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Date: Thursday, April 26, 2012 9:06:42 AM
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Attached my comments

I have limited computer availability here so could not do track changes so had to resort to different fonts and anything that should be deleted i have marked in blue italics and words added in red

I want to make sure that this is a review not a technical audit at high level and have emphasized the reasonableness of the inputs to derive the least cost and CPW

Hope this makes sense

I also have changed the review requirements that MHI identified to data and information to be made available in ST Johns during the review - i want to make sure that they do not walk away or request drawings, data and information

Paul

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

Date: April 19, 2012

Revision 6

1. Objective

MHI (the Consultant) shall review 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 whilst recognizing the unique electrical isolated system of Newfoundland and common accepted practice in Newfoundland regarding the electrical system.

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 work shall be performed in Newfoundland and Labrador other than specialized engineering work.**

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

A review of 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 **data and** information provided by Nalcor **during meetings and working sessions**. 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 the **reasonableness of** 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. **No new information data or reports are required for this review to proceed**. MHI's final report will include a review of which documents were reviewed (~~delete studied~~), identification of salient points necessary for the CPW analysis, and if the various studies **were reasonable and where applicable** prepared in accordance with good (~~delete utility~~) practices. The technical assessment will focus on the following areas that are generally used as inputs into the CPW analysis:

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 to be **made available during the review which is to be carried out in St John's**:

- 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:

A report on the reasonableness of the following as input to the CPW and to determine the reasonableness to determine the least cost option to meet the provinces generation needs.

*(delete Documentation on) the 2012 Load Forecasts
delete this item it is covered in the line above
(delete Commentary on) the **potential** impact of the large industrial loads to the Generation Expansion Plan and Nalcor's related mitigation strategies
delete this item it is covered by the reasonableness wording.*

Review of AC integration studies completed for the Muskrat Falls and LIL HVdc configuration options **to determine the reasonableness to determine the least cost option to meet the provinces generation needs as inputs to the CPW**

Information required **available during the review which is to be carried out in St John's:**

:

AC integration study report
Meetings with Nalcor's System Planning Staff
and/or the consultant who performed the analysis.

Outcomes **A report on the reasonableness of the above as input to the CPW and to determine the reasonableness to determine the least cost option to meet the provinces generation needs.**

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Delete this item it is covered by the reasonableness test.

Delete this item it is covered by the reasonableness test.

Review the Muskrat Falls GS post DG2 design changes, cost estimates, and construction schedules. *(Delete this we do not require a technical audit Identify any technical weaknesses);* review revised cost estimate inputs; and the cost implications of any new requirements for environmental licensing **to determine the reasonableness of these to determine the least cost option to meet the provinces generation needs as inputs to the CPW**

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Information **to be made available during the review which is to be carried out in St John's:**

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Muskrat Falls GS **Current Basis of Design**
Muskrat Falls GS updated **design data and information** including AC switchyards and transmission lines to Churchill Falls
Muskrat Falls updated master cost estimate **at major component level**
Muskrat Falls updated **high level** master project schedule-
Manufacturer cost estimates used as input into the master cost estimates
Muskrat Falls GS risk analysis
This information and data will be reviewed during meetings with Nalcor personeel *(delete SNC from this review)* responsible for the Muskrat Falls GS design to review work completed subsequent to DG2.

Outcomes A report on the reasonableness of the above as input to the CPW and to determine the reasonableness to determine the least cost option to meet the provinces generation needs.

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Delete this item it is covered by the reasonableness test.

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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 **at major component level** .

Information **to be made available during the review which is to be carried out in St John's**

Information as listed above

HVdc updated master cost estimate **at major component level**

HVdc updated **high level** master project schedule
Shore electrode cost estimates, and construction schedules *(delete this... including the risk analysis of the electrode conductor being placed on the tower)*

This information and data will be reviewed during meetings with Nalcor personeel *(delete SNC from this review)* responsible for the HVdc Converter Stations design and AC switchyards.

Outcomes:

Delete this item it is covered by the reasonableness test

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Review of the overhead HVdc transmission line and associated AC collector transmission lines including its reliability design criteria, route details and final metrology review **to determine the reasonableness of these to determine the least cost option to meet the provinces generation needs as inputs to the CPW..(Delete... A n**

engineering) A 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 endeavour to clarify both the business and local issues implicit in the selection of reliability return period.

Information to be made available during the review which is to be carried out in St John's:

- 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

This information and data will be reviewed during meetings with Nalcor personeel (*delete SNC from this review*) responsible for the transmission line design to review work done to date.

Outcomes:

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Delete this item it is covered by the reasonableness test.

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

Information to be made available during the review which is to be carried out in St John's

- 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 (*Delete.....SOBI risk analysis report*)

IThis information and data will be reviewed during meetings with Nalcor personeel (*delete SNC from this review*) responsible Marine Crossing project manager to obtain any updates or identified risks relevant to the review.

Outcomes:

Delete this item it is covered by the reasonableness test

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Nalcor's Cumulative Present Worth Analysis will be reviewed (*delete....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 **resasonableness and** 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. (*delete this it is proposing that MHI carry out runs of MHI's replicated CPW model we do not need this the Nalcor model has been previouslt checked and verified.....An input data specification will be prepared by MHI in order to minimize the potential impacts to Nalcor operations.*)

I *Delete all this listed below it should be a review of Nalcor's CPW not MHI's using the same input data)nfornation required:*

DEleteGeneration resource sequencing (size, type, date,) of each of the two options which defines the base case 2012 CPW analysis

Delete.....Input documentation of all capital cost inputs and AFUDC for each of the two Options

Delete....Input documentation of all operating cost for the base case for each of the two Options

delete....Documentation disclosing of all escalation and inflation factors used in 2012 CPW analyses

delete....Documentation of all updated fuel price forecasts, including a PIRA 2012 fuel price forecast for the 2012 CPW base cases.

delete....Documentation of the PIRA fuel price forecasts of high, low, reference and expected prices for the fuel price sensitivities.

delete....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

delete....Nalcor's interest rate sensitivity analysis for each of the two options

delete,,,,Nalcor's Fuel price sensitivity analysis for each of the two options.

Outcomes of the review of Nalcor's CPW is A report on the reasonableness of the above as input to the CPW and to determine the reasonableness to determine the least cost option to meet the provinces generation needs.

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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:

- Load forecast variations
- Revised capex costs
- Revised opex costs
- Fuel price variations
- Demand variability
- Potential impacts on the CPW analysis of any identifiable AC integration studies gaps
- Potential impacts on the CPW analysis of Muskrat Falls cost variances
- Potential impacts on the CPW analysis of overhead HVdc transmission line cost variances

Review of the **any available** revised Isolated Island capital cost inputs for thermal plants, small hydro plants, and the wind farms.
(DeleteNalcor has committed to updating and revising a number of these cost estimates as part of the DG3 process.)

Information **to be made available during the review which is to be carried out in St John's**:

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.

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.

Provision of ongoing support to the Client.

Schedule Item Scheduled Completion Date (tentative)

Kick off Meeting: April 17th, 2012

First Draft Report July 6th, 2012

2nd Draft Report July 23rd, 2012

Submission of Final Report July 31st, 2012

Presentation to the Government TBD

Completion of Services September 30th, 201