**Reference from the Lieutenant-Governor in Council**
**On the Muskrat Falls Project**
**(the "Muskrat Falls Review")**

**REQUESTS FOR INFORMATION**

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## NALCOR'S SUBMISSION DATED NOVEMBER 10, 2011

**PUB-Nalcor-133** On pg. 2, lines 8-10 of the Executive Summary it is stated that *"each year NLH engages in a comprehensive load forecasting exercise to determine the province's electrical consumption over a 20 year horizon."* On pg. 19, lines 14-18 of the Submission it is stated that a long-term load forecast is completed annually beginning in the last quarter. Has such a load forecast been completed in 2011? If yes, please provide. If not, why not?

**PUB-Nalcor 134** On pg. 4, lines 18-19 of the Executive Summary it is stated that Nalcor was directed to progress the development of the Lower Churchill by the Government's 2007 Energy Plan. Please describe the weight/priority placed by Nalcor on this direction and describe how Nalcor incorporates this direction in its short and long-term business plans and corporate strategy.

**PUB-Nalcor 135** On pg. 21, lines 14-17 of the Submission, it is stated that "*direct input from those customers forms the basis for NLH's forecast of total industrial power requirements"* and that *"it would not be appropriate for NLH to forecast industrial requirements independent of the input provided by the industrial customers themselves."* Explain the process followed to determine industrial load from the time input is received from industrial customers to the finalization of the load forecast. Are factors, other than input from customers, considered? If so, describe them.

**PUB-Nalcor-136** On pg. 28, lines 10-11 of the Submission it is stated that *"the island's electricity requirements have declined recently due to structural changes within international pulp and paper markets."* Describe in detail the analysis completed by Nalcor on international pulp and paper markets to assess future load implications for the Island's electricity requirements, particularly in light of the significant impact the closure of two mills has had on the Island's load forecast in the recent past.

**PUB-Nalcor-137** On pg. 22, line 21 of the Submission it is stated that one of the main factors in the economic forecast supporting the long-term load forecast for the Island is continued newsprint production at Corner Brook over the forecast period of 20 years to 2029. What level of production was assumed for the forecast period for this customer and what information was relied on by Nalcor to support the assumption?

**PUB-Nalcor-138** Table 16 on pg. 46 of the Submission gives the Forced Outage Rate for the Labrador Island Link (per pole) as 0.89. Is this on a per pole or bipole basis?

**PUB-Nalcor-139** In reference to Table 20, pg. 51 of the Submission and pg. 26 of Exhibit 27, please provide an explanation as to the factors causing the growth in the Island load forecast in the years 2021-2023.

**RESPONSES TO RFIs AND EXHIBITS**

**PUB-Nalcor-140** The response to PUB-Nalcor-61 states in lines 14-16 that it is not *"currently"* the case that Hydro must comply with NERC reliability guidelines. What consideration has been given as to whether such compliance will be required in the future?

**PUB-Nalcor-141** The response to PUB-Nalcor-94 states in part: *'In considering emissions, the Government of Canada has also published its proposed greenhouse gas (GHG) regulations for coal fired generating facilities, and has proposed a 45 year design life for coal fired facilities. These have been filed in Exhibit 107."* The response goes on to state: *"...Nalcor expects the Government of Canada to impose limitations on heavy fuel oil fired generating facilities that are similar to those proposed for coal fired generation."*

Exhibit 107, pg. 37 of 147 states *"In 2008...GHG emissions from the electricity generation sector contributed around 16% (or approximately 120 megatonnes(Mt) to Canada's inventory of emissions. In the same year, coal fired electricity generation was responsible for 93 Mt of GHG emissions in Canada, which represent 78% of total electricity sector emissions."*

Has Nalcor had any formal discussions with the Government of Canada regarding confirmation that oil fired plants will be subject to similar regulations as coal fired plants and, if so, the projected timeline for such regulations? What is the basis for the statement that Nalcor expects similar restrictions to those for coal fired plants to be extended to heavy fuel oil plants?

**PUB-Nalcor-142** Further to the response to PUB-Nalcor-95 which referred to the economic and employment benefits associated with the Muskrat Falls project, please explain the considerations given by Nalcor, including the priority or weight to such benefits, in its DG2 decision.

**PUB-Nalcor-143** The response to MHI-Nalcor-44 states: *"Large projects such as the Lower Churchill Project are considered under separate integration studies. Final integration studies for the Lower Churchill Project are underway with an expected completion date of November 2011."*

Please provide a copy of the Report covering these integration studies for the current configuration of the Lower Churchill Project.

**PUB-Nalcor-144** Further to PUB-Nalcor 143, have these studies been conducted to include the Maritime Link, exclude the Maritime Link or, to both include and exclude the Maritime Link?

**PUB-Nalcor-145** The responses to PUB-Nalcor-127 and PUB-Nalcor-128 state that as the Holyrood condition assessment report, Exhibit 44, did not address the potential remaining useful life of the assets at 2041, no costs for refurbishment or replacement were included in the CPW analysis.

Pg. 5 of Exhibit 44 states that one basis for the condition assessment and life extension study was to have the Holyrood units operating as synchronous condensers to 2041.

Pg. 6 of Exhibit 44 goes on to state: *"Holyrood is also expected to be able to meet its 2041 end of life date for operation in a synchronous condensing mode, but will require some further substantial equipment refurbishments and replacements specific to that role."*

Given these statements, it would appear reasonable to expect costs to be included in a CPW analysis extending to 2067, assuming the equivalent reactive capacity of these machines is required post 2041.

Please confirm that the equivalent reactive capacity post 2041 has been included in Nalcor's studies and, if so, why no costs have been included in the CPW analysis.

**PUB-Nalcor-146** The response to MHI-Nalcor-41 Rev. 1 contains a revision to a CPW sensitivity using an Annual Load Decrease of 880 GWh. The original results of this sensitivity conducted by Nalcor showed a difference in the Cumulative Present Worth of the Isolated Island and Labrador Interconnected Options of only $1 million, i.e. the two alternatives were basically equal from a CPW perspective.

The revision now shows a difference of $408 million in favour of the Labrador Interconnection. Nalcor states that this revision provides a correction for a calculation error and now properly reflects the reduction in fuel costs for the Interconnected Island alternative.

Please provide the specifics of this calculation error.

**PUB-Nalcor-147** Further to PUB-Nalcor-146, in light of this error, have all other sensitivities and/or analyses completed by Nalcor been reviewed to determine whether they contain the same or other calculation errors?

**PUB-Nalcor-148** Pg. 16 of Exhibit 27, states: *"Industrial load forecasts are based on consultations with each of the individual industrial customers and generally reflect existing contractual arrangements with the customer. While business cycle risk exists for Hydro's sales to its direct industrial customers, it is more of a short-term operational risk for Hydro than a longer-term system planning risk. The PLF does not exercise judgement respecting the longer-term viability for established industry in the Province unless definitive notices have been provided to the Province."*

Please describe the nature and timeframe for these types of consultations that were most recently held with Corner Brook Pulp and Paper. When were these most recent consultations held and what were the specific outcomes of these consultations?

**PUB-Nalcor-149** The response to PUB-Nalcor-46 states that the purchase price paid by Hydro to Nalcor for the power and energy from the Muskrat Falls Plant escalates evenly over time and is applied only to power actually used by rate payers. PUB-Nalcor-90 states that changes in energy volumes would not affect the internal rate of return. Is the purchase price for power and energy to be paid by Hydro to be on a take-or-pay basis, that is, the price paid does not change depending on volumes taken or used?

**PUB-Nalcor-150** The response to PUB-Nalcor-46 pg. 2 lines 4-5 states that the power purchase price paid by Hydro to Nalcor for power and energy from the Muskrat Falls project is an escalating price that is subject to escalation at CPI. The response to PUB-Nalcor-48 lines 8-10 states that a 2% general inflation escalator was applied to the power purchase price. Please describe how the power purchase price was escalated in the analysis and how it will be treated in the PPA.

**UPGRADE TRANSMISSION LINE CORRIDOR – BAY D'ESPOIR TO WESTERN AVALON REPORT**

**PUB-Nalcor-151** Please provide a copy of the Report *"Upgrade Transmission Line Corridor – Bay d'Espoir to Western Avalon"*, dated September 2011, which was filed with the Board in Newfoundland and Labrador Hydro's 2012 Capital Budget Application, September 22, 2011.

**PUB-Nalcor-152** On pg. 2 of the Report referred to in PUB-Nalcor-151 it is stated, "*Given that the Lower Churchill Project has yet to receive final project sanction, analysis of the Bay d'Espoir East 230 kV transmission system must consider both the continued Isolated Island Scenario and the Labrador Infeed Scenario. In effect, the proposed project must be appropriate to either an Isolated Island or Labrador-Interconnected future.*" Does this mean that any issues identified with the Bay d'Espoir East 230kV transmission system for the Isolated Island Scenario must have a solution that can be applied to correct issues identified under the Labrador Infeed Scenario?

**PUB-Nacor-153** Further to PUB-Nalcor-152, with reference to pg. 2 of the Report referred to in PUB-Nalcor-151, what issues have been identified with the Bay d'Espoir East 230kV transmission system: i) under the Isolated Island Scenario; and ii) under the Labrador Infeed Scenario?

**PUB-Nalcor-154** Further to PUB-Nalcor-153, with reference to pg. 2 of the Report referred to in PUB-Nalcor-151, what are the potential solutions to the issues identified: i) under the Isolated Island Scenario; and ii) under the Labrador Infeed Scenario?

**PUB-Nalcor-155** As the Transmission Line Corridor Upgrade is required for the Labrador Infeed Scenario, as stated on pg. 6 and pg. 38 of the Report referred to in PUB-Nalcor-151, will all or any part of the costs be included as part of the construction costs of the Infeed Project? If not, why not?

**PUB-Nalcor-156** From the Report referred to in PUB-Nalcor-151, it seems that Hydro is assuming that all Gas Turbines will be available to increase the amount of load that can be served from the eastern transmission system. What has been Hydro's experience with the failure to start of the Gas Turbines and how would that affect the ability to serve load?

**PUB-Nalcor-157** On pg. 9 of the Report referred to in PUB-Nalcor-151, Hydro states that there is "*significant exposure for unsupplied load*" in the 2011 to 2016 timeframe in certain circumstances. What is Hydro proposing to do to mitigate this exposure?

**PUB-Nalcor-158** On pg. 17 and pg. 18 of the Report referred to in PUB-Nalcor-151, it is stated that "*No additional generation would be installed east of Bay d'Espoir in a continued Isolated Island scenario until the 2022 timeframe when a 170 MW combined-cycle combustion turbine (CCCT) would be installed on the Avalon Peninsula. Transmission upgrades are therefore required.*" Have any alternatives employing earlier generation additions to the Avalon Peninsula such as simple cycle gas turbines or CCCTs been considered from a cost benefit perspective under either of the two generation expansion scenarios? In responding please address how these could potentially: i) alleviate or resolve the transmission issue; ii) reduce the requirements for starting units at Holyrood early in the load forecast cycle and then operating them at a more fuel efficient, higher capacity, and iii) improving the reliability of supply to the Avalon by having generation available directly at the load center.

**PUB-Nalcor-159** Figure 8, on pg. 22 of the Report referred to in PUB-Nalcor-151, demonstrates that there is an angular stability issue with increased transfers which are not solved by the addition of a shunt capacitance at Come by Chance. The reason provided but not demonstrated was that the angular stability issue was a result of a voltage stability problem. In Exhibit CE-03(Public), one of the recommendations was that the effectiveness of power system stabilizers should be investigated, including the identification of potential new stabilizers to provide benefit to the overall stability of the system. This recommendation would suggest that angular stability problems exist in the absence of voltage instability. Please demonstrate that this instability is a direct result of voltage instability and not angular instability.

**PUB-Nalcor-160** Has the potential application of power system stabilizers within the Newfoundland system been examined in detail? If so, when was it completed and provide a copy of the analysis.

**PUB-Nalcor-161** Will any upgrading work be required on the section of transmission line from Western Avalon to St. John's if the Labrador Infeed does not proceed? If yes, describe the required upgrading.

**PUB-Nalcor-162** Has a report been completed on the entire 230kV transmission system from Bay d'Espoir to St. John's to identify the required upgrading for the Isolated Island Option and for the Labrador Infeed scenario. If yes, provide a copy. If not, why not?

**PUB-Nalcor-163** Pg. 28 of the Report referred to in PUB-Nalcor-151 refers to a full import of 475 MW from the Maritimes under the Labrador Infeed scenario during the loss of the HVdc link between Labrador and the Island. What improvements, if any, would be required to the transmission system west of Bay d'Espoir to accommodate the full import of 475 MW from the Maritimes, what are the anticipated further capital expenditures associated with these improvements and will they be included in the cost of the Maritime Link?

**NALCOR'S EXHIBIT 105**

**PUB-Nalcor-164** Pg. 3 of Exhibit 105 states: "*While Hydro does not have a formal transmission planning criteria consistent with NERC transmission planning standards TPL-001 through TPL-006, most, if not all, of the procedures used in planning Hydro's transmission system are comparable to those used by other utilities. This Planning Manual documents the current transmission planning practices used and the tests applied to verify these practices. The Planning Manual also serves as a first step towards the development of a formal criteria.*"

When does Nalcor anticipate completion of the development of its formal transmission planning criteria?

**NALCOR'S EXHIBIT 106**

**PUB-Nalcor-165** With reference to pg. 13 of Exhibit 106, should the phrase "*0.38 and 4.9 pole outages per year*" be "*0.16 and 4.9 pole outages per year*"?

**PUB-Nalcor-166** On pg. 21 of Exhibit 106, in reference to the corridor for 230 kV lines, TL202 and TL206, it is stated: "*It is difficult to determine the exact return period due to the lack of meteorological data along the corridor, loading data on the transmission lines, and actual line failures of TL202 and TL206. Based upon the analysis completed for the Avalon Upgrades and the lack of a structural failure on either TL202 or TL206, it is assumed that the design of each line is in the order of 1:25 years.*"

The table on pg. 155 of Exhibit 85 clearly shows a structural failure of both TL202 and TL206 in February, 1970, due to wind and ice.

Please explain this discrepancy.

**PUB-Nalcor-167** Further to PUB-Nalcor 166, with the failure data in Exhibit 85, more recent meteorological data and the analysis completed for the Avalon Upgrades, could an analysis such as that performed for the Avalon Upgrades be completed for TL202/206?

**PUB-Nalcor-168** Table 5, Exhibit 106, indicates that the level of unsupplied energy for the Isolated Island Option varies from 0 MWh to 19,838 MWh for the years 2017 to 2037. Corresponding figures for the Island Interconnected Option without the Maritime Link range from 14,384 MWh to 93,744 MWh over the same period. This demonstrates that over the period 2017 to 2037 the Isolated Island Option has less unsupplied energy than the Island Interconnected Option without the Maritime Link.

Assuming for the moment that the loss of TL202/206 under the Isolated Island Option and a bipole outage under the Island Interconnected Option without the Maritime Link for the *"worst 2 week window"* is a reasonable comparison, please confirm that Table 5 demonstrates that the Isolated Island Option is more reliable than the Island Interconnected Option without the Maritime Link for the period 2017-2037?

**PUB-Nalcor-169** Has Nalcor established a standard for the maximum acceptable limit of unsupplied energy? If so, please advise this standard. If not, why not?

**PUB-Nalcor-170** Pg. 14, footnote 7 of Exhibit 106, refers to continuous monopolar rating of 552.6 MW. Is this correct? If not, the figure of 702.6 MW is also incorrect.

**PUB-Nalcor-171** Pg. 31, third full paragraph of Exhibit 106 states: *"Building the HVdc line to a very high reliability level (i.e. 1:500 year return period) while the connected ac transmission system has a lower reliability level (i.e. 1:25 year return period) is problematic as a 1:50 year weather loading will result in failures to the ac transmission system while the HVdc line is unaffected. The end result is that the HVdc line is intact but the converter station cannot function as there is insufficient ac system transmission strength and capacity to operate the station or transmit power to load centers."*

Recognizing that weather loading in excess of 1:50 year loading could also happen in an area of the Province, e.g. Long Range Mountains or Labrador where no other transmission would be affected, the end result would be that the HVdc line is out while all other transmission facilities are intact. How has Nalcor considered such potential occurrences in its analysis to support the above-noted statement?

**PUB-Nalcor-172** Further to PUB-Nalcor-171, if such an event as described were to occur, please explain why having the HVdc line intact with only portions of the 230 kV system out, would not be a significant improvement with respect to total system restoration time.

**PUB-Nalcor-173** Pg. 32, last paragraph of Exhibit 106 states: *"While it may appear desirable to increase the return period for the Labrador-Island Link, the entire 230 kV grid east of Bay d'Espoir would need to be upgraded to a similar return period in order to achieve the desired reliability improvement."*

Please explain the basis for this statement given that the HVdc line is approximately 1,100 km long and a weather related loading in excess of the 1:50 year return period could occur at any point in the line.

**PUB-Nalcor-174** Pg. 32, third paragraph of Exhibit 106 states: *"Should the Maritime Link not materialize then the significance of the sudden loss of the Labrador-Island Link becomes more severe."*

Pg. 33, last paragraph of Exhibit 106 states: *"While the impact of these outage events could be further mitigated with the application of additional combustion turbines on the Island Interconnected System, given the low probability of the event and minimal impact on unsupplied energy, Nalcor, in the interest of minimizing overall cost to the customer, has opted to apply load rotation and other means to minimize the impact to customers should an event occur."*

Explain in detail what is meant by "*load rotation*" and what *"other means"* Nalcor is opting to apply? Please confirm that Nalcor does not intend to install standby generation for the Island Interconnected system without the Maritime Link.

**PUB-Nalcor-175** With reference to pg. 23, Table 5 of Exhibit 106, please provide a CPW sensitivity analysis with standby combustion turbines being added to the Island Interconnected scenario (without Maritime Link) assuming a bipole outage such that the unsupplied energy for the worst two week window is approximately equivalent to that of the Isolated Island scenario with a TL202/206 outage. The analysis should cover the years 2017 to 2037, be presented in a format similar to Table 5 and include the comparative results of the CPW calculations.

**PUB-Nalcor-176** With reference to pg. 23, Table 5 of Exhibit 106, do the results for Island Interconnected scenario (with and without Maritime Link) include the 230 kV transmission line from Bay d'Espoir to Western Avalon being built before 2017? (Footnote 1 is missing from both these scenarios). If not, why not?

**GENERAL**

**PUB-Nalcor-177** Please provide a CPW analysis for the Interconnected Island Option assuming a full Cost of Service methodology is used to determine the power purchase price of Muskrat Falls power and energy to be paid by Hydro to Nalcor over the period 2017 to 2067 rather than the PPA approach.

**DATED** at St. John's, Newfoundland this 16th day of December, 2011.

**BOARD OF COMMISSIONERS OF PUBLIC UTILITIES**

Per _____
Cheryl Blundon
Board Secretary