NEWFOUNDLAND AND LABRADOR HYDRO
Lower Churchill Project
P. O. Box 12400, St. John's, NL A1B 4K7
Telephone (709) 737-1805; Fax (709) 737-1829

Doc. No. 08-12/2399

To: Bob Barnes
Paul Harrington

From: Gilbert Bennett

Re: Reliability design return period for the Labrador-Island HVdc Link

Date: December 3, 2008

The current version of the basis of design indicates that the reliability design return period is "being discussed and further evaluated internally."

I also understand that the reliability design return period used internally for our estimates is 500 years, and that our current budget contains a discount to reduce the total budget back to a 150-year reliability return period. This direction has previously been given by the gatekeeper.

In my opinion, we have not completed sufficient analysis to demonstrate that a 500-year reliability design return period is appropriate, so I am directing that the basis of design and our underlying capital cost estimates be adjusted to reflect a 150-year reliability return period.

This direction is based on a number of factors.

CSA 22.3 60828-06 provides guidance on the appropriate reliability return period.

> **5.1.1 Reliability requirements**
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> **5.1.1.1 Reliability levels (weather related loads)**
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> Reliability requirements aim to ensure that lines can withstand the defined climatic limit loads (wind, ice, ice and wind, with a return period *T*) and the loads derived from these events during the projected life cycle of the system can provide service continuity under these conditions.

> Transmission lines can be designed for different reliability levels (or classes). For the purposes of this standard, the reference reliability level is defined as the reliability of a line designed for a 50-year return period climatic event associated with a 10 % exclusion limit of strength (applies to the components selected as the least reliable). This reference reliability level is generally regarded as providing an acceptable reliability level in respect of continuity of service and safety.
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> Lines can be designed for higher reliability levels by increasing the return period *T* of climatic events. A higher reliability can be justified for example by the importance of the line in the network. Three reliability levels are proposed in this standard and are assumed to cover the range of values to be considered for most transmission lines. These levels are expressed in terms of return periods of climatic limit loads as shown in Table 1. For temporary lines, some wooden poles or lines of limited importance, return periods of about 25 years may be appropriate.
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> …
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> In some cases, individual utility's requirements can dictate other reliability levels depending on the proper optimization between initial cost of the line and future cost of damage, as well as on uncertainties related to input design parameters.

The design team has quite correctly pointed out that the HVdc link is an essential element in the Island's electrical power system, and I agree with the position that the HVdc link could reasonably require a higher level of reliability than the reference reliability level of 50 years.

We have not, however, reached a conclusion on the extent to which our reliability design should exceed the reference level, and I therefore do not concur with advancing our estimate to a 500-year return period at this time.

Although, the relevant CSA standards do make reference to corresponding levels of reliability based on the importance of a line, they do not provide explicit direction on the required reliability standard, and we have not reached a point in our analysis where we have demonstrated that the 500-year reliability return period is justifiable.

In the normal course of business, the incremental cost of any reliability improvements beyond those stipulated in codes and generally accepted as good utility practice would require approval by our Public Utilities Board. Therefore, the current optimization work by Asim Haldar, and the resulting final report as accepted by LCP, will provide recommendations on the optimum reliability level. This work will be integral to the decision-making and approval process for any levels above the base suggested by the standards.

Note that the applicable code states that:

> This reference reliability level (50 years) is generally regarded as providing an acceptable reliability level in respect of continuity of service and safety.

We will, therefore, need significant justification in order to demonstrate that an investment beyond the reference design level is justifiable and in the best interests of ratepayers. The “best interest” assessment includes giving consideration to costs as well as the benefits of the improved reliability.

I expect that the work underway by Asim Haldar will provide further guidance on this matter, including a full and detailed assessment of the scope and capital cost, as well as the consequences of failure under each reliability level.

I am satisfied that it is appropriate for us to carry an allowance in our capital budget for an improved level of reliability for the HVdc link, but no justification has been presented to support an additional allowance to provide for a 500-year return period design.

Consequently, I request that both the Budget and the Basis of Design be updated to reflect a 150-year return period for the HVdc link transmission line. This decision will be revisited when Asim has completed his risk analysis.

Sincerely,

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Gilbert Bennett, P. Eng.
VP – Lower Churchill

cc John Mallam, P. Eng.
Jim Haynes, P. Eng.