Information Note
Cabinet Secretariat
Draft

Title: Muskrat Falls Oversight Committee November 29 - December 1, 2016 Site Visits and Meetings

Issue: Update on site visits and meeting with the Independent Engineer (IE), Natural Resources Canada (NRCan) and Nalcor officials.

Background and Current Status:

- Meetings and site visits were held with the IE, NRCan, and Nalcor officials from November 29th to Dec 1, 2016. Oversight Committee (the Committee) members (Paul Carter, Cory Grandy and Walter Parsons) participated in sessions as schedules permitted.

- Meetings included sessions with updates and questioning on Muskrat Falls Generation, the Labrador Island Transmission Link, including the Strait of Belle Island submarine cable link, and Labrador Transmission Assets. Sites visits included:
  - Soldiers Pond (attended by Paul Carter and Cory Gandy)
  - Muskrat Falls Generation (attended by Cory Grandy)

Analysis:

- In most cases, information presented by Nalcor and as observed during the site visits was consistent with previous updates presented to the Committee by Nalcor regarding progress and schedule, and without the IE indicating any significant concerns. However, throughout the three days of meetings and site visits, three issues occasioned with notable discussion: 1) geological mapping of the North Spur; 2) enclosure of powerhouse unit 1; and 3) cofferdam leakage.

<u>Geological Mapping of the North Spur</u>

- This was an item in the IE report for the July visit, which noted that while geological mapping data of the North Spur was being collected during construction activities, it was recorded within field books rather than being transposed in real time to as-built maps as construction progressed. The IE noted that real time mapping is standard industry practice for this type of activity, and therefore felt that the manner in which it was being treated by Nalcor was deficient in this regard.

- Nalcor responded that the information is being recorded and it is currently in the process of developing the as-built mapping now that construction is complete. In essence, the difference in treatment is that the IE was of the opinion that mapping should be developed as construction progresses as opposed to a post construction activity.

- The IE also commented that during the July visit it was noticed that three of the slurry cut off wall panels being installed at the time were sitting on the foundational clay layer rather than being imbedded within it,

as was the normal installation practice, and asked for information related to what was eventually done with these panels.

- Paul Carter recommended that Nalcor provide required information to IE to close the geological mapping information gaps during the first day of meetings. Nalcor agreed that information requested by the IE during the meetings and site visit would be done as the meetings closed. Subsequent to the meetings, in Nalcor's written response to the Committee on the July site visit report, Nalcor suggests that its ongoing practice related to geological mapping is in line with accepted industry practice.

Enclosure of Powerhouse Unit 1

- The IE observed during the November visit of the powerhouse at the Muskrat Falls site that the foundation and structural steel work for the powerhouse building had advanced further than the IE had expected. It was noted during discussion that this was a positive development and that the contractor should take every advantage of this to enclose unit 1 as soon as possible with either permanent or temporary (e.g. tarps) construction to facilitate advancing winter construction within the powerhouse, (i.e. commencement of installation of generator infrastructure). The IE noted that this strategy was intended in the schedule and could still be achieved.

- Nalcor noted the observation but was non-committal regarding Nalcor's/contractor's intent at this time.

Cofferdam Leakage

- Over the three days of meetings both in St. John's and at the Muskrat Falls site, there was much discussion regarding the events in November that started with the raising of the reservoir, observed leakage of the cofferdam, subsequent lowering of the reservoir, and the analysis related to mitigation and repair. The discussion was notably tense at times given the significance of the issue and its impacts, compounded by what might be perceived as a July 2016 warning about the potential for leakage by the IE in his report from the July visit.

- On Day 1 of the meetings, Nalcor presented a summary of the events and a brief of a repair grouting program that was in development. In the ensuing discussion, the IE asked detailed questions that could not be immediately answered by the Nalcor presenters. It was indicated that pertinent members of the project team (both Nalcor and their design consultant SNC) were at site in Labrador and would be returning to St. John's on Day 2 when the IE would be in Labrador. A request was made to have these individuals call in for discussion, but no such discussion took place due to the unavailability of these experts.

- During the site visit on Day 2 of the meetings, the IE was able to observe the cofferdam and speak to construction managers to gain better insight into the timing and location of the observed leakage. This limited information led to verbal theorizing by the IE as to potential root causes for the failure. This discussion included the IE commentary that due to the fact that water would remain between the rock groins during the placement of the impervious core it would not have been possible to view and inspect the riverbed to ensure no open boulders and/or broken rock was present. In such a circumstance there was a

possibility that leakage could be experienced and that appropriate contingencies should have been put in place in preparation for this possibility.

- Nalcor advised that such conditions were not observed, that grouting works were available, and that appropriate contingencies were put in place specific to the leakage as it was identified. Nalcor also commented that additional sourcing of services (drilling/grouting) was initiated subsequent to the leakage occurring. The IE recommendation in the IE report for the July visit was that these services should be secured in advance in preparation for such circumstances should leakage occur.

- The IE acknowledged throughout these discussions that their comments were speculative in nature owing to the fact that they did not have access to detailed information or the project experts engaged in the analysis and the development of mitigation strategies.

- During the close out meeting on Dec 1, Nalcor stated that the information requested was not yet available as the project and design engineering teams were still developing this plan, but that they would forward this information as it evolved. The IE team reluctantly accepted this and while there were statements made that acknowledged that the Nalcor and contracted design team hold ultimate responsibility for design and mitigation, the IE team was clearly looking to assist in mitigation activities. Up to the point of the meetings concluding, this information and/or engagement with the experts had not been provided to the IE team.

- Committee members present still question the lack of clarity as to the root cause of the leakage. If the riverbed was not entirely visible during construction, unequivocal statements by Nalcor such as no open boulders or broken bedrock being observed/encountered or that the cause of the leakage is not related to open boulders or broken rock may be overstatements. It is noteworthy that the grouting plan as understood by the Committee includes both rock grouting of the riverbed bedrock and compaction grouting of the till core in the affected areas of the cofferdam.

- Also of note is that mitigation strategies include the raising of an existing downstream cofferdam and reestablishment and raising of another cofferdam that protects the powerhouse construction site from flooding. If the reservoir in the coming weeks cannot be raised to elevation 25m, and an ice cover formed over the reservoir, frazzle ice downstream of the spillway create an ice dam that could cause flooding of the powerhouse construction site. Raising the existing powerhouse cofferdam would assist in protecting against such flooding. When questioned by Committee members, Nalcor was not able to quantify the damage that any such flooding might cause.

Conclusion

- In concluding the meetings, Committee members sought clarification from Nalcor and the IE team on their alignment on the issues identified in the IE report for the July visit. While the IE team was more aggressive on the issues of the cofferdam and geological mapping of the North Spur in earlier meetings in the week, there was seemingly reluctant acceptance that the Nalcor and contracted design team hold ultimate responsibility for design and mitigation. Overall, the IE team is generally aligned on Nalcor's management of

the project. The IE team was, however, unequivocal in its message that the IE team was eager to help and assist to ensure the success of the project.

- Subsequent to the meetings, the Committee was informed via an email to the Deputy Minister of Natural Resources referencing cofferdam repairs and other mitigations that *"...the IE is aligned with the experts we have involved and the way forward - conversations have been had and input from all reference experts taken into account."* It was later confirmed with the IE by the Executive Director of the Committee that prior to departing St. John's, a meeting was held with the SNC experts and that the statement in the email to the Deputy Minister was accurate.

- On February 24, 2017 the IE also confirmed that he was satisfied with additional information given to him at this time on January 24, 2017 related to the slurry cut off wall panels keying in to the foundational clay layer.

Action Being Taken:

- On December 14, 2016 the Committee wrote Nalcor advising Nalcor to:
    - to ensure that all IE site visit reports, as soon as they are received (draft or final), be made available to the Committee;
    - to ensure all information requested by the IE is made available to the IE in a timely manner for both the IE's due diligence purposes and engineering support for the project;
    - to ensure updating the Committee as soon as new information becomes available on cofferdam repairs and other mitigations to protect project assets at the generation site along with any schedule changes; and
    - Nalcor be directed to include/copy the Committee on all project related government briefings.

Approval:

December 9, 2016

Updated February 28, 2017