Q. **Reference: Assessment of Labrador Island Transmission Link (LIL) Reliability in Consideration of Climatological Loads, March 10, 2021 (Haldar Report) by Dr. Asim Haldar, Ph.D., P. Eng. page 51, lines 1491-1494.**

What are the implications for the reliability of the LIL that it does not meet industry practice in that the foundations fail before the towers except in Zones 4a and 10-1 and industry's best practice is that the tower is supposed to fail before the foundation?

A. *The following response has been provided by Haldar and Associates.*

CSA 60826 requires a proper sequence of failure be maintained among critical key line components (towers, foundations, conductors, insulators etc.) and among various tower types should a line failure event occurs. For an extreme event, it is important that key components of overhead line fail in a certain sequence to ensure the recovery time (repair rate) would be minimum (hence the unavailability time be minimum). It is also important to reduce the impact on other key line components in order to ensure that the redistribution of the force in the remaining system takes place in a certain sequence; in this context, in a suspension tower-foundation system, foundation should fail after the failure of a suspension tower because, reinstallation/replacement of a failed foundation is more involved and may have significant impact on the recovery rate (number of days needed to replace the foundation). This may also impact the Labrador-Island Link ("LIL") availability (or unavailability) and expected energy not supplied.

Newfoundland and Labrador Hydro provides the following additional information.

Based on the work to date, it has been determined that the towers/foundations are not the critical component; and, in theory, the cable will fail before the tower/foundation. It should be noted that as a result of the failure sequencing incorporated into the LIL, the towers and

foundations are stronger than they would be following typical CSA 60826 sequencing, where the cable system would typically have the highest capacity.

Although failure sequence is typically structured to reduce durations of unexpected service interruptions by avoiding failure and replacement of foundation components, there are instances where foundations have also been replaced during excessive tower damage as there is no way to determine if damage occurred to the underground components based on the loads induced during the failure. As a result, the recovery rate may not be impacted and in this scenario, this failure sequence may not be critical to the governing reliability. In failure instances where the damage to the tower is such that it is not expected to impact foundation integrity, failure sequence is critical to ensure the foundations remain intact to limit repair time.