Q. **System Design**

To what Canadian Electricity Association (CEA) standards do Hydro's current transmission pole line and distribution line pole strength criteria comply? How much of Hydro's transmission system, and how much of its distribution system, were constructed under older standards with lower strength requirements than indicated by the existing standard?

A. In general, Hydro's current pole strength criteria complies with CSA C22.3 No. 1-10 "Overhead Systems." This standard is updated/revised every five years and the revised rules apply only to new lines that are built after the release of the updated standard. The standard is not applied retrospectively unless an upgrading is done to an existing line asset.

Hydro operates and manages 2,500 km of high voltage transmission line wood pole plant assets consisting of 69 kV, 138 kV and 230 kV voltage levels. During the development of Bay d'Espoir Phase 1 in the mid-1960s, one of the design wind and ice loads for Hydro's transmission system was based on CSA C 22.3 standard (Canadian Standards Association) and was 12.5 mm radial glaze ice (density = 0.9 g/cm^3) combined with 90 km/hr wind (390 Pa pressure) on the line. Upon review of the pertinent information available at the time, two basic load conditions evolved: Normal Zone with 25.4 mm radial glaze ice; and Ice Zone with 38 mm radial glaze ice. The Ice Zone, however, was used for a small section of the line system. In addition to these loading criteria for vertical loads, the Hydro design standard also included an extreme wind gust load of 176 km/hr (1500 Pa pressure) on the line.

Until 2001, CSA stipulated weather loads based on three categories: Heavy (12.5 mm ice and 389 Pa wind); Medium A (6.5 mm ice and 390 Pa wind); and Medium B (12.5 mm ice and 260 Pa wind). The Heavy Loading district is normally applicable to Newfoundland and Labrador. In 2001, CSA changed the weather loading districts and introduced a new category as Severe Loading district (19 mm ice and 400 Pa wind) and redefined the previous three categories as follows: Heavy (12.5 mm ice and 400 Pa wind); Medium A (6.5 mm ice and 400 Pa wind); and Medium B (12.5 mm ice and 300 Pa wind). The Severe Loading criterion only applies to the Avalon and Bonavista Peninsulas, while the rest of the Island and Labrador is designated under Heavy Loading. On the Avalon Peninsula, 140 km of 230 kV wood pole transmission lines (6% of the pole plant asset) falls under the category of Severe Loading. Although there is a net increase of 22% load on the conductor due to reclassification of the loading districts, it is still within Hydro's design limit because the extreme wind load governs in most cases. All the transmission lines that were built in Hydro's system comply with CSA Heavy Loading criteria with an overload capacity factor of 2.0.

The same rationale is applied to the design of Hydro's distribution lines as is applied to its transmission lines. Hydro's distribution lines have been designed to the criteria of the heavy loading district of CSA 22.3 No. 1.