Q. Explain in detail why and how a larger generation unit would aid such integration.

A. An HVdc converter station utilizing the line commutated converter technology such as the Soldiers Pond converter station requires a considerable amount of reactive power (MVAR) in the ac to dc and dc to ac conversion processes. Detailed transmission planning analyses of the Labrador-Island HVdc Link (LIL) revealed that in addition to the reactive power provided by the converter station ac harmonic filters, additional reactive power sources were required near the Soldiers Pond converter station. The operation of Holyrood Unit 3 in synchronous condenser mode following completion of the LIL provides a portion of the required reactive power. However, this alone is insufficient to ensure acceptable system operation and performance during system contingencies such as a transmission line fault. Analysis revealed the requirement for high inertia synchronous condensers to provide not only the necessary reactive power but also the inertia, or spinning mass, to assist in frequency response of the system during LIL contingencies. In optimizing the size of the high inertia synchronous condensers, a maximum of three 175 MVAR units (two in service at all times – one out for maintenance as per the transmission planning criteria for LIL) provided sufficient inertia to assist in frequency response. However, the synchronous condenser package of Holyrood Unit 3 in synchronous condenser mode and two, 175 MVAR high inertia synchronous condensers at Soldiers Pond are approximately 120 MVAR short of the reactive power capability required. Prior to the decision to proceed with the option to acquire the unused 120 MW combustion turbine previously built due to its low cost and early availability, the plan was to add a nominal 60 MW combustion turbine in 2015 built in accordance with Hydro's specification. Proceeding with a Hydro specified unit would have provided the option to specify the supplier

manufacture a plant that has an alternator capable of providing the 120 MVAR synchronous condenser capability.

In reference to a nominal 60 MW combustion turbine, the normal sized alternator would provide between 52 and 63 MVAR of reactive power capability when operated as a synchronous condenser. Installing a larger alternator with a nominal rating of 166 MVA connected to a 60 MW combustion turbine would provide approximately 127 MVAR of reactive power when operated in synchronous condenser mode. Consequently, a single larger electric generator connected to the nominal 60 MW combustion turbine would ensure acceptable operation of the LIL.