Q. Further to the response to CA-NLH-055, state whether or not the primary and secondary auxiliary power supplies can be impacted simultaneously by disturbances on the ac transmission network and/or ac retail distribution network.

A. Primary and back-up station auxiliary power supplies for each converter station are listed in Hydro's response to CA-NLH-053. The simultaneous interruption of these supplies would require a complete outage to the high-voltage transmission system at the site of the converter station.

As noted in Hydro's response to CA-NLH-053, each converter station is designed with two ac station service supplies to provide power to the converter station auxiliaries. The ac station service supplies are connected to the ac terminal station (i.e., 230 kV bus) in a circuit breaker arrangement that ensures that a fault on one ac station service transformer with a circuit breaker failure to open does not result in the tripping of the second ac station service transformer. Further, connections on the low voltage side (i.e., station service/auxiliary load side) of the ac station service transformers is configured such that upon failure of one station service transformer, circuit breakers can be opened and closed so that the remaining station service transformer can supply all load. In addition, the protection and control systems are redundant and supplied from redundant dc battery banks such that loss of one protection and control scheme or battery bank does not result in a trip to the converter station equipment.

With both ac station service supplies being connected to the same high voltage transmission system, each station service supply will experience the same voltage sags, dips and spikes that may occur on the connecting high voltage transmission

system due to normal fault clearing. As noted in Hydro's response to CA-NLH-055, the converter equipment is designed to ensure that the HVdc system can remain online under abnormal voltage conditions caused by critical faults or other contingencies.

Given that the redundant ac station service supplies are connected to the same high voltage transmission system, simultaneous loss of both ac station service supplies would require the loss of all high voltage transmission lines connecting the ac component of the converter station to the interconnected transmission system. In essence, there would have to be a complete outage to the ac component of the converter station. The simultaneous loss of all ac transmission lines connecting the converter station to the interconnected transmission system is a rare event. In the case of the Soldiers Pond Converter Station, for example, this would be an N-6 contingency.

Despite the extreme unlikelihood of the loss of all ac transmission lines to the converter station, and subsequent loss of both ac station service supplies, each converter station is equipped with back-up diesel generation which is designed to start following loss of ac supply from the grid and provide power to critical equipment such as the valve cooling system, heating and ventilation, etc. to ensure converter equipment is not damaged.