

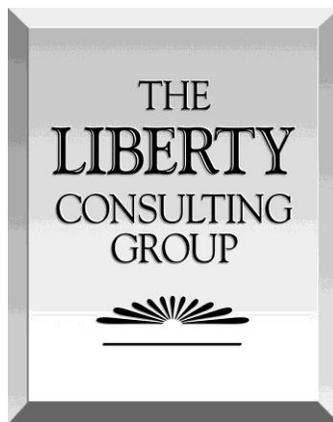
**Fourth Quarterly Monitoring Report on the
Integration of Power Supply Facilities to the
Island Interconnected System**

Presented to:

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

Presented by:

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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 year, we have been monitoring TTO progress in preparation for the turnover to operations of the LIL. We have not addressed construction of Muskrat Falls, where we have limited our review to 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 network facilities that will, in the interim before Muskrat Falls completion, permit the import of power from the LIL and the Maritime Link (ML). A long-standing concern with and focus on the sufficiency of supply resources to serve the Island Interconnected System (IIS) led to a decision to place a special focus on readiness of those links, to provide import sources of supply prior to the availability of electricity production from Muskrat Falls. The LIL will make recall power available from the LIL connection to Labrador and the ML will make available supply sources originating in or passing through Nova Scotia.

We therefore address readiness in both the interim (pre-Muskrat Falls) and longer-term (post Muskrat Falls) periods. Hydro has in the past addressed the need for support provided from LIL connections to an operating IIS and an operating ML. The focus placed on completing and getting the LIL into operation led to the establishment of a 1st power date for the link of June 30, 2018. 1st power begins a list of tests and activities whose performance is necessary prior to commercial operation.

Typically the duration from first power to the completion of the commissioning of a pole takes no more than two months. Then follows a two-month trial operation period, during which the scheme continuously transmits power. Therefore, it was expected that an end of second quarter 1st power date would make the LIL available to support supply needs on the IIS this coming winter. Supply adequacy has proved very troublesome in past winter seasons, and remains a matter of significant attention now.

As our preceding quarterly report observed, TTO program management continues to plan and measure progress using the same four work streams we described in our last quarterly report. 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

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outside resources, and the development of operations and maintenance plans, systems, strategies, and procedures for the integration of the IIS and the 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) required reports, contractor deliverables, and turnovers to operations.

b. The Purpose of this Report

This report sets forth the results of our third quarterly review of efforts under 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 year:

- Sufficiency of BTPO, RFI, and RCFI work stream plans and schedules in providing a sufficiently comprehensive, well-defined, logically sequenced and tied 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 an extensive list of topic areas and issues we provided following our review of a report on TTO schedule activities. 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:

- LTA and LIL operation at ~ 45 MW for 25 Days of Power Transfer Operations @ 10 Hrs. per day (Jun 19 – Jul 7, Jul 18 – Jul 27)
- System remained offline for the remainder of the third quarter to address equipment issues.
- Punch-list items for Transmission Line A&B completed in September
- GE Controls software (Release 16a) Factory Acceptance Testing completed. (This release provides an interim version lacking certain functional controls; *e.g.*, change over between the redundant controllers in the event of the active control lane

malfunctioning, resulting in decreased reliability of the control system; the full control version remains under testing.)

- The Labrador Electrode Line completed in August
- High frequency PM's/check sheets in place and operationalized for LTA and LITL assets
 - Except for converter stations and synchronous condenser plant
- Repair & restoration (ERR) requirements completed and tested (OHTL)
- Remaining TTO transmission deliverables to enable asset turnover on track to meet current project schedules
- Recruiting progressed with 54/59 Transmission, 8/27 Generation, 38/43 engineering, and 10/15 Support Services roles secured as of the end of September
 - All critical transmission hires secured and Hydro Operator roles posted.

3. Summary of Liberty's Conclusions

Some time ago, Nalcor changed its plans for completing work on the LIL to enable first operation of a single pole. The goal of this change was to permit the use this coming winter season of what will eventually become a bipole power transmission path. Successful completion of this plan will provide access to recall power from Labrador, through initial, single-pole operation.

With the achievement of 1st power in June, third quarter focus became completion of activities necessary to support dynamic commissioning of the LIL monopole in preparation for trial operations and commercial operation, currently targeted for December 31, 2018.

Substantial work on construction and other bulk TTO activities remains. Progress has still not recaptured all time lost in the previous quarters, even as measured by management. We observed good progress against schedule in the third quarter in key areas, but observed regression in some respects second-quarter achievements management had reported. Management nevertheless observed that remaining deliverables to enable asset turnover for commercial operations remained on track despite some considerable delays and setbacks that occurred during the quarter.

We do not share management's view. We continue to have significant reservations about Nalcor's ability to deliver a reliable source of power using the LIL to mitigate power interruptions this coming winter. We did not see enough to suggest an encouraging level of improvement in General Electric's performance. General Electric continues to miss deadlines affecting the work of the transition team, including late delivery of operator training, delays in equipment turnovers and associated documentation and identification of spare parts.

GE controls software issues and equipment failures adversely affected dynamic commissioning efforts. We continued to observe delays in completing system turnover items that support LIL Pole 1 commercial operation. We remain uncomfortable with the current lack of focus on: (a) the critical path, and (b) milestones in general. Securing greater focus and more timely performance from General Electric will continue as the greatest challenge facing management in coming months.

Management has, however, made additional progress in the third quarter to address internal resource shortages, ramping up hiring of internal resources and increasing reliance on specialty

contractors for on-going start-up and operational support. Total secured staffing increased from 69 percent in the second quarter to 77 percent by the end of the third quarter.

The pace of transition work has clearly accelerated over the past several months, but significant numbers of activities remain to be completed. Construction delays and ensuing schedule extensions have given the TTO team added time to complete its work. However, the team cannot continue to rely on being handed additional time due to construction delays, as construction/turnover activities near completion, TTO must become more effective and consistent in meeting its schedule completion dates, in order to avoid impacts to the reliable operation of the assets.

4. Program Schedule Structure and Third Quarter Performance

a. Summary

Shortcomings in TTO activity schedules and in the ability to use them to monitor performance and status effectively led us to begin our monitoring work under a “work around” approach to support our monitoring work back in September 2017. That approach involved use of 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 then considered that schedule comprehensive in laying out the detailed work activities going forward. 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 which prompted us to make some additional adjustments to the baseline in early 2018. These changes did not produce schedule extensions for any activities.

The schedule stabilized, but we have continued to find it limited in certain respects:

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

b. July-September 2018 Milestone Changes

The foundation for the baseline integration schedule used by TTO comes from several key milestones extracted from the LCP construction schedule. These milestones provide a framework for the planning, scheduling, and tracking of TTO activities designed 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. Since the last quarterly report, we saw some significant slippage in a number of near-term critical milestones including:

- SP Synchronous Condenser-Ready for Operation- 10/22/18 to 5/24/19 (7 months)

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- LITL Transfer Power (Pole2) – 2/18/19 to 11/19/19 (9 months)

Nalcor has advised that slippage in the Soldiers Pond Synchronous Condenser resulted from discovery of oil contamination during commissioning activities. No determination of the cause of the contamination had been made, with a root cause analysis underway. Regarding the slippage of LITL Pole 2 1st Power, management stated that it changed the schedule to reflect anticipated issues with the GE control software. We asked for further details regarding Nalcor’s explanation for this delay. Management agreed to provide them, but we have not received them. Several other longer-term milestones related to Muskrat Falls also slipped several months.

Our last report expressed concern about the sufficiency of management’s focus on the critical path and the intermediate milestones, evidenced, for example, by exclusion from the TTO schedule of several important milestones, such as LIL Pole 1 In-Service date. We continue to view this exclusion as a shortcoming, but were encouraged to see that one new major milestone related to LITL Monopole Commissioning has been added in the third quarter.

In the past, management listed two main contributors to delays in achieving milestones: (a) General Electric’s late completion of construction/turnover activities and (b) internal resource shortages. Management now expresses comfort with the resource numbers currently in place. General Electric’s performance continues to pose major schedule threats. The next chart provides a high-level program, showing activities related to power delivery to the IIS. Original dates show in blue and actual/forecast dates in red.

	Baseline	2017	2018	2019	2020
Maritime Link					
Maritime Link 1 st Power	10/30/17	▲	▲ 12/16/17 Act		
Labrador Transmission Assets					
Churchill Falls Switchyard (New) - Ready to Energize	10/31/17	▲	▲ 2/14/18 Act		
Muskrat Falls Switchyard – Ready to Energize	11/28/17	▲	▲ 4/02/18 Act		
LTA Ready for Power Transmission	01/01/18	▲	▲ 4/27/18 Act		
Labrador Island Link Assets					
HVdc Transmission Line Construction Complete	10/27/17	▲	▲ 10/30/17 Act		
SP Switchyard & Converter Station – Ready for Operation	02/12/18	▲	▲ 5/16/18 Act		
Muskrat Falls Converter Station – Ready for Energization	01/16/18	▲	▲ 5/10/18 Act		
SP Synchronous Condensers- Ready for Operations	03/06/18	▲		▲ 5/24/19	
LITL 1 st Power Transfer Labrador to Newfoundland (Pole 1)	05/01/18		▲ 6/11/18 Act		
LITL Monopole Commissioning	-			▲ 12/24/18	
LITL 1 st Power Transfer Labrador to Newfoundland (Pole 2)	10/30/18		▲		▲ 11/19/19
Muskrat Falls					
Power House Unit 1- Ready for Operation	04/17/19			▲	▲ 12/09/19
Power House Unit 2 Ready for Operation	07/09/19			▲	▲ 2/21/20
MFG First Power	07/30/19			▲	▲ 12/09/19
Power House Unit 3- Ready for Operation	10/16/19			▲	▲ 5/06/20
Power House Unit 4- Ready for Operation	01/22/20			▲	▲ 07/20/20
MFG Full Power	01/22/20			▲	▲ 07/20/20

c. July– September Activity Slippage

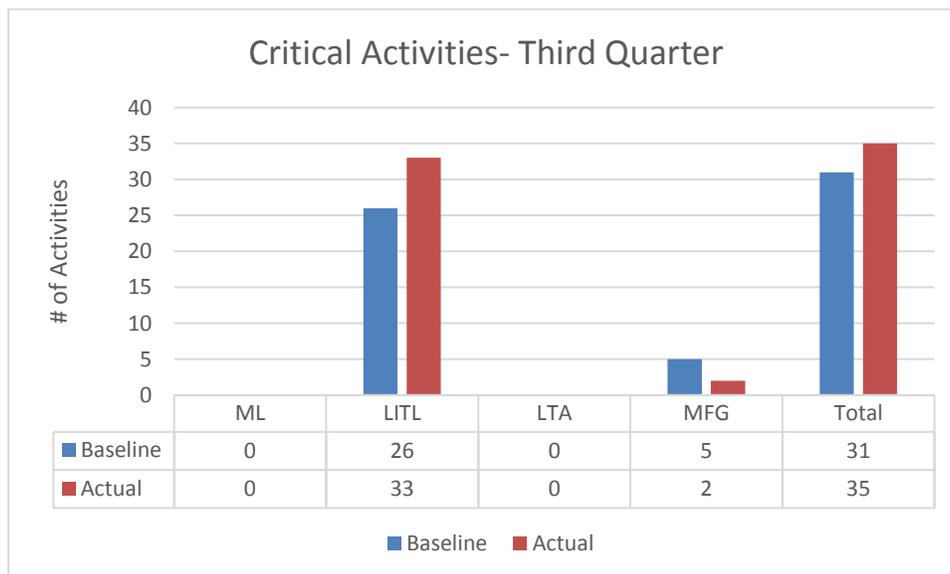
Completion of planned activities for the third quarter continued to lag. The table below shows 64 activities scheduled for completion in the third quarter of calendar 2018, with 13 actually completed. Despite this gap, the transition team did make considerable progress in completing activities delayed from prior quarters.

Baseline Activities Scheduled	Baseline Activities Scheduled and Completed	Unscheduled Activities Completed	Total Activities Completed
64	13	66	79

The preceding table’s activities slated for completion in the third 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 third-quarter progress on activities that schedules show as critical to completion.



The baseline schedule called for the completion of 31 critical activities in the third quarter of 2018. Management completed a total of 35 critical activities in the quarter - - 22 of them scheduled for completion by the end of the preceding quarter (June 30, 2018). Management also completed another 5 not originally included in the baseline plan. Thus, management secured the completion of only about 26 percent (8 of 31) of the critical activities targeted for completion in the third quarter of 2018.

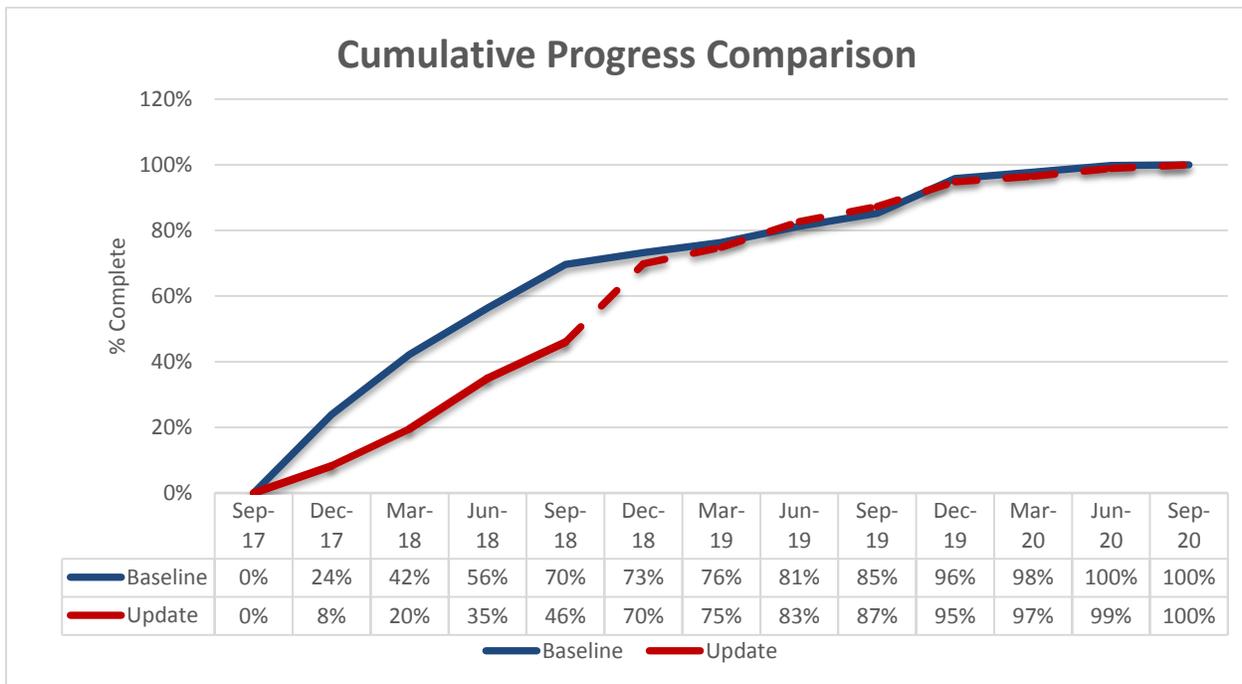
d. The Completion “S-Curve”

We reported last quarter on progress against a cumulative percent-complete “S-curve” as a metric for assessing delay. We found this approach useful, given the gaps in schedule construction and reporting described earlier. Percent complete as we measured it equals cumulative number of activities scheduled for completion divided by total outstanding activities. Our curve for the last 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 46 percent of total outstanding activities, versus targeted completion of 70 percent.

We observed in our report for the last quarter that the pace of progress would have to pick up substantially in 2018 for a return to conformity with the expectations of the baseline. The next chart shows that progress continued to lag by the S-Curve measure through the first nine months of 2018. In the third quarter, progress advanced by 11 percent, as compared to 15 percent in the second quarter. Overall progress improved to 46 percent, but still fell significantly short of the baseline target of 70 percent. We were encouraged by the improvement we saw in the second quarter (15 percent) but it appears like progress regressed somewhat in the third quarter (11 percent).

Management has cited two primary constraints driving low completion rates: (a) setbacks in completing baseline activities resulting from late staffing additions, and (b) delays in completing General Electric work activities. Progress has been made in addressing staffing issues, but that does not appear to be the case with General Electric. Nevertheless, despite being behind schedule currently with reference to the baseline plan, continued delays in construction/ turnover activities still allow sufficient time for the TTO team to get back on track. The continued schedule recovery needed to do so however, will require a continued focus on: (a) completion of activities affecting critical path activities, and (b) sustained improvement in the completion of bulk work activities.

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e. Summary of Progress by Teams

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

- The RFI team made progress in a number of areas. Significant progress was made in the development of NERC Reliability Standards. NLSO NERC related training also progressed including Code of Conduct training, with all NLSO and NEM employees completing the course. Stage IV (high power) operational studies fell behind, and were moved to the fourth quarter due to some additional work identified for the Stage III studies.
- The BTPO team made additional progress in hiring staff in the third quarter. The current plan calls for 90 positions to be filled in 2018. As of the end of September, 64 of the 90 were secured, with 19 in various stages of acquisition, leaving 7 not materially advanced. The BTO Team has completed JD1 asset uploads and high frequency PM’s/check sheets for all LTA and LITL assets except, for converter stations and synchronization plant. The BTPO Team has successfully completed the mock trial of the overhead transmission line Emergency Restoration Response (ERR). The BTPO team’s development of asset management plans, delivery of employee training, in particular operator training slated for delivery by General Electric, and inventory related activities continue to lag into the fourth quarter of 2018.
- The RFCI Team filed with the PUB on August 23, 2018 a pilot agreement for the Optimization of Hydraulic Resources. Management expected a decision in the second quarter of 2019. The RFCI Team also completed the NL Interconnection Agreement #3 and NL system operating procedures for LIL monopole. The Multi-Party Pooling Agreement was executed by transmission companies.

f. Management's Conversance with Schedule Drivers

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.

However, we were not satisfied with Management's responses to our questions related to impacts related to completion of General Electric's work in support of the LIL Pole 1's in-service date. Management continued to lack confidence in General Electric's ability to meet the vendor's commitments for delivery and testing of operating software, acceptance testing, and training of operating personnel. Once again, we emphasized to management the critical importance of the LIL for this winter, and expressed our concern that a greater sense of urgency and level of management attention would be necessary to avoid further slippage of this significant milestone.

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-
- General Electric (GE)
- Commercial Generation Production Optimization Arrangements
- BTPO Training
- Staffing
- Spare Parts.

a. LIL Pole 1 In-service Date-

During commissioning of the LIL Monopole, a number of issues have resulted in delays that threaten the current in-service date of December 31, 2018. One example of a significant problem identified, but unresolved, was the Glycol leak that was discovered halting the commissioning process. The source of the leak had not been found as of our meeting with management. GE had dispatched an expert from Stafford, UK. Following identification and correction of the leak source, management planned to restart commissioning.

Nalcor has also encountered a number of issues with the Maritime Link Frequency Converter. Management advised that trips and that starting and stopping the LIL have caused observable changes in Nova Scotia, because the Maritime Link, operating in frequency-control mode, responded to eliminate the frequency change in Newfoundland. Consequently, Nova Scotia has advised Hydro that it must provide notice before seeking to transfer more than 45MW on the LIL. There was a risk (since reportedly resolved) that the ML frequency controller would be turned off to protect the Nova Scotia system and the power transfer over the LIL could be limited 45MW.

We have received limited information related to the operating experience on the LIL in June/July 2018. This information discloses the discovery of a number of problems requiring rectification. Without knowing the specifics, we cannot comment in detail, but we found the number of outage

days during this period much larger than typically necessary during the commissioning process. These circumstances indicated a need for major investigations and changes, and the risk that significant issues may lie ahead.

GE has not yet completed the control software that should be used for commercial operation. An interim version of the software, tested in Stafford, has been loaded at the site, and has enabled the start of commissioning. However, the software lacks some functionality, potentially slowing the progress of commissioning and making the software less reliable, resulting in some unexpected trips of the LIL.

The commissioning of an HVDC scheme always includes risks, which in the worst case could produce equipment damage threatening prolonged LIL outages. We have no information about the size of team that GE has provided at each site for the commissioning process. In our experience, the teams should include both experts (*e.g.*, controls and valves) and general commissioning engineers. We have been told that GE teams at the two sites have been increased, but we do not know the actual numbers, leaving open the possibility that insufficient numbers of GE personnel are at the sites. Therefore, concern exists about the sufficiency of numbers for efficient commissioning of the LIL, even with support from Nalcor's contractors, Growler and ATCO.

It is clear that once the system returns to operation, other equipment issues and trips are likely to arise, as Nalcor works through the commissioning process. Management acknowledges the need for more time and higher output levels before the system can be deemed reliable for commercial operation. We have only had an opportunity to review a very limited amount of information regarding the commissioning process, but based on what we have seen to-date, we have strong reservations that the LIL Monopole will be available as a reliable power source for Newfoundland throughout this coming winter.

b. General Electric (GE)

GE, the Contractor for the Converter stations has been undergoing structural changes and cut-backs, which potentially affect the staff located in the HVDC Center in Stafford. GE is currently working on 7 HVDC schemes, which we believe by far to be the highest number of projects they have ever worked on at the same time.

Recruiting people to work on HVDC projects is not easy. Prior expertise in the area of HVDC is required, because training of new inexperienced staff requires a significant amount of time and effort. Indications from the current activities on the LIL are that GE is struggling to allocate sufficient personnel to the LIL project. One consequence is that training of the Nalcor operating and maintenance personnel and engineers has not been performed as required. To address this need, GE has had to agree to retain some of the commissioning personnel on site for an indeterminate period, at least until the Nalcor personnel have been fully trained and can operate, maintain, and fault find the LIL.

Delays associated with the Muskrat Falls Hydro generation have required that GE perform extra work to accommodate the import of recall power. Changes have been necessary in the control software, and additional studies, engineering and testing have been necessary to verify that the

scheme can work with the much weaker ac network that results from the absence of power generation at Muskrat Falls. The delay to the synchronous condensers at Soldiers Pond has also been a contributing factor impacting GE. We have no information of what changes have been made to the commercial contract, and to what program commitments GE has agreed.

c. Commercial Generation Production Optimization Arrangements

Our last quarterly report discussed Nalcor's development of the Extra Provincial Marketing Agreement, whose purpose was to govern the sharing of economic benefits resulting from combined operation of regulated and non-regulated assets. In our recent meetings with Nalcor, we learned that this agreement has now been replaced with the Hydraulic Resources Optimization Agreements.

A Pilot Agreement was proposed by Hydro in an application to the PUB in 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. Hydro is awaiting a schedule for comments from intervenors on the application.

A Long-Term Agreement being developed by Hydro was planned for submittal to the PUB around the end of 2018, but that filing date appears unlikely. Management is reviewing the schedule, including contemplating how execution of the Long-term Agreement integrates with the rate mitigation review initiated by the Province.

d. BTPO Training

As of September 30th, only ten of the twenty identified General Electric Operator training courses in the TTO work plan had been run. Remaining courses are being rescheduled, but the latest information from management show it unlikely that this training will be completed prior to the LIL Pole 1 being placed in-service. It would have been highly desirable to have had this training completed prior to the LIL being in service. 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.

e. Staffing

The table below shows progress through the third quarter in securing O&M resources. Significant hiring was completed in the Transmission O&M and Engineering Services areas. One area still requiring significant hiring is Generation O&M. Management has made a decision to defer most of this hiring into the third and fourth quarter of this year, to conform to when these resources will actually be required. Management believes it has currently a strong pool of apprentice training program candidates to fill these positions as the need arises.

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Overall Staffing Status as of September 30, 2018							
	<i>Total Planned</i>	<i>In Process</i>	<i>Hired-On- Board</i>	<i>Offers Accepted</i>	<i>*Total Secured</i>	<i>% Secured Third Quarter</i>	<i>% Secured Second Quarter</i>
Transmission O&M Staff	59	1	52	2	54	92%	88%
Generation O&M Staff	27	13	5	3	8	30%	22%
Engineering Services Staff	43	4	31	7	38	88%	81%
Support Services Staff	15	0	8	3	11	73%	40%
BTPO Staff/Contractors	15	3	11	0	11	73%	73%
Total	159	21	107	15	122	77%	69%
<i>* Secured = On-Board + Offer Accepted</i>							
<i>**In Process includes posted, screening, interview or offer stage</i>							

f. Spare Parts

As previously reported, significant progress has been made on identification of spare parts for the terminal stations and overhead lines. However, converter station spare parts identification continues to lag, due to delays in the receipt of information from GE. To-date, GE had not provided a final recommended spare parts listing, but a draft copy is being revised to clarify some part numbers. This area will require attention to avoid potential reliability issues after LIL turnover to operations. All spares for HVdc assets will remain in the contractor’s care, custody, and control until completion of bi-pole low power trial operation.