Q. **B-29, Install Additional 230 kV Transformer, $3,535,200**

Is it possible to specify an impedance value (range) for the proposed T4 addition at Oxen Pond in order to minimize the loss of firm capacity due to the mismatch of impedances?

A. When Hydro prepares the specification for a new power transformer to be placed in parallel with existing units, the specification includes the impedance data for the existing units so that the manufacturer can match the impedance of the new unit to those already in service. Hydro transformers are manufactured to standard CAN/CSA-C88-M90 Power Transformers and Reactors, Electrical Power Systems and Equipment, a National Standard of Canada. Section 14 of CAN/CSA-C88-M90 provides the tolerances to be applied to a number of rated quantities which are subject to manufacturer's guarantees. Table 9 of the standard indicates that the impedance at rated current for a two winding transformer must be within ±7.5% of the guaranteed value during specification/bid.

The existing transformer impedances in the Hardwoods – Oxen Pond Loop are summarized in Table 1 below. The average impedance of the seven 230/66 kV power transformers in the Hardwoods – Oxen Pond Loop is 8.75%. The variation of each transformer to the loop average impedance is within the range specified in CAN/CSA-C88-M90, Section 14.

Based upon the standards Hydro will specify a transformer impedance on the order of 8.75% for Oxen Pond T4, with the manufacturer's tolerance being an impedance in the range 8.09% to 9.4%. This will minimize the loss of firm capacity due to impedance mismatch.

Table 1 **Hardwoods – Oxen Pond Loop Transformer Impedances**		
Transformer	**Impedance %**	**Variation from average - %**
Hardwoods T1	8.30	-5.14
Hardwoods T2	9.12	+4.22
Hardwoods T3	8.45	-3.42
Hardwoods T4	8.80	+0.57
Oxen Pond T1	8.85	+1.14
Oxen Pond T2	9.02	+3.08
Oxen Pond T3	8.73	-0.22
Average	8.75	