Q. Has Hydro identified any LIL failure conditions that could result in a blackout of the IIS? In this response state whether an assessment of such a risk been performed for all conceivable system states prior to a failure of the LIL.

A. To date, Hydro's analysis and subsequent design for the integration of the LIL has been based upon single contingency analysis assuming all equipment in service. There has been no identified single contingency loss of the LIL components (i.e. single element such as pole, transformer, valve, electrode conductor, etc.) that results in a complete blackout or even partial load loss on the Island Interconnected System. This approach is consistent with Hydro's past transmission planning practices. Hydro believes this is consistent with the NERC TPL-001-4 standard categories P0 and P1 (previously NERC TPL-001 and TPL-002). Further, Hydro's analyses has considered peak, intermediate and light load cases. This approach is consistent with the NPCC Directory #1 – Design and Operation of the Bulk Power System December 1, 2009 which states at page 8:

> *Design studies shall assume **power** flow conditions utilizing transfers, **load** and generation conditions which stress the system. Transfer capability studies shall be based on the **load** and generation conditions expected to exist for the period under study. All **reclosing** facilities shall be assumed in service unless it is known that such facilities will be rendered inoperative.*

With respect to the Island Interconnected System, winter peak load conditions are assessed as these conditions stress the system with respect to high power transfers and corresponding low bus voltages and large electrical angles across the power system. Intermediate loading conditions of spring and fall are considered as the loading conditions exhibit impacts on the thermal loading of transmission lines. The summer light load conditions are assessed as the condition tends to stress the system with respect to high bus voltages and synchronous machines operating in under excited mode, which is inherently dynamically less stable than the over excited mode.

Following the loss of a single element, the reliability criteria permit system adjustment before loss of a second element. This analysis would be considered an N-1 starting point and the contingencies then N-1-1 or P6 Multiple Contingency (two overlapping singles) from NERC TPL-001-4. NERC requires system stability for the event but permits interruption of firm transmissions service and non-consequential load loss.

It is Hydro’s intent to consider the N-1-1 contingency analysis as part of the operational studies. The approach is consistent with that prescribed in both the NERC TPL standards and NPCC Directory #1. The outcome of the analysis will result in operating procedures and necessary adjustment to protection schemes such as the Under Frequency Load Shedding program which will prevent an Island wide black out for the N-1-1 events. To this end an Island Wide Blackout is highly improbable if all equipment operates in accordance with design and the system operator follows standard operating procedures to keep line flows and voltages within design limits. Hydro will not be completing an analysis for all conceivable system states prior to the failure of the LIL. Given the number of system elements and the range of system load the resultant combinations resulting in separate system states would make the analysis impracticable. Given the nature of interconnected transmission systems and the experience of many transmission planners, the transmission planning processes and standards have been set to use load and generation conditions expected during the study and load and generation conditions that are known to stress the system as noted above.