RW Block Consulting

Memorandum

From: Derek Hennessey, Director, R.W. Block Consulting, LLC

To: Grant Thornton, Muskrat Falls Project Team

Date: November 1, 2018, Amended November 20, 2018

Subject: Muskrat Falls – Additional Areas for RWBC Comment

The Grant Thornton Muskrat Falls Project Team ("Grant Thornton) requested that R.W. Block Consulting, LLC ("RWBC") provide its point of view on the following areas:

1. Identify the industry leading practices for updating budgets/forecast on these types of projects, and address how potential or negotiated costs should be treated in the forecasts.
2. The use of temporary enclosures, like the integrated cover system Astaldi proposed, to protect the work and workers from the weather conditions.
3. Structuring the labor component of the Astaldi contract as a cost reimbursable component with a guaranteed maximum value.
4. The use of large construction contract packages on mega projects.
5. The typical owner's project management structure for executing large construction projects/programs.
6. Identify who typically performs the bid leveling.

The following sections contain RWBC's point of view on these subjects.

1. Budget Forecasting Leading Practices

The leading practice is to update project budget forecasts on a routine basis (e.g. monthly, quarterly), and the frequency is often identified by a project's procedures or the organization's overarching policies/procedures. The process for updating the budget forecasts depends on the types of cost elements contained within the contracts used to execute the project (i.e. lumps sum, cost reimbursable, unit price). The following are the general approaches used for determining the forecasts for the aforementioned types of cost elements:

- Lump Sum – the original value for the cost element plus the value of all fully approved change orders and the value of expected change orders associated with the cost element, which can include changes that:
  - Have been agreed to but have not been fully approved (the agreed upon price would be included in the forecast),
  - Are under negotiation but have not been agreed to (the best estimate of the price that is likely to be agreed to would be included in the forecast)
  - Are expected due to impending owner driven changes (the best estimate of the value of the work would be included in the forecast).
- Cost Reimbursable – The costs incurred to-date plus the expected value to complete the cost element. The typical approach for assessing the expected value to complete is to identify the

remaining work and develop an estimate to complete based on (a) the contract terms and conditions (i.e. rates, allowable costs and mark-ups) and (b) the expected level of effort to complete the work which would include assessing the productivity that has been experienced to-date and that can be expected in the future. Developing the expected value to complete by simply subtracting the costs to-date from the budget, is not an acceptable or leading practice, and should not be considered forecasting.

- Unit Price – The costs incurred for the units of work that have been completed to-date plus the costs associated with the units of work that have yet to be completed. The unit of work to be completed should be determined from reviewing the remaining work, and not simply subtracting the completed units from the budgeted units, as it is common for there to be variances in the measurement of the work that was actually completed from the budgeted (or originally estimated) quantities. These variances can be caused by errors in the original quantity estimates or differences in the actual versus anticipated field conditions.

Once the forecast is complete, the project team assesses how any increases in the forecast could be funded. The typical sources of funding available to address cost exposures include:

- A project's contingency, but care must be taken to ensure the uncommitted contingency value is reasonable for the remaining duration/risks associated with a project.
- Cost savings associated with other aspects of a project (i.e. aspects where the forecast has been reduced), but care must be taken to ensure these forecast reductions are reasonable, especially if they are associated with aspects of a project that has not started.
- Providing additional funding to a project to fund cost increases.

The following Muskrat Fall project documents address cost forecasting:

- Project Control Management Plan – Nalcor Doc. No. LCP-PT-MD-0000-PC-PL-0001-01, Rev. B2, dated May 9, 2015 (revision B1 was the original issue document and was dated March 7, 2011)
- Procedure for Cost Control – Nalcor Doc. No. LCP-PT-MD-0000-PC-PR-0005-01, Rev. B1, dated May 10, 2016

Based on our review of these documents, it appears the project cost forecasts should be updated on a monthly basis, and that the processes included approaches to identify (and quantify) potential, pending and approved changes, as well as performing trend analysis to identify variances from the established baseline costs.

2. Use of Temporary Enclosures (Astaldi Contract)

The use of temporary enclosures to protect the work from undesirable weather is common in construction. While the use temporary enclosures is a widespread practice, the types of enclosures vary widely from just plastic sheeting used for hours of protection at one end of the spectrum and designed temporary structures used for months at the other end. The determining factors in deciding on the required scope of a temporary structure are:

- The likely impacts to the work, such as not being able to work at all, significantly reduced productivity resulting in higher costs, detrimental impacts of the conditions to the work (e.g. frozen concrete),
- the required schedule for a project, and
- the cost of the structure.

For projects that have significant exposure to the weather, such as projects in northern climates with prolonged periods of sub-optimal working conditions, the use of temporary enclosures increases, especially for critical path elements of the work and for static work areas.

On the Muskrat Falls project Astaldi included a large temporary enclosure that encompassed the bulk of the powerhouse area to allow the work to proceed through the winter in climate-controlled conditions, as well as localized structures to allow other areas of the work to proceed through the winter months also. In Nalcor's "Recommendation for Award for the CH0007: Construction of Intake and Powerhouse, Spillway and Transition Dams" document dated September 24, 2013 (NAL0285103) they state:

- "The quality and thoroughness of the Astaldi bid denotes a good understanding of the work." (page 10)
- "The covered shelter permits Astaldi to better project production rates as well as allows them to perform extensive work over the 2014/2015 winter and thus helps flatten the manpower curve. A kick off team composed of members of the bid team would mobilize early to get the contract off the ground. This is considered to be a strong element of their execution strategy." (page 10)
- "The two Canadian bidders (IKC and Aecon JV) have provided relevant reference projects demonstrating good knowledge of the construction constraints inherent to performing parts of the Work in winter conditions….Astaldi plans on enclosing the work areas in winter shelters, which aligns with usual construction approaches in these climates and with IKC and Aecon JV…" (pages 11 and 12)

Therefore, the proposal evaluation team, which contained people the most familiar with the work at the time of the proposals were evaluated, believed that Astaldi had a "good understanding of the work" and that their proposed temporary enclosure was a "strong element of their execution strategy." These statements would appear to indicate the evaluation team believed Astaldi's proposed enclosure and approach were feasible.

Our review of the information related to Astaldi's proposed temporary enclosure contained in Astaldi's "Justification For Incremental Compensation" (dated March 21, 2016) and Nalcor's "Summary Response by Muskrat Falls Corporation to Astaldi Canada Inc.'s 'Justification For Incremental Compensation'" (undated), indicates that neither party was disputing the potential effectiveness of the proposed structure, rather they appeared to be disputing certain elements that impacted the final design and implementation of the proposed structure (e.g. rock over-break, availability of as-built excavation survey data, timeliness of approvals, foundation design details, and performance of the

structure's subcontractor). Therefore, we view the issues with Astaldi's proposed temporary structure as execution related issues, and not a flawed concept.

3. **Labor as a Cost Reimbursable Cost Element with a Guaranteed Maximum Value (Astaldi Contract)**

Nalcor's "Recommendation for Award for the CH0007: Construction of Intake and Powerhouse, Spillway and Transition Dams" document dated September 24, 2013 (NAL0285103) indicated that only one of the four bidders (Salini JV) proposed a fixed price for the complete scope of the work for the CH0007 contract. The other three, including Astaldi, proposed a fixed price with a target cost for labor to perform the complete scope (page A1-1). The adjusted price evaluation (page A1-2) indicates the difference between Astaldi and Salini JV was $155.9 million, or 14.1% more (these values include the maximum amount for the target labor component).

There are two primary reasons owners will use cost reimbursable approaches:

i. The scope of the work cannot be defined well enough to solicit fixed prices, or

ii. The owner believes the cost premium associated with shifting all the cost risk to the contractor is too high.

For the CH0007 contract the owner provided the bidders with the option to provide either a "Fixed Price"[1] for the complete scope or a "Fixed Price with Target Cost of Labour"[2] for the complete scope. Three bidders chose to provide a fixed price with a target cost for labor proposal, which indicates the likely felt the risks associated with labor costs and productivity were too high for them to provide a fixed price.

Appendix 10 of the CH0007 award recommendation summarizes the scoring of the various components of proposal used to develop the award recommendation. The primary difference between the Astaldi and Salini JV, was the difference in price. While there was a difference in risk profiles between the two proposals, at the maximum labor value for the Astaldi contract the two risk profiles would be the same, as per the original contract Astaldi would be responsible for all labor costs in excess of the established labor maximum value.

Based on the information available at the time the award was made, treating labor costs as a reimbursable cost element with a guaranteed maximum value, would cap Nalcor's cost exposure while also providing a potential for a lower cost if the labor costs were less than the guaranteed maximum value. As the maximum value of this contract was less than the second bidders fixed price, this would appear to be a reasonable approach based on the information known at the time of the bid.

[1] "Option 1" in Table 1.1 - Commercial Bid Price Tabulation in Appendix A of "Recommendation for Award for the CH0007: Construction of Intake and Powerhouse, Spillway and Transition Dams" document dated September 24, 2013 (NAL0285103) – Page A1-1

[2] "Option 2" in Table 1.1 - Commercial Bid Price Tabulation in Appendix A of "Recommendation for Award for the CH0007: Construction of Intake and Powerhouse, Spillway and Transition Dams" document dated September 24, 2013 (NAL0285103) – Page A1-1

4. The Use of Large Construction Contract Packages

Nalcor chose to use primarily large construction packages, as opposed to smaller construction packages, on the Muskrat Falls project. There are advantages and disadvantages to both approaches.

With larger construction packages:

- There are generally fewer firms that are capable of executing them, which limits competition.
- There are fewer contract interfaces[3], which should limit the interface risks to the owner.
- There are fewer contracts to manage, which should require a small owner project management team.

With smaller construction packages:

- There should be more firms capable of executing them, which should increase competition.
- There are more contract interfaces, which likely increases the interface risks to the owner.
- There are more contracts to manage, which would likely require a larger owner project management team.

Nalcor also indicated the large contracts strategy was stipulated as a preference of the three rating agencies that assessed the project[4].

Assuming Nalcor's indication the ratings agencies preferred a large contracts strategy[5], given the project needed to be financeable, and there are other benefits to using larger construction packages, the decision to structure the project using larger construction packages seems reasonable.

5. Typical Owner's Project Management Structure

The project management structure used by owners depends on their internal level of staffing and the skill sets that an owner's internal staff possess. Owners that routinely execute construction projects generally have more internal staff, and staff with higher level skill sets for overseeing and managing construction projects, than owners who do not routinely execute construction programs. However, for large construction projects like Muskrat Falls, few, if any, owners would have the required number of staff with the necessary skills to adequately staff a project management team. In these cases, the owner needs to determine the approach for managing the project which will influence the manner in which the additional required staff are secured. The two common approaches are:

i. Utilization of an integrated team/extension of staff approach where the owner providing key positions augmented with contract employees from a program management/engineering firm, or

[3] Contract interfaces are where the work for different contracts interface with one another. These are often the areas where issues arise regarding which contract certain scopes of work are included in (in some instances neither or both) or where the work from two contractors need to connect to one another and there can be issues regarding which contractor performed the specified work correctly (it can be neither, one or both and if it is both it is likely a design coordination issue at the interface). The fewer contracts there are, the fewer interfaces there are, and therefore there is a decreased likelihood of interface issues arising.

[4] "Muskrat Falls Project Summary of Pre-Sanction Briefing Note as Requested by Nalcor Legal Counsel McInnes-Cooper", undated, page 47.

[5] The memorandum was amended to clarify that we were assuming the larger contracts strategy was stipulated by the ratings agencies as Nalcor indicated in the referenced documents, and that we were not taking Nalcor's indication as a fact. We had to assume this, given we have not been provided with source documents from the ratings agencies to review which would allow us to independently verify that a larger contracts strategy was preferred by the ratings agencies.

ii. Outsourcing the project management function to an engineering or construction management firm.

If a construction management firm is engaged, there are a number of different project delivery methods that can be used, but a common approach in the utility sector is an Engineering, Procure, Construction Management ("EPCM") approach, especially if the engineering is also being performed by the same firm selected to perform the construction management function. For large projects, the scope of services solicited by the owner often includes both the engineering and construction management scopes.

If a construction management firm is engaged, owners still need to have a project management team to manage the construction manager, provide general oversight to the project, and to make decisions that only the project owner can make[6]. The size of the owner's team, as well as the amount of time dedicated to a project, will vary depending on the size and complexity of the project.

On the Muskrat Falls Nalcor originally favored an integrated team approach for managing the project but decided on using an EPCM approach after evaluating: (i) the Expressions of Interest solicited from six firms, (ii) the overall market conditions and (iii) its internal growth[7]. It is our understanding that Nalcor switched to the integrated team approach in March 2013, due to performance issues by the EPCM contractor[8].

6. <u>Bid Leveling</u>

Bid leveling is typically performed by the project management team and procurement staff for the entity that is soliciting the pricing for a given contract. If the pricing is being solicited by a construction manager, the leading practice is for members of the owner's project management team to provide input into the process, review and comment on the results of the process, and to provide general high-level oversight of the process.

For projects such as Muskrat Falls that are using an integrated project team to manage the project, bid leveling should be performed by staff from the appropriate functional areas (e.g. engineering, project management, procurement) for the given contract. It is likely these staff members could be employees of different firms given the integrated approach that was used.

On the Muskrat Fall project, we have seen documents (e.g. NAL0271790 – Bid Evaluation Plan CT0319 – Construction Of 315kV HVAC Transmission Line [MF TO CF]) that provide detailed guidance on the process for receiving, reviewing and evaluating the bids, as well as the evaluation team members and their roles and responsibilities. Preparing documents such as these is a leading practice, as it provides structure to the bid evaluation process. We reviewed eight bid evaluation plans for the Muskrat Fall project, and all eight were prepared before the bid opening dates[9]. These eight evaluations each required between four and seven review/approval signatures, and 42 review/approval signatures were required in total for the eight packages. Of the 42 required review/approval signatures, 35 (or 83%)

[6] Examples of decisions that only the owner can make include approving change orders and approving the scope to be included in a project.
[7] Overarching Contracting Strategy – LCP-PT-MD-0000-PM-ST-0002-01, Rev. B1, dated February 2012, pages 36 - 38
[8] Project Management Team presentation to Grant Thornton titled "Lower Churchill Project 4 – SNC Lavalin Inc. Contract", dated May 2018
[9] We reviewed eight different plans: CD0502, CH0002, CH0007, CH0008, CH0009, CH0031, CT0319 and SH0018

were dated on or before the bid opening dates. Preparing the documents before the bid openings is a leading practice as it outlines the review process prior to opening the bids. The leading practice would be for all reviews/approvals of the process to be completed before the bid opening dates as well. However, as the documents were not modified as a result of the formal review/approval process, receiving some of the final signatures after the bid opening dates likely did not impact the integrity of the process outlined in the documents.