



NEWFOUNDLAND AND LABRADOR  
**BOARD OF COMMISSIONERS OF PUBLIC UTILITIES**  
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2015-09-15

Mr. Geoff Young  
Newfoundland and Labrador Hydro  
P.O. Box 12400  
St. John's, NL A1B 4K7

Dear Sir:

**Re: Investigation and Hearing into Supply Issues and Power Outages on the Island Interconnected System – Phase Two - Requests for Information PUB-NLH-504 to PUB-NLH-532**

Enclosed are Information Requests PUB-NLH-504 to PUB-NLH-532 regarding the above-noted matter. The deadline for Responses to these Requests for Information (RFIs) will be set at a later time.

If you have any questions, please do not hesitate to contact the Board's Legal Counsel, Ms. Jacqui Glynn, by email, [jglynn@pub.nl.ca](mailto:jglynn@pub.nl.ca) or telephone (709) 726-6781.

Yours truly,

Cheryl Blundon  
Board Secretary

/cpj  
Encl.

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1 **IN THE MATTER OF**  
2 the *Electrical Power Control Act, 1994*,  
3 SNL 1994, Chapter E-5.1 (the "*EPCA*")  
4 and the *Public Utilities Act*, RSNL 1990,  
5 Chapter P-47 (the "*Act*"), as amended; and  
6

7 **IN THE MATTER OF** the Board's Investigation  
8 and Hearing into Supply Issues and Power Outages  
9 on the Island Interconnected System.

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**PUBLIC UTILITIES BOARD  
REQUESTS FOR INFORMATION**

**PUB-NLH-504 to PUB-NLH-532**

**Issued: September 15, 2015**

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- 1 **PUB-NLH-504** Further to the response to PUB-NLH-468, please explain the potential  
2 reduction in power delivery capability when operating in monopolar  
3 operation with a single electrode conductor in Labrador during high load  
4 periods on the Interconnected Island System. In the response include the  
5 amount of load shedding that would be required during worst case  
6 conditions.  
7
- 8 **PUB-NLH-505** Further to the response to PUB-NLH-468, please state whether, given the  
9 present design of the overhead line towers, it would be possible to  
10 increase the conductor area to increase the power delivered to Soldiers  
11 Point such that additional load shedding would not be necessary taking  
12 into account the maximum expected ambient temperature during high  
13 load conditions and if so, has this been considered.  
14
- 15 **PUB-NLH-506** Please provide any studies that may have been performed with one AC  
16 harmonic filter out of service, and with a permanent loss of one converter  
17 pole including results for loss of AC harmonic filters both at Muskrat  
18 Falls and at Soldiers Pond. If no studies have been performed, please  
19 comment on the possibility of AC voltage instability or collapse as a  
20 consequence of overload operation of the HVDC converter.  
21
- 22 **PUB-NLH-507** Further to PUB-NLH-506, please state what measures would be taken to  
23 prevent problems caused by lack of reactive power provision at the  
24 converter station during sudden overload operation.  
25
- 26 **PUB-NLH-508** Please provide an estimate of the annual number of outages that could be  
27 caused by faults in the HVDC switching station and an estimate of the  
28 repair time for faults at the HVDC switching station and the contribution  
29 of such faults to unavailability of the Labrador Island Link.  
30
- 31 **PUB-NLH-509** Further to PUB-NLH-508 please describe the measures which will be  
32 taken in the design of the HVDC switching stations to minimise the  
33 number and duration of outages including the steps which will be taken  
34 to protect the equipment from the weather conditions at the HVDC  
35 switching stations and describe the steps that will be taken to ensure that  
36 the HVDC switching stations can be accessed during all weather  
37 conditions.  
38
- 39 **PUB-NLH-510** Further to the response to CA-NLH-110, please state when the exchange  
40 of PSCAD models is planned and whether both Vendors are on-track to  
41 exchange the models on the planned date.  
42
- 43 **PUB-NLH-511** Further to the responses to PUB-NLH-484 and PUB-NLH-494 and  
44 noting that the "Maritime Link, Preliminary Interconnection Study" dated  
45 August 1, 2014, filed in response to PUB-NLH-264, stated that faults at  
46 Bay d'Espoir are accepted as "Exceptional Contingency", and therefore

1 under-frequency load shedding is permitted when this event happens,  
2 please give a progress report on the studies which are planned for  
3 2015/2016 to investigate solutions to this problem.  
4

5 **PUB-NLH-512**

6 The benefit of being able to curtail the Maritime Link in the event of  
7 problems with the Labrador Island Link or during major events in the  
8 Island Interconnected System is demonstrated in the "Maritime Link,  
9 Preliminary Interconnection Study" dated August 1, 2014 filed in  
10 response to PUB-NLH-264. Have any studies been performed in which  
11 the power flow on the Maritime Link is reversed, rather than curtailed in  
12 the event of problems with the Labrador Island Link or during major  
13 events in the Island Interconnected System? If yes, provide copies.  
14 Would such action be acceptable to the Nova Scotia AC network and has  
15 the acceptability of such action been discussed with the Nova Scotia  
16 network operator?

17 **PUB-NLH-513**

18 Further to the responses to PUB-NLH-482 and PUB-NLH-487, Hydro's  
19 definition of a bipole failure is quite different from the definition used by  
20 Cigre, which counts only simultaneous (caused by the same event) failure  
21 of both poles as a bipole outage. However, Hydro classifies the failure of  
22 a pole whilst in bipolar operation as a bipole failure.

23 Using Hydro's definition of a bipole failure is likely to result in a  
24 significant increase in the number of bipole failures, since one of the  
25 poles may be out of service for extended durations (days or weeks)  
26 because of maintenance, repair or simply fault finding. It is also likely to  
27 result in longer bipole outage times in the event of a failure of the  
28 remaining pole in service, e.g. because it is necessary to fault find and  
29 repair a much more complex system, and some repairs may take several  
30 days, if special equipment (e.g. cranes) has to be brought to site for  
31 equipment replacement.

32  
33 Please explain why Hydro's definition of a bipole outage is different  
34 from the normal Cigre definition and explain why a higher number of  
35 bipole outages, than presently estimated by Hydro, would not occur.  
36

37 **PUB-NLH-514**

38 Further to PUB-NLH-513, please explain whether there are any  
39 conditions, not discussed in the responses to PUB-NLH-482 and PUB-  
40 NLH-487, that would be considered to give an N-1 starting position, and  
41 for which Hydro would consider it to be permissible for under-frequency  
42 load shedding to occur in the event of a single pole tripping. Please  
43 include in the reply a discussion of the impact of operation with an  
44 outage of an AC harmonic filter and operation with a single electrode line  
conductor.

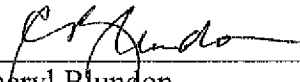
- 1    **PUB-NLH-515**            Further to the response to NP-NLH-022, please explain why the ground  
2                                    wires have not been designed for the same radial ice weight as the high  
3                                    voltage conductors. Clearly, the ground wire would have lower  
4                                    mechanical strength than the high voltage conductor, and would therefore  
5                                    be more susceptible to breaking, and creating a short circuit, if the same  
6                                    radial ice weight accumulated on it as on the high voltage conductors.  
7  
8                                    In the response explain what the consequences would be of designing the  
9                                    ground wire for the higher ice accumulation.  
10  
11   **PUB-NLH-516**            Does heavy pollution (e.g. salt fog) or forest fires cause flashovers of the  
12                                    AC overhead line insulators? If so, what counter measures does Hydro  
13                                    take to cope with such flashovers? Furthermore, noting that HVDC  
14                                    overhead lines are more susceptible to accumulation of pollution on the  
15                                    insulators, what steps does Hydro propose to take to cope with such  
16                                    flashovers?  
17  
18   **PUB-NLH-517**            Further to the response to PUB-NLH-212, and given that an overhead  
19                                    line tower collapse is most likely to occur during adverse weather  
20                                    conditions please explain and justify the average repair time of 24 hours.  
21  
22   **PUB-NLH-518**            Please confirm that Hydro does not plan to operate in bipolar mode with  
23                                    the neutral point of both the converter stations connected directly to the  
24                                    station ground mat.  
25  
26   **PUB-NLH-519**            Further to the response to PUB-NLH-212, Attachment 2, please explain  
27                                    why steps have not been taken to reduce the estimated outage rate of the  
28                                    electrode lines to less than 2 per year, since the outage of the electrode  
29                                    line would result in a pole failure becoming a bipole outage, with  
30                                    consequent potential under frequency load shedding.  
31  
32   **PUB-NLH-520**            Please describe how steps will be taken to minimise the consequences of  
33                                    the following events on the performance of the Labrador Island Link.  
34                                    Please also state the predicted contribution to the outage rate and  
35                                    unavailability (monopolar and bipolar) of the Labrador Island Link of  
36                                    each of the following events.  
37                                    1.    Tripping of one or more AC lines at Muskrat Falls converter  
38    station.  
39                                    2.    Tripping of one or more AC lines at Soldiers Pond converter  
40    station.  
41                                    3.    Delayed clearing of faults in close proximity to the Muskrat Falls  
42    and Soldiers Pond converter stations, e.g. because of breaker  
43    failure.  
44                                    4.    Major faults, e.g. fire or extensive insulation damage to one or  
45    more high inertia synchronous condensers, requiring major and

- 1 prolonged repair at times of high loading on the Labrador Island  
2 Link.
- 3 5. Operator errors.  
4 6. Major fires in the converter stations.  
5 7. Major failure of 2 or more converter transformers, requiring factory  
6 repair (such faults could be caused by latent defects or design errors  
7 not detected at type and routine testing).  
8
- 9 **PUB-NLH-521** Please explain whether the Maritime Link will be equipped with a  
10 frequency controller, capable of controlling the Island Interconnected  
11 System frequency and state whether or not the negotiations with the Nova  
12 Scotia transmission system operator have included discussion of the  
13 frequency control as potential ancillary service, and if so the response of  
14 the Nova Scotia transmission system operator to this issue.  
15
- 16 **PUB-NLH-522** Further to the responses to PUB-NLH-481 and PUB-NLH-482, please  
17 confirm that Hydro will introduce operating restrictions, such that, when  
18 the Island Interconnected System has stabilized after a single pole outage,  
19 under-frequency load shedding will not occur as a consequence of the  
20 failure of the remaining pole.  
21
- 22 **PUB-NLH-523** Further to the response to PUB-NLH-488, has Hydro completed its  
23 assessment of the need for additional reactive power compensation in the  
24 Bottom Brook area? If so, what were the conclusions, and please provide a  
25 copy of the study report. If not when will it be completed?  
26
- 27 **PUB-NLH-524** Further to the response to PUB-NLH-264, which stated that further studies  
28 would be performed, please provide any additional studies that have been  
29 completed since the Preliminary Interconnection Study. If not completed,  
30 state the dates for expected completion.  
31
- 32 **PUB-NLH-525** Further to the responses to PUB-NLH-481 and PUB-NLH-482, please  
33 state whether it is still intended to rely on import on the Maritime Link for  
34 provision of adequate power to the Island Interconnected System during a  
35 bipolar outage of the Labrador Island Link. If so, please state the  
36 maximum power that could be required from the Maritime Link.  
37
- 38 **PUB-NLH-526** Further to the response to CA-NLH-034, please state the progress that has  
39 been made on the detailed action plan with respect to protection and  
40 control to address the issues associated with breaker failure protection  
41 system design.  
42
- 43 **PUB-NLH-527** Further to the response to PUB-NLH-483, please state what progress has  
44 been made towards identifying the proposed new type of under-frequency  
45 load shedding and its setting, to avoid unnecessary load shedding, whilst  
46 still maintaining the security of the Island Interconnected System.

- 1 **PUB-NLH-528** Further to the responses to PUB-NLH-482 and PUB-NLH-487, please  
 2 explain the statement that the tripping of a monopolar scheme will be rare,  
 3 and statistically will not occur more often than every 3 years.  
 4
- 5 **PUB-NLH-529** Further to PUB-NLH-528, what is the estimated total number of bipole  
 6 trips using Hydro's definition, and taking all causes, including tripping of a  
 7 monopole, into account? The estimate should take into account both fault  
 8 and maintenance outages of each pole.  
 9
- 10 **PUB-NLH-530** Please state whether or not the Labrador Island Link and Maritime Link  
 11 Vendors have benchmarked the PSS/E models against their PSCAD  
 12 models.  
 13
- 14 **PUB-NLH-531** Further to PUB-NLH-530, what studies have been performed with the new  
 15 PSS/E models? What major differences in results have been observed?  
 16 Please provide the new study reports.  
 17
- 18 **PUB-NLH-532** Further to the response to PUB-NLH-275, please explain why a power  
 19 supply from Nova Scotia of up to 300MW is assumed, since the limit of  
 20 power delivery from a single pole of the Maritime Link is less than  
 21 250MW (250MW less the power loss in the converters (total about 2%),  
 22 and the power loss in the dc cable, which is unknown). What would be the  
 23 date of any shortfall on the Island assuming this reduced availability to  
 24 250MW on the Maritime Link?

**DATED** at St. John's, Newfoundland this 15<sup>th</sup> day of September 2015.

**BOARD OF COMMISSIONERS OF PUBLIC UTILITIES**

Per   
 Cheryl Blundon  
 Board Secretary