

Date : 4/19/2012 3:19:31 PM

From : "Bown, Charles W."

To : "Parsons, Walter"

Subject : Fw: NFL2 SCOPE OF SERVICES - Government of Newfoundland - Muskrat Falls DG3 review

Attachment : NFL2 SCOPE OF SERVICES - Government of Newfoundland - Muskrat Falls DG3 review rev6.docx;

Sent Via BlackBerry

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**From:** Paul Wilson <plwilson@mhi.ca>

**To:** Bown, Charles W.

**Cc:** Allen Snyder (amsnyder@██████████) <amsnyder@██████████>; Mack Kast (mkast@██████████) <mkast@██████████>

**Sent:** Thu Apr 19 13:34:55 2012

**Subject:** NFL2 SCOPE OF SERVICES - Government of Newfoundland - Muskrat Falls DG3 review

Hello Charles, it was a pleasure to meet with you and Walter over the last two days. As a result, we have gained a better understanding of the project constraints, goals, and inputs for this important review project. Al and I have revised the scope of work which now captures all the important elements required and factors in the data availability and schedule. We have also removed the items that do not require our involvement, in particular the power system reliability review, Muskrat Falls Hydrology review, and the detailed HVdc converter station review.

I will begin to estimate the amount of effort and pricing for your consideration and wait to hear from you if this scope of work is agreeable.

My regards,

**Paul Wilson, P. Eng.**

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Manitoba Hydro International's Review of the  
Muskrat Falls and Labrador Island HVdc Link (LIL)  
and the Isolated Island Options for the Government of Newfoundland and  
Labrador

## Scope of Services

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Date: April 19, 2012

Revision 6

### 1. Objective

MHI (the Consultant) shall review all work completed by the Proponent (Nalcor) since Decision Gate 2 (DG2) in preparation for Decision Gate 3 (DG3). The review shall include an assessment of the Cumulative Present Worth (CPW) Analysis of the various components for each of the two Options, including a reasonableness assessment of all inputs into that analysis. The test of reasonableness for this assessment is generally defined as the work following Good Utility Practices of the majority of electrical utilities in Canada.

The Consultant will also provide such advice and other services as may be required from time to time by the Government of Newfoundland and Labrador (Client).

### 2. Services

The Consultant acknowledges that the Client is relying on the skill and knowledge of the Consultant in performing the Services. The Consultant shall exercise the degree of skill, care and diligence required by customarily accepted practices and procedures for such a Contract.

The Consultant shall only use key personnel to perform the Services who have been named by the Consultant in the Proposal and who have been accepted by the Client. The Consultant may only substitute or replace the accepted key personnel with the prior written agreement of the Client.

The Services which the Consultant shall perform or cause to be performed with diligence, skill and care include the following:

- a) A review of all work performed by Nalcor and/or their consultants or others related to the Muskrat Falls and Labrador Island HVdc Link (LIL) and the Isolated Island Option subsequent to DG2. The level of review shall be sufficient for the Consultant to report on whether the work was performed with the degree of skill, care and diligence required by customarily accepted professional practices and procedures completed in the performance of similar work. This work will be undertaken by examination of design reports, technical documentation or memos, in

direct meetings with Nalcor, or with other information provided by Nalcor. The Request for Information process will not be implemented as part of these services, nor will any preparation for public hearings be taken into consideration.

A high level review will focus on existing engineering or financial documents used in the development of the CPW analysis including design documents, design studies, material and equipment specifications, cost estimates and schedules. MHI's final report will include a review of which documents were studied, identification of salient points necessary for the CPW analysis, and if the various studies were prepared in accordance with good utility practices. The technical assessment will focus on the following areas that are generally used as inputs into the CPW analysis:

i. Load Forecast Update including:

- a. An assessment of the 2012 Load Forecast accuracy for the Island of Newfoundland and Labrador. Two load forecasts are being prepared, the first for the Isolated Island Option, and the second for the Infeed Option.
- b. Identification of large industrial load demands on both the Island of Newfoundland and Labrador, and potential impact on the generation resource expansion plan. This review will include an examination of Nalcor's mitigation strategies to limit demand risk exposures.

Information required:

- Updated 2012 Load Forecasts for each option
- Assessments by Nalcor of large industrial loads used as inputs into the generation expansion plan
- Any other new load requirements.

Outcomes:

- Documentation on the 2012 Load Forecasts
- Commentary on the accuracy of the 2012 Load Forecasts
- Commentary on the impact of the large industrial loads to the Generation Expansion Plan and Nalcor's related mitigation strategies
- Impact to the CPW analysis of changes in Load Forecast since DG2 and any potential deficiencies in the updated Load Forecast.

ii. Review of AC integration studies completed for the Muskrat Falls and LIL HVdc configuration options.

Information required:

- AC integration study report

- Meetings with Nalcor's System Planning Staff and/or the consultant who performed the analysis.

Outcomes:

- Identification of material gaps in the AC integration study that may impact the operational performance of the Infeed Option.
- Impact to the CPW analysis for related cost changes associated with the AC integration study.

- iii. Review the Muskrat Falls GS post DG2 design changes, cost estimates, and construction schedules. Identify any technical weaknesses; review revised cost estimate inputs; and the cost implications of any new requirements for environmental licensing.

Information required:

- Muskrat Falls GS design definition
- Muskrat Falls GS updated design reports including AC switchyards and transmission lines to Churchill Falls
- Muskrat Falls updated master cost estimate
- Muskrat Falls updated master project schedule
- Manufacturer cost estimates used as input into the master cost estimates
- Muskrat Falls GS risk analysis
- If required, meetings with Nalcor and/or their consultant responsible for the Muskrat Falls GS design to review work completed subsequent to DG2.

Outcomes:

- Identification of material gaps in the design documents that would impact the performance of the Muskrat Falls GS
- Review and assessment the material and labour cost estimates
- Review and assessment the master project schedule
- Review and assessment of project risks
- Impact on CPW analysis of potential deficiencies and related cost changes associated with the Muskrat Falls GS.

- iv. Review the HVdc Converter Stations and associated AC switchyards. This will include a review of the single line diagram, revised cost estimates, construction schedules, and DC project definition.

Information required:

- Information as listed above
- HVdc updated master cost estimate
- HVdc updated master project schedule

- Shore electrode cost estimates, and construction schedules including the risk analysis of the electrode conductor being placed on the tower
- If required, meetings with Nalcor and/or their consultant responsible for the HVdc Converter Stations design and AC switchyards.

Outcomes:

- Identification of material gaps in the design documents that would impact the performance of the HVdc system
  - Review and assessment the material and labour cost estimates
  - Review and assessment the master project schedule
  - Impact on the CPW analysis of potential deficiencies and related cost changes associated with the HVdc Converter Stations and AC switchyards.
- v. Review of the overhead HVdc transmission line and associated AC collector transmission lines including its reliability design criteria, route details and final metrology review. An engineering review of tower and line designs, review of cost estimates, and cost estimate sensitivity to various reliability design criteria, and construction schedules will be conducted. MHI will work with Nalcor to obtain a common understanding of the HVdc transmission line design philosophy and it's alignment to the design details provided and operating practices. This undertaking will clarify both the business and local issues implicit in the selection of reliability return period.

Information required:

- Information as listed the above paragraph
- Transmission line design basis
- Transmission line updates to the master cost estimate
- Transmission line updates to the master project schedule
- Transmission line risk analysis report
- Transmission line emergency response preparedness or disaster recovery plans
- HVdc electrode line design specifications, design drawings, construction schedules, line route, and cost estimates
- Meetings with Nalcor and/or their consultant responsible for the transmission line design to review work done to date.

Outcomes:

- Identification of material gaps in the design documents that would impact the performance of the HVdc transmission line
- Review and assessment of the material and labour cost estimates
- Review and assessment of the master project schedule
- Impact on the CPW analysis of potential deficiencies and related cost changes associated with the HVdc Transmission Line.

- vi. Strait of Belle Isle (SOBI) marine crossing review will include a review of the cost estimates and construction schedule. The SOBI risk analysis project update will be reviewed.

Information required:

- Information as listed in above paragraph
- Cost estimates for transition stations
- Marine crossing capital cost updates to master cost estimate
- Marine crossing updates to master project schedule
- SOBI risk analysis report
- If required, meetings with the Nalcor Marine Crossing project manager to obtain any updates or identified risks relevant to the review.

Outcomes:

- Review and assessment the material and labour cost estimates
- Review and assessment the master project schedule
- Review and assessment of project risks
- Impact on the CPW analysis of potential deficiencies and related cost changes associated with the Strait of Belle Isle (SOBI) marine crossing

- vii. The Cumulative Present Worth Analysis will be analyzed with revised inputs for both capital costs and operating expenses, load forecasts, fuel price variability, interest rates, and escalation for the two options. All changes in costs between DG2 and provided by Nalcor, as available, will be summarized and assessed in terms of their material impact on the CPW Analysis. CPW sensitivities listed below, some of which were previously analyzed in the DG2 review, will be updated with the new inputs. An input data specification will be prepared by MHI in order to minimize the potential impacts to Nalcor operations.

Information required:

- Generation resource sequencing (size, type, date, ) of each of the two options which defines the base case 2012 CPW analysis
- Input documentation of all capital cost inputs and AFUDC for each of the two Options
- Input documentation of all operating cost for the base case for each of the two Options
- Documentation disclosing of all escalation and inflation factors used in 2012 CPW analyses
- Documentation of all updated fuel price forecasts, including a PIRA 2012 fuel price forecast for the 2012 CPW base cases.

- Documentation of the PIRA fuel price forecasts of high, low, reference and expected prices for the fuel price sensitivities.
- Nalcor's sensitivity analysis of Capital Cost Estimates with AACE Class 3 (+30% to -10%) accuracy band around the base case for each Option for the CPW analysis
- Nalcor's interest rate sensitivity analysis for each of the two options
- Nalcor's Fuel price sensitivity analysis for each of the two options.

Outcomes:

- Identification of material gaps or weaknesses in the CPW analysis as a result of the new inputs
- CPW analysis and validation of results for the base case of the two Options
- Assessment of the sensitivities on the CPW analysis to capture:
  - o Load forecast variations
  - o Revised capex costs
  - o Revised opex costs
  - o Fuel price variations
  - o Demand variability
  - o Potential impacts on the CPW analysis of any identifiable AC integration studies gaps
  - o Potential impacts on the CPW analysis of Muskrat Falls cost variances
  - o Potential impacts on the CPW analysis of overhead HVdc transmission line cost variances

- viii. Review of the revised Isolated Island capital cost inputs for thermal plants, small hydro plants, and the wind farms. Nalcor has committed to updating and revising a number of these cost estimates as part of the DG3 process.

Information required:

- Cost estimate details for the small hydro plants.
- Cost estimate details for the CT and CCCT thermal plants.
- Cost estimate details for any changes at Holyrood
- Cost estimate details for the wind farms.
- Any other cost estimates that are revised for the Isolated Island Option.

b) Preparation of a final report anticipated to include, as a minimum the following:

- An executive summary;
- A description of the Consultant's review team;
- A description of the methodology used to complete the Services;
- A summary of the results of the review, including significant data gaps and issues, if any.

- c) Provision of ongoing support to the Client.



<b>Schedule Item</b>	<b>Scheduled Completion Date (tentative)</b>
1. Kick off Meeting:	April 17 <sup>th</sup> , 2012
2. First Draft Report	July 6 <sup>th</sup> , 2012
3. 2 <sup>nd</sup> Draft Report	July 23 <sup>rd</sup> , 2012
4. Submission of Final Report	July 31 <sup>st</sup> , 2012
5. Presentation to the Government	TBD
6. Completion of Services	September 30 <sup>th</sup> , 2012

Note: This is a very aggressive schedule and completion on these milestones is dependent on the availability of information from Nalcor.