

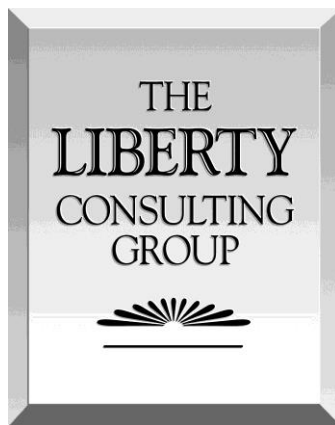
**Sixth Quarterly Monitoring Report on the  
Integration of Power Supply Facilities to the  
Island Interconnected System**

**Presented to:**

**The Board of Commissioners of Public Utilities  
Newfoundland and Labrador**

**Presented by:**

**The Liberty Consulting Group**



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*Table of Contents*

1. Introduction ..... 1

    a. Interim and Longer-Term Transmission System Readiness ..... 1

    b. The Purpose of this Report ..... 2

2. Management’s Overall Perspective ..... 2

3. Summary of Liberty’s Conclusions ..... 3

    a. Monopole LIL Operation-In Service Date ..... 3

    b. LIL Bipole In-Service Date ..... 3

    c. Other TTO Work ..... 4

4. Program Schedule Structure and First Quarter, 2019 Performance ..... 5

    a. Summary ..... 5

    b. January-March 2019 Milestone Changes ..... 6

    c. January–March- Activity Slippage ..... 7

    d. The Completion “S-Curve” ..... 8

    e. Summary of Progress by Teams ..... 9

5. Specific Issues ..... 10

    a. LIL Pole 1 In-service Date ..... 10

    b. LIL Bipole In-service Date ..... 11

    c. General Electric (GE) ..... 12

    d. Long-Term Agreement for the Optimization of Hydraulic Resources ..... 13

    e. BTPO Training ..... 13

    f. Staffing ..... 13

6. Follow-Up Action Items ..... 14

## 1. Introduction

### a. Interim and Longer-Term Transmission System Readiness

The Transition to Operations (TTO) organization has been tasked with integrating Muskrat Falls and the Labrador-Island Link (LIL) into the province's electrical system. Over the past eighteen months, we have been monitoring TTO progress in preparation for turnover to operations. Our scope has excluded Muskrat Falls construction activities, but we have examined efforts planned and executed to become fully prepared to operate the facilities that connect the new generating station to the Island grid, after supply resources become available.

We have also examined readiness to operate the LIL and the Maritime Link (MIL) to permit import of power onto the Island prior to the availability of generation from Muskrat Falls. This interim role has been considered critical, given the nature and status of supply resources available to serve the Island Interconnected System (IIS). Initially energizing the LIL on a monopole basis was planned to make (and this past winter has made) recall power available from the LIL connection to Labrador. The ML has made available supply sources originating in or passing through Nova Scotia.

We have to date placed substantial emphasis on interim (pre-Muskrat Falls) operation of the LIL. Management achieved "First Power" on the LIL on June 11, 2018. Achieving 1<sup>st</sup> power marked the start of dynamic commissioning, and initiated a list of tests of power transmission from Muskrat Falls to Soldiers Pond - tests seeking to demonstrate specified performance prior to commercial operation.

It typically takes two months from First Power to the completion of commissioning of a pole. At the time of writing, dynamic commissioning remained uncompleted. Upon satisfactory completion of the required tests begins a two-month trial operation period, during which the scheme must continuously transmit power, and demonstrate reliable operation. On completion of the trial operation period, the pole can be turned over to Nalcor.

As discussed in prior reports, a series of problems have extended the commissioning process. As of this report, the first pole has still not been fully commissioned. Control and protection software required for operation, the primary cause of delay to date, remains unavailable in a final form. We have found surprising the large number of software problems exposed during the commissioning process. Such software should undergo rigorous factory testing prior to dispatch to site. It has tripped on several occasions in recent months. Fortunately, operation of the Maritime Link averted Under Frequency Load Shedding (UFLS) on most LIL trip occasions, even during periods of high demand this past winter season. However, despite these circumstances, the LIL has transmitted recall power to the IIS during the winter period. Completion of commissioning of Pole 1 has now been moved to coincide with commissioning of the bipole in late November, 2019; *i.e.*, at the commencement of the coming winter season.

As our preceding quarterly reports observed, TTO program management continues to plan and measure progress using the same four work streams we described in our prior quarterly reports. Muskrat Falls construction continued to proceed under its own plans and schedules; progress

against those construction milestones have continued to bear on and have material linkages to the TTO work streams and their schedules. For example, in many cases, TTO activity commencement depends on construction (and other) work being performed by General Electric. Our interest in construction milestones in this report focuses solely on addressing how they may influence TTO activities.

The four work streams of the TTO, each of which operate under dedicated teams, consist of:

- BTPO (Building the Production Organization) - - focused on operations and maintenance strategy, organization design and staffing, training, securing needed services from outside sources, and the development of operations and maintenance plans, systems, strategies, and procedures for the integration of the IIS and the Lower Churchill Project (LCP)
- RFI (Ready for Integration) - - focused on system planning inputs for design and operational requirements, development of reliability standards, support for operational readiness, and participation in testing
- RCFI (Ready for Commercial Integration) - - focused on commercial, legislative, and regulatory matters
- RFO (Ready for Operations) - - functional oversight of a variety of requirements (*e.g.*, safety and environmental), contractor deliverables, and turnovers to operations. The transition schedule contains no RFO activities, which are embedded in the LCP.

#### **b. The Purpose of this Report**

This report sets forth the results of our sixth quarterly review of activities scheduled for the BTPO, RFI, and RCFI work streams. We address how well TTO work has proceeded in support of the integration of and reliable operation of the assets at the planned in-service dates.

Our work in reviewing progress over the past quarter has continued to focus on the five substantive areas we have addressed over the past eighteen months:

- Sufficiency of BTPO, RFI, and RCFI work stream plans and schedules in providing a sufficiently comprehensive, well-defined, logically sequenced and connected set of activities
- Progress made in the last quarter relative to schedules for these work streams
- Management familiarity with schedule drivers
- Management's identification of measures to minimize schedule slippage
- Key measures, actions, and results for coming months.

## **2. Management's Overall Perspective**

As it has done regularly in connection with our quarterly reviews, management prepared a detailed presentation describing TTO progress. This presentation also addressed specifically a list of topic areas and issues we provided to management. We found the report generally responsive to the topics and issues about which we sought information. Within the limits of what one can glean from a review of the TTO work stream scheduling and reporting (we discuss those limits below), we found the presentation and management's responses to our detailed questions useful in our assessment of schedule status and jeopardy to key milestone dates. We continue to acknowledge

management's support for our efforts. An overview of key accomplishments provided by management follows:

- Ongoing power transfer over the LIL monopole continued throughout the quarter.
- Pole 2 control and protection cabinets were installed at Muskrat Falls and Soldiers Pond.
- Pole 2 is now 90% mechanically complete.
- Three planned maintenance outages on the LIL during the quarter permitted completion of repairs at Churchill Falls, Muskrat Falls and Soldiers Ponds, with all scheduled work completed as planned.
- High and low frequency Preventive Maintenance plans and check sheets for generation assets advanced substantially.
- A Commercial Operations committee consisting of Nalcor/Hydro/Power Supply stakeholders was formed to prepare for commercial operations and compliance requirements at high power.
- A review of the TTO work plan produced addition and refinement of detailed activities required to support operational transition of generation assets.
- Continued recruiting brought Transmission (56/60), Engineering (38/42), and Support (11/15) personnel well toward completion, but left Generation (9/28) still very far short of requirements by the end of March.

### 3. Summary of Liberty's Conclusions

#### a. Monopole LIL Operation-In Service Date

The commissioning process for Pole 1 began in the third quarter of 2018, but has not yet been completed. Based on our experience, a typical commissioning effort would require about two months, followed by a two-month trial operation period. Despite a duration of some nine months, by the end of the first quarter of 2019, the process still appears far from completion. It continues to be impossible to provide a sound estimate of the date for completion of the first pole's commissioning process.

Monopole LIL completion and operation remains beset with substantial problems in becoming a fully reliable performer at high capacity levels. The LIL transferred recall power from the Churchill Falls converter station to the Island during the first quarter, 2019. Power transfers over LIL Pole 1 reached a maximum of 150 MW - - well below the anticipated 225 MW transfer limits. Seven LIL trips occurred during the first quarter. Investigation and resolution of six of these trips came expeditiously. The remaining, February 5, trip resulted from a hardware issue and incorrect software setting of a LIL protection. Resolving its underlying causes will remain open until installation of the bipole software later this year.

#### b. LIL Bipole In-Service Date

Management has scheduled commissioning of the bipole to start this coming September, but this date assumes that GE delivers the bipole Factory Acceptance Tested (FAT ) software to the site by August 31. Preliminary information from management and from GE's Independent Third Party (ITP) consultants gives very low confidence GE will deliver the bipole software by the required August date. Management stated at our March working session that GE was awaiting additional

cubicles and equipment to enable bipole software testing, given that the pole 2 cubicles had been shipped to site for installation. It appears to us that, exercising proper foresight, GE should have ordered the necessary equipment earlier.

Our last report identified an agreement by GE and Nalcor to use ITP consultants to assess software development progress and functionality conformance. Two separate firms have been hired, beginning their monitoring efforts in March. A firm named Systematic (used by GE on prior occasions) was hired to assess software development progress and Amplitude was hired to assess conformance to HVdc functional requirements. Management reported that a Systematic preliminary audit of software progress identified preliminary concerns and issues with the bipole software development schedule, finding the current schedule aggressive and without float to address activity delays. We asked Nalcor some time ago to provide background information addressing the qualifications of the two firms for the work they are undertaking. That request remains unanswered.

It also appears that GE's current financial troubles have resulted in high staff turnover rates, making it difficult to retain competent personnel. Management reported that GE is attempting to secure other third party support to assist in the development process. This situation will continue to threaten its work on the LIL, as GE management allocates limited resources among multiple clients who, like Nalcor, will pressure them for delay mitigating efforts. Continuing GE-caused delays under these circumstances make it prudent to discount probabilities of meeting scheduled dates for remaining activities involving the LIL in both single pole and final configuration.

We see substantial risk that bipole commissioning will slip. Such slippage would take commissioning well into the winter operating period, thus increasing the probability of system outages. Substantial reason for concern also arises from management's statement that bipole software development will not be fully completed until some testing, using the initial version of the software, at the site. We find this process unusual, and believe that it creates a risk of extensive delay. It also appears that commissioning of Pole 2 will not commence until Pole 1 has been commissioned with the new bipole software. If the bipole software is unreliable or not fully tested and commissioned, errors in the software could result in both poles being tripped at the same time, potentially causing UFLS in the IIS during high load conditions. Management has stated that the loading of new versions of control and protection software require an outage of two or more weeks. If so, then any significant problems with the bipole software could result in a prolonged outage of the LIL, with significant consequences for IIS-served customers.

Management has stated that the software version used on Pole 1 during the last nine months cannot be used on Pole 2. Plans call for a four-week, May installation of Software version 17c on Pole 1. Software version 17c cannot be used on Pole 2 - a reconfiguration must be available before commissioning of Pole 2 can commence. We have received no description or plan for Pole 2 and the bipole testing at the GE facilities in Stafford and at site.

### **c. Other TTO Work**

Substantial work on construction and other bulk TTO activities remains. We observed in our report for the last quarter that the pace of progress would have to pick up substantially for a return to



conformity with the expectations of the baseline program. Progress has still not recaptured all time lost in the previous quarters, even as measured by management. Management nevertheless observed that remaining deliverables to enable asset turnover for commercial operations remained on track. We continue to have significant reservations but despite the delays, it appears that sufficient time still remains for TTO to complete its transition work, provided additional work scope does not emerge, and provided that management does not divert resources to other work.

In our last report, we recommended management make a detailed review of remaining work scope a high priority, in order to avoid potential schedule issues as the project moves into its final stages. In the first quarter of 2019, management followed through on this suggestion which resulted in the addition of a large number of activities and enhancements to the schedule. It has been about 18 months since we established the original baseline back on October 1, 2017. We always recognized that a re-baseline would likely be required at some point. With the most recent refinements to the TTO generation activities, we now believe it is time to re-baseline the plan utilizing the April 01, 2019 update as a basis for future monitoring. Management has indicated they are comfortable that future scope increases will be minimal, and are in agreement that it is time to re-baseline the plan. This approach should stabilize our monitoring metrics going forward and enable us to better utilize the schedule data to assess future progress.

Management indicated they are continuing to have a difficult time securing experienced operating positions for the Muskrat Falls generation plant due to the high cost of living in the area. The problem has become sufficiently severe to lead management to place reliance on contractor support (perhaps using retirees brought back through a third party), perhaps for an extended period, as apprentices gain necessary experience. Securing experienced operating personnel in the next quarter will be critical as turnover and startup activities get underway at Muskrat Falls.

#### **4. Program Schedule Structure and First Quarter, 2019 Performance**

##### **a. Summary**

As we began our monitoring work in September 2017, shortcomings in TTO activity schedules and in the ability to use them to monitor performance and status effectively led us to employ a “work around” approach. We chose to use an “official” baseline schedule established at that time. Our work has included reports from management on progress against that schedule, continuing through the present. Management made a surprisingly large number of changes to this schedule in the last quarter of 2017. Those changes included activity additions that we viewed as sound enhancements in schedule detail. The changes prompted us to make some additional adjustments to the baseline in early 2018. These changes did not produce schedule extensions for any activities. Since that time, changes to the schedule have been limited. However, during the last quarter, management has made a large number of additions and enhancements, resulting from its detailed review of activities required to support operational transition of generation assets.

Despite the recent schedule enhancements, we continue to find it limited in certain respects:

- Sufficiency of linkages among schedule activities
- Continuing use of long duration activities
- Reliance on subjective, percent complete information to assess progress.

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**b. January-March 2019 Milestone Changes**

Key milestones extracted from the LCP construction schedule provide the foundation for TTO's baseline integration schedule. These LCP milestones provide a framework for TTO planning, scheduling, and tracking of activities to prepare fully for operations. TTO schedule milestones identify linkages between construction and integration activities. Milestone dates tracked in the transition schedule represent the earliest date that the transition team can be ready. The TTO schedule milestones may differ with milestone dates released to the public or those contained in the construction schedule. In the past, Nalcor has categorized these TTO schedule milestone dates as "stretch targets."

The chart below shows that nominally reported milestone progress since the September 2017 baseline has continually fallen short of planned levels. Key changes in milestones since the last quarter report include:

- Addition of a new milestone - - "LITL Bipole Commissioning (Initial Low Load)" (November 22, 2019).
- Rescheduling of LIL Pole 2 commissioning to coincide with commissioning of the bipole (November 22, 2019).
- Addition of a new milestone "MFG Full Impoundment" to address the need for water hazard components of the generation safety program to be in place prior to full impoundment.
- Several changes to MFG milestones, resulting from efforts to review remaining transition activities required to support transition of generation assets to operational status.

Management had previously listed two main contributors to delays in achieving milestones: (a) General Electric's late completion of construction/turnover activities and (b) internal resource shortages. General Electric's performance continues to pose major schedule threats. We reported in our last quarterly report the agreement to employ an independent third party to confirm satisfaction of all system functionality requirements. Our most recent monitoring meeting with management disclosed retention of two separate firms, who began monitoring efforts in March. Systematic was hired to assess software development progress and Amplitude was hired to assess conformance to HVdc functional requirements. The agreement with GE comprise a step in the right direction but longstanding and continuing delays associated with GE's work require caution in assuming that GE's past performance will likely improve dramatically going forward. The monitoring, however, will hopefully produce a fuller understanding of unmet needs and schedule requirements for meeting them. That understanding may not produce accelerated schedules, but should at least produce more realistic durations to achieve key milestones.

The next chart illustrates at a high-level activities related to power delivery to the IIS. Original baseline dates show in blue and actual/forecast dates in red. With first power on pole 2 on the 30<sup>th</sup> October, the bipole commissioning date of 22<sup>nd</sup> November is not realistic. Furthermore, with the first generator being ready for operation on the 4<sup>th</sup> September, two months of energy production will be lost.



Sixth Quarterly Transition-to-Operations Monitoring Report



**c. January–March- Activity Slippage**

Completion of planned activities for the first quarter continued to lag. The table below shows 18 activities scheduled for completion in the first-quarter of calendar 2019 - - management completed only 6. The transition team did complete an additional 38 activities that were either delayed from prior quarters or added as new activities. A considerable number of outstanding activities from prior quarters still remain to be completed. As we have reported for some time, continuation of a large number of outstanding activities increases in importance and schedule threat as overall project completion approaches. With ever less time to complete such activities, a “corner” needs to be turned in meeting planned dates.

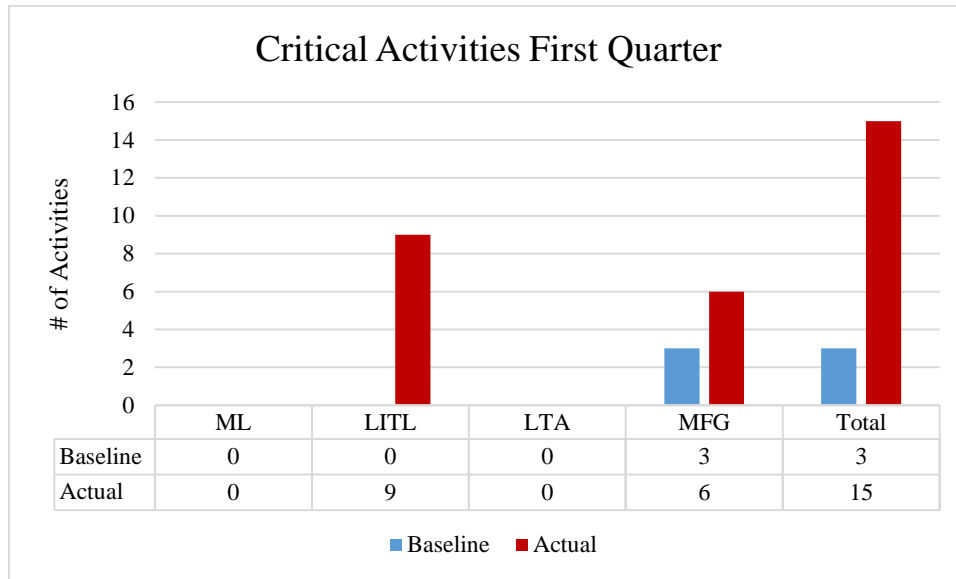
**Q1 2019 Performance Summary**

Baseline		Unscheduled Completed	Total Completed
Scheduled	Completed		
18	6	38	44

The table’s activities slated for completion in the first quarter fell into two categories:

- Critical activities - - those having an impact on critical path milestones
- Bulk activities - - those just requiring completion by the end of the project.

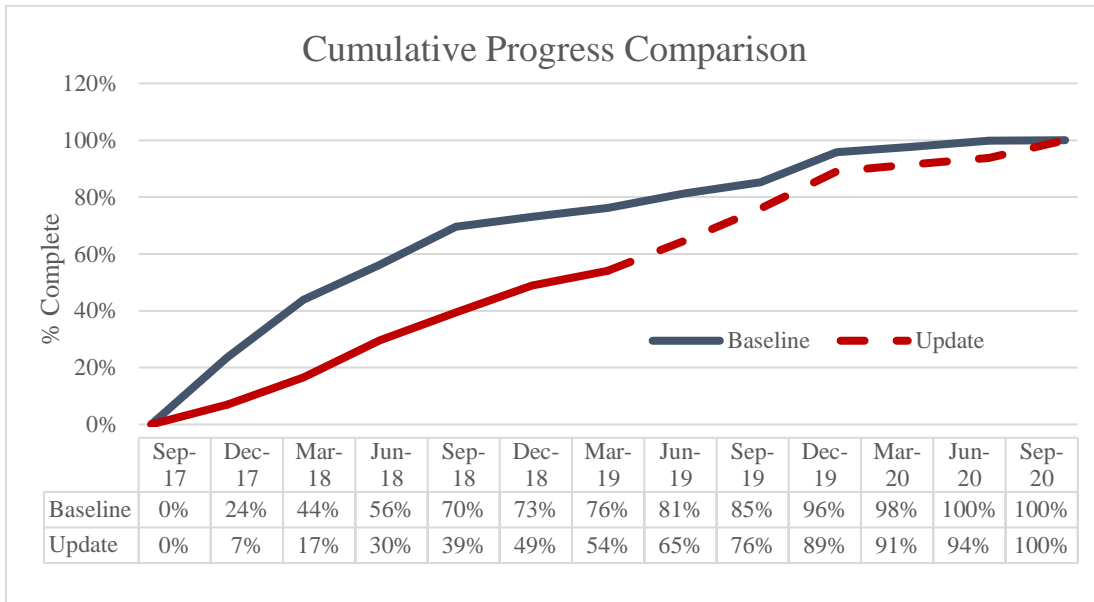
At this phase of the project, a focus on critical activities best illuminates schedule status. The chart below summarizes first-quarter progress on activities that schedules show as critical to completion.



The baseline schedule called for the completion of 3 critical activities in the first quarter of 2019. Only one of these activities was actually completed in the first-quarter. Management did complete 14 other critical activities during the quarter, all delayed from completion dates by the end of the preceding quarter (December 31, 2018) or newly identified.

**d. The Completion “S-Curve”**

We have also measured progress against a cumulative percent-complete “S-curve” as a means for measuring. We have found this approach useful here, given the gaps in schedule construction and reporting described earlier. Percent complete as we have measured it equals cumulative number of activities scheduled for completion divided by total outstanding activities. Our curve through the first quarter, incorporating all planned activities, confirmed a lack of progress at rates commensurate with the activities called for by the September 2017 baseline. The curve showed completion of only 54 percent of total outstanding activities, versus targeted completion of 76 percent. It is important to note that fourth quarter performance was actually 56 percent. The addition of new schedule activities during Q1 2019 drove the decline in progress from Q4 2018. These new activities came from management’s detailed review of activities required to support operational transition of generation assets.



It has been about 18 months since we established the original baseline in October 2017. Shortly after establishment of the initial baseline, management identified a significant number of new activities and detail enhancements were identified. At that time, we agreed to minor adjustments to the baseline, but felt strongly that a wholesale re-baseline was not warranted. Over the last year, scope increases and changes remained limited, but we recognized that at some point, it would become appropriate to re-baseline, as additional scope became identified and as focus shifted from LIL to generation-related activities. Management’s most recent refinements to the generation related activities now make it time to re-baseline the plan, employing management’s April 01, 2019 update as a basis for future monitoring. Management has indicated comfort that future scope increases will be minimal, and with the re-baselining. This approach should stabilize our monitoring metrics going forward, and enable us to better utilize the schedule data to assess future progress.

We continue to believe that despite the delays, sufficient time still remains for TTO to complete its transition work, provided additional new scope is not identified and resources are not diverted to other areas.

**e. Summary of Progress by Teams**

The teams whose work streams we examined made the following overall progress in the quarter just ended.

- The RFI team Stage IV (high power) study work has remained at approximately 80 percent complete overall, with 7 of 11 components finalized. Focus has switched to completion of transitional studies, targeted for second quarter 2019 completion. Stage IV studies are scheduled for completion in the third quarter. Progress continues in the development of NERC Reliability Standards, with 64 documents now delivered.
- The BTPO team completed low frequency PM’s and check sheets for HVac and HVdc transmission lines. High and Low frequency PM’s and check sheets were substantially advanced for MFG intake/spillway structures, powerhouse and balance of plant

electrical/mechanical sub systems. A Risk assessment (RA) for the MFG site commenced, including preparation for a workshop in May. BTPO continued to focus on hiring staff for Muskrat Falls, but attracting qualified candidates has proven to be a challenge due to the high cost of living in the area. BTPO's delivery of operator training, slated for delivery by General Electric, continues to lag.

- The RFCI team established a commercial operations committee with Nalcor, Hydro and Power Supply stakeholders to prepare for commercial operations/compliance requirements at high power

The schedule and the supplemental information continued to support a very high-level evaluation of overall performance during the past quarter. Team leads and support personnel for each of the TTO work streams pertinent to our review continued to show knowledge of and confidence about their areas of responsibility. Management generally provided significant information in its presentation to us, and generally offered clear responses to our questions.

## 5. Specific Issues

Our work in the quarter addressed by this report found a number of specific issues bearing attention.

- LIL Pole 1 In-service Date
- LIL Bipole In service Date
- General Electric (GE)
- Long-Term Agreement for the Optimization of Hydraulic Resources
- BTPO Training
- Staffing.

### a. LIL Pole 1 In-service Date

Efforts to commission LIL Pole 1 continued through the first quarter. The LIL was re-energized on November 1, 2018 at 45 MW, using the existing version (version15) of GE software. Another version (16) was delivered to the site, and GE completed factory acceptance testing ("FAT") of the next release (17c) in Stafford. Management decided to continue LIL operation under version (15) for the remainder of the winter season, given satisfactory performance of this version and to avoid the impact of the winter-period outage that installation of the new software would have required.

The LIL transferred power from Churchill Falls to the Island in 24/7 continuous operation during the first quarter. Power transfers over LIL Pole 1 reached 150 MW, but never attained the anticipated 225 MW transfer limits. Several Q1 2019 LIL trips occurred. Six of these trips were investigated and resolved quickly. The remaining, February 5 trip resulted from a hardware issue and incorrect software setting of a LIL protection. This issue required further mitigation. A precautionary low fixed limit (45MW) was initially placed on LIL by the NLSO during investigation. The 45MW limit has now been lifted; it now tracks Holyrood units' output and island load to maximize power transfers. The combination of LIL and Holyrood is limited in accordance with the "maximum unit loading" guidelines. The current approach minimizes

Holyrood output when possible, in order to maximize power transfers over LIL. Management expects to resolve the incorrect protection setting upon bipole software installation later this year.

Pole 1 has not completed its commissioning process, which should include a 70-day trial operation period (during which at least twenty days should be continuous service without a trip). It is our understanding that the Pole 1 trial operation period will run concurrent with bipole commissioning, now scheduled in late November. Conducting the trial operation period over the winter raises concern. GE may insist that trial period be completed as soon as possible, given its linkage to commercial conditions and considerations. If so, long investigations of any faults and trips that occur may result, in order to maximize the chances of satisfying this critical milestone.

#### **b. LIL Bipole In-service Date**

Management currently plans to remove the LIL from service this spring to install monopole controls software version 17c on Pole 1. Dynamic commissioning of version 17c will test functionality not included in the currently operating version 15, which will assist in development of the bipole software. Installation and dynamic commissioning of version 17c will take approximately 4 weeks, with the installation window planned between May-June. We were told earlier that the installation of the software would take three weeks, which leaves only one week for commissioning. We consider it optimistic to expect completion of comprehensive testing of the new software in a single week, particularly if testing discloses errors.

Monopole software versions 15 and 17c are configured for Pole 1, and cannot be installed on Pole 2. Installation of the remaining Pole 2 hardware is ongoing. Management plans to install a preliminary version of the bipole software on both poles for static checks and verification this summer. We found management's statement that these static tests will provide information required for the completion of the bipole software development surprising and worrying. We do not understand what information could not be predetermined during development, and this method could prolong the software development. Dynamic commissioning of the bipole will start in September, provided that GE delivers the bipole FAT software by August 31. Low load bipole commissioning is slated to start in November, but we have no information on which we can judge the credibility of the plan for commissioning, as we have received no information concerning:

- How Pole 1 will be tested/commissioned with software version 17c
- How Pole 2 will be commissioned (and with what software)
- How the Bipole software will be developed
- How the Bipole software will be tested
- How the Bipole will be commissioned
- What facilities will remain available in Stafford for the investigation of software/hardware control and protection errors found during commissioning.

Based on our experience with LIL Pole 1 software/commissioning, we have significant concern that bipole commissioning slippage will extend the process well into the winter operating period, increasing the probability of system outages. One should question the sufficiency of the Pole 1 control and protection software testing prior to site installation. In addition, at the time of our March meeting with management, GE Stafford did not have replica control and protection cubicles for the testing of the control and protection system in Stafford. This equipment had been ordered

and was due to be delivered. Without such cubicles and their installed equipment, full testing of the control and protection cubicles before the equipment is used on site will not be possible. Thus, material faults could remain and be undetected. If so, more site troubleshooting may lead to extensive delays in the commissioning of the LIL, as has been found during the Pole 1 commissioning process.

We also have concern that the bipole software may not be fully developed and tested before completing commissioning of the “bipole.” If so, the two poles may operate under a higher probability of tripping simultaneously, which may limit the maximum power that can be transmitted on the LIL, because trips of both poles when the LIL is operating at high power (*e.g.*, more than 225MW) would cause UFLS.

At this stage it is not clear whether, should the bipole software not be completed in time for the winter, it would be possible to use Pole 1 and Pole 2 together (with manual co-ordination), or to use either Pole 1 or Pole 2 with the other being out of service. Statements have been made that changing the present set of priorities in respect of the development of the various software packages could jeopardise the complete program. Obviously, Nalcor and GE should choose the direction considered most appropriate, given the constraints.

In the upcoming months, close and detailed monitoring of GE’s progress will be required to better understand the impacts LIL availability will have on the winter 2019/20 operating period. To assist in meeting this objective, we have requested, and management agreed to provide, additional schedule details of key activities, deliverables and expected durations for this critical work.

### **c. General Electric (GE)**

During the first quarter, GE continued to support daily power transfers over the monopole, investigating and resolving various system issues. GE is now focused on development of the bipole software, which is slated for release in August, 2019.

As we previously discussed, GE and management have agreed to appoint an Independent Third Party (ITP) to confirm that all system functionality requirements are met. At our most recent monitoring meeting, we learned two separate firms have been hired and began their monitoring efforts in March. Systematic was hired to assess software development progress and Amplitude was hired to assess conformance to HVdc functional requirements. We are not familiar with nor did we find significant information about these two companies.

Management reported that Systematic has completed a preliminary audit of software progress, identifying preliminary concerns and issues with the bipole software development schedule. Apparently, the current schedule is extremely tight and has no float. It also appears that GE’s current financial troubles have resulted in high turnover rates and difficulties in retaining personnel. GE is attempting to secure other third party support to assist in the development process. Limited resources are likely to complicate GE management efforts to satisfy multiple clients seeking expeditious completion of their work. The LIL will thus likely be competing with other projects for resources.



As stated above, Systematic completed an initial review of the software functionality in April. Management had not received the results from that review as of the time of our meeting. We understand that both firms will be issuing joint update reports on a monthly basis. We have requested copies of these various reports. Management indicated they it would need to examine contractual arrangements between GE and these firms before committing to releasing the actual reports. However, management did agree to provide us with summary level findings from the reports.

In light of the above findings and considering GE's recent track record, we have significant reservations concerning GE's capability to meet the critical August 31 delivery date for the bipole software. Furthermore, given the time that it took to partly commission Pole 1, we believe that there is significant risk that Pole 2 and the bipole will not be fully commissioned by 22<sup>nd</sup> November 2019.

#### **d. Long-Term Agreement for the Optimization of Hydraulic Resources**

A Pilot Agreement was proposed by Hydro in an application to the Board of Commissioners of Public Utilities (the Board) last August, to accumulate the proceeds from such activities in a deferral account, pending a future application on its disposition and how the accumulated value is shared between the participating Nalcor entities. The Pilot Agreement was approved by the Board on December 18, 2018. The Board order required that the Long-Term Agreement not be filed for a period of one year, in order to allow time for assessing the effectiveness of the Pilot Agreement. We reported last quarter that management indicated delaying the submittal of the Long-Term Agreement by one year, would require rework on a number of affiliate and external contracts related to Muskrat Falls Units 1&2. Management reported that it is evaluating several alternative approaches to address the impact of the Board order. At this time, management anticipates that a preferred approach will be selected during the second quarter of 2019.

#### **e. BTPO Training**

As of March 31, limited progress was made in the first quarter, with only eleven of the twenty one identified General Electric Transmission Operator training courses in the TTO work plan completed. No GE training was completed on the four Synchronous Condenser courses identified. Remaining courses are being re-scheduled. Delivery of the courses remains dependent on General Electric personnel currently involved on higher priority commissioning work. Management has turned to outside resources for some support of training development and execution as well. Management has established contingency plans to address course non-delivery. These measures seek to secure additional time to provide required training, by providing for operational coverage by General Electric until turnover, and by HVdc support services resources thereafter.

#### **f. Staffing**

As indicated in the table below, little progress was made in the fourth quarter securing additional resources. Of particular concern is the slow progress in hiring operations staff for Muskrat Falls Generation. At our most recent meeting, management indicated continuing difficulties securing experienced operating positions, due to the high cost of living in the area. They expect to require contractor support and retirees to supplement existing staff, until suitable candidates are secured

or entry level apprentices gain necessary experience. Securing experienced operating personnel in the next quarter will be critical as turnover and startup activities get underway at Muskrat Falls.

Overall Staffing Status as of March 31,2019							
	<u>***Total Planned</u>	<u>In Process</u>	<u>Hired-On-Board</u>	<u>Offers Accepted</u>	<u>*Total Secured</u>	<u>% Secured First Quarter 2019</u>	<u>% Secured Fourth Quarter 2018</u>
Transmission O&M Staff	60	2	55	1	56	93%	95%
Generation O&M Staff	28	13	12	2	14	50%	52%
Engineering Services Staff	42	1	37	3	40	95%	93%
Support Services Staff	15	0	14	0	14	93%	93%
BTPO Staff/Contractors	13	2	11	0	11	85%	73%
Total	158	18	129	6	135	85%	85%
<i>*Secured = On-Board + Offer Accepted</i>							
<i>**In Process includes posted, screening, interview or offer stage</i>							
<i>***Total Planned reflects minor refinements to the Transmission ,Generation and BTPO Resource plan since the fourth quarter, 2018.</i>							

## 6. Follow-Up Action Items

The following is a list of action items resulting from the recent discussions at the monitoring meeting.

- a. Provide Liberty with all related documents and update reports generated by the Independent Third Party consultants (Systematic and Amplitude)
- b. Provide Liberty a more in-depth schedule of activities along with expected durations for the development and testing of the bipole software, and the subsequent commissioning of Pole 1, Pole 2, and the Bipole.
- c. Nalcor to update the current TTO baseline schedule to reflect the current forecast dates reflected in the April 01, 2019 update. The April 1<sup>st</sup> schedule update will be used as the official baseline for all future reporting.