Q. **Reference: RRAS, 2022 Update, Vol. III, page 18 (99 pdf)**

Citation:

> The Haldar & Associates report, "Assessment of Labrador Island 1 Transmission Link (LIL) Reliability in Consideration of Climatological Loads" ("Original LIL Reliability Report"),[76] considered the LIL design with respect to CSA 22.3 No. 60826-10[77] and the overall likelihood of failure of the LIL with respect to both glaze[78] and rime[79] icing events. Scenarios not directly following the guidance of CSA 22.3 No. 60826-10 (such as effective line lengths and wind speedup) were also considered to provide a fully informed assessment. The Original LIL Reliability Report also included a qualitative review of local conditions based on past operational experience. As part of the Original LIL Reliability Report, LIL return periods were defined to be in the range of 1:72 to 1:160 years.[80,81] A revised reliability analysis ("Phase II LIL Reliability Report") that was based on more extreme loading considerations,[82] indicates an annual probability of full bipole failure of 10% and a return period of 1:10 years due to structural failure. Other outcomes include consideration of regional correlation[83] and line length where the return period could be as low as 1:6 years with an associated annual failure rate of 16%. [84]

How does Hydro explain the dramatic difference between the results of the Original LIL Reliability Report and the Phase II LIL Reliability Report?

A. The Haldar & Associates Inc. ("Haldar & Associates") report, "Assessment of Labrador Island Transmission Link (LIL) Reliability in Consideration of Climatological Loads" ("Original LIL[1] Reliability Report"),[2] was based on engineering principals established under CSA 22.3 No. 60826-10,[3] which was developed to ensure utilities follow industry best practice. The revised reliability analysis ("Phase II LIL Reliability Report")[4] went over and above the requirements of CSA 22.3 No. 60826-10 by focusing on additional concepts identified by Haldar & Associates. These concepts involve a level of complexity to projects that are not necessarily followed in utility

[1] Labrador-Island Link ("LIL").
[2] "Assessment of Labrador Island Transmission Link (LIL) Reliability in Consideration of Climatological Loads," Haldar & Associates Inc., rev. April 11, 2021 (originally issued March 10, 2021).
[3] Canadian Standards Association. (2010). CSA 22.3 No. 60826-10, *Design Criteria of Overhead Transmission Lines* is a national standard that specifies the loading and strength requirements of overhead lines derived from reliability-based design principles.
[4] "Assessment of Labrador Island Transmission Link (LIL) Reliability in Consideration of Climatological Loads - Phase II," Haldar & Associates Inc. December 12, 2021.

practice on a regular basis. When these advanced principles are applied, there is a significant impact on the overall reliability, thereby resulting in a variance between the results presented in the Original LIL Reliability Report and the Phase II LIL Reliability Report, specifically for the following:

- **Regional Correlation & Line Length**

  During the assessment completed by Haldar & Associates, it was identified that in order to maintain the same level of reliability while incorporating regional correlation, there would need to be an exponential increase in load factors. As this increase was not incorporated into the original design parameters, the analysis outcomes indicate a reduction in reliability.

- **Wind Speed-Up**

  Methods of calculation for wind speed-up effects due to local topography was added to CSA 22.3 No. 60826-10 (Annex G) in 2017, prior to the design of the LIL. This addition focuses on lines located in the proximity of topographical features such as hills, ridges, escarpments, or spurs that can experience significantly increased wind speeds due to topographical effects, particularly if they are close to peaks. Prior to 2017, CSA 22.3 No. 60826-10 made only brief mention of wind speed-up effects—"Furthermore, the effects of acceleration due to funneling between hills or due to sloping grounds are not covered and may require specific studies to assess such influences."[5] The design did include such investigation for known areas of concern, such as the Long Range Mountains. During the assessment conducted by Haldar & Associates, it was identified that the effect of wind speed due to sloping terrain has the potential to increase the loading on existing support structures by approximately 35%. As this was not identified or incorporated throughout the entire line during the design stage, there appears to be a deficit in reliability when analyzed after the fact, which therefore results in a reduction in reliability.

[5] Canadian Standards Association. (2010). CSA 22.3 No. 60826-10, *Design Criteria of Overhead Transmission Lines*, sec. 6.2.1, p. 43.