newfoundland labrador hydro
a nalcor energy company

Hydro Place. 500 Columbus Drive.
P.O. Box 12400. St. John's. NL
Canada A1B 4K7
t. 709.737.1400 f. 709.737.1800
www.nlh.nl.ca

May 26, 2017

The Board of Commissioners of Public Utilities
Prince Charles Building
120 Torbay Road, PO Box 21040
St. John's, NL A1A 5B2

Attention: Ms. Cheryl Blundon
Director of Corporate Services and Board Secretary

Dear Ms. Blundon:

Re: The Board's Investigation and Hearing into Supply Issues and Power Outages on the Island Interconnected System – Availability of Requested Information from Hydro, May 26, 2017 Update

In our letter of May 15, 2017, Hydro noted that organizational changes were announced in the Lower Churchill Project ("LCP") since the responses to certain Requests for Information were filed in Phase 2 of the Outage Inquiry and that an update would be provided by May 26, 2017 for the benefit of the Board and parties.

In addition, the table provided by Hydro in its correspondence of May 15, 2017 has been updated to provide status of the information requested by the Board (see Appendix "A"), as of the date of this letter. More detail on the status of some of the items in that table is contained in this letter.

LCP ORGANIZATIONAL CHANGES AND TRANSITIONAL ACTIVITIES

On June 15, 2016, Nalcor Energy ("Nalcor") publicly announced the division of LCP into two components: Power Development and Power Supply. Power Development will encompass the completion of the hydroelectric generating facility at Muskrat Falls, including the powerhouse and spillway components. Power Supply will encompass all transmission related activities for the project including the 315 kV ac transmission lines, Labrador Transmission Assets ("LTA") from Churchill Falls to Muskrat Falls, the HVdc transmission line, the Labrador-Island Link ("LIL"), and their associated electrical infrastructure.

The current organizational changes as announced in the last twelve months do not currently change the structure of the commercial arrangements between Hydro, the LIL asset owner and the LTA asset owner. However, these changes do provide a focussed group within Nalcor

dedicated to the commissioning and long-term operation of the transmission assets associated with LCP.

The current executive of Power Supply is attached as Appendix "B". In addition to internal staffing, Power Supply (via Nalcor Energy) has contracted with a third party organization with HVdc expertise, to be embedded within the Power Supply team through final commissioning and completion of activities for the LIL. While Power Supply is recruiting operational resources who may themselves bring HVdc expertise, this third party organization may be further utilized post-commissioning to assist in developing the expertise of the HVdc teams within Power Supply.

MAY 3, 2017 INFORMATION REQUESTS - UPDATE

Current Organizational Structure for Transition Teams

This item (item #2 of the information requested in the Board's May 3, 2017 letter) is attached as Appendix "C".

Studies Update

As a result of the shift of in-service dates of the LCP assets, it is expected the Labrador HVdc systems will be in service prior to Muskrat Falls Generation. The in-service of the HVdc systems provides Hydro an opportunity to deliver both capacity and energy to the Island Interconnected System ("IIS") from off Island sources, thus increasing reliability for Hydro's customers on the Island.

Given the availability of this opportunity and recognizing that the HVdc link to Labrador cannot operate to full capacity without some of the Muskrat Falls Hydroelectric Generating Station units in service, the Ready for Integration ("RFI") work plan has been refocused in 2017 on ensuring reliable operation of the HVdc links at low power[1] for the provincial transmission system.

In 2018, the RFI work plan will consist of operational studies associated with high power operation of the HVdc links, including the LIL at its 900 MW capability operating in concert with the Maritime Link ("ML") HVdc links and Muskrat Falls Generation, to ensure reliable operation of the provincial transmission system with the larger power transfers.

As part of executing the RFI work plan, TransGrid Solutions[2] has been commissioned to assist in the completion of low power and high power operational studies. The following section

[1] "Low power" is 218 MW as measured at Muskrat Falls on the LIL. Analysis has been completed as part of the RFI work plan to demonstrate that up to 218 MW can be transmitted over the LIL HVdc link in advance of Muskrat Falls generation without additional dynamic reactive support. Maritime Link transfer limits are currently being investigated as part of operational studies.

[2] TransGrid Solutions is an engineering firm based in Winnipeg that provide engineering consultancy services for HVdc and EHV (extra high voltage) ac transmission systems, with a focus on system studies.

outlines the scope of the studies, the actions to be completed, and the deliverables for each of the operational studies.

a) Low Power Studies

The purpose of the low power studies is to examine the operation of the provincial power system following the interconnection of the LTA, the LIL HVdc system, and the ML HVdc system. The study objectives will include the definition of system operating limits to ensure reliable operation. These studies to support the development of operating limits and procedures are well underway. As studies are completed, these results are being used to develop operating procedures.

The following activities are scheduled to be completed by the fall of 2017, prior to the asset in-service dates:

- Preparation of new operational procedures and associated system studies;
- Maine & Atlantic Technical Planning Committee ("MATPC") emergency assistance reserve sharing studies;[3]
- Studies of the performance of the IIS with the ML in service and with it out of service; and
- ML frequency controller study.

The reports presenting these study results and the related operating procedures will be provided to the Board as they are completed, which is currently anticipated to be Q3 2017 for the ML studies and Q4 2017 for the LIL related studies.

The above analysis should address the following requested items from the Board's May 3, 2017 letter:

Item #	Description
9	Interaction studies between the IIS and the ML completed since Preliminary Interconnection Studies dated August 2014, including with the ML in and out of service [Low Power]
12	Frequency Controller study for the ML
24	Studies of the performance of the IIS with the ML in service and with it out of service (and resulting operating guidelines) [Low Power]

a) High Power Studies

The high power studies will examine system operations with the Muskrat Falls Hydroelectric Generating Station in-service, which enables the LIL HVdc system to function at rated capacity and which in turn will provide sufficient power for the ML to be operated at its full 500 MW capacity without putting the IIS at risk of a large load rejection.

[3] MATPC analysis is complete and study results have confirmed the technical limits of the ML, attached as Appendix "D".

The following activities are scheduled to be completed in 2018, in advance of the expected in-service date of Muskrat Falls Generation:

- HVdc converter station contractor's studies for high power operation;
- Consideration of re-strikes on the LIL OHL during high power transfer;
- Options, such as operating limits, to reduce incidents of underfrequency load shedding due to loss of high power transfers;
- Any necessary studies of the interaction between the IIS and the ML with high power transfers beyond those completed as part of the Preliminary Interconnection Studies dated August 2014. These will include studies reflecting the impact on the IIS of having the ML in and out of service for LIL high power transfer contingencies;
- Study regarding additional reactive power requirements for high power transfer;
- Preparation of high power operational procedures and associated system studies;
- Studies to determine possible solutions to the Bay d'Espoir instabilities under a three phase fault condition; and
- Study to determine the benefit of a fourth high inertia synchronous condenser or other technical solution near Soldiers Pond and if required, site studies for cost and schedule.

The above analysis should address the following requested items from the Board's May 3, 2017 letter:

Item #	Description
6	HVdc converter station contractors' studies and copies of any completed study
9	Interaction studies between the IIS and the ML completed since Preliminary Interconnection Studies dated August 2014, including with the ML in and out of service [High Power]
10	Update on study regarding additional reactive power
13	Systems Studies to determine reserve sharing between LIL and IIS generation
17	Update on planning criteria applicable post Muskrat Falls
19	Bay d'Espoir instability studies
20	Underfrequency Load Shedding scheme post Muskrat Falls
21	Operational Studies regarding IIS post Muskrat Falls
24	Studies of the performance of the IIS with the ML in service and with it out of service (and resulting operating guidelines) [High Power]

Further updates will be provided as soon as they are available.

Please advise if you have any questions with respect to the attached.

Yours truly,

NEWFOUNDLAND AND LABRADOR HYDRO

Geoffrey P. Young
Corporate Secretary & General Counsel

GPY/lmb

cc: Gerard Hayes – Newfoundland Power
Paul Coxworthy – Stewart McKelvey Stirling Scales
Roberta Frampton Benefiel – Grand Riverkeeper Labrador
Dennis Browne, Q.C. – Consumer Advocate
Danny Dumaresque

ecc: Denis Fleming- Vale Newfoundland & Labrador Limited
Larry Bartlett – Teck Resources Ltd.

INFORMATION REQUESTED BY THE BOARD – MAY 3, 2017
Status Update - May 26, 2017

Item #	Description	Reference	Status
1	Current integrated transition work plan and schedule	PUB-NLH-501, Liberty Report, page 79, Recommendation IV-6 and page 106, Recommendation VI-1	On or before July 5, 2017.
2	Current organizational structure for transition teams	PUB-NLH-500, Liberty Report, page 107, Recommendation VI-3 and VI-4	**RESPONSE PROVIDED TO THE BOARD, MAY 26, 2017.** **ITEM COMPLETE.**
3	Current schedule for completion of LIL and ML		On or before July 5, 2017.
4	Any change in design of the LIL from that described in Chapters III and IV of the Liberty Report, August 19, 2016 ("Liberty Report")		**RESPONSE PROVIDED TO THE BOARD, MAY 15, 2017.** **ITEM COMPLETE.**
5	Update on service support agreements and copies of any such agreements	Liberty Report, page 27	Update to be provided on or before July 5, 2017.
6	Update on studies for HVdc converter station contractors' studies and copies of any completed study	Liberty Report, page 79, Recommendation IV-2	**HIGH POWER STUDY SCHEDULED FOR 2018.** The scope and timing of this study may be subject to any response by Hydro to this recommendation and the Board's final determination on (i) Liberty's recommendations and (ii) the parties' submissions.

Item #	Description	Reference	Status
7	Update on Emergency Restoration Plans and copies of any draft or final plans	PUB-NLH-503 and Liberty Report, page 107, Recommendation VI-11	**RESPONSE PROVIDED TO THE BOARD, MAY 15, 2017.** An update on timing will be provided on or before July 5, 2017.
8	Update on arrangements for use of LIL and copies of any contracts regarding same	NP-NLH-158	Update to be provided on or before July 5, 2017.
9	Update on interaction studies between the IIS and the ML completed since Preliminary Interconnection Studies dated August 2014, including with the ML in and out of service	Liberty Report, page 34, Recommendations III-3 and PUB-NLH-524	**LOW POWER STUDY SCHEDULED FOR DELIVERY FALL 2017.** **HIGH POWER STUDY SCHEDULED FOR 2018.**
10	Update on study regarding additional reactive power	PUB-NLH-531	**HIGH POWER STUDY SCHEDULED FOR 2018.**
11	Update on Emergency Power / Reserve Sharing arrangements	PUB-NLH-502, PUB-NLH-593 and Liberty Report, page 71 and page 102-103	Update to be provided on or before July 5, 2017.
12	Update on Frequency Controller study for the ML	PUB-NLH-521	**STUDY SCHEDULED FOR DELIVERY FALL 2017.**
13	Systems Studies to determine reserve sharing between LIL and IIS generation	PUB-NLH-564, Liberty Report, page 71	**HIGH POWER STUDY SCHEDULED FOR 2018.**
14	Update on agreements regarding Recall Power supply over LIL, including amounts available for the Labrador Interconnected system and IIS with relevant time frame	PUB-NLH-280	Update to be provided on or before July 5, 2017.

Item #	Description	Reference	Status
15	Update on technical requirements regarding use of Recall Power on the IIS, including addition of synchronous condenser	PUB-NLH-630, Attachment 1	**UPDATE TO BE PROVIDED ON OR BEFORE JULY 5, 2017.**
16	Updated Energy Supply Risk Assessment Post Muskrat Falls	Liberty Report, page 87, Recommendation V-3 and page 112, Recommendation V-3	**RESPONSE PROVIDED TO THE BOARD, MAY 15, 2017.** The scope and timing of this study may be subject to any response by Hydro to this recommendation and the Board's final determination on (i) Liberty's recommendations and (ii) the parties' submissions.
17	Update on planning criteria applicable post Muskrat Falls	PUB-NLH-539 and PUB-NLH 540	Update to be provided on or before July 5, 2017. **CRITERIA WILL BE FURTHER REVIEWED IN 2018.**
18	Update on Power Supply over the ML including status of negotiations with potential suppliers	NP-NLH-160, PUB-NLH-620 and Liberty Report, page 87, Recommendation V-1	Update to be provided on or before July 5, 2017.
19	Bay d'Espoir instabilities studies	PUB-NLH-511, PUB-NLH-564 and Liberty Report, page 79, Recommendation IV-4	**HIGH POWER STUDY SCHEDULED FOR 2018.**
20	Underfrequency Load Shedding scheme post Muskrat Falls	PUB-NLH-527, PUB-NLH-535, PUB-NLH-537 and Liberty Report, page 71	**HIGH POWER STUDY SCHEDULED FOR 2018.**
21	Operational Studies regarding IIS post Muskrat Falls	PUB-NLH-445, PUB-NLH-486 and PUB-NLH-563	**HIGH POWER STUDY SCHEDULED FOR 2018.**

Item #	Description	Reference	Status
22	Update on multi-year reliability compliance program and Provincial Reliability Framework	Liberty Report, Recommendations VI-15, page 106	Update to be provided on or before July 5, 2017. The nature of the information provided may be subject to any response by Hydro to this recommendation and the Board's final determination on (i) Liberty's recommendations and (ii) the parties' submissions.
23	Status of plan for compliance with NERC	Liberty Report, page 101-102 and Recommendation VI-14, page 106	Status update to be provided on or before July 5, 2017. The nature of the information provided may be subject to any response by Hydro to this recommendation and the Board's final determination on (i) Liberty's recommendations and (ii) the parties' submissions.
24	Operating Guidelines for operation of IIS with LIL and with the ML in service and the ML out of service		**LOW POWER STUDY/GUIDELINES SCHEDULED FOR DELIVERY FALL 2017.** **HIGH POWER STUDY/GUIDELINES SCHEDULED FOR 2018.**

POWER SUPPLY EXECUTIVE (AS OF MAY 2017)

Executive Vice President, Power Supply. John MacIsaac was appointed Executive Vice President, Power Supply in June 2016, where he is responsible for all transmission elements of the Muskrat Falls Project including the Labrador Transmission Assets, the Strait of Belle Isle marine cable crossing and the Labrador-Island Transmission Link from Muskrat Falls to Soldiers Pond as well as the project's future integration into the Hydro system. John is also the executive lead for Churchill Falls operations.

Vice President, Transition to Operations. The Vice President, Transition to Operations (Rob Henderson) is responsible for the implementation of Nalcor's long-term model for electricity operations following the in-service of Muskrat Falls and the integration of Muskrat Falls, the Maritime Link, and the Labrador-Island Transmission Link into the Newfoundland and Labrador electrical system and the North American electricity grid.

Vice President, Transmission and Town Services. This position provides leadership regarding the operations and maintenance of existing and installed transmission assets plus the integration of new assets including Labrador Transmission Assets, the Strait of Belle Isle crossing and the Labrador-Island Link. In addition, the Vice President provides leadership to personnel and manages the operation of all facilities, services and activities in support of the town of Churchill Falls.

Vice President, Production. This position provides strategic and operational leadership regarding the adequate supply of energy from Churchill Falls, Muskrat Falls and Menihek generation facilities to customers in a safe, reliable and least cost manner.

Vice President, Engineering Services. This position leads provides ongoing functional leadership and direction across all areas of Power Supply with a focus on ensuring best practice processes and standards in the areas of asset management, project design, and project management. The Vice President also leads the development, design and execution of selected multi-disciplined complex capital projects as required.

Vice President, Finance. This position provides strategic leadership in the achievement of Power Supply financial goals and objectives. This includes accountability for all aspects of financial accounting and reporting, strategic planning, risk management, treasury, commercial, financial planning and internal control areas for Power Supply. The Vice President, Finance also has responsibility for all corporate financing for Nalcor.

Project Director for the LCP Transmission Project. This position reports directly to the Executive Vice President of Power Supply.

CURRENT ORGANIZATIONAL STRUCTURE FOR TRANSITION TEAMS

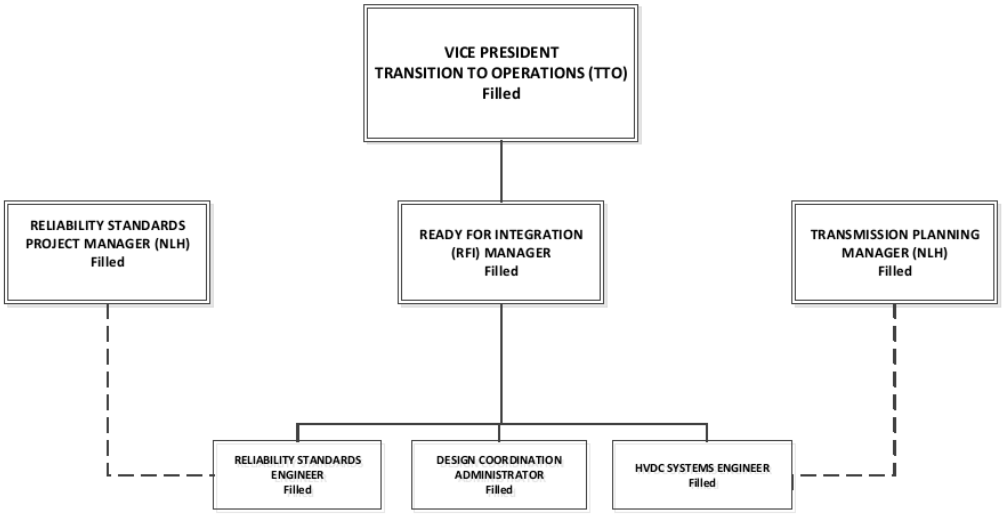
TTO Steering Committee Membership

The current membership of the TTO Steering Committee is as follows:

Gordon McIntosh	DM	Department of Natural Resources	GNL
Derrick Sturge	VP	Finance and CFO	Nalcor
Chris Kieley	VP	Strategic Planning & Business Development	Nalcor
Jim Keating	VP	Project Execution and Technical Services & CF(L)Co	Nalcor
Michael Roberts	VP	HR and Organizational Effectiveness	Nalcor
Rob Hull	GM	Commercial Management and Integration	Nalcor
Deanne Fisher	Manager	Corporate Communications	Nalcor
Jan-Peter De Souza	Program Manager	TTO	Nalcor
Jim Haynes	President	NL Hydro	NL Hydro
Dawn Dalley	VP	Regulatory Affairs and Customer Service	NL Hydro
Josh DeCoste	Manager	Interconnection & Integration	NL Hydro
Ron LeBlanc	VP	Transmission Ops	NL Hydro
Paul Harrington	Project Director	Lower Churchill Project	Power Development
Gilbert Bennett	VP	Lower Churchill Project	Power Development
Rob Henderson	VP	TTO - Chair	Power Supply
John MacIsaac	EVP	Power Supply	Power Supply
Walter Parsons	VP	Transmission & Town Services	Power Supply

Changes to RFI Team Structure

The current RFI Team Structure organization is shown below:



Changes in the RFI team structure occurred in late 2016 and early 2017. These changes consisted of the following:

- The RFI Team Manager transitioned back to a role within Hydro Transmission Planning;
- The RFI Systems Integration Lead left the company;
- A new TTO Program Manager was engaged to support TTO activities and manage the RFI scope;
- The RFI work scope was merged with Hydro's Transmission Planning team's work plan with additional resources provided to that team; and
- An external consulting firm specializing in integration studies for HVdc systems was engaged to complete system studies required for energization and operations.

Changes in RFI Scope and Work Plan

In January 2017, the RFI scope, work plan and capacity to deliver were re-evaluated. This included:

- A review of deliverables, priorities, dependencies, associated work efforts, completion status and resource assignments;
- An evaluation of the LCP transmission project schedule for 2017 for its impacts to RFI schedules, deliverables and priorities;
- An evaluation of Hydro System Operations expectations for RFI delivery; and
- An evaluation of RFI risks and mitigation requirements.

This assessment identified several areas where additional supports could be pursued to enhance successful delivery.

RFI Staffing Adequacy Improvements

An evaluation of RFI staffing to meet objectives was held in early 2017. It was determined that the team did not have the capacity to deliver some of its existing work program. Mitigation activities were put in place, leveraging contract resources and team replacements to achieve 2017 objectives.

- **Studies**: With team changes and the transmission schedule update, it was determined that RFI did not have the capacity to deliver system study requirements (planned reports and unplanned supports). Additionally, limited options existed for the recruitment of systems engineers either with or without the desired technical context to hit the ground running.
- **Mitigation**: Capacity was mitigated with the extension of a contract with a consulting firm specializing in HVdc integration studies. The consultant had the expertise and historical technical context to accelerate the delivery of studies. The consultant was also engaged in related activities for the LCP project team responsible for the HVdc system and had capacity to undertake additional work. The consultant's scope includes completion of key operational studies including grid energization and restoration studies, all in support of the development of operating procedures for system operators.
- **HVdc Controls Factory Acceptance Testing ("FAT")**: HVdc FAT witnessing was deemed as a valuable exercise that would be undertaken by Hydro Transmission Planning engineers pending their availability.
- **Reliability Standards Implementation**: This work was not resource constrained as the bulk of the work was planned to be completed by an external consultant with expertise in implementation of NERC standards and procedure development. Resources with Hydro and the RFI team are deemed to be sufficient to complete the 2017 planned reliability standards implementation.
- **RFI Governance**: Team management, system operator communications and overall reporting were lacking.
- **Mitigation**: These tasks were assumed by the TTO Program Manager. Weekly team meetings were established to review progress against 2017 quarterly objectives and the weekly/monthly work plan. Weekly meetings were established with Hydro system operations and monthly progress reports were refined.

Building the Production Organization ("BTPO") Staffing Adequacy Improvements

- A TTO Program Manager was engaged in January 2017 to support TTO activities.
- Acceleration of BTPO team hires was identified as a key priority for resolution. The following mitigation actions were taken:
    - Resource plans and BTPO scope requirements were reviewed;
    - The decision gate for O&M staffing and BTPO team hires was decoupled into two decisions allowing BTPO requirements to be pursued as a Phase I requirement and O&M as later phases pending completion of collective bargaining;
    - A re-scoping exercise was conducted for BTPO requirements based on completion plan of the transmission system systems, the critical priorities for 2017 delivery and the team needed to achieve it; and
    - A strategy and enablement plan was developed, defining the strategy for each work scope element through 2017, the resource hires required and how the resources would eventually dovetail into the Hydro and Power Supply organizations over time. Considerations were also given to how existing project

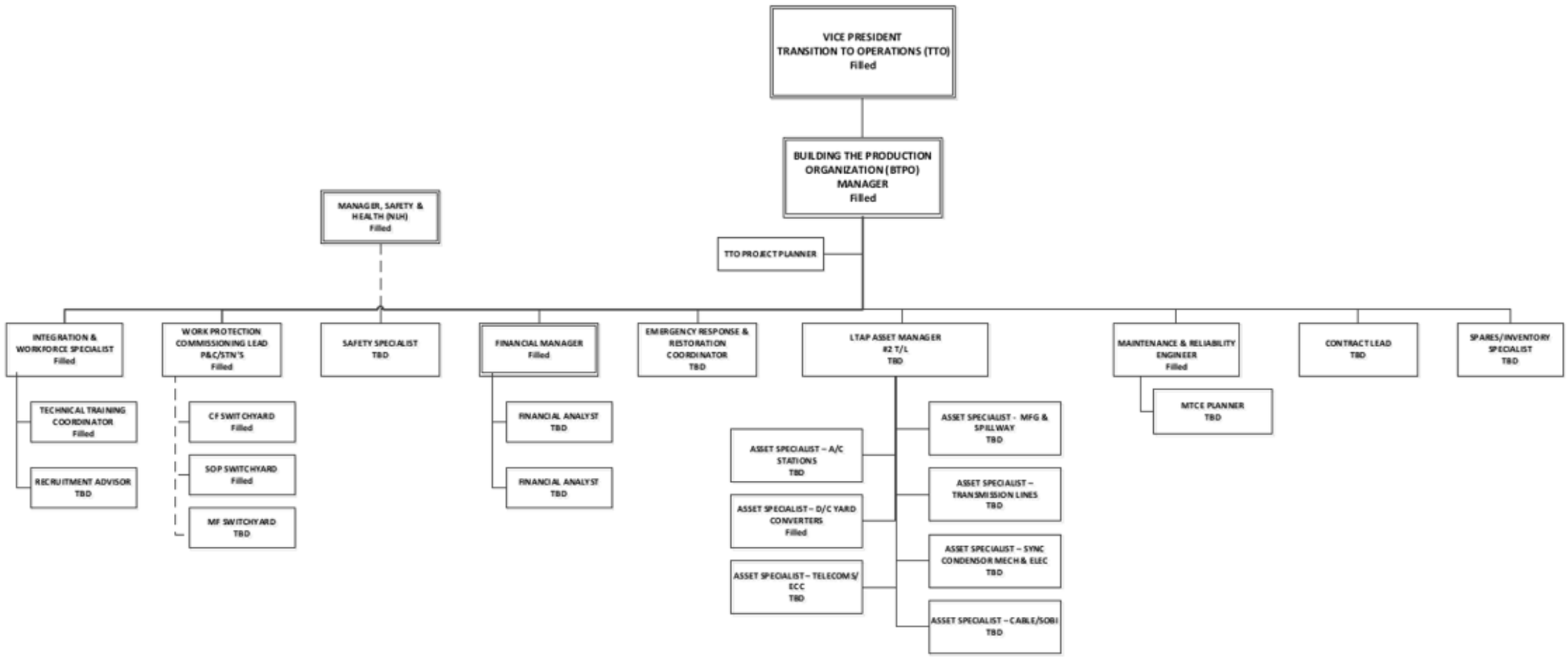
resources could be leveraged and the best use of contract positions versus full time roles.

- The plan was presented and reviewed with executive decision makers, human resources and associated stakeholders.
- **Outcome:**
    - BTPO team staffing was approved in March 2017.
    - The following requisitions were subsequently released and posted for candidate submissions:
        - 1 x Recruiting Lead;
        - 1 x Training Coordinator;
        - 1 x Emergency Response Coordinator;
        - 1 x Safety Lead;
        - 2 x Financial Analysts;
        - 3 x Asset Specialists;
        - 1 x Contract Lead; and
        - 1 x Inventory/Spares Specialist.
    - One additional asset specialist joined BTPO from the project team.
- As of May 15, 2017, all employment positions had been closed to candidate submissions, one position had been filled and screening and interviewing for remaining positions was ongoing. The current organizational chart is included on the following page.

Lower Churchill Project

Chart LCP18: Building the Production Organization (BTPO) Team

As per version B11 issued through Aconex on 17 May 2017.



Maine & Atlantic Technical Planning Committee

NBP/NLH/NSPI Reserve Study Working Group

Summary of Maritime Link Transfer Capability

1.0 Introduction

The Maine & Atlantic area consists of the Nova Scotia Balancing Area (NSPI and ENL), the New Brunswick Balancing Area (New Brunswick, Prince Edward Island and parts of Northern Maine) as well as the Newfoundland and Labrador control area.

Transmission service providers within the Maine & Atlantic area are:

- New Brunswick Power (NBP)
- Newfoundland and Labrador Hydro (NLH)
- Nova Scotia Power Inc. (NSPI)
- Northern Maine Independent System Administrator (NMISA) which includes Emera Maine Northern Operating Region (EMNOR) and Eastern Maine Electric Cooperative (EMEC), and
- Maritime Electric Company Limited (MECL)
- Emera Newfoundland and Labrador (ENL).

The function of the Maine & Atlantic Technical Planning Committee ('MATPC' or the 'Committee') is to review intra-area transmission and generation plans with regards to transmission reliability and impacts on the MATPC interconnected system.

The Committee may recommend joint studies. At the request of NBP, NLH and NSPI an Atlantic Area System Study working group was formed to investigate the transfer capability of Atlantic Area ties under a variety of system conditions. NBP, NLH and NSPI committed resources for the PSSE Load flow and Stability analysis. At the request of NLH, this document is made available to provide a brief summary of results for the transfers between Newfoundland and the Eastern Interconnection

2.0 Assumptions

The year chosen for the study was 2019, which includes the planned Maritime Link project and all associated system upgrades.

In 2019, the Nova Scotia and New Brunswick power systems are expected to be interconnected via one 345 kV line (L-3025/8001) and two 138 kV lines (L-1159/6535 and L-160/6536). On the NS side of the NB tie, 138kV lines L-6535 and L-6536 come together at the 74N-Springhill substation which is connected to the rest of Nova Scotia system via the 138 kV line L-6613. Effectively, the Nova Scotia system is therefore connected to the New Brunswick system via two lines; L-3025/8001 and L-6613.

The Nova Scotia power system is planned to connect to Newfoundland's Interconnected Transmission System via the Maritime Link (ML). The Maritime Link (ML) is a bi-

directional bipolar Voltage-Source Converter High Voltage Direct Current interconnection between the island of Newfoundland and Nova Scotia (NS).

The study cases include the following existing and planned generation and transmission changes in each province up to 2019:

NB:

- New Keswick 345/138 kV tie transformer
- Memramcook L1143 re-terminated at Cape Tormentine cable 1 (was Murray Corner)
- L1244 - New 138 kV line from Memramcook to Cape Tormentine cable 2

PEI:

- Two new 138kV, 200MVA cables between Cape Tormentine, NB and Borden.

NS:

- Maritime Link: The nominal rating of the converter is 500 MW, but with cable and inverter losses, the delivered power at the 101S-Woodbine terminal is expected to be approximately 475 MW. The ML is configured as two asymmetrical monopoles, of 250 MW (net 237.5 MW) each.
- 67N–Onslow Node Swap: Termination nodes for L-8001 (Memramcook–NB L-3025) and L-8003 (79N-Hopewell) swapped.
- L-6513 Upgrade (line now limited by 287MVA breaker rating).
- L-8004/L-7005 Separation: L-8004 and L-7005 separated from the same double circuit tower at the Strait Crossing.
- L-6511 thermal upgrades: New line ratings of Summer A/B – 142/156 MVA, Winter A/B – 186/204.6 MVA.
- L-7019 Thermal Upgrades: New line ratings are Summer A/B – 274/301 MVA, Winter A/B – 338/371.8 MVA
- Upgrade 101S-Woodbine Substation: L-7011 and L-7012 diverted into Woodbine, and second 556 MVA transformer added. ML Infrastructure added.
- Addition of 50MVAR Capacitor Bank at 103H-Lakeside to 138kV Bus B62
- Addition of 50MVAR Capacitor Bank at 90H-Sackville to 138kV Bus B2

NLH:

- Labrador Island Link (LIL) and associated DC transmission facilities and converter stations
    - Soldiers Pond Converter Station (SOPCS)
    - Soldiers Pond Terminal Station (SOPTS)
    - Soldiers Pond Synchronous Condenser Facility (SOPSC)
        - 3 High Inertia Synchronous Condensers
    - Muskrat Falls Converter Station (MFACS)
    - Muskrat Falls Terminal Station (MFATS)

- Churchill Falls Switchyard 735 kV Extension (CHFTS2)
- Labrador Transmission Assets (LTA)
    - 2x315 kVac Transmission Lines Between CHFTS2 and MFATS2

- Maritime Link and associated DC transmission facilities and converter stations

- 230 kV Transmission Line TL267 Between Bay d'Espoir (BDETS) and Western Avalon Terminal Stations (WAVTS)

- 230 kV Transmission Line TL269 Between Bottom Brook (BBKTS) and Granite Canal (GCLTS)

3.0 Technical Model

The base case models originated from the NERC Multi-Regional Modeling Working Group (MMWG). The load flow and dynamic base cases are based on the 2012 series updated to 2019 for NB and NS, truncated to the NPCC footprint, with the NL system added. Base case models are provided for winter peak, summer peak, and light load conditions.

The transfer levels for each of the base cases studied are shown in Tables 1-3.

Winter Peak Cases
Six winter peak cases were developed, in three sets of two as shown in Table 1. Each of the three sets included one case having a NB dispatch pattern that maximized generation and HQ imports in Northern NB, and a second case that maximized generation in Southern NB.

Study cases included scenarios with the Maritime Link in operation at its rated capacity of 500 MW at Bottom Brook. 475 MW is received at Woodbine in these cases.

In the reverse direction, scenarios were developed with 325 MW being transferred from Woodbine, with 310 MW received at Bottom Brook. The limit of 325 MW at Woodbine was set in accordance with the maximum loss of load limit for the Maritime Area in place

at the time of study. This limit reflected the maximum block of load that could be shed in the area while adhering to system interchange limits with New England.

Table 1: Winter Peak Base Case Models							
Reserve study #	**System Condition**	**LAB/NL**	**NL/NS @101S**	**NB/PEI**	**NB/HQ**	**NB, constrained**	**Wind**
9010	Winter Peak	900/830	350/325	80 (200)	-1040	Max in North	conservative, sens. analysis
9011	Winter Peak	900/830	350/325	80 (200)	-560	Max in South	conservative, sens. analysis
9012	Winter Peak	900/830	500/475	80 (200)	-1040	Max in North	conservative, sens. analysis
9013	Winter Peak	900/830	500/475	80 (200)	-560	Max in South	conservative, sens. analysis
9040	Winter Peak	0	-310/-325	80 (200)	-1040	Max in North	conservative, sens. analysis
9041	Winter Peak	0	-310/-325	80 (200)	-560	Max in South	conservative, sens. analysis

Summer Peak Cases

Four summer peak cases were developed, in two sets of two as shown in Table 2. Each set included one case having a NB dispatch pattern that maximized generation and HQ imports in Northern NB, and a second case that maximized generation in Southern NB.

Study cases included scenarios with the Maritime Link in operation at its rated capacity of 500 MW delivered from Bottom Brook. 475 MW is received at Woodbine in these cases.

In the reverse direction, scenarios were developed with 210 MW being transferred at Woodbine, with 200 MW received at Bottom Brook. ML transfer limits were coordinated with hydraulic dispatches within the Newfoundland system to meet summer loading conditions.

Table 2: Summer Peak Base Case Models							
Reserve study #	**System Condition**	**LAB/NL**	**NL/NS @101S**	**NB/PEI**	**NB/HQ**	**NB, constrained**	**Wind**
9060	Summer Peak	900/830	500/475	80 (200)	-910	Max in North	conservative, sens. analysis
9061	Summer Peak	900/830	500/475	80 (200)	-750	Max in South	conservative, sens. analysis
9062	Summer Peak	0	-200/-210	80 (200)	-910	Max in North	conservative, sens. analysis
9063	Summer Peak	0	-200/-210	80 (200)	-750	Max in South	conservative, sens. analysis

Summer Light Load Case
The Light load case 9070 is shown in Table 3 and was developed to determine the impact of a high wind, light load scenario. For this case, LIL imports were fixed at 110 MW, with NS ML imports fixed at 100MW.

Table 3: Summer Light Load Base Case Model

Reserve study #	System Condition	LAB/NL	NL/NS @101S	NB/PEI	NB/HQ	NB, constrained	Wind
9070	Summer LL	110/110	103/100	-100	500	-	High Wind

4.0 Study Results – Maritime Link Transfer Limits

The results of the analysis indicated that the specified transfers over the Maritime Link in the study cases did not result in unacceptable operating conditions in load flow or dynamic simulations. The interchange values that were studied may therefore be applied as acceptable transfer limits as per the following:

Maritime Link Maximum Transfer Limits

- Newfoundland to Nova Scotia: 500 MW
- Nova Scotia to Newfoundland: 325 MW, based on Loss of Load Criteria at the time of study

Power transfers from Newfoundland to Nova Scotia can be performed up to the full rating of the Maritime Link. Power transfers from Nova Scotia to Newfoundland are restricted by the maximum loss of load limit for the Maritime Area.

The analysis also indicated that at a minimum, 200 MW can be delivered to Newfoundland during Summer Peak loading conditions and summer months and 100 MW can be delivered to Nova Scotia during Summer Light loading conditions. Power flows in these cases were restricted as a result of dispatch limitations for the specified operating conditions. The detailed specification of transfer limits based on system conditions shall be performed by system operators in Newfoundland and Nova Scotia as part of operational studies.