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To: jasonkean@nalcenergy.com
Cc: [James Meaney](#)
Subject: Re: Responses to MWH re DG3 Estimate
Date: Monday, March 4, 2013 2:24:55 PM
Attachments: [_png](#)
[NE_IE_Review_Task 5\(1\) - JK_ph Comments.docx](#)

Jason

Pls find attached my suggested additions to your text - I am open to discussion on any point

Thanks Paul



NE_IE_Review_Task 5(1) - JK_ph Comments.docx



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Jason Kean---03/04/2013 01:04:07 PM---Paul / Jim, Please have a review of my draft responses to MWH's comments to our DG3 estimate. I wou

From: Jason Kean/NLHydro
To: Paul Harrington/NLHydro@NLHydro, James Meaney/NLHydro@NLHYDRO
Date: 03/04/2013 01:04 PM
Subject: Responses to MWH re DG3 Estimate

Paul / Jim,

Please have a review of my draft responses to MWH's comments to our DG3 estimate. I would like to issue to them tomorrow.

Jason

[attachment "NE_IE_Review_Task 5(1) - JK Comments.docx" deleted by Paul Harrington/NLHydro]



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Nalcor Energy's Responses to MWH's Comments to DG3 Cost and Schedule Review

MWH Comment 1

The text on pg. 11 indicates that the ACEI has not published a cost estimate classification and references Recommended Practice No. 17R-97 as the basis for classification of the DG3 cost estimate. The ACEI has published a cost estimate classification system as Recommended Practice No. 18R-97. Perhaps, the disconnect resides in the desire for a specific cost estimating classification system for heavy civil works as opposed to process facilities, which 18R-97 addresses. Minor issue that doesn't necessarily require resolution.

Nalcor's Response

As indicated, the statement on Page 11 is indeed incorrect. Reference Page 24 of the Basis of Estimate for the correct statement:

"While ACE International is yet to publish a cost estimate classification system for hydro or transmission projects, Nalcor has built upon the general guidance contained within Recommended Practice No. 17R-97 to map the level of estimate maturity required for each of the gate decisions within Nalcor's Gateway Process."

MWH Comment 2

As noted in Table 2, pg. 15, the 7% indicated P50 "estimate contingency" is considered aggressive or low by a factor of 100% relative to legacy experience with similar projects. While the project benefits from a robust analytical risk analysis effort and some fixed pricing, the low contingency recommendation is considered non-customary and undermines confidence for the cost opinion. The issue is flagged as critical for reconciliation.

Nalcor's Response

The results of the cost risk analysis contained in "Decision Gate 3 Project Cost and Schedule Risk Analysis Report" indicates the overall probabilistic distribution of potential cost outcomes, including for both tactical and strategic risks. The "shape" of the resultant distribution is a reflection of the maturity of project definition, including significant amount of market intelligence that has occurred. As is typical, Estimate Contingency is recommended at a P50 expected cost level for tactical risks, while exposure beyond this is considered management reserve.

As the capital cost estimate, inclusive of estimate contingency, is just one of several key inputs into the Cumulative Present Worth (CPW) analysis undertaken for DG3, a conscious effort was made to ensure that all inputs (e.g. energy and capacity, interest rates, debt-service-coverage ratio, etc.) reflect an expected outcome, rather than each being skewed towards an aggressive or conservative side of the distribution of outcomes. In this regard, a P50 Estimate Contingency is considered appropriate and aligns with the basis of all other inputs into the CPW modeling.

In addition to the contingency for tactical risks there is a further escalation allowance which when combined is considered to be a "growth allowance" which equals \$729,643,555.00 or 13% of the base estimate.

Furthermore there is a recognition that there are strategic risks which are deemed to be outside of the control of the Project team , these risks are treated as Management Reserve and have been determined by risk analysis. The Province has guaranteed completion of the project and that the Management Reserve will be provided if called upon.

The Terms and Conditions of the Federal Loan Guarantee state that the MF/LTA, LIL and ML project capital costs are capped at \$6.3B. There are Individual Debt Caps established as follows:
MF/LTA \$2.6B with a Debt Equity ration of 65:35
LIL \$2.4B with a Debt Equity ratio of 75:25
ML \$1.3B with a Debt Equity ratio yet to be finalized

MWH Comment 3

The project team's extensive qualitative risk identification effort is recognized as extensive and best practice, but it's not clear how the qualitative efforts were quantitatively captured in the cost estimate and/or contingency recommendation. Further Investigation of the Monte Carlo simulation inputs (cost estimate and schedule) would support a better understanding of the applied methodology and implied contingency recommendations.

Nalcor's Response

Reference Section 10.1 of "Decision Gate 3 Project Cost and Schedule Risk Analysis Report" for a discussion on the quantitative estimate contingency setting practice used by Nalcor in the Decision Gate 3 recommendation. Attachment B.10 of this report provides cost model, key ranges, and basis of cost ranges used in the Monte Carlo simulation. We would be pleased to walk you through this item.

MWH Comment 4

A means to communicate what specific mitigation schemes and/or allowance reserves are incorporated within the DG3 cost estimate or the management reserve would help to support or explain a lower contingency recommendation and provide additional confidence in the cost/time models.

Nalcor's Response

Reference page 14 of "Decision Gate 3 Project Cost and Schedule Risk Analysis Report" for a summary of the key opportunities identified for estimate savings that were factored into the Estimate Contingency Setting activity, which resulted in a lower than what might be expected recommended estimate contingency. We would be pleased to walk you through this item.

MWH Comment 5

The existence of a management reserve allowance is unclear. Communication as to location and working amount of the allowance to mitigate changed conditions during field execution would provide additional confidence in the cost estimate.

Nalcor's Response

Reference Section 10.3 of "Decision Gate 3 Project Cost and Schedule Risk Analysis Report" for recommendations made with respect to requirement for Management Reserve. Attachment B.14 provides the basis of the calculations, while Attachment B.7 lists the key risks, which influence overall management reserve levels. These management reserve recommendations form the basis of the Contingent Equity levels maintained by the Shareholder, as equity provider, for the Project.

MWH Comment 6

As noted in Table 2, the percentage of historical or spent costs to the total estimated project cost of the project at approximately 3.0% is not considered significant to mitigate a traditional contingency recommendation in the range of 12.5% to 17.5%.

Nalcor's Response

Independent Project Analysts (IPA) recommends that for optimal Front-End Loading, 4 – 6% of total capital expenditure be invested prior to Sanction. The Muskrat Falls Project benefits from, yet is not financially burdened by, the extensive front-end loading activities completed by the same team on the Gull Island project between 2006 and 2010 related to project execution, environmental, aboriginal, technical studies related to the Churchill River. Most of this work was directly applicable and transferable to the Muskrat Falls Project, thus increasing the overall cost effectiveness of the pre-sanction activities. With consideration of the relevant spent cost on Gull Island, the effective spent cost would be well within the range recommended by IPA.

MWH Comment 7

Not clear from Table 4, how general condition type costs representing the mobilization, winterization, and field office oversight indirect costs are carried in the cost estimate. Some general condition costs, but not all expected, are shown for the MF contract, but similar type expenses are not shown at all for the LITL and LTA contracts. For heavy civil projects of this scale and complexity, the general condition costs typically run from 10% to 20% of directs. The issue requires reconciliation and is flagged as important.

Nalcor's Response

Reference Section 14.0 of "Decision Gate 3 Basis of Estimate" for discussion on the key inputs into the estimate. The questioned items are contained in each of the 4 categories shown on page 49 and discussed within the section. [We would be pleased to walk you through this item.](#)

MWH Comment 8

As shown in Table 4, the metric of the owner's soft costs (e.g., General) at \$697M expressed as a function to the program's total costs (\$4,608.17M) at 15% is significantly less than expected based on similar program experience. Typically, the ratio of construction costs inclusive of contingency to all-in

program costs exclusive of IDC ranges from 2.0 to 2.5 vs. the 1.15 ratio for LCP. This disconnect requires further investigation and reconciliation and is flagged critical.

Nalcor's Response

Dialogue is required to understand the basis of MWH's metrics. Nalcor can provide the basis of Owner's costs to support reconciliation activity. We would be pleased to walk you through this item.

MWH Comment 9

The notion that labor availability is a strategic risk or a project issue that is out of the owner's control relative to a tactile or tangible risk can be debated. As a known issue, best practice dictates that mitigation schemes be inclusive within the cost estimate to train, attract, motivate and retain the craft work force. Communication that cost mitigation is inclusive within the cost estimate for maintaining labor productivity and retention would promote confidence for the reported project cost.

Nalcor's Response

Consistent with MWH's comment, provisions to attract and retain a skilled craft work force is considered within the Base Estimate, prior to the application of Estimate Contingency. The Base Estimate is built upon prudent labor rates that have been benchmarked against other projects (reference Section 14.3.4 of "DG3 Basis of Estimate Report" while further details are contained in the report "Trade Labor Rates as used in the Preparation of Capital Cost Estimates"), and subsequently confirmed within the financial framework of the three 93) collective agreements negotiated for the Project. The Base Estimate includes relevant costs for training and orientation of new employees. Further, Nalcor has successfully leveraged substantial training funding through the Government of Canada for training of aboriginal workers in Labrador, having provided advanced education training for approximately 500 persons-to-date.

While the provisions with the Base Estimate are considered pragmatic, Nalcor does recognize that the availability of skilled craft labor and supervision is a strategic risk for the Project (reference Page 162 of "Decision Gate 3 Project Cost and Schedule Risk Analysis Report"). To that effect, a risk management cost has been calculated (reference Attachment B.14 on page 282 of the before mentioned report) and included within management reserve recommendations summarized on page 17.

Whilst availability of skilled labor and supervision has been identified as a strategic risk it is the impact on productivity that is the key issue. It has been demonstrated that ongoing projects in NL have been able to attract and retain a skilled workforce in the numbers that are required , for example the Vale project at Long Harbour has currently over 4,000 persons on site of various skilled trades. The Independent Engineer reports for the Vale project did not identify the lack in numbers of skilled workers rather it was the overall project productivity that was the issue. Whilst labour productivity is a contributing factor to the overall productivity of the project, there are other factors such as the complexity of the design, incomplete/late engineering and procurement, supervision and performance of the managing contractor that must be taken into account. The labour agreement that has been negotiated for the Lower Churchill project and ratified by the unions has taken careful note of the lessons learned regarding labour productivity and work practices and these have been addressed in the labour agreements.

MWH Comment 10

The assumption that the published cost estimate range should reside between the P10 and P90 end points is not customary and unknowingly implies greater estimating accuracy (-12% to + 13%) to decision makers relative to AACEI standard practice and legacy experience.

Nalcor's Response

As stated within AACE International RP 17R-97, "Estimate accuracy must be evaluated on an estimate-by-estimate basis, usually in conjunction with some form of risk analysis process" (page 6). Nalcor has elected to use a probabilistic estimating basis which will be used in line with the AACE International Recommended Practice 42R-08 using P50 as an expected cost for Cumulative Present Worth (CPW) modeling, with P10 as the low side and P90 as the high side basis used as a means to assess estimate accuracy. This is a customary approach towards quantitation of expected estimate accuracy.

Based upon this approach, and using the results of the risk analysis, interpretation of these results indicates that the entire Base Estimate has an overall accuracy (P10/P90) in the range of -12% to +13%, which is well within the expectations of the targeted Class 3 estimate for a DG3.

MWH Comment 11

While project opportunities can offset project risks, typically opportunities are discounted by the distribution algorithms to provide conservatism and measure into the cost estimate range. As such, an understanding into the treatment of opportunities as opposed to risks would provide additional basis to discuss and rationalize the estimate contingency recommendation.

Nalcor's Response

Reference Nalcor's response to MWH Comment 4. [We would be pleased to walk you through this item.](#)

MWH Comment 12

An improved and robust project cost escalation scheme is described and applied to the project. While the sophistication is appreciated, the implied average annual escalation rate of approximately 2.5% is considered somewhat aggressive relative to standard practice and the notion that the current economic recovery will not significantly impact the project cost model. As such, the well-reasoned analysis may need to be tempered or cross-checked against improving economic conditions that dictate that a higher annual rate be utilized. That is, the likelihood that actual annual escalation will exceed the implied allowance is considered high.

Nalcor's Response

Nalcor has conducted a comprehensive analysis of escalation as detailed in the "Decision Gate 3 Capital Cost Escalation Report." This analysis benefits from extensive escalation and market analysis conducted since 2008 and benchmarked with other utilities, and leveraging the market forecast intelligence of both Global Insight and PowerAdvocate. We acknowledge MWH's comment, however believe the approach taken presents a credible projection of escalation allowance, in lieu of the traditional industry approach of using X% per year.

Furthermore the project has experienced fixed pricing contracts for significant supply and install contracts such as the turbine and generator package and the Strait of Belle Isle sub sea cable. The prices negotiated (in the 100's of millions\$) are fixed and firm.

MWH Comment 13

The basis for understanding the level of prime and subcontractor markups and/or compounding adders applied to the cost estimate was not detected at the cost estimate summary level and is seen as relevant to assessing the reasonableness of the cost opinion.

Nalcor's Response

Reference Section 13.0 (page 44) and 14.4.3 (page 61) of report "Decision Gate Basis of Estimate" for relevant explanation of the estimating basis used for contractor mark-up. We would be pleased to walk you through this item.

MWH Comment 14

The significance of realizing completion for LCP scope is not known relative to what the cost estimate assumes and what the contracting strategy can deliver. That is, what mitigations or allowances are contained within the cost estimate for less than optimum competition if three or more competitive tenders are not received?

Nalcor's Response

The LCP Base Estimate is exclusive of any allowances for mitigations related to inability to realize the Project's contracting strategy. Rather, the Estimate Contingency includes some tactical risk related to the inability to achieve competitive pricing, while risk exposure beyond this is considered to be covered by management reserve.

MWH Comment 15

It doesn't appear that the project schedule incorporates the sub-Project packaging strategy described in Section 10 to organize and manage the project timeline. Additionally, the schedule's incorporation of the project's critical planning and/or decision points would work to enhance project execution and confidence in the estimated project duration.

Nalcor's Response

The Project Control Schedule commentary (reference "Project Control Schedule Baseline Document LCP-SN-CD-0000-PC-SH-0001-01") is aligned with the contract packaging strategy set forth in the document "Overarching Contracting Strategy LCP-PT-MD-0000-PM-ST-0002-01 Rev B1" and further packaged in "LCP Master Package Dictionary LCP-PT-CD-0000-PM-LS-0001-01 Rev B2."

The Project Control Schedule supports the achievement of the Milestones and Key Dates described within the document "Target Milestone Schedule LCP-PT-ED-0000-EP-SH-0001-01 Rev B2."

MWH Comment 16

A Basis-of-Schedule document or discussion would communicate to an independent reviewer the basic assumptions employed in the project schedule. It's unclear as to what calendars, what assumptions, and/or weather constraints were factored into the developed schedule. Also, how was the uncertainty analysis factored into or contingency applied to the timeline? Finally, the schedule doesn't appear to capture program activities such as ROW acquisition, engineering, permitting or similar pre-construction tasks as constraints or predecessors to the field execution tasks.

Nalcor's Response

The basis of the schedule has been documented and encompasses all aspects of the Project, including those noted in your commentary (reference "Project Control Schedule Baseline Document LCP-SN-CD-0000-PC-SH-0001-01"). As discussed on page 10 of "Decision Gate 3 Project Cost and Schedule Risk Analysis Report" this Project Control Schedule was used as the basis for development of the time-model used for schedule risk analysis. The resulting time model, including key logic, is contained within the attachments of this report.

MWH Comment 17

The Westney presentation indicates that the cost estimate qualifies as an AACEI Class 2. The IE working assumption is that the cost estimate qualifies as Class 3.

Nalcor's Response

Nalcor's Decision Gate 3 estimate has been prepared with the intention of meeting the requirements of an AACE International Class 3 estimate. Westney's views are expressed as their own views, and based upon their review of the estimate as part of the risk analysis process.