

# MEETINGS IN ST. JOHN'S, NL AND VISITS TO LOWER CHURCHILL PROJECT SITES, JULY 6-9, 2015

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## 1. GENERAL

The MWH Independent Engineer (IE) team, together with a representative of Natural Resources Canada (NRCan) and representatives of the Lower Churchill Management Corporation (LCMC), (the Nalcor Energy subsidiary responsible for project development and management activities associated with the Lower Churchill Project) attended project briefings in St John's and participated in site visits to the Muskrat Falls Site during July 6 to 9, 2015. Site visits were made to project works sites in the area of Muskrat Falls in Labrador. Niall O'Dea and Anoop Kapoor represented NRCan on the site visits and the IE was represented by Nik Argirov, Paul Hewitt (IE Cost and Schedule Subject Matter Expert (SME)), and Hamdy Khalil (Transmission SME). Representatives from the Government of Newfoundland and Labrador (GNL) included Cluney Mercer and Cory Grandy. The itinerary was as follows:

- July 6:
  - am: Update briefings at the St. John's Lower Churchill Project office
  - pm: Travel from St. John's to Goose Bay
- July 7:
  - am and pm: Site visit to North Spur, the spillway site and the powerhouse site (Paul Hewitt and Nik Argirov)
  - am and pm: Detailed tour of the different areas (and activities) along the HVac transmission lines (Hamdy Khalil)
- July 8:
  - am: Debriefing meeting with LCMC staff in Goose Bay
  - am and pm: Tour of stringing activities along the HVac transmission line and tour to different areas of the HVdc transmission line
  - pm (evening): Travel from Goose Bay to St John's
- July 9:
  - am and pm: Meetings in St John's and data redaction

Principal observations and comments on the active construction works are presented in the following paragraphs. Labeled photographs are presented in Appendix 1.

## 2. NORTH SPUR

This site visit started on the north side of the river to review progress of the North Spur Stabilization Works being conducted by Gilbert Newfoundland and Labrador Contracting Ltd. (the "Contractor"). The Integrated Project Schedule (IPS) Analysis shows a planned progress of 32.8% vs. an actually earned progress of 7%. These numbers are misleading and do not reflect the performance of the Contractor. The planned progress of 32.8% reflects the original North Spur schedule which included a one year float and is not the current plan.

The Contractor appeared to be well organized and performing at an excellent pace. Mobilization of their earthmoving spread is fully complete and work is progressing ahead of their schedule. The upstream excavation of overburden material is completed and mobilization for the cut-off walls has just begun. The Contractor has started the upstream cut-of wall work platform (Photo 1.1). Clearing of the downstream slope is partially completed (Photo 1.2). This contract should be completed on time.

### 3. COFFERDAMS

Contract CH0009 for the north and south dams has been under negotiation for a significant length of time. The closure of the river is to be performed in July 2016 under this contract. Some concern should be expressed that the contract is not yet in place and is key to meeting the river closure date. Also critical to the access to the north dam is the design and construction of a temporary access bridge across the spillway approach channel. The location of this structure is illustrated in Photo 2. The bridge will span between the upstream leading edge of the Separation Wall (in view) and the RCC Cofferd Dam. The design and construction of this bridge is the responsibility of the CH0009 Contractor.

### 4. TRANSMISSION LINES

#### 4.1. HVdc Transmission Line

The work is advancing in all areas including access, structure hauling, structure assembly and structure erection.

The IE visited several assembly sites as well as some locations where structures were erected. Observations made in the field include the following:

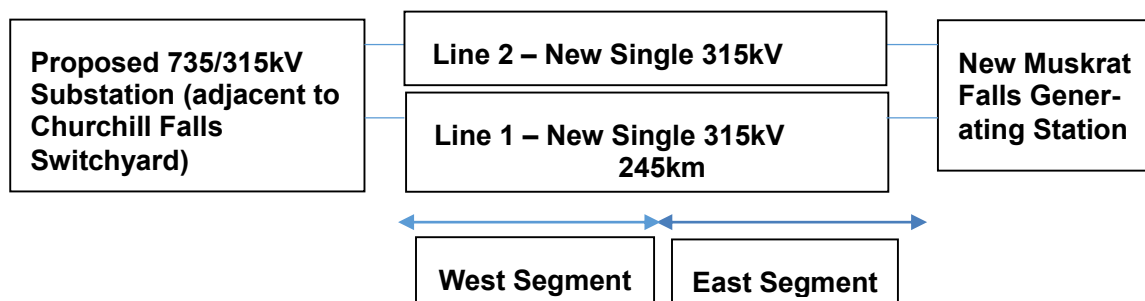
- The quality of clearing along the transmission line was good.
- Foundation was approximately 20% complete.
- Tower assembly and installation was approximately 15% complete (Photos 3.1, 3.2 and 3.3).

This portion of the project, constructed by Valard, is slightly behind schedule. The Contractor is in the process of setting up additional camps and building up his workforce to pick-up the lost time. Currently Valard is more focused on the HVac lines sections. Closer to the completion of the HVac work more crew teams will be moved to the HVdc sections. Based on the excellent performance on the HVac line, the Contractor has demonstrated their ability to get back on schedule.

Overall, it was evident that LCMC has the Construction Management team in place and the work is advancing well.

#### 4.2. HVac Transmission Line – Goose Bay

The HVac lines consist of two parallel 315kV lines connecting from the proposed 735/315kV Substation (adjacent to Churchill Falls Switchyard) to the new Muskrat Falls Generating Station as shown in the diagram below:



The two new HVac transmission lines have separate structures and share the same right of way (100m) in parallel to an existing 138kV line. The lines are split into East and West segment. The East segment starts from the new Muskrat Falls Generation Station and runs to STR # 323. The West segment is between STR # 323 and the new 735/315kV Substation at Churchill

Falls. Each line has bundled conductor (2-795kcmil – Drake/phase) and uses steel structures with horizontal configuration. There are approximately 1200 towers for the two lines. Line 1 is to the south, includes one OPGW (Optical Ground Wire) and one OHSW (Overhead Shield Wire) while Line 2 is to the north, and includes two OHSW.

There is a full capacity redundancy, as only one of the HVac transmission lines with the bundle Drake conductor is capable of transferring the full load. In other words, one line can be totally out of service with no impact on the load transfer.

The HVac transmission line work started in May 2014. Currently it is at an advanced stage, proceeding slightly ahead of schedule. The IE visited the eastern end of the Muskrat Falls to Churchill Falls HVac transmission line on July 7 and 8, 2015 to observe tower assembly, erection, and stringing works by Valard. Observations made in the field include the following:

- The quality of clearing and cleanup along the transmission line is good (Photos 4.1 and 4.2).
- More than 90% of the foundations have been completed.
- More than 60% of the HVac towers (Photo 4.3) had been erected at the time of the site visits.
- Stringing between structure 12 and structure 165 is complete and insulator/hardware has been installed.
- The IE witnessed erection of different foundation types including rock foundation at structure 9 and concrete foundation at structure 10, 11 & 12 (Photos 4.4, 4.5 and 4.6).
- The IE witnessed stringing, pulling wires and installation of implosion splices at structure 165 (Photo 4.7).
- A site visit was made to the Marshaling Yard managed directly by LCMC (Photo 4.8). Materials were well organized and marked. The operation of this yard was first class and looked able to easily keep up with progress of the transmission lines.
- It is understood that work on the HVac transmission line is on schedule. All work is being done to an acceptable standard.
- The construction is expected to be completed in early Q1/Q2 of 2016.

It was evident that the Contractor is well organized and performing at an excellent pace, and is well positioned to complete the work on time.

## 5. PROJECT SITE OFFICE AND CAMP FACILITIES

This site visit included visits to the Project Administration Offices and Project Camp. Both were first class facilities and well managed. The new gym was fully operational (Photo 5). The level of service and quality of food was excellent and should not be a detriment to the project schedule. The main camp was at about 70-75% occupancy. With the CH0009 contract for the north and south dams, and the installation phase of the Turbine Contracts coming on stream, LCMC will also have to utilize the initial Phase 1 camp. LCMC will have to monitor the capacity of the camps closely.

## 6. SPILLWAY

This site visit was followed by a visit to the Spillway, Separation Wall and Transition Dams (Photos 6.1). The completion of this portion of the work is key to enable the river diversion to happen as scheduled in July 2016. The Contractor Astaldi is back on schedule. The IPS Analysis shows a planned progress of 49.5% vs. an actually earned progress of 44.9%. The main spillway piers are constructed in three blocks. The downstream blocks were already completed. The concrete at the upstream blocks was at level ten (10) with formworks at level eleven (11). The remaining three lifts up to the final level fourteen (14) are planned to be completed by the end of August 2015. The middle blocks were at level six (6) with level ten being the top (crest) level. The middle blocks are to be completed shortly after completion of the upstream blocks. Both North and Central Transi-

tion Dams (Photos 6.2 and 6.3) as well as the Separation Wall (Photo 6.4) are planned to be completed by the end of August 2015 as well. It appears that the Contractor will be able to turn over the work area to the Spillway Gates Contractor, Andritz, in time to meet the River Diversion Milestones.

## 7. POWERHOUSE / INTAKE

This site visit was then followed by a visit to the Powerhouse and Intake area. The IPS Analysis shows a planned progress of 36.6% vs. an actually earned progress of 13.7%. This portion of the project, also constructed by Astaldi, is significantly behind schedule. Small concrete blocks of the invert slabs have been placed in Units 3 and 4 Intakes (Photos 7.1 and 7.2). Powerhouse concreting was mostly at base slab levels with only draft tube invert slab completed for Unit 1. Preparation for erection of formwork of Unit 1 draft tube was in progress (Photo 7.3). Work on the Powerhouse / Intake structure will proceed in earnest upon completion of the Spillway concreting in early September 2015.

The IPS Target Milestones are still showing a Powerhouse Crane Commissioning Date of January 18, 2016. This is an indication of when the Powerhouse should be ready for turbine installation. Based on the observations during the site visit, it appears that this date will not be met.

## 8. COMMENTS AND CONCLUSIONS

Overall, the project is managed and progressing well. However, fully meeting the current overall schedule for the powerhouse and intakes will be a significant challenge, not impossible, but likely not probable. The IE also notes that such scheduling challenges are typical for most large hydroelectric projects.

The IE notes that Astaldi's contract, with respect to the actual labour man-hours vs. the target man-hours, provides that the contractor is only made whole based on actual hours to a cap. This type of contract merits attention to the labour inputs; this has been discussed with LCMC and it is acknowledged this concern has been identified and it is being discussed with Astaldi. The IE understands the sensitivity of these discussions and will monitor accordingly.



# APPENDIX NO. 1

## PHOTOS

### Muskrat Falls Site Visit – July 6-9, 2015

#### 1. North Spur



**Photo 1.1** Looking at Upstream Slope of North Spur. Clearing and OM excavation completed. Contractor working on preparation of CB Work platform (*July 7, 2015*)



**Photo 1.2** Looking at Downstream Slope of North Spur. (July 7, 2015)

## 2. Location of Proposed Access Bridge to South Dam



**Photo 2:** Looking (from top of RCC Cofferd Dam) along proposed centerline of Temporary Access Bridge to South Dam.  
(July 7, 2015)

### 3. HVdc Transmission Line



Photo 3.1 HVdc structure assembly (July 8, 2015).



**Photo 3.2** HVdc transmission line foundation installation (*July 8, 2015*).



**Photo 3.3** HVdc transmission line installation (*July 8, 2015*).

#### 4. HVac Transmission Line



**Photo 4.1** HVac transmission line clearing and clean up (*July 7, 2015*)



**Photo 4.2** HVac transmission line clearing and clean up (*July 7, 2015*).





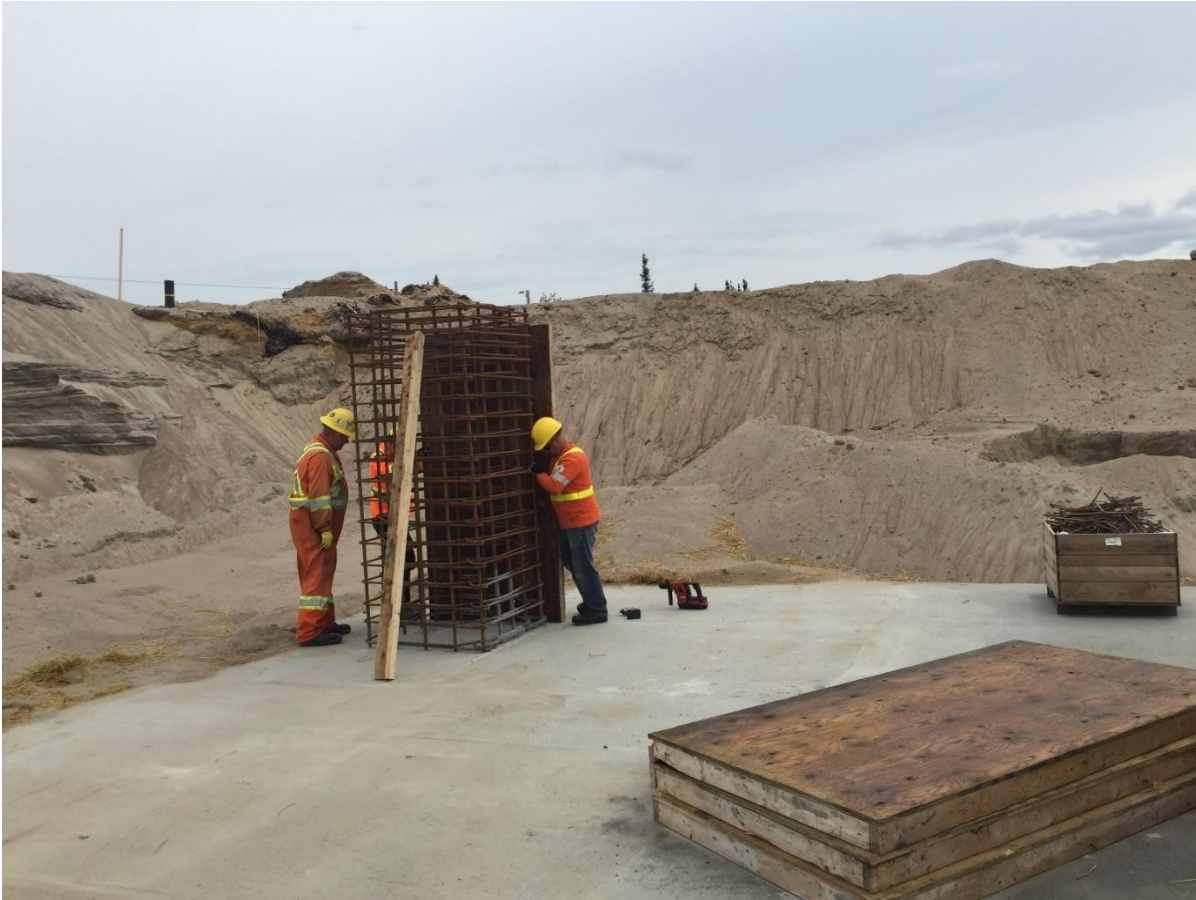
**Photo 4.3** HVac transmission line erection (July 7, 2015).



Photo 4.4 HVac transmission line – Rock foundation (July 7, 2015).



Photo 4.5 HVac transmission line – Concrete foundation (July 7, 2015).



**Photo 4.6** HVac transmission line – Concrete foundation (July 7, 2015).



**Photo 4.7** HVac transmission line – Stringing (July 8, 2015).



**Photo 4.8** Transmission lines Marshaling Yard (July 8, 2015).

## 5. Project Camp



**Photo 5** Fully operational gym in the project camp complex (July 7, 2015).

## 6. Spillway



**Photo 6.1** Upstream view of Spillway piers, Transition Dams and Separation Wall (July 7, 2015).



**Photo 6.2** Upstream view of Spillway piers and North Transition Dam (July 7, 2015).



**Photo 6.3** Upstream view of Central Transition Dam (July 7, 2015).

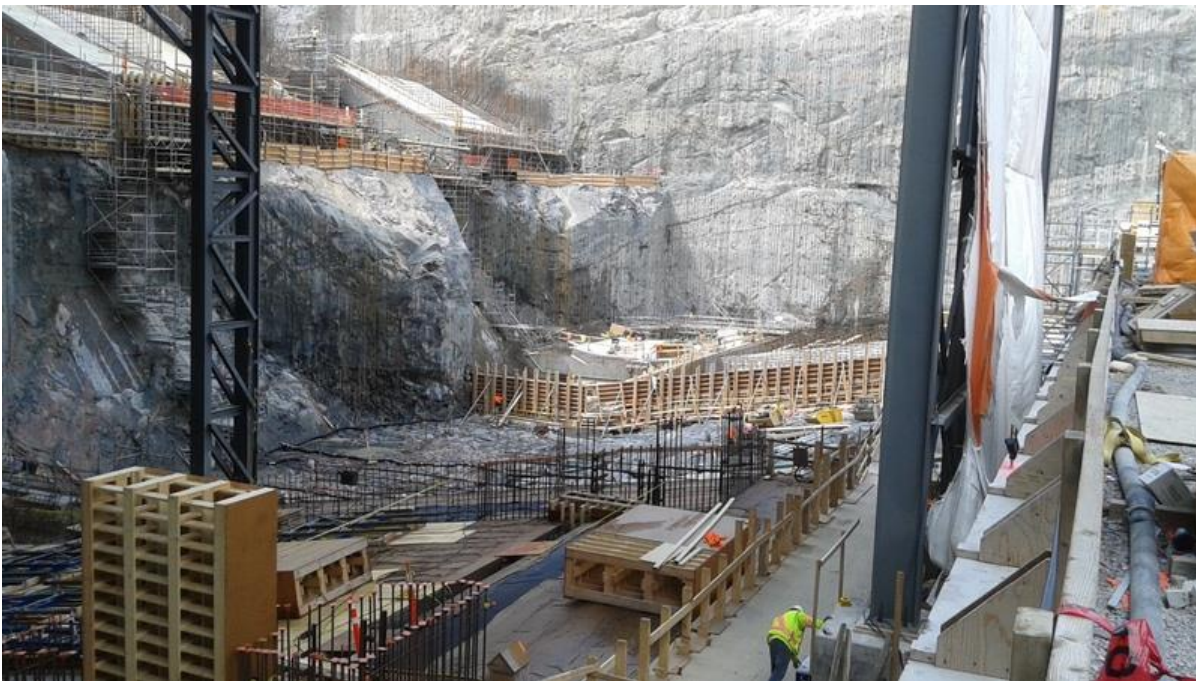


**Photo 6.4** Side view of Spillway piers, Central Transition Dam and Separation Wall (July 7, 2015).

## 7. Powerhouse / Intake



**Photo 7.1** Unit 3 – Intake invert slab completed with central pier reinforcement dowels in place (July 7, 2015).



**Photo 7.2** Units 3 and 4 – Downstream concrete blocks of the Intakes invert slabs completed. Formwork and reinforcement partially installed for draft tubes invert slab concreting (July 7, 2015).





**Photo 7.3** Unit 1 – Invert slab of draft tube completed. Upstream end of draft tube central pier ready for formwork and reinforcement erection (July 7, 2015).