Q. Please confirm that the HVDC manufacturer has included the following studies, in addition to the evaluation of fundamental frequency induction during normal operating conditions:

- Corona and Field effects
- Impact on the LIL of transient currents (e.g. from line to ground faults and 3ph faults) in the AC line.
- Impact on the AC line of transient currents (e.g. from line to ground faults and pole to pole faults) in the HVDC OHL.
- The risk of contact between the AC OHL and the HVDC OHL, including collapse of transmission towers.
- The impact of contact between the AC OHL and the HVDC OHL.

If the HVDC manufacturer did not perform these, has the evaluation been performed by someone else? If not, please explain why not.

A. The HVdc manufacturer (GE Grid) is responsible for completing technical engineering studies to ensure the Labrador Island Link (LIL) is designed to and meets all contractual specifications. GE Grid has provided the following:

1. Corona and Field Effects
    a. GE Grid have studied coronal and field effects in study report titled *"Common – Converter Station Radiated Interference Design Report"* doc# ILK-AS-SD-8000-EL-H99-0008-01.
    b. The GE Grid report covers the following:
        i. RF noise at converter station boundary due to radiation from thyristor valves.

ii. RF noise at converter station boundary due to conducted interference on the ac side busbars.
iii. RF noise at converter station boundary due to conducted interference on the HVdc side busbars.
iv. Corona noise calculation.
v. Combined radiated interference due to the above items.

2. Impact on the LIL of transient currents (e.g. from line to ground faults and 3ph faults) in the AC line.
    a. Ge Grid studied fundamental frequency induced currents and provided Nalcor with the results in report titled, *"Common – Assessment of the Impact of AC Lines in Parallel with DC Lines Study Report",* doc# ILK-AS-SD-8000-EL-H99-0017-01.
    b. GE Grid has not studied the impact of transient currents on the LIL for ac transmission line faults. GE believes that transient studies will not add value to the steady state analysis that was completed. The HVdc OHL and ac transmission line crossings consist of very short spans of conductor which would experience induced currents due to induction. GE Grid suggests that the effect of induction over the short span for such a short period of time (fault) is negligible.

3. Impact on the AC line of transient currents (e.g. from line to ground faults and pole to pole faults) in the HVDC OHL.
    a. GE Grid has not studied the impact of transient currents on the ac transmission lines due to faults on the HVdc OHL. Similarly, as described in bullet 2b, the impact of transient induced currents of

the relatively short crossings and short time during the fault is negligible.

4. The risk of contact between the AC OHL and the HVDC OHL, including collapse of transmission towers.
    a. LCMC and Nalcor have evaluated the risk of contact closely when it comes to right-of-way proximity to NL Hydro's existing transmission line corridors. Firstly the width of the HVdc corridor has been designed using proper utility practice and standards to evaluate conductor swing and clearance requirements to select the appropriate right-of-way width. With respect to collapse of HVdc transmission towers into adjacent corridors, Nalcor has evaluated the typical failure methods and probability of failure for both guyed and self-supported structure and determined:
        i. Direct transverse line failure is very rare. Having primarily guyed steel structures minimizes this risk, as guyed structures are highly resilient to transverse failure, as evidence by no failure of this type found.
        ii. Design optimization has reduced this risk by limiting guy tensions under transverse loads. With this limitation, the tower will fail above the guy attachment point prior to wire failure leaving adequate clearance to adjacent lines or the tower restrained by the attached wires.
        iii. Self Supported Towers failure under max transverse loads are designed to fail at the tower waist which is well above ground line and will not impact adjacent right-of-ways.

iv. The probability of a transverse failure of the HVdc line interacting with the existing major HVac lines is lower than a weather event that would take out the HVdc and any adjacent HVac lines.

5. The impact of contact between the AC OHL and the HVDC OHL.
   a. In the event of contact between the ac transmission and HVdc transmission both systems will activate the necessary protections to clear the fault.
   b. GE Grid is conducting a study to evaluate the ac system transient stability of the interconnected transmission system post LIL installation. Results of the study will be provided in document titled, *"Common-Transient Stability, Dynamic Multi Interaction, GSE and FFTOV Study Report"*, doc# ILK-AS-SD-8200-EL-H99-0012-01. The study will address the impact of faults on the ac transmission system and HVdc transmission system; however combined ac and dc line faults will not be in the scope of the study.