephenville generating units considered in the analysis? If so, how do they impact the results? If not, why not?

Dated at St. John's, in the Province of Newfoundland and Labrador, this 17th day of June, 2016.

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