Q. **T&D Planning**

Describe how Hydro forecasts peak demands for developing capital load growth projects in the medium and long term, for each feeder, for each substation, and for each transmission line. Indicate the levels (e.g. 95%, 100%, or 105% of ratings) of anticipated forecast peak loads on feeders, substations, or transmission lines that trigger load growth projects.

A. For developing load growth driven capital projects for distribution system feeders and substations, Hydro prepares aggregate system peak demand forecasts annually for 25 Island interconnected distribution systems, three Labrador interconnected distribution systems and 21 isolated diesel systems. The standard forecast is for five years with longer-term peak demand forecasts prepared as required. The methodology for the distribution systems' load forecast is a combination of analytical judgment and statistical analysis. Generally, the principal rate classes for each individual system are reviewed and projected separately, with larger general service customer accounts individually evaluated. To facilitate system planning, the primary load forecast focus is on system peak demand.

Many of Hydro's systems only have one substation, in which case the substation peak demand is the system peak demand. In cases where the system has more than one substation, non-coincident substation peak forecasts are based on the distribution system peak. Historical peak demands are determined using a number of methods such as use of EMS data, recloser demand readings, and field load and voltage studies. These historical peak demands, along with local knowledge of new loads and the system peak demand forecast are then used to develop peak load forecasts for each substation.

Non-coincident distribution feeder peak demand forecasts are prepared in much the same manner. They are based on the distribution system peak. Historical feeder peak demands are determined using a number of methods such as use of EMS data, recloser demand readings, and field load and voltage studies. These historical peak demands, along with local knowledge of new loads and the system/substation peak demand forecast are then used to develop peak load forecasts for each feeder.

For developing medium term load growth driven capital projects for transmission systems including the associated feeders and substations, Hydro relies on the same aggregate system peak demand forecasts used for distribution systems with the exception of the 21 isolated diesel systems. In addition to these medium term peak demand forecasts, Hydro also relies on Industrial Customer demand forecasts and annually completed peak demand forecasts provided by Newfoundland Power[1]. For the large Industrial Customers directly served by Hydro, input with respect to medium term power requirements is provided by the Industrial Customers.

For longer-term Island transmission planning analysis, Hydro produces aggregate peak forecasts for the Newfoundland Power system and the Island Rural System using statistical regression techniques. For the large industrial peak demands in the long term, Hydro maintains the medium term demand requirements as status quo except for those Industrial Customers with a known closure date.

From these aggregate peak demand forecasts, the relationships to specified load points on the transmission system are established and modelled using load flow modelling software “PSSE” and “CYMDIST”. For feeders and transmission lines,

[1] Newfoundland Power provides a five-year peak demand requirements forecast for each of the locations where Newfoundland Power purchases power from Hydro. This forecast is referred to as the "Infeed Load Forecast”.

loading levels exceeding 100% of their thermal rating is the trigger for upgrading or line replacement. In cases where a feeder or transmission line are not radial, line outage contingencies are analyzed to determine if that element will be overloaded beyond its 100% rating after system restoration/mitigation measures.

For substation transformers, loading levels exceeding 100% of their thermal rating is the trigger for replacement or addition of new transformer capacity. In the case where there are multiple transformers in a substation or the substation is part of an underlying looped system (i.e., 66 kV loop system within St. John's area), then the contingency of failure of one transformer is analyzed to determine loading on the remaining transformer(s) in the station or looped system. Overload beyond 100% in this case with system mitigation measures will trigger replacement or addition of new transformer capacity.

For substation circuit breakers or bus work, loads exceeding 100% of the equipment rating for both normal and abnormal system conditions (i.e., operation of circuit breakers within a substation causing re-routing of power through other system elements) will be the trigger for load growth projects.