Q. **Reference: *Reliability and Resource Adequacy Study – 2018,* November 16, 2018, Volume I: Study Methodology and Proposed Planning Criteria, Section 4.2.5 1– Transmission Modelling: LIL Reliability, Page 40, lines 16 through 17; Attachment 7, page 20, Table 13.**

The report, at page 40, indicates the forced outage rate ("FOR") for the LIL is 0.56% per pole and 0.01% for the bi-pole (full link). Table 13 in Attachment 7 reflects similar numbers, assuming rounding, for the reliability of the LIL converters only. If the FOR used in the planning criteria only reflects converter outages, please provide the FOR for a complete HVDC reliability model, and comment on how this may impact the results of the near-term and long-term reliability assessments.

A. The Forced Outage Rate ("FOR") data used in the development of the technical note filed as part of Newfoundland and Labrador Hydro's ("Hydro") 2018 Reliability and Resource Adequacy Study for the HVDC converter stations was taken from available CIGRE data. The CIGRE data does not provide meaningful reliability data to reflect the performance of an entire system due to the breadth of different designs of the various systems which may or may not include overhead lines, cables and switching stations. As such, while information is presented in the technical note that provides some indication of the reliability of various systems worldwide, there is no ready source of meaningful data from industry to base the FOR for those components outside of the converter stations that would be comparable to the design and components specific to the Labrador-Island Link ("LIL"). In order to provide a FOR for the entire system, an analysis would have to be carried out on the frequency and duration of various types of outages that could occur on the components of the LIL outside of the converter stations. An analysis of the frequency of failures has been carried out for the components of the LIL based on available information. The applicable durations have not been analyzed. Such an analysis has not been carried out due to the high level of uncertainty and judgement necessary to predict failures and the restoration time for those failures.

To determine the FORs from failure rates, judgement must be given to the duration of the outages. As presented in Tables 15 through 18 of Attachment 7, the duration of the assumed outages has a material impact on the associated FOR, with calculated FORs ranging from 0.131% for a one day outage to 1.25% for three week outage. However, in performing these calculations the rate of failure per year was held constant. It is Hydro's opinion that a longer duration outage, such as one that would be associated with a tower collapse, would be less likely than one of a short duration, such as one associated with a converter station related event, based on available data. As such, rather than assess this low probability high consequence event probabilistically, Hydro presented analysis in Section 6.2 of the 2018 Reliability and Resource Adequacy Study, later updated in the 2019 Update to the Reliability and Resource Adequacy Study, which deterministically placed the bipole out of service for a three week period at time of peak to inform a risk-based analysis of the implications of such an outage. This presents an onerous case, as the likelihood of the loss of a bipole for an extended period is very low by design and it is less likely again that this loss would occur during the highest load period of the year. Hydro probabilistically assessed the impact of short duration outages by modelling 1 outage hour per year in its Reliability Model to consider one randomly placed outage per year of a duration longer than ten minutes, meaning the duration was beyond that which could be addressed using the temporary overload capability of the LIL.

As stated in correspondence to the Board of Commissioners of Public Utilities on March 17, 2020 and further outlined and discussed during the June 4, 2020 technical conference, Hydro has engaged Haldar & Associates Inc., an external expert in transmission line design with particular experience in Newfoundland and Labrador, to complete an assessment of the reliability of the LIL considering climatological loads with full consideration given to local conditions including rime icing. This report is being completed and will be filed as part of Hydro's 2020 Update to the Reliability and Resource Adequacy Study in November 2020. Should this report determine a different failure rate is more appropriate for the LIL, Hydro will adjust its composite failure rate as appropriate. At that time, Hydro would determine whether it remains appropriate to continue to model the three week LIL outage deterministically.

If the composite reliability were included in Hydro's reliability model, it would have limited impact on the early year results presented in Hydro's Near-Term Reliability Report, where the

LIL is modelled with a FOR of 10% per pole and Holyrood remains in service, however it would have more on an impact on later year results as the LIL FOR is modelled to decrease. Modelling of the composite reliability in Hydro's reliability model would increase the reserve margin required for long-term planning, however for the reasons previously described, Hydro believes it more appropriate to consider the prolonged unavailability of the LIL as a discrete case, and engage with stakeholders based on the outcome of the analysis being executed by Haldar & Associates to determine the level of mitigation, if any, reasonable in this jurisdiction.

Finally, given that the LIL has not yet been placed in service, the above has all been considered on the basis of the design parameters of the LIL. Should the level of reliability suggested by the design fail to materialize in operation, Hydro would assess the associated implications at that time.