Backgrounder: Application to Construct the Muskrat Falls Dam on the Churchill River, Labrador

An 824 megawatt (MW) hydroelectric generating facility is being constructed at Muskrat Falls on the lower Churchill River, approximately 30 km west of Happy Valley-Goose Bay. The facility consists of two dams and a powerhouse, and will be the second-largest hydroelectric facility in the province when complete.

Dam Safety

The design, construction, and operation of water retaining structures are important activities for any hydroelectric operator, and the north spur at Muskrat Falls is no exception. An incident involving such a structure has the potential for significant public safety and business impacts, so great care is taken to ensure to avoid such an incident.

In Newfoundland and Labrador, the construction and operation of dams is subject to conditions established in the Water Resources Act. Given the potential for losses in the event of an incident, dam owners maintain facilities to a high standard. In addition, the potential for incidents involving public safety is a professional consideration for professional engineers involved in dam design, construction, and operation.

The overarching objective of the stabilization activities on the north spur is to establish the north spur as an engineered dam with the same safety margins as any other constructed dam in Canada. As a member of the Canadian Dam Association, Nalcor Energy and its subsidiaries comply with the Association's Dam Safety Guidelines for its facilities.

Independent Review of Design & Approach

Given the significant financing associated with hydro facilities, the design and construction the facility (including the north spur) is of interest to lenders, or in this case, the Government of Canada as guarantor of the debt for Muskrat Falls. The Government of Canada has retained its own independent engineering advisor, MWH Canada, to act as advisor in relation to the project.

Extensive geotechnical investigations have been undertaken at the north spur. Field work dates back to the mid 1960's, and the project team has a good understanding of the site, as presented in the Nalcor blog posted in October 2013. Detailed engineering for stabilization works has been undertaken SNC Lavalin using highly experienced and qualified engineers, and the approaches used to ensure stability of the site are identified in the poster presentation available in the blog.

The work undertaken by SNC Lavalin was subject to 'cold eyes' review by an external team engaged by the Lower Churchill Project, and Canada's Independent Engineer (MWH Canada) also reviewed the work. Their conclusions are found in Section 2.3 of the Independent Engineer's report.

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As noted in the report:

> The stabilization works have been designed in accordance with currently accepted geotechnical design practices and will effectively stabilize the north spur when the reservoir is impounded. The upstream impervious blanket and the plastic cement slurry cut-off walls will control seepage and piezometric levels in the spur. Slope flattening excavations and the placement of lower slope weighting berms will enhance slope stability. Erosion control blankets of rockfill and rip rap will be placed on the upstream and downstream slopes to prevent natural erosion that would contribute to slope degradation and instability over time. The planned long term monitoring program is an important component of the works which will ensure safe operation of the reservoir and detect on a timely basis any anomalous behavior that may affect safe operations (*Section 2.3.4, p.9*).

Permit Application & Issuance

Given that a permit to operate the Muskrat Falls dam is required from the Government of Newfoundland and Labrador, a package supporting that permit was filed with the Province. This information is available on the project's website at: http://muskratfalls.nalcorenergy.com/newsroom/reports/.

The application covers various activities, including the cofferdams protecting the excavations at site today, cofferdams for the construction of the main concrete dam, the north spur stabilization, and also the north and south permanent dams.

As part of its review, the Province requested additional information:

- Geotechnical Design Criteria
- Civil Works Design Criteria
- Hydraulic Design Criteria
- Hydraulic Modeling and Studies
- Muskrat Falls Probable Maximum Flood and Construction Design Flood Study
- Wind-Generated Wave Study

These documents are available on the Muskrat Falls Project website at: http://muskratfalls.nalcorenergy.com/newsroom/reports/.

After reviewing the entire package of information, the Province issued a permit for the construction of the Muskrat Falls facilities. The permit explicitly includes requirements for preparation of emergency response plans, regular dam safety reviews, and ongoing compliance with Canadian Dam Association dam safety guidelines, commitments which have already been met by the project team. A copy of the permit can be viewed online at http://muskratfalls.nalcorenergy.com/newsroom/reports/.