

1 Q. Reference PUB-NLH-504: Please provide an estimate of the return period for the
2 shortfall of power delivery of between 0MW and 58.8MW in the event of the loss of
3 one of the electrode line conductors whilst in mono-polar operation.

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- 6 A. The scenario described above arises when:
7 a) The Island Interconnected System is operating at peak loads,
8 b) A LIL pole outage has occurred, and
9 b) one of the two electrode conductors fails during the pole outage.

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11 Table 3-3 from the response to GRK-NLH-060 (Revision 1, Mar 2-15) indicates the
12 LIL pole outage rate is 7.36 failures per year, with an annual downtime of 70.58
13 hours per year.

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15 The LIL electrode conductors are built to the same standard as each of the HVdc
16 poles, so the electrode conductor failure rate can conservatively be assumed to be
17 the same as the HVdc pole. Referring to the same Table 3-3, the failure rate is 2.04
18 failures per year with a downtime of 12.87 hours annually.

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20 Assuming a peak period duration of two weeks, the probability of a LIL pole outage
21 during that period is:

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23 $336 \text{ hr} / 8760 \text{ hr/yr} * 7.36 \text{ events / yr}$, or 0.28 events during the peak period
24 annually.

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26 The duration during which LIL would be expected to be operating in monopole
27 mode during the same two week on-peak period is:

1 $70.58 \text{ hr / yr} * 336 \text{ hr} / (8760 \text{ hr/yr}) = 2.70 \text{ hr.}$

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3 The probability of an electrode conductor failing during the 2.70 hr on-peak LIL pole
4 outage period is:

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6 $2.70 \text{ hr} / (8760 \text{ hr/yr}) * 2.04 \text{ failures / yr, or } 0.0006 \text{ failures / year.}$

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8 This corresponds to a return period of approximately 1,600 years.

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10 This result is consistent with the conclusion drawn by SNC Lavalin in Section 3.3 of
11 Attachment 2 to the response to PUB-NLH-212, stating:

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13 *"The reliability of the electrode line is considered to have no*
14 *significant impact on the composite reliability of the link."*

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16 It also supports the decision stated by Hydro in its response to PUB-NLH-
17 541 not to take into account the risk of electrode line failures.