

1 Q. Please explain the operating restrictions that will be imposed on the Labrador Island  
2 Link in the event of a cable being out of service.

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5 A. Detailed operational studies necessary to develop complete operating guidelines  
6 for the Labrador-Island HVdc Link (LIL) will be completed in the 2015-16 timeframe  
7 following completion of the HVdc converter design and final, validated PSS<sup>®</sup>E and  
8 PSCAD<sup>™</sup> model development by the vendor.

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10 The nominal ratings of the LIL with all submarine cables in service are as follows:

- 11 • Bipolar Operation;
- 12 ○ Rated Power at Rectifier (Muskrat Falls): 900 MW (450 MW per  
13 pole).
- 14 ○ Rated Power at Inverter (Soldiers Pond): 830 MW (415 MW per  
15 pole).
- 16 ○ Rated Current: 1286 A per pole.
- 17 • Ten Minute Monopolar Operation; and
- 18 ○ Rated Power at Rectifier (Muskrat Falls): 900 MW.
- 19 ○ Rated Power at Inverter (Soldiers Pond): 662 MW.
- 20 ○ Rated Current: 2572 A.
- 21 • Continuous Monopolar Operation – Earth Return.
- 22 ○ Rated Power at Rectifier (Muskrat Falls): 675 MW.
- 23 ○ Rated Power at Inverter (Soldiers Pond): 552 MW.
- 24 ○ Rated Current: 1929 A.

1 With one submarine cable out of service, loss of a second submarine cable becomes  
2 the limiting factor on the LIL ratings. Therefore, the nominal ratings of the LIL with  
3 one submarine cable out of service are as follows<sup>1</sup>:

- 4 • Bipolar Operation;
  - 5 ○ Rated Power at Rectifier (Muskrat Falls): 900 MW (450 MW per
  - 6 pole).
  - 7 ○ Rated Power at Inverter (Soldiers Pond): 830 MW (415 MW per
  - 8 pole).
  - 9 ○ Rated Current: 1286 A per pole.
- 10 • Five Minute Monopolar Operation; and
  - 11 ○ Rated Power at Rectifier (Muskrat Falls): 900 MW.
  - 12 ○ Rated Power at Inverter (Soldiers Pond): 662 MW.
  - 13 ○ Rated Current: 2572 A.
- 14 • Continuous Monopolar Operation – Earth Return.
  - 15 ○ Rated Power at Rectifier (Muskrat Falls): 450 MW.
  - 16 ○ Rated Power at Inverter (Soldiers Pond): 396 MW.
  - 17 ○ Rated Current: 1286 A.

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19 In comparing the two sets of ratings one notes that with only two cables in service  
20 the 100% overload capability is available for only five minutes instead of ten  
21 minutes with all cables in service. As well, the continuous monopolar load level is  
22 limited to 396 MW<sup>2</sup> delivered with only two cables as opposed to 552 MW  
23 delivered with three cables in service. This is a 156 MW difference in continuous  
24 monopolar mode.

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<sup>1</sup> The two cable only scenario considers the ratings given that a second cable failure could occur leaving only one cable in service following a permanent pole outage.

<sup>2</sup> The 396 MW delivered rating is based upon a second cable failure leaving only one cable in monopolar mode.

1 In order to minimize the risk of load shedding to customers on the Island  
2 Interconnected System during a submarine cable outage (i.e., failure and repair), it  
3 would be necessary to maximize use of on island resources to supply the total  
4 Island load. With the LIL having only a 100% overload capability for five minutes in  
5 this scenario, the conservative approach would be to assume little or no standby  
6 generation can be started and fully loaded in the five minute window. Therefore, to  
7 limit the risk of under frequency load shedding for a permanent pole outage (i.e.,  
8 monopolar operation with one cable), the power delivered to the Island for Island  
9 use would be limited to 396 MW. At this load level, a pole fault on LIL would result  
10 in the Nova Scotia Block being curtailed and 396 MW of monopolar capability for  
11 Island use. With no change in the Island deliveries via LIL, under frequency load  
12 shedding on the Island for this mode of operation is prevented.

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14 During the single cable failure/repair the total Island capacity includes:

- 15 • 1013 to 1043 MW of on Island hydro-electric (variation due to reservoir  
16 levels);
- 17 • 234.7 MW of NLH standby combustion turbines and diesel (including the  
18 new 120 MW Holyrood CT);
- 19 • 41.5 MW of Newfoundland Power standby combustion turbine and diesel;
- 20 • 396 MW of import at Soldiers Pond on LIL;
- 21 • Customer generation including; and
  - 22 ○ 79.1 MW of Newfoundland Power hydro-electric (gross continuous  
23 rating).
  - 24 ○ 81.1 MW of 60 Hz Deer Lake Power hydro-electric generation.
- 25 • For a total Island capacity of 1845.4 to 1875.4 MW.

1           When the total Island load exceeds the total Island capacity of 1845.4 to 1875.4  
2           MW, Hydro would have several alternatives at its disposal.

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4           First, the LIL deliveries could be increased with under frequency relaying set on the  
5           Island system to shed load should there be a permanent pole fault on the LIL with  
6           more than 396 MW being delivered for Island use. The under frequency relaying  
7           would have to be set to shed the LIL load in excess of 396 MW. For example, if LIL  
8           was loaded to 496 MW in this scenario with all on Island resources in service, the  
9           under frequency load shedding scheme would need to shed 100 MW for a  
10          permanent pole fault.

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12          Second, Hydro could initiate interruptible load contracts with industrial and  
13          commercial customers to reduce the total Island load to the 1845.4 to 1875.4 MW  
14          range. This would have the effect of reducing the LIL load for Island use to 396 MW  
15          with all on island resources in service and eliminate under frequency load shedding  
16          in the event of a permanent pole fault.

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18          Third, Hydro has the option to import power from the Maritimes/New England via  
19          the Maritime Link to supply system load in excess of the 1845.4 to 1875.4 MW  
20          capability during the cable repair as needed in order to maintain reserves to avoid  
21          under frequency load shedding.