

**Date :** 3/31/2012 6:20:45 PM

**From :** "Bown, Charles W."

**To :** "Taylor, Brian W." , "Power, Glenda"

**Subject :** Fw: Draft Materials

**Attachment :** KM - PUB Report March 2012.doc;PUB Lower Churchill Project Review - Final Report.DOC;Summary and Analysis of PUB Report.ppt;

I've attached draft BN, KM's and a Deck for tomorrow. Minister was sent these materials but has not yet signed off. I wanted you to have these now rather than see them cold tomorrow. Robert has a copy as well.  
Charles

Sent Via BlackBerry

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**From:** Bown, Charles W.

**To:** Thompson, Robert

**Sent:** Sat Mar 31 16:15:05 2012

**Subject:** Draft Materials

Key Messages  
PUB (Review of Muskrat Falls)  
March 31, 2012

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The PUB concluded that based on the information available today, they are unable to make a determination if Muskrat Falls is the least-cost option to respond to future power needs on the Island, and would require information from the DG3 process to make a conclusion.

The MHI Report, commissioned by the PUB, and the Consumer Advocate concluded that based on the information available today, Muskrat Falls is the least-cost option. We have always maintained the importance of the DG3 process and information which will provide government up to date, critical information to help make an informed decision.

MHI had significant data to make a decision on the least-cost option – the new data which will be available through DG3 will be the most comprehensive to date and provide new information for a sanction decision.

The PUB report represents another important piece of information for government to consider as we move closer towards making a decision on final project sanction. This review is another piece of work to ensure that the investment decision benefits from rigorous input from multiple sources prior to project sanction.

The gated process that Nalcor has identified is consistent with major resource projects – we are confident that DG3 information will provide the information required to make a decision on whether the time is right to proceed with Muskrat Falls. DG3 data will include an updated load forecast, defined capital costs, and system integrated studies.

Our government encourages questions and debate – at the end of the day this project must be developed in the best interests of the people of our province. Questions will make the project a better one.

We want to ensure people are engaged, informed and confident in the decision to develop the Lower Churchill.

Planning for future electricity needs is critical – we must take action to ensure we have reliable, affordable, electricity for the people of our province.

Criticisms of Nalcor are unfortunate – we have full confidence in the team at Nalcor and their abilities. There are always ways to do things better, and we will take into account the comments made by the PUB and work through the areas of concern with Nalcor.

With respect to CBPPL, there is no reason to believe the mill in Corner Brook will shut down. Kruger and the union are working together to develop a plan for the future, and government will be there to provide support.

Muskrat Falls will meet electricity demand on the Island, replace the high costs associated with oil prices to operate Holyrood, and will meet industrial growth in Labrador.

Background:

In June 2011, Government referred to the Board of Commissioners of Public Utilities (PUB) the question of whether the Lower Churchill project, as currently proposed, is the least cost option for future supply of electricity for the Island of Newfoundland.

As part of the PUB review, Manitoba Hydro was hired as a consultant (result of RFP) to review and report on the expansion alternatives for the Island which included the review of all relevant studies and reports and other available info.

The current configuration proposed for the Lower Churchill project would develop Muskrat Falls first, together with a transmission line to the Island of Newfoundland (Labrador Island Link).

Development of the Lower Churchill is the most significant electrical generation project undertaken by this province in 50 years.

The project will also see the province connected to the North American electricity grid for the first time in its history; improving electricity reliability and facilitating the development of other renewable energy projects.

Nalcor submitted 180 exhibits of information to the Board, and received a total of 440 Requests for Information from the PUB, Manitoba Hydro and the Consumer Advocate.

Nalcor had over 20 face to face meetings between various subject matter experts and Manitoba Hydro to help inform the process and provide any information or context they required.

Nalcor provided the Board in the order of 15,000 pages of documentation to inform the Board's assessment of the reference question and when asked for further information, or when something was not clear, Nalcor has endeavored to satisfy the requests coming from the Board, its Consultant and the Consumer Advocate.

Under section 5(1) of the *Electrical Power Control Act 1994*, Government can refer any matter regarding electrical power to the Board. The Board is then bound to inquire and report back the Minister of Natural Resources.

No hydro projects – especially one of this magnitude have been through the PUB process.

Government (Liberal) amended the *Electrical Power Control Act* and the *Public Utilities Act* in 1999 to allow the Lieutenant Governor in Council to exempt specific projects from regulatory approval by the Public Utilities Board. In 2000, the Liberal Government directed the PUB to exempt the LCP from its regulatory oversight.

Generation projects have been exempt in the past from a PUB review. Two non-utility generators **Star Lake (ENEL)** and **Rattle Brook (Algonguin Power)**, **Rose Blanche (Newfoundland Power)** and **NLH's Granite Canal project** were not subject to PUB oversight. The **Exploits River incremental energy project** at Grand Falls and Bishop's Falls carried out by Abitibi and Fortis; and the **Corner Brook Pulp and Paper thermal co-generation project** were also not subject to PUB oversight. Additionally, the **decision to develop two of the largest generation developments in the province's history, Bay d'Espoir (670MW) and Holyrood (500MW)**, were approved by Cabinet and were not subject to regulatory review.

**Information Note**  
**Department of Natural Resources**

**Title:** Board of Commissioners of Public Utilities (PUB) Report on Muskrat Falls/Labrador-Island Link Project Review

**Issue:** The PUB has filed its final report regarding the review of the Lower Churchill Project.

**Background and Current Status:**

- In June of 2011, Government submitted a reference question to the PUB asking it to determine which of the two generation expansion options under consideration was the least cost over the period from 2011 to 2067. Government initially requested that the PUB submit a final report by December 31, 2011 and later extended the deadline to March 31, 2012.
- As part of its review, the PUB hired Manitoba Hydro International (MHI), a wholly-owned subsidiary of Manitoba Hydro with 25 years of power sector consulting experience in over 60 countries, to review and report on the technical feasibility and cost estimates of the two generation expansion options under consideration. The MHI report was released on February 1, 2012.
- The Consumer Advocate (CA) was also given a mandate to represent domestic and general service customers during the review, to review Nalcor's submission as well other material and submissions, attend the public hearings and make representation to the PUB on behalf of ratepayers. The CA report was filed with the PUB on March 2, 2012.
- The PUB's report, entitled Review of Two Generation Expansion Options for the Least-Cost Supply of Power to Island Interconnected Customers for the Period 2011-2067, was forwarded to the Minister of Natural Resources on March 30, 2012.

*Findings of the PUB Final Report:*

- The PUB's primary finding concluded that "the information provided by Nalcor in the review is not detailed, complete or current enough to determine whether the Interconnected Option represents the least-cost option for the supply of power to Island Interconnected customers over the period of 2011-2067, as compared to the Isolated Island Option."
- The PUB concluded that the Decision Gate 2 stage is premature to undertake an adequate comparison between the options based on a number of key points including issues with Nalcor's load forecast, cost analysis, analysis gaps, Nalcor performance and analysis scope/screening.
- The PUB found that the load forecast provided by Nalcor does not demonstrate an immediate need for the significant amount of new generation contemplated in the Interconnected option.

*Load Forecast Issues:*

- Use of 2010 Planning Load Forecast:
  - The PUB expressed concern that Nalcor is relying on a 2010 Planning Load Forecast. Nalcor stated that it did not prepare a 2011 forecast to ensure consistency of information for the PUB review; however, the PUB finds this explanation inadequate.
- End-Use Modeling:
  - The PUB feels that Nalcor has not undertaken best-practices with respect to load forecasting and that the current forecast methodology uses econometric modeling techniques which consistently under-forecast future residential demand by about 1% per annum. The PUB states that Nalcor should adopt end-use modeling prior to making a determination on the interconnected option.
- Process for Industrial Load Forecasting:
  - The PUB is concerned about Nalcor's approach to forecasting industrial load, and states, "according to Nalcor the industrial load forecast was determined based on information from each industrial customer without the application of any judgment or any independent analysis."
  - The PUB states that Nalcor did not forecast the previous closure of two paper mills and did not take any additional steps outside of the normal load forecasting process to obtain reassurance in relation to the anticipated industrial load. The PUB notes that without Corner Brook Pulp and Paper, there would be no energy deficit during the PUB's 20-year planning period.

*Cost Comparison Analysis:*

- Fuel Price Forecast for the Isolated Island Option:
  - PUB noted that the fuel price forecast is the most significant factor in the CPW analysis (~70% of CPW costs for Isolated Option) and the main driver for the Interconnected Option preference.
  - PUB noted that fuels prices are volatile, difficult to forecast over a long period and subject to significant variability.
  - PUB noted that fuel price forecasts used in the analysis are current and based on credible sources; however, there is significant risk as the forecast has been extended over a 57 year outlook period by Nalcor which the PUB indicates is beyond a more reasonable expectation of 2025 (PIRA's outlook end year).
- Capital Costs Estimates:
  - The PUB noted the degree of project definition as well as other related cost uncertainties could result in capital costs 50% higher than forecast and significantly increase the Interconnected Option CPW to about \$8.6 billion.
  - PUB noted that project schedule delays could also impact costs and highlighted the Interconnected Option environmental release was six months behind schedule.
- Other Inputs:
  - The PUB indicated that MHI found the inputs used by Nalcor to be appropriate although MHI had some issue with transmission system losses which could increase Interconnected Option costs.
  - The PUB noted that the proposed take-or-pay PPA contract arrangement between Nalcor and NLH (which has yet to be worked out) poses some risk to the Island Interconnected customers if there is significant variance in load from forecast.
- Cumulative Present Worth Analysis:
  - The PUB noted that the CPW analysis based on November 2010 available information does not assist in determining the least-cost option as inputs may be incorrect, incomplete or out of date.
- Sensitivity Analysis and Risk Mitigation:
  - The PUB noted that, during its review, there was concern raised on risks of large capital projects, potential cost overruns, and forecasts (load and fuel price) over extended outlook periods.
  - The PUB noted that Nalcor undertook sensitivity analyses that demonstrated significant risks relating to capital costs, load forecast and fuel price forecast whereby potential combination of scenarios could shift the decision preference towards Isolated Island Option.

*Nalcor DG2 Information Gaps:*

- The PUB says it is very significant that MHI found major gaps in Nalcor's information and analyses at DG2 especially with respect to transmission design criteria, AC integration, system reliability, and compliance with the North American Electric Reliability Corporation (NERC).
- The transmission design criteria that Nalcor chose for the transmission line would ensure reliable service up to a 1 in 50 years (i.e. 1:50) weather event such as ice or wind. MHI recommended higher standards of 1:150 or 1:500, which are currently used in other provinces such as Manitoba, Alberta or Quebec. The PUB says Nalcor rejects changing the design and prefers to increase reliability with more combustion turbines.
- The PUB stated that Nalcor did not sufficiently study the issues around integrating Muskrat power into the Island grid before DG2. The PUB report says Nalcor relied on earlier AC integration studies and is working on new studies that will inform the DG3 decision.
- The PUB suggests that Nalcor should use probabilistic reliability assessments being used in other jurisdictions such as BC, Manitoba, and Ontario instead of the simplistic deterministic model that Nalcor uses. Probabilistic assessments apply probabilities of numerous events to establish the probability of system failure.
- Eight of the ten Canadian jurisdictions comply with NERC standards, but Nalcor does not. Nalcor responded that it is in the process of assessing the implications of complying with NERC.

- The PUB states, “All the gaps relate to the Interconnected Option and would, if incorporated, likely increase the capital costs of this option.”

#### *Nalcor Performance:*

- The PUB repeatedly cites instances of Nalcor performance that cause the PUB concern. These instances include:
  - Nalcor delays in replying to information requests from MHI and the PUB
  - insufficient information in Nalcor responses
  - Nalcor having insufficient information about important aspects of the project
  - Nalcor filing documentation as confidential without screening as to whether it was actually commercially sensitive
  - Nalcor providing new information on March 9, 2012 which was too late for the PUB to consider in its report

#### *Scope/Screening:*

- The report seems to imply that the scope of the reference question was too narrow and should have included the other supply options that Nalcor screened out before DG2. The report extensively quotes presenters who took this position.
- “There seems to be a strong and widely held belief that supply options such as natural gas, additional wind or Upper Churchill power could be viable options.”
- “...the Terms of Reference did not include consideration of the eliminated supply options. While Nalcor did provide information on the options eliminated, this information was summary and not technical in nature and was not examined during the review.”
- Despite the scope of the reference question, the report discussed alternative supply options including Upper Churchill, natural gas, and wind. The PUB questions whether accessing Upper Churchill power would be a realistic option given concerns in relation to the continued operation of the Holyrood Thermal Generating Station until 2041.

#### NR Analysis on Key Issues:

##### *DG2 vs. DG3*

- The PUB characterizes DG2 as a concept or feasibility-level stage of a project planning process and therefore cannot be relied upon to determine whether the Interconnected option is the least cost alternative; however, Government has clearly communicated that it understands the limitations of DG2 information and consequently is not making a sanction decision until DG3 numbers are complete.
- Generally, MHI, the Consumer Advocate, and Navigant all concluded that DG2 numbers were an appropriate basis to determine that the Interconnected option was the least cost alternative by a CPW difference of \$2.2 billion as compared to the Isolated Island option.

##### *Need for Power*

- The concerns identified by the PUB with respect to the load forecasting were also identified by MHI. Despite these concerns, MHI generally concluded that Nalcor’s electricity demand forecasting process was conducted with due diligence, skill, and care and meets acceptable utility practices.
- Importantly, MHI ultimately concluded that Nalcor’s load forecasting is likely to be below future requirements due to a conservative domestic sector outlook and no new industrial load included.

##### *Least Cost Option*

- The PUB agrees with MHI and Nalcor that based on DG2 numbers, and ignoring the gaps in Nalcor’s work found by MHI, the Interconnected option has a lower CPW. However, whereas MHI was generally satisfied to conclude that the Interconnected option had a CPW advantage of \$2.158 billion based upon the DG2 numbers, the PUB emphasized that DG2 numbers cannot be used as a basis to determine least cost alternative. The limitation of DG2 is recognized by Government and DG3 numbers are required prior to any sanction decision.

**Action Being Taken:**

- NR officials will continue to monitor the debate in the aftermath of the PUB review as well as other activities related to the Lower Churchill Project.

**Prepared / Approved By:** NR Energy Policy / Paul Scott  
03 31 2012



# Summary and Analysis of PUB Review

April 1, 2012

# Outline

- Summary of Report
- Conclusions
- Other Considerations from MHI Report
- Comments about Nalcor
- Select comments from the Report

# Summary

- MHI concluded that Interconnected Option was least cost, but noted risks and uncertainties
- DG2 is a concept study or feasibility level stage
- Gaps in analysis have the potential to significantly impact project definition and costs
- Questions whether load forecast should be relied on
- No immediate need for new power
- Driver appears to be fuels savings from closing Holyrood
- Sensitivities that adjust capital costs, load and fuel price result in a change in CPW preference
- Information was not provided in a timely fashion
- Nalcor did not provide updated info that was being prepared for DG3
- Not possible to make a least cost determination on a concept/feasibility study
- Concerned about gaps identified by MHI and Nalcor's response to MHI.

# Conclusions

- MHI concluded that, when considered together with the underlying assumptions and inputs provided by Nalcor, the Interconnected Option represents the least-cost option of the two alternatives reviewed.
- MHI noted, however, that the risks and uncertainties associated with the key inputs are magnified by the project's scope and the length of the analysis period, and changes in key inputs and assumptions can impact the results of the analysis and shift the preference for the least-cost option.
- Decision Gate 2 is a concept study or feasibility level stage of the project planning process which provides for changes in project scope and costs as detailed design progresses.
- The degree of project definition associated with Nalcor's Decision Gate 2 analysis is 5% to 10% for the Interconnected Option and even less so for the Isolated Island Option.
- The risks of capital cost overruns and the uncertainties around load and fuel forecasts for a planning period of over 50 years were concerns during the review. The sensitivity analyses show that the CPW results are significantly affected by changes to the assumptions for fuel prices, load and capital costs.
- Gaps identified by MHI in Nalcor's analysis ... have the potential to significantly impact the project definition and costs for the Interconnected Option

## Conclusions

- The Board notes that one of the ways that these risks can be mitigated is to ensure that the best available information is considered in the generation planning process.
- ...the Board reviewed the load forecast used by Nalcor and questions whether this forecast should be relied on in answering the Reference Question. This load forecast is approximately two years old and was not updated during the review
- While the forecast shows a gradual increase in load, it does not demonstrate an immediate need for the significant amount of new generation contemplated in the Interconnected Option.
- Assuming no monetization of excess power, the potential supply associated with the Interconnected Option is much greater than the forecast load.
- The preference for the Interconnected Option would appear to be the result of forecasted fuel savings associated with the closing of the Holyrood Thermal Generating Station

# Conclusions

- Nalcor advised that work has been ongoing since Decision Gate 2 and that, by June 2012, it will have an updated load forecast, a CPW analysis with updated inputs including fuel forecasts, and better defined capital costs. Updated information in relation to this ongoing work was not made available to the Board during the review.
- The Board was not asked to determine whether this decision (*DG2*) was correct. Rather, the Board was asked to determine whether the Interconnected Option represents the least-cost option for the supply of power to Island Interconnected customers.
- The Board does not believe that it is possible to make a least-cost determination based on a concept study or feasibility level of information generally from November 2010 which was intended only to ground Nalcor's decision to move to the next phase of the analysis, especially given that so much additional work has already been done to define the project and costs and to further eliminate uncertainties.
- In the Board's view the time to answer a least-cost question is not at Decision Gate 2, but further along in the decision-making process when there is a higher degree of project definition and significantly less variance around the estimated capital costs. As discussed above, it appears there is no urgent need to proceed in advance of a full review of this information, though there may be other factors outside the scope of this review which may influence decision timing.

## Conclusions

- **The Board concludes that the information provided by Nalcor in the review is not detailed, complete or current enough to determine whether the Interconnected Option represents the least-cost option for the supply of power to Island Interconnected customers over the period of 2011-2067, as compared to the Isolated Island Option.**

## Conclusions

### Other Considerations - MHI Recommendations

- There were gaps in Nalcor's information and analysis at Decision Gate 2, including: **i) ac integration studies were not done; ii) probabilistic reliability studies to compare the two options were not done; iii) there is uncertainty with respect to adherence to NERC standards, and iv) the design return period for the HVdc overland transmission line is not in accordance with accepted standards and best practice.**
- The Board is concerned with the gaps in Nalcor's work as identified by MHI in its review. All the gaps relate to the Interconnected Option and would, if incorporated, likely increase the capital costs of this option.
- In the Board's opinion, when considered together, **these gaps related to power system reliability raise serious concerns in relation to Nalcor's assessment of the interconnection of the significant generation associated with the Muskrat Falls generating facility to the Island Interconnected system.** These deficiencies should be addressed by Nalcor in a meaningful way should the Interconnected Option proceed to project sanction.
- In closing the Board notes the comments of the Industrial Customers on the issue of these gaps and the need for an open and transparent process to assess the implications of the issues raised by MHI, particularly with respect to the issue of the appropriate transmission line design criteria. The Industrial Customers suggested that **the Board should have the opportunity under its statutory mandate, by a streamlined process if necessary, to further review the areas of concern identified by MHI before the Interconnected Option is sanctioned.**



## Comments about Nalcor

- Difficulties were encountered from the beginning with the receipt of timely and complete information from Nalcor.
- The gathering of information was a challenge and the answers to requests for information were often incomplete, requiring further requests for information to clarify answers.
- The Exhibits were often disjointed and out of context so it was difficult to identify important information and make linkages. Information was provided in a piecemeal way on various elements which made it difficult to gain an understanding of each option.
- The way Nalcor dealt with confidential documentation was also a challenge in the review.
- Initially Nalcor filed significant documentation as confidential without screening as to whether it was indeed commercially sensitive or could be released publicly.
- Sixty-seven (67) Exhibits were filed as confidential of which 53 were later released to the public, either fully or in an abridged manner, with the majority being released to the public after November 1, 2011.

## Comments about Nalcor

- The delay in providing information and the manner in which it was provided by Nalcor, including its approach to commercially sensitive information, impacted the review process and this report.
- The Board's report was delayed by three months and the costs will be significantly higher than otherwise would have been the case.
- More significant from the Board's perspective is the impact on the Board's ability to answer the Reference Question.
- The Board believes that the originally planned technical review period with requests for information and conference would have provided an opportunity to further investigate the significant technical and financial issues that were raised during the review.
- This exchange would have permitted the filing of additional information to address the issues that were identified.
- The Board notes that Nalcor provided new information in its Final Submission and in revisions to an Exhibit filed on March 9, 2012. This information could not be reviewed and was not considered by the Board.

## Comments about Nalcor

- The Board notes that MHI also identified challenges related to the information provided by Nalcor. These challenges had a significant impact on the schedule and the cost of completing their work.
- MHI stated that these factors made a “comprehensive analysis difficult and time consuming” and made release of its report by September 15, 2011, as originally anticipated, impossible.

## Select Comments from the Report

### Review Scope

- Since the Terms of Reference provide the only source of authority to the Board in relation to Nalcor, **the scope of the review excluded many issues that were raised by interested persons.**
- MHI did point out that **there is risk in relying on the Holyrood Thermal Generating Station to remain operational until 2041.**
- **There is no regulatory requirement for low NOx burners at the present time.** The Holyrood Thermal Generating Station is currently operating in full compliance with its operating certificate. The proposed pollution control upgrades will not address GHG emissions.
- The Board notes that, based on the information provided in the review, **the fuel costs and life extension concerns in relation to the continued operation of the Holyrood Thermal Generating Station until 2041 raise questions as to whether accessing Upper Churchill power would be a realistic option.**
- **The exclusion of the Maritime Link was a notable limitation** throughout the review, both in terms of evaluating the costs of each option and in terms of assessing the technical aspects of the project.

## Select Comments from Report Load Forecast

- MHI completed a detailed analysis of Nalcor's load forecasting practices and methodologies and found that **the load forecasting process is conducted with due diligence, skill and care and meets acceptable utility practices with the exception that end-use modeling techniques for domestic loads are not currently employed.**
- MHI noted that the domestic sector forecast consistently under predicts future energy needs at a rate of one percent per year. **MHI concludes that the domestic forecasting process is inherently biased towards under predicting energy consumption.**
- The Consumer Advocate noted that the sensitivity analysis conducted by Nalcor shows that, **even if actual load growth was only 50% of the Nalcor projections, the Interconnected Option still has a sizable preference.**
- Nalcor noted that **there is considerable opportunity for industrial load growth in Labrador but there have been no firm commitments so this has not been factored into Nalcor's analysis.**
- ... the Board has three concerns related to the load forecast: **i) the date of the Planning Load Forecast, ii) end-use modeling; and iii) the industrial customer load forecast.**

## Select Comments from Report Load Forecast

- This forecast is based on provincial economic forecasts from 2009 and analysis completed in the first part of 2010, which means **this forecast is now two years old.**
- **The decision to break from its established load forecasting process and not prepare a 2011 Planning Load Forecast is a concern** and, in the Board's view, Nalcor's explanation is inadequate.
- It appears that **Nalcor did not take any additional steps outside of the normal load forecasting process to obtain reassurance in relation to the anticipated industrial load.**
- With so few industrial customers, the recent unforecasted closure of other pulp and paper mills in the province, the current challenges facing Corner Brook Pulp and Paper which is the largest industrial customer, and the potential for significant increases in the Labrador load, one might expect that **as part of such a major generation planning exercise the utility would, to the extent possible, be proactive in trying to obtain some reassurance in relation to the industrial customer load.**
- The Board notes that, **without the Corner Brook Pulp and Paper load, there would no energy deficit during the 20-year planning period**

## Select Comments from Report Load Forecast

- The Interconnected Option involves a very large incremental increase in generation capability and a significant amount of excess energy and capacity until well beyond the 20-year planning period.
- This graph highlights the significance of the assumption required by the Terms of Reference that the excess power is not monetized or utilized.
- As shown in the third graph **the Isolated Island Option offers what might be considered a less risky approach more in line with principles of distributed generation, where capacity and energy are added in smaller increments more closely matching the load forecast.**
- These graphs show that **there is not an immediate need for the large incremental supply associated with the Interconnected Option and that Island electricity needs could be met in the short to medium term with available renewable sources on the Island and/or additional thermal generation.**
- **It appears that avoidance of fuel costs is a critical factor in this generation planning decision.** Nalcor's analysis shows that the Interconnected Option is least-cost primarily as a result of the avoided fuel costs associated with the closure of the Holyrood Thermal Generating Station.

## Select Comments from Report Cost Analysis

- MHI commented that...
  - *“The Strategist tool that Nalcor used for its CPW analyses is sophisticated and will optimize a resource plan based on available resource options, load forecasts, fuel pricing, and capital and operating costs.”*
- **The Consumer Advocate accepted MHI’s findings that Nalcor’s CPW analysis was completed using recognized best practices.**
- The Consumer Advocate agreed with MHI that there is uncertainty related to pricing of fuel for thermal power generation:
  - *“If the absence of uncertainty in oil price forecasts was required before advancing with capital spending, one would observe little capital spending. The reality is that corporations have to make investment decisions on the basis of less than certain information and upon assumptions about the future grounded in the best available information.”*
- Based on the information filed it appears that the **fuel price forecasts provided are current and based on credible sources**. The significant risks associated with forecasts of fuel 57 years into the future must be recognized and monitored. Even with all the best forecasts the Board agrees with MHI that it is beyond a reasonable expectation to predict fuel price escalation beyond 2025.



## Select Comments from Report

### Cost Analysis

- MHI reviewed the capital cost estimating process followed by Nalcor and concluded that **Nalcor's process is very similar to that used by Manitoba Hydro and is a utility best practice**. MHI also confirmed the degree of project definition and accuracy ranges associated with an AACE Class 4 estimate ....
- MHI concluded that the overall cost estimate methodology is appropriate for a major construction project and would allow for a reliable estimate provided that the inputs to the analysis are meaningful.
- **MHI identified certain gaps and deficiencies in Nalcor's work as of Decision Gate 2 for the Interconnected Option which have the potential to impact capital cost estimates**. These gaps relate to the appropriate design for the HVdc overland transmission line, probabilistic reliability studies, system integration studies and compliance with NERC standards.
- **The costs to address these deficiencies** were not included in the Decision Gate 2 capital cost estimates for the Interconnected Option reviewed by MHI but, together, they **could be significant**.
- MHI noted that the capital cost estimates for the Isolated Island Option were less detailed than for the Interconnected Option

## Select Comments from Report

### Cost Analysis

- The capital cost estimates provided by Nalcor in this review are reflective of a concept study or feasibility level estimate with a degree of project definition of approximately 5%.
- With this degree of project definition Nalcor said that the capital cost estimates may be as much as 50% higher than forecast. **A cost increase within this range would result in total CPW for the Interconnected Option in the order of \$8,616 million.**
- Aside from the level of project definition and range of accuracy **there are a number of other uncertainties in relation to the capital costs of both options which, taken together, could significantly affect the CPW analysis.**
- The Board also notes project schedule delays can impact costs and **it seems there may be a delay in the schedule for the Interconnected Option**

## Select Comments from Report Cost Analysis

- MHI generally found the inputs used by Nalcor in its CPW analysis to be appropriate.
- The Board acknowledges the issues raised by some presenters in relation to the use of the power purchase agreement approach. The Board notes Nalcor's explanation that **this approach ensures that the ratepayer is not overly burdened in the early years of such a large project where the full capacity may not initially be used.**
- It should be noted that the proposed take-or-pay aspect of **this arrangement might pose some risks to Island Interconnected customers if there is a significant variance in load from forecast**

## Select Comments from Report

### Cost Analysis

- MHI determined that **Nalcor's CPW analysis was completed using recognized best practices and the cumulative present worth for each option was correct based on the inputs used by Nalcor.**
- The Consumer Advocate agreed that MHI has undertaken an in-depth analysis and stated:
  - *"The Consumer Advocate accepts MHI's determination that Nalcor's cumulative present worth analysis for the two Options was completed using recognized best practices and that the cumulative present worth for each option was correct based on the inputs used by Nalcor."*
  - *The Consumer Advocate accepts MHI's determination based upon its technical and financial analysis that the inputs used by Nalcor were generally found to be appropriate."*
  - *"The Consumer Advocate agrees with MHI's finding that the Muskrat Falls Generating Station and the Labrador Island Link HVdc projects represent the least cost option of the two alternatives, when considered together with the underlying assumptions and inputs provided by Nalcor."*
- The Industrial Customers stated:
  - *"In the view of the current Island Industrial Customers, unduly delaying the choice between the Infeed Option and the Isolated Island Option, and in the interim proceeding with significant 'stop gap capital investments in Island generation capacity, is not the least cost option."*

## Select Comments from Report Cost Analysis

- **To the extent that an input is incorrect, incomplete or out-of-date the CPW will not be an accurate reflection of the present value of the costs.** In particular, certain key inputs have a very significant impact on the CPW analysis. *[load, fuel price, capital costs]*
- **There are also notable gaps in Nalcor's information and processes which may impact the CPW analysis.**
- The Board is of the view that the **Decision Gate 2 CPW analysis does not form an adequate basis upon which to consider the two supply options as set out in the Terms of Reference**, especially given the concerns in relation to Nalcor's load forecast and capital cost estimates.

## Select Comments from Report Cost Analysis

- During MHI's presentation Mr. Kast talked about combined sensitivities:
  - ...Assume the fuel cost decreased by 20 percent, the load growth decreases by 20 percent and capital costs for Muskrat Falls and LIL increase by 20 percent, in which case the CPW is essentially reduced to a.. \$100 million differential
  - ...In Example two, if we have a pulp and paper mill closure and capital costs of Muskrat Falls and LIL increase by 10 percent, the CPW is essentially reduced again to a minimal differential.
- The Industrial Customers stated:
  - ***"The current Island Industrial Customers accept that **the postponement of the choice between the Infeed Option and the Island Isolated Option is not likely to significantly reduce, over the mid and- long terms, the risks raised by the inherent uncertainty of oil price and load forecasts and regarding future greenhouse gas emissions regulation.** It appears to the current Island Industrial Customers that the Manitoba Hydro International (MHI) report confirms that when subjected to various sensitivity tests in relation to oil price and load forecasts (and the risk of project cost overruns), **the Infeed Option continues to maintain a margin of preference over the Isolated Island Option as least cost generation over the Review period of 2010-2067.**"***

## Select Comments from Report Cost Analysis

- Risk is a factor in every generation planning decision and, in the current context, **it is magnified given the large scale of the contemplated generation addition, the costs and the timeframe involved.**
- **Nalcor was able to demonstrate** during the review that it had undertaken a comprehensive assessment of the risks associated with the Interconnected Option and **that it is putting the necessary steps and processes in place to mitigate these risks.**

## Select Comments from Report Cost Analysis

- The Industrial Customers stated:
  - *“In the view of the current Island Industrial Customers **there remains the opportunity, prior to making the decision to sanction** (Decision Gate or DG3) the Infeed Option, to address certain areas of concern raised by MHI in its report...*
  - *The current Island Industrial Customers, on review of the MHI report and of the transcripts of the presentations to the Board are left with the view that **these areas of concern could and should all be further addressed before DG3, in a transparent and accountable manner.**”*