Q. Please provide a copy of the analysis that was carried out in June and July of 2010 which confirmed that the 900 MW HVDC link would require a minimum operating voltage of 320 kV as referenced in Exhibit 30, Section 4, paragraph 4.

A. For analysis the maximum HVdc system losses has been set at 10% (worst case) in order to prepare a load flow model of the scheme. It must be noted that a detailed conductor and voltage optimization will be required in final design. For analysis purposes it is assumed that the converter stations will account for 2% of the system losses. At this point in time the "largest" standard conductor in the Canadian Alcan catalog is selected. The conductor is a 55.88 mm, 91 strand, 3640 kcmil, A1 (ASC) conductor with Rdc at 20 C = 0.01568 Ω/km and a rated tensile strength of 304 kN.

There is a total of 1038 km of overhead line between Muskrat Falls and Soldiers Pond. The submarine cable across the Strait of Belle Isle is assume to be an 1800 mm^2 copper cable with Rdc at 20 C = 0.0098 Ω/km. The cable route is estimated to be 30 km in length.

The total resistance per pole equals:
Rdc at 20 C = (1038 * 0.01568) + (30 * 0.0098) = 16.5698 Ω/pole

At 450 MW per pole the pole losses, excluding the converter station losses, should be less than or equal to 36 MW. The pole current is calculated as:

Ploss = I^2 Rdc at 20˚C

36 MW = I2 (16.5698 Ω/pole)

I = 1473.9 Adc/pole

To send 450 MW/pole assuming a 1474 A pole current, the sending end voltage is calculated as:

P = I * V

450 MW = 1474 Adc * V

V = 305.2 kV

The resultant nominal 900 MW HVdc system ratings are:

- ± 320 kV;
- pole current of 1406 A; and
- losses of 41.8 MW/pole or 83.6 MW/bipole – 816.4 MW receiving end.