

NLH 2013 Amended General Rate Application

Information - #6

Filed: Sept. 16, 2015 Board Secretary: [Signature]

APPENDIX B

TL 267 PROJECT – 230 kV Transmission

Bay d'Espoir to Western Avalon

Report

SUMMARY

The Board of Commissioners of Public Utilities (the Board) approved the Newfoundland and Labrador Hydro Upgrade of Transmission Line Corridor (the Project) on December 12, 2014, with a total capital expenditure of approximately \$291M and an in-service date of May 1, 2018. The project includes two terminal station expansions and 188 km of 230 kV transmission line.

Engineering for both the transmission line and terminal stations has commenced and is on schedule to feed the procurement and construction efforts. The environmental assessment process is also on schedule, with the project submitted for registration on July 16, 2015. Procurement plans are on track, with the bulk of the equipment purchases to occur in 2015 and 2016. Construction is scheduled for 2016 to 2018, and all activities to support the required start dates are in progress as planned.

Cost expenditure is tracking as expected and planned, with much of the cost to occur in the 2016 to 2018 years. The re-baselined schedule has been developed based on the new start date and is being used for tracking and control purposes.

Overall, the project is on target for successful completion, on time and within budget.

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1 INTRODUCTION

The Board approved the Project on December 12, 2014. The Project, now known as TL 267, involves design and construction of 188 km of 230 kV steel tower transmission line, as well as station expansions at Bay d'Espoir and Western Avalon at Chapel Arm. The approved capital expenditure is \$291,658,000. As directed by the PUB as part of the release of the Project, an annual report shall be filed with each capital budget application until completion of the Project. The Project will continue until commissioning on or before May 1, 2018.

2 PROJECT DESCRIPTION

On April 30, 2014, Hydro filed an application for approval to construct a 230 kV transmission line between Bay d’Espoir (BDE) Hydroelectric Generation Station and Western Avalon Terminal Station (WAV) at Chapel Arm, including upgrades at both stations to accommodate the new infrastructure. The Project was justified based on maintaining system reliability and meeting the long-term power requirements of the Island Interconnected system. It will provide additional capacity, enhance resiliency to system faults and relieve congestion on the existing transmission system. Based on the information supplied by Hydro as part of the Project review process, the PUB released Board Order P.U. 53(2014) on December 12, 2014 approving the Project as described. Given the synergies between the execution of the TL 267 Project and the Lower Churchill Project, the Lower Churchill Management Corporation will provide all project management, engineering and construction management services for this Project.

The Project is comprised of three distinct projects, and two sub projects. The three distinct projects are:

- 1) the addition of portions of a third breaker and one half station diameter (a row of breakers between two common busses - see photo – “Bay d’Espoir Terminal Station 2”) including 2 circuit breakers, 4 disconnect switches and associated electrical and protection and control equipment in Bay d’Espoir Terminal Station 2 (BDE-TS2) using traditional Air Insulated Switchgear (AIS),
- 2) the addition of gas insulated switchgear (GIS) ring bus in WAV at Chapel Arm , and
- 3) a new 230 kV transmission line 188 km in length linking the two stations.

The two sub-projects are:

1. modifications to BDE-TS2 to allow for independent isolation of TL 206, converting the existing ring bus to a breaker and one half scheme, and
2. modifications to WAV to connect TL 208, which currently services the VALE site, to the new station expansion.

Given limited outage opportunities, the two sub-projects will be executed after TL 267 goes in service, and as outage coordination and limitations permit.

3 ENGINEERING

The Project, including all station modifications and line designs, will utilize all of the latest industry standards and practices and design criteria currently in use by Hydro. Modifications to the stations will include the latest electrical and protection and control equipment that is currently maintained in the system and form the basis of new designs going forward.

Transmission line design will utilize Hydro's operational experience and design criteria applicable along the existing corridor to ensure a reliable addition to the Island Interconnected grid. Two icing zones have been identified for the transmission line: between Bay d'Espoir and Pipers Hole Park with 50 mm radial glaze and between Pipers Hole Park and WAV with 75 mm radial glaze.

The engineering for TL 267 involves the creation of a new tower family capable of structurally maintaining reliable service with the inclusion of shield wire for lightning outage protection. This new tower family includes two new suspension towers, modelled along the same design fundamentals of the 315 kV lines for the Lower Churchill Project. These towers follow the guyed-Y configuration (see Section 9) with the A-Type tower capable of 0° to 1° line angles, and a B-Type tower designed for angles of 0° to 6°. Two new strain towers are required, with a self-supported C-Type tower capable of angles from 0° to 30°, and a full-tension deadend D-Type tower for 0° to 45°. The D-Type tower is capable of anti-cascade failure containment within the range of angles of the tower. The existing Hydro NDD-Type tower, designed for the Avalon Upgrade in the early 2000s, has been verified as adequate for this application and will be utilized for angles between 45° and 90°. Shield wires, including one standard overhead ground wire and one optical ground wire which includes optical fibres for the communication system, will be utilized along the entire length.

Design for the new tower family commenced in January 2015, and foundation design began in May 2015 once tower loads and reaction forces were finalized. All towers are being fully designed in-house, including all necessary documentation for eventual detailing of the tower connection plates, prototype assembly of all towers, full-scale tower testing of the A-type and

D-type towers, as well as mass production by the tower manufacturer. To date, and as planned, all tower designs are 100% complete to the level required for the tender package. Tower foundations are also 100% complete to the level required for the tender package. Tower foundations will be manufactured by the same tower manufacturer awarded the contract following the Public Tender process.

The first step in line design is assessing and selecting a preliminary line route. This route is preliminary given that the environmental assessment process (discussed in Section 4) has not yet been completed. Preliminary line design, which has been completed as planned, quantifies the number, types and heights of the required towers for the entire line using "stick models". Stick models are representative towers used in the design software and are based on the "as-designed" capacity. Final line design requires the use of the final tower model capacities after detailing by the manufacturer, and will be completed in 2016. The preliminary line design allows for quantification of the towers and hardware for tendering purposes, allowing for accurate bid quantities and initial ordering of the first material deliveries.

Station design involves a significant amount of detailed engineering prior to tendering, given that both station modifications are in existing terminal stations, and it is more efficient to provide the design details to the potential bidders.

For the BDE-TS2, the original station design included space for an additional electrical breaker and one half diameter, and therefore expansion outside the existing station footprint is not required. The new station diameter will include standard AIS using modern circuit breakers and associated equipment and infrastructure. Support equipment, including take-off structures for the overhead lines, will be similar to the existing infrastructure. New protection and control panels will be required in the existing control building, as well as associated station modifications to run the control wiring. Connection to the SCADA system for communication with the Energy Control Centre is also required.

The WAV station involves a new GIS module given the lack of easily usable space around the station, and the cost of developing new land in the area. An investigation confirming the requirement for GIS was completed and verified that GIS is the most economical solution for WAV. Hydro currently has a GIS at the Cat Arm Generating Station which has operated reliably for the past 30 years, and GIS solutions are common in areas when the footprint is limited.

Engineering commenced for WAV and BSE-TS2 with site visits completed in May, 2015. Quantification of the complete work scope and the collection of existing documentation have also begun. BSE-TS2 will involve tendering for the major components including circuit breakers, disconnect switches and associated equipment. A second tender will include all protection and control equipment. Engineering has commenced on detailing the technical specification for the station equipment, both electrical and protection and control.

WAV will be executed as an Engineer Procure and Construct (EPC) contract. Therefore, a detailed technical specification and scope of work are under development as planned, but are only at a preliminary level to date.

4 ENVIRONMENTAL ASSESSMENT

Given the size and nature of the Project, registration for environmental assessment (EA) under the Environmental Protection Act is required. Environmental assessment is an evaluation of a project's potential environmental risks and effects before it is carried out. EA also identifies ways to improve project design and implementation to prevent, minimize, mitigate, or compensate for adverse environmental effects and to enhance positive effects. The EA Registration Document for this project is an enhanced registration document, which includes baseline studies for key environmental components such as caribou, avifauna, historic resources, rare plants, and an assessment of the effects of the Project on these components.

Consultation is a cornerstone of the EA process. Hydro consulted with key stakeholders, and held open house sessions in June, 2015, in select communities including, Bay d'Espoir, Come By Chance and Chapel Arm to inform stakeholders about the new line and to have meaningful discussions and identify concerns.

The Project was submitted for registration as an undertaking under Part 10 of the provincial *Environmental Protection Act* on July 16, 2015. Following a public review period, the Minister of Environment and Conservation has 45 days from registration to notify the proponent of release, or that an environmental preview report or environmental impact statement is required. However, the preferred and primary routing through the Bay Du Nord Wilderness Reserve (BDNWR) will delay the decision by the Minister until the process described in the following paragraph is completed.

The primary route for TL 267 is parallel and adjacent to existing transmission lines along the entire 188 km to minimize the environmental impact. As part of the EA, alternative routes will be considered and assessed. The primary route is located within the BDNWR for 13 km. The reserve was established as a Wilderness Reserve under the Newfoundland and Labrador Wilderness and Ecological Reserve Act in 1990. Although it contains two existing transmission lines constructed in the mid-1960s, the Wilderness Reserve Regulations do not allow for the

construction of a new transmission line through the BDNWR. Provisions in the Act outline the process to allow for the Lieutenant-Governor in Council to reduce the size of the reserve. In order to allow for line construction through the BDNWR, the proposed right of way, 40 m wide and 13 km long, would have to be removed from the BDNWR. The process required for this removal was initiated in May 2015, and is currently ongoing. A decision regarding the BDNWR is expected in 7 to 8 months, and will be run concurrently with the EA process. Final release will occur when both processes are complete.

No construction can proceed prior to release by the Minister of Environment and Conservation from the EA process. All required environmental activity is on schedule as planned.

5. PROCUREMENT

Procurement activities reflect the early stage of the Project. Therefore, the contracting strategy is subject to change during execution. The pre-qualification for tower manufacturers has been issued as planned. Results of this pre-qualification effort will be used for the tower and foundation tender, which is on the critical path for the Project. Next steps include tenders to be issued for tower hardware, steel wire, insulators, conductor, electrical and protection and control equipment for BDE-TS2. Tenders will also be issued for the EPC contract for the WAV GIS module, construction for the BDE-TS2 modifications, clearing and access for the transmission line, and construction of the transmission line. A high level schedule for this activity is shown in Appendix A.

6. CONSTRUCTION

Given the early stage of the Project, and the status of the EA process, construction has not commenced; however, this is as planned, with clearing scheduled to start in March 2016. An assessment of the constructability has been completed, including a flyover of the preliminary line route. An access assessment has also been completed. The access assessment is important given that 90 km of the line is accessible from each end only via existing access trails constructed for parallel lines (e.g., TL 202, TL 206). The constructability assessment indicated that there are no significant issues that will restrict line construction, despite the limited access to the central section of the transmission line.

7. COST

A significant portion of the expenditure for this Project will occur in 2016 and 2017. The first 7 months covered by this first annual report primarily includes EA, engineering and planning expenditures and the rate of spend across the project duration will increase as construction commences.

As part of the project execution, a re-baseline of the cash flow was completed based on the actual start date of the project, post Board approval, and based on the execution model detailed previously. This re-baseline will include expenditures of \$4.4M (2015), \$75.3M (2016) \$123.7M (2017) and \$88.2M (2018). Approximately \$500,000 has been expended during the first seven months of 2015 on transmission and station engineering, environmental work and project management. This is in line with the planned Project start-up. Significant equipment expenditure will be realized prior to the next update in August 2016, when most of the results of the tender packages for line and station equipment will be available. A more detailed report will be presented at that time. The July 2016 Annual Report for this Project will also include the clearing contract cost as it will have been awarded and partially executed.

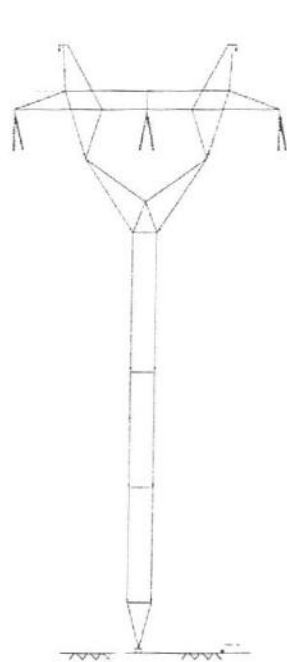
8. SCHEDULE

The updated milestone schedule is in Appendix A.

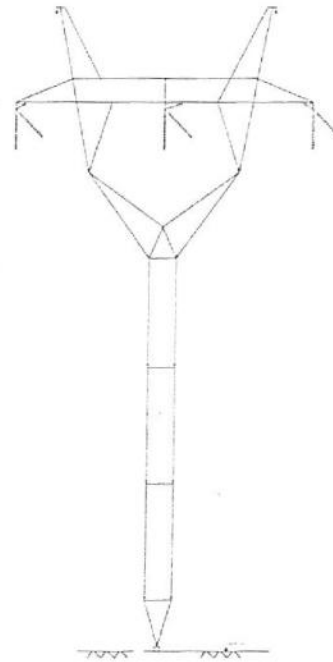
This schedule is currently being used to track progress, and is based on an environmental assessment (EA) release by the Minister in December 2015 to allow for clearing activities to start in March 2016. The Project was submitted for registration for EA on July 16, 2015, and the process to remove the Right of Way from the BDNWR was initiated in May 2015. Overall, at this early point of execution, transmission engineering is on schedule with tower and foundation designs and preliminary line design completed. The tower and foundation tender package is ready to be distributed to the successful pre-qualified bidders. Station engineering, although early in the process, is progressing as planned.

Based on the start date of January 1, 2015, and the in-service date of May 1, 2018, the project is on schedule and there are no schedule challenges identified to date. Environmental assessment approval is currently on schedule; however, delay in release from EA is a known risk for all projects requiring EA approval and is largely outside the control of Hydro. Although not anticipated, this can influence the construction start time.

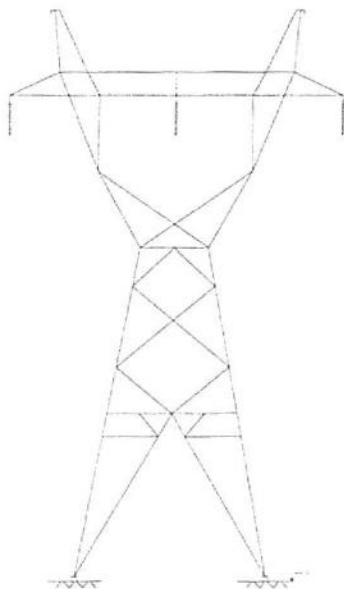
9. DRAWINGS AND PHOTOS



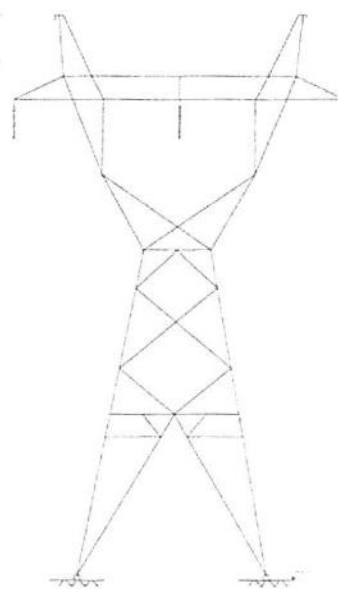
Tower Type A



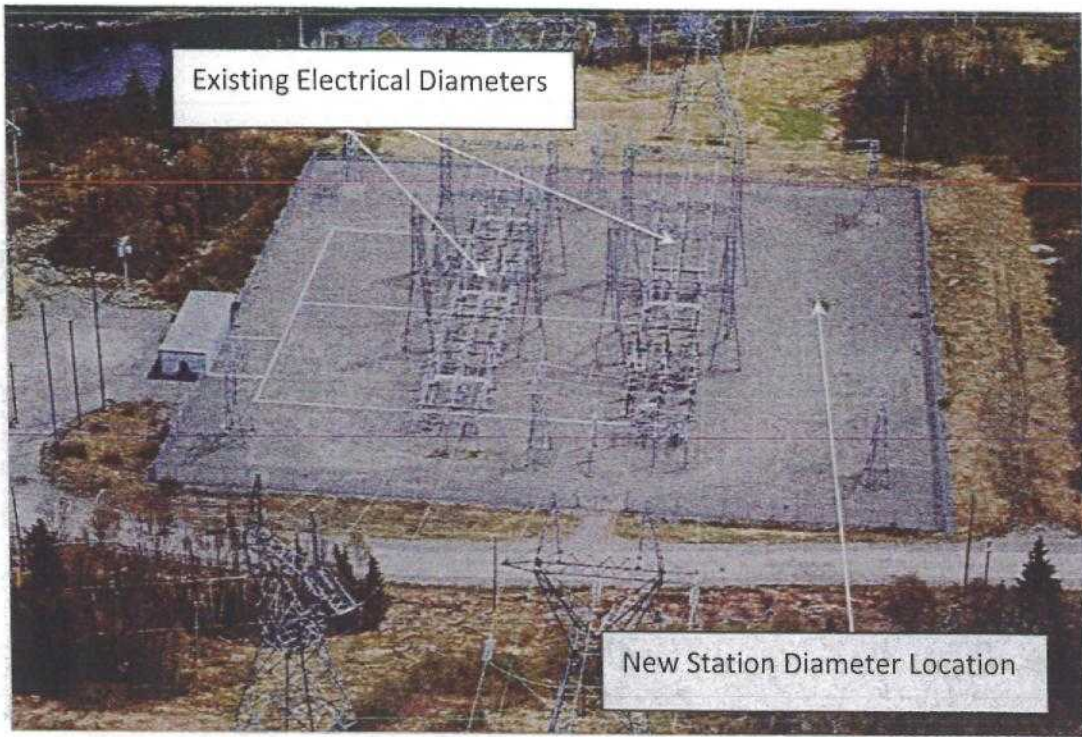
Tower Type B



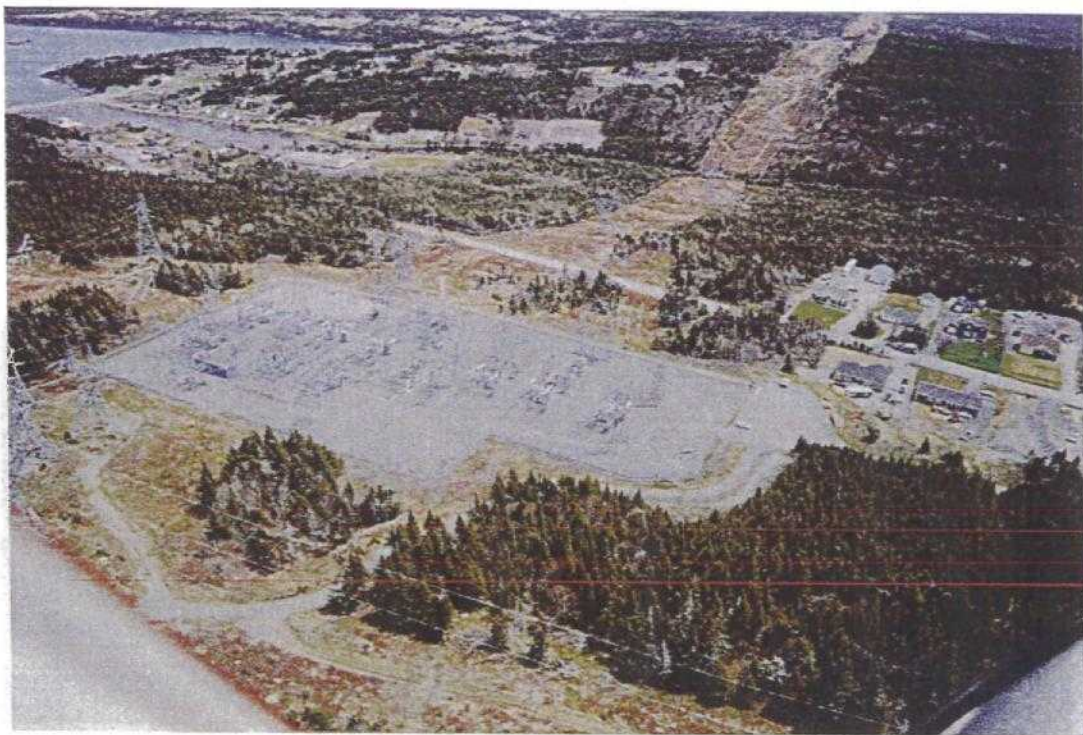
Tower Type C



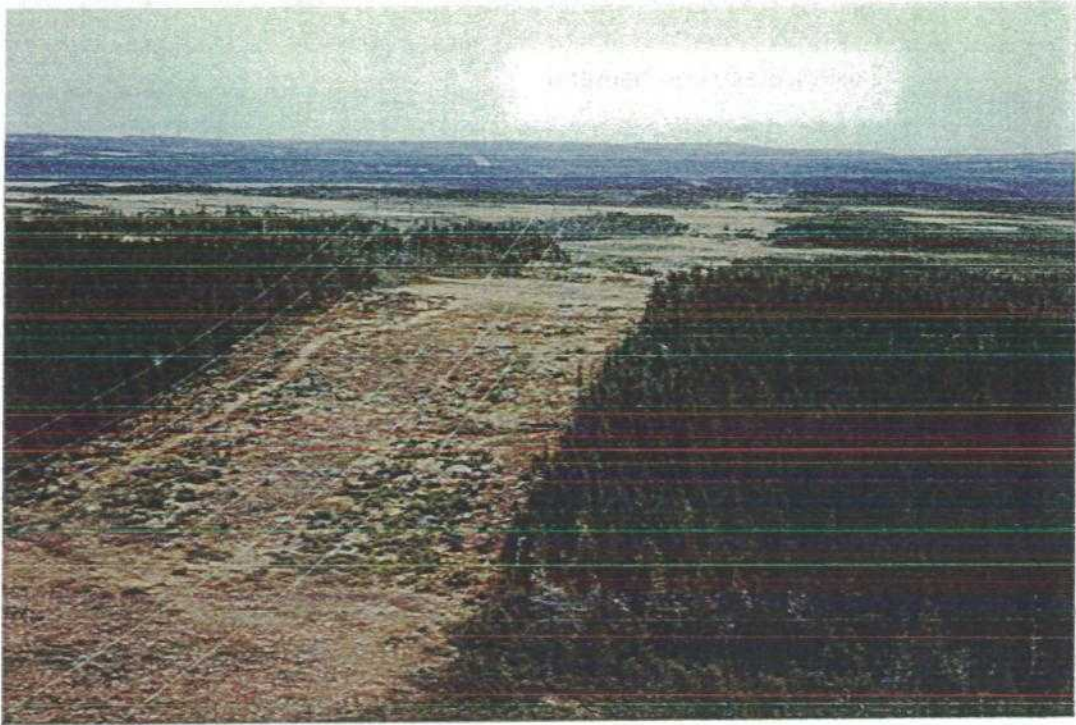
Tower Type D



Bay d'Espoir Terminal Station 2



Western Avalon Terminal Station



Typical TL 202/TL 206 right of way near BDE; TL 267 will be on the right



Typical TL 202/TL 206 right of way near BDE; TL 267 will be on the right



TL 202/TL 206 right of way with existing Hydro access bridge within the Bay Du Nord Wilderness Reserve



Typical TL 202/TL 206 right of way in limited available access zone west of Pipers Hole Park



Typical TL 203/TL 237 right of way on the Avalon Peninsula; TL 267 will be on the right

APPENDIX A

