Questions and Answers

Construction Activities for the Muskrat Falls Project

Topic: General Inquiries

November 2013

Q1. Is there a plan to have ships use the dock at Happy Valley throughout the winter? If so what accommodation are in place for ski-doo users and if not when will the last ship be in?

A1. Nalcor does not have any plans to ship material for the Muskrat Falls Project via the port of Happy Valley-Goose Bay during the winter. We will be transporting materials via truck from Quebec and Ontario over the winter season.

Q2. With the clearing of land for the project and the cutting of thousands of trees, as a concerned citizen, I'm wondering what happens to all of these trees once they're cut? Are they just left to rot? If so, that is a huge, huge waste.

A2. Currently the majority of wood cut in central Labrador for the Muskrat Falls Project is made available to the public and this is advertised for people to come and take it when it is ready and safe to do so. In addition, the Department of Natural Resources had issued public expressions of interest requesting businesses to put in proposals to provide a plan for the commercial use of the wood. Two proposals are still being evaluated. The Department of Natural Resources hopes that a company with a viable option on how to manage the wood available in central Labrador will be in place soon.

Topic: Muskrat Falls Hydroelectric Generating Facility/Site

November 2013

Q1. When do you expect to develop remedial actions to stabilize the North Spur? Will your remedial plan be made public?

A1. The concerns that have been publically raised about the north spur have been addressed through engineering feasibility studies. The geotechnical conditions at the North Spur are well understood with the final details being confirmed following a field program completed this year. Nalcor is confident in the approach for the North Spur and the cost estimate for this was included in the DG3 project estimate.

We published information and a technical presentation on October 31, 2013. While technical in nature, this presentation outlines the stabilization work for the North Spur. This information can be found at: http://blog.nalcorenergy.com/lower-churchill-project-north-spur-stabilization-works-2/

Q2. Have you awarded the contract for the powerhouse and other structures to Astaldi? What is the value of the contract?

A2. In October 2013, Nalcor announced that it selected Astaldi Canada Inc. as the preferred contractor for the construction of major civil works for the Muskrat Falls hydroelectric generating facility which includes construction of the powerhouse, intake, gated spillway, transition structures and other associated work. Since that time, Nalcor has been focused on completing commercial negotiations with Astaldi to finalize the contract. We are under final contract completion for this work. This contract is valued at approximately $1 billion.

Topic: Transmission Lines

July 2014

Q1. What role will be played by the transmission line between Churchill Falls and Muskrat Falls? What factors influenced the transmission capacity of this line?

A1. The transmission line is required to enable water management between Churchill Falls and Muskrat Falls in compliance with the Electrical Power Control Act by facilitating energy transfer between the two generating facilities.

The factors that directly influence the transmission capacity of the line are the operating voltage (315 kV), conductor arrangement (2 bundle 795 MCM Drake conductor), and line configuration (two circuits). These were selected in order to ensure stable post-contingency operation after all fault conditions were analyzed.

March 2014

Q1. In light of the advice tendered by Manitoba Hydro International in their report of October 2012 has Nalcor decided to review its design standards for the Labrador Island Link? See quote below:

MHI notes that CAN/CSA C22.3 suggests a greater reliability of design to 1:150-year or 1:500-year return periods for lines of voltages greater than 230 kV which are deemed of critical importance to the electrical system. It is MHI's opinion the ± 350 kVdc and 315 kV ac lines proposed for the Lower Churchill Project be classified in a critical importance category due to their operating voltage and role in Nalcor's long term strategic plan for its transmission system and be designed to a reliability return period greater than 1:50 years. (MHI Report October 2012 page 47.)

A1. Nalcor is committed to providing a safe, reliable energy supply to Newfoundlanders and Labradorians. The Labrador-Island Link has been engineered for high reliability and to withstand severe ice and wind conditions across the province, reducing the probability of outages throughout the province. Selection of the route has been carried out to avoid areas that are susceptible to extreme climatic conditions where possible. In sections of the line where events are most likely to occur – such as the Long Range Mountains and regions in Labrador – Nalcor

has taken steps to mitigate potential impacts on the line and our customers through extensive design and planning.

The link is designed to withstand extreme meteorological conditions that are expected over its length. In sections of the transmission line with the most severe ice and wind loading, the spans between towers has been shortened to reduce loading on the structure. In the Long Range Mountains, for example, the line is designed to withstand sustained winds of over 180 km/h and 115 mm of ice buildup.

The transmission line design criteria are based on a comprehensive review of the latest meteorological data and event history, sophisticated modeling techniques, as well as significant operational data. Manitoba Hydro International (MHI) reviewed the design criteria in their Decision Gate 3 review of the project and concluded the following:

It is MHI's opinion Nalcor undertook appropriate due diligence selecting the weather loads for [LIL] (MHI report p. 47).

The climatic loadings for each line section are approximately equivalent to the climatic loadings calculated assuming Canadian Standards Association (CSA)1:500 year return period. (MHI report p. 47).

In MHI's opinion, Nalcor has undertaken a diligent and appropriate approach to design the transmission line to withstand the many unique and severe climatic loading regions along its line. (MHI Report, p. 49).

The MHI report can be viewed online at: https://muskratfalls.nalcorenergy.com/wp-content/uploads/2013/03/MHI-Review-October-2012.pdf

The addition of the Maritime Link between the island of Newfoundland and Nova Scotia further enhances the reliability of the provincial electricity system. Once the Maritime Link is in service and should additional power be required, the Interconnection Operators Agreement established between Newfoundland and Labrador Hydro and Nova Scotia Power Inc. includes provisions for emergency assistance and emergency energy transactions. This document can viewed on the Muskrat Falls website at: https://muskratfalls.nalcorenergy.com/newsroom/reports/

January 2014

Q1. How much power will the line being established to NS be capable of carrying?

A2. The Maritime Link, which is being constructed and financed by Emera Inc. of Nova Scotia, will be a 500 megawatt (MW) (+/- 200 kilovolt) high voltage direct current (HVdc) line. Additional information about the Maritime Link is available on Emera NL's website at www.emeranl.com.

Q2. What is the life of this cable (Maritime Link) and when will it have to be replaced?

A2. The design life of the Maritime Link cable system is 50 years. This expectation is based on operational experience and condition assessments of existing mass impregnated cable systems worldwide. Nalcor will assume ownership of the Maritime Link after 35 years.

Q3. Is the line to NS designed to carry power in both directions and does our deal with Emera allow us to use it to transport power from NS to NL?

A3. The Maritime Link is designed to transmit power to and from the island of Newfoundland. The Maritime Link will connect the island of Newfoundland to Nova Scotia and to the North American transmission grid for the first time. This interconnection to the North American grid will provide access from the island of Newfoundland to markets in Atlantic Canada and New England allowing us to export energy not required in Newfoundland and Labrador to other markets throughout Atlantic Canada and New England, thereby returning revenue back to our province.

At the same time, the Maritime Link will enhance the reliability of our provincial electricity system. Following in-service of the Maritime Link, we will have the ability to import power from other markets in the unlikely event that more power is needed on the island than we can supply. Should additional power be required, the *Interconnection Operators Agreement* that has been established between Newfoundland and Labrador Hydro and NS Power Inc. includes provisions for emergency assistance and emergency energy transactions.

Q4. What is the length of the line from Muskrat to the Avalon? Is this line going to be installed overhead or underground and if overhead what precautions are being taken to protect it from ice storms and freezing rain. If a major ice storm destroys a section of this line including the towers along the Great Northern Peninsula of approx. 100 kilometers what would be the expected time required to reconstruct the line and have it functioning. What would be the price difference between an overhead and an underground line?

A4. The Labrador-Island Transmission Link is a 1,100 km, High Voltage direct current (HVdc) transmission line that runs from the Muskrat Falls hydroelectric generating site in Labrador to Soldiers Pond on the Avalon Peninsula. The link will be constructed entirely overhead with the exception of the marine cable crossing in the Strait of Belle Isle.

The Strait of Belle Isle marine cable crossing will include the installation and operation of three marine power cables along the seabed across the Strait of Belle Isle. Using horizontal directional drilling (HDD) technology, two drill rigs will bore three holes from the shoreline and out under the seabed on both sides of the Straits. Sea floor conduits will be installed on each side of the Strait for transitioning the cables from shore to deep water, thereby providing protection from surface ice, icebergs and other external influences. Cables will be installed through the drilled holes, and placed along the sea floor by a cable installation vessel. The cables will then be covered by rock berms to protect against marine traffic and fishing activity.

The length of each cable conduit (casing) will be approximately 1500m on the Labrador side and 2300m on the Newfoundland side. The conduits will be installed in boreholes which are to be drilled from shore and extend out under land and exit onto the ocean floor at a depth of greater than 70m true vertical depth (TVD).

Typically underground, or buried, cable is approximately five to ten times more expensive than overhead construction. The lack of access, the amount of rock terrain in the province, and the weight of a buried cable of this size would result in significant costs, and therefore was not feasible for the Labrador-Island Link.

The Labrador-Island Transmission Link has been engineered to withstand extreme weather conditions and reduce the probability of outages throughout the province. Selection of the route has been carried out to avoid areas that are susceptible to extreme climatic conditions, where possible. In sections of the line where events are most likely to occur – such as the Long Range Mountains and regions in Labrador – Nalcor has taken steps to mitigate potential impacts on the line and our customers through extensive design and planning.

The link is designed to withstand extreme meteorological conditions that are expected over its length. In sections of the transmission line with the most severe ice and wind loading, the spans between towers has been shortened to reduce loading on the structure. In the Long Range Mountains, for example, the line is designed to withstand sustained winds of over 180 km/h and 115 mm of ice buildup.

The addition of the Maritime Link between the island and Nova Scotia will further enhance the reliability of the provincial electricity system. While repair time for impacts on the Labrador-Island Link would depend upon a number of factors such as the extent of damage, weather conditions, location, etc., once the Maritime Link is in service we will have the ability to import power from other markets in the unlikely event that more power is needed on the island than we can supply, reducing the probability and/or duration of outages for customers while repairs are carried out.

November 2013:

Q1. Where can I find a detailed map or satellite image of the island transmission route for the Muskrat project?

A1. The most detailed maps are in the EIS and are broken down by sections/regions. The link to the Dept. of Environment and Conservation website has an overview map which can be seen here: http://www.env.gov.nl.ca/env/env_assessment/projects/Y2010/1407/index.html.

The maps are included in Parts 1 and 2 under the section titled "EIS Additional Information - New December 2012". The maps start on page 20 in part 1 and continue into part 2.

Q2. As you know this power is direct current as opposed to alternating power. It would appear that your tap off point is somewhere on the Avalon. Is this not a much longer route than say around Corner Brook, thus adding to additional power losses. Also power to the mainland would be less reliable if a connection were to be made East of Corner Brook.

A2. The transmission link from Muskrat Falls in Labrador goes all the way to Soldier's Pond just outside St. John's because the major load center in on the Avalon Peninsula. The transmission link between Soldier's Pond and Cape Ray takes advantage of existing transmission lines. With the exception of the line section between Bottom Brook (near Stephenville) and Cape Ray the transmission link between Soldier's Pond and Cape Ray already exists. Power from Muskrat Falls will be delivered to Soldiers Pond where the majority of it will be dropped off to supply the Avalon Peninsula load with the excess being transferred over the existing network towards the west coast. This alternative results in the minimum kilometres of new line construction, and less cost for consumers.

Q3. Has there been a specific route decided for the Island portion of the transmission link, I am interested in the area between Clarenville and Soldier's Pond?

A3. The route for the Labrador-Island Transmission Link is available at the following link http://www.env.gov.nl.ca/env/env_assessment/projects/Y2010/1407/Nalcor_EIS_Addendum_LetterSize_ECopy_Part2.pdf.

The area you are interested in, from Clarenville to Soldiers Pond, are figures #32-#38 on pages 15-21 of the document.

Q4. What climatic return period has Nalcor selected for the HVdc TL to NL?

A4. Nalcor is committed to providing a safe, reliable energy supply to Newfoundlanders and Labradorians. We have designed the Labrador-Island Link (LIL) for high reliability and to withstand severe ice and wind conditions across the province, reducing the probability of an outage. Once in service, LIL will be one of the most robust transmission lines in the province. It will be able to withstand sustained winds of up to 180 km/h and designed to exceed the most extreme ice loading conditions experienced in Newfoundland and Labrador over the past 50 years.

The transmission line design criteria are based on a comprehensive review of the latest meteorological data and event history, sophisticated modeling techniques, as well as significant operational data. MHI reviewed the design criteria in their DG3 review of the project and concluded the following:

- It is MHI's opinion Nalcor undertook appropriate due diligence selecting the weather loads for [LIL] (MHI report p. 47).
- The climatic loadings for each line section are approximately equivalent to the climatic loadings calculated assuming Canadian Standards Association (CSA) 1:500 year return period. (MHI report p. 47).
- In MHI's opinion, Nalcor has undertaken a diligent and appropriate approach to design the transmission line to withstand the many unique and severe climatic loading regions along its line. (MHI Report, p. 49).

In addition to the robust design of the transmission line, the addition of the Maritime Link will further enhance the reliability of the provincial system. In the event that more power is needed on the island than we can supply (either due to generation or transmission interruptions from Labrador), we will have the ability to import power from the Maritimes and other markets to meet the needs of residents.

Q5. Does this mean that a 1:500 year return perod has been used for all sections of the 1100 Km HVdc single TL from MF to NL? (Re MHI Report p.47)

A5. The climatic loadings for each line section are approximately equivalent to the climatic loadings calculated assuming Canadian Standards Association (CSA) 1:500 year return period. Figure 9 on page 47 (https://muskratfalls.nalcorenergy.com/wp-content/uploads/2013/03/MHI-Review-October-2012.pdf) shows the climatic ice loads along the HVdc route compared to the CSA standard.

Topic: Strait of Belle Isle Marine Cable Crossing

March 2014

Q1. Please explain whether the Strait of Belle Isle cables will be laid in existing underwater channels in order to achieve protection from iceberg scouring.

A1. The SOBI cables will be routed along existing topographic features and deep water so as to afford maximum cable protection. The SOBI cable will be laid to take advantage of bathymetric protection where possible however, the cables are only placed on bottom in water depths that are below the reach of iceberg keels. The southern strait is protected from icebergs by a shallow 55 m deep bank that extends approximately 50 kms north. The seafloor at water depths in excess of 60 m in the southern portion of the strait has a minimum of 1 in 1000 year chance of seeing an iceberg keel.

Q2. To what extent will the cables be bundled or separated for each of the two Strait crossings, i.e., the Cabot Strait and the Strait of Belle Isle?

A2. SOBI cables are not bundled. The SOBI cables will be placed a minimum of 50 metres apart on the seabed.

The cables across the Cabot Strait cables will be separated by approximately 500 m. or more information on the Maritime Link cable crossing, please visit Emera NL's website at: www.emeranl.com.

Q3. How much redundancy will be built into each of the two cable links, namely the Maritime Link and the Strait of Belle Isle crossing?

A3. The SOBI cable crossing employs two methods of redundancy – first is overload built into each cable that allows a single cable to carry additional load in the short term, second a complete spare cable is being installed. The SOBI cable system has a third cable that will permit operation at rated capacity indefinitely in the event of a single cable failure. Continued operation at half power rating is possible on a single cable with the return path through the electrode system.

In the case of the Cabot Strait system, the system will operate at half power in the event of a single cable failure. For additional information on the Maritime Link cable crossing, please visit Emera NL website at: www.emeranl.com.