**Q. In his report, on page 26, Mr. Ghannoum concludes that the analysis conducted by Hydro does not demonstrate that the LIL meets or exceeds the return periods claimed. Hydro has concluded that a bipole failure of the LIL from all causes is estimated to occur about once every three years. In Mr. Ghannoum's opinion, what are the implications for the bipole failure rate if his opinion on the return period for the LIL is correct?**

A. In the response to Request for Information PUB-NLH-124, Hydro indicates "a total bipole failure rate of 0.3278 per year, or one bipole failure every three years."[1] This outage frequency is in relation to all potential causes of a bipole outage, most of which are temporary in nature and are not likely to require field repair.[2]

Mr. Ghannoum's analysis relates directly to structural failures of overhead transmission lines and towers. Outages of this nature tend to be less frequent, but much longer in duration than temporary bipole outages. The impact of such extended outages on customers is much more severe than temporary bipole outages.[3] As such, it is not necessarily meaningful to compare the more frequent temporary bipole outages to the less frequent extended bipole outages.

Reliability levels of overhead transmission lines are commonly referred to in terms of return periods of climatic loads.[4] Mr. Ghannoum concluded that the reliability level of the Labrador Island Link ("LIL") corresponded to no greater than a 1:50 year return period. This reliability level is less than what is recommended by Canadian and International overhead transmission line design standards.[5] Hydro claims the LIL, as-designed, meets 1:500 year return period loads for certain sections of the line and 1:150 year return period loads for others.[6]

Mr. Ghannoum's analysis indicates that the LIL is designed to a lesser standard than what Hydro has claimed and is therefore less likely to withstand climatic loadings that are

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1 See Page 3, Lines 5-6 of the response to Request for Information PUB-NLH-124.

2 See Attachment 1, Pages 16-17 of the response to Request for Information PUB-NLH-212.

3 The time required to restore a temporary bipole outage could be a matter of minutes whereas the time required to restore a bipole outage stemming from a structural failure is more likely to take days, weeks, or even longer.

4 Climatic and weather loads for overhead transmission line design are selected on the basis of the "return period" of specific weather conditions. For example, a specified level of radial ice accumulation on a transmission line conductor may be determined on the basis of scientific evaluation to occur once, on average, every 50 years. In that case, the specified ice accumulation is said to have a return period of 50 years.

5 The applicable Canadian standard for the design of overhead transmission lines is the National Standard of Canada CAN/CSA-C22.3 No. 60826-10 Design criteria of overhead transmission lines. The Canadian standard is an adoption, with Canadian deviations, of the identically titled CEI/IEC (International Electrotechnical Commission) Standard 60826 (third edition, 2003-10).

6 In his evidence, Mr. Ghannoum also observes (i) that the LIL is exposed to climatic zones that are, to some degree, uncorrelated, and (ii) that sections of the LIL will traverse terrain, such as the Long Range Mountains, where transmission lines have never before existed. These factors also increase the uncertainty relating to the reliability levels determined by Hydro.

likely to occur on the LIL route. In Mr. Ghannoum's opinion, his analysis demonstrates that the risk and frequency of bipole outages due to structural transmission line failures is greater than what Hydro claims, and greater than what is prescribed by International and Canadian transmission line standards. This implies that additional measures may need to be taken to mitigate the risk of extended customer outages on the IIS.