

1 Q. Further to the response to MHI-Nalcor-44, will Emera, Nalcor and/or Newfoundland
2 and Labrador Hydro be required to comply with North American Electric Reliability
3 Corporation Standards in the completion of the Maritime Link? If not, why not?
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6 A. The Government of Nova Scotia reports that Nova Scotia Power Inc., an Emera
7 subsidiary, is required to maintain compliance with North American Reliability
8 Council (NERC) reliability guidelines.¹ Design and operation of the Maritime Link
9 will therefore need to comply with applicable Nova Scotia reliability standards,
10 including those that originate from NERC. As a result, Emera or an Emera subsidiary
11 will be expected to demonstrate compliance to applicable NERC standards prior to
12 interconnecting the Maritime Link to the Nova Scotia electrical system.
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14 This is not currently the case in Newfoundland and Labrador, as the Government of
15 Newfoundland and Labrador has not established a role for NERC within the
16 province. As a result, the interconnection of the Maritime Link to the Island
17 Interconnected System and the facilities of Newfoundland and Labrador Hydro will
18 be approved by Hydro. Hydro's reliability, design, and operational criteria will apply
19 to the Newfoundland side of the interconnection.
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21 The Nova Scotia Power System Operator and Hydro will confirm that no Maritime
22 Link operational events, either planned or unplanned, can adversely affect the Nova
23 Scotia and Newfoundland electrical systems respectively, prior to permitting the
24 interconnection of the Maritime Link.

¹ <http://www.gov.ns.ca/energy/electricity/transmission.asp>

1 Q. Further to PUB-Nalcor-61, how has compliance with the referenced standards been
2 considered in the Project design for the Muskrat Falls-Labrador-Island Link Project?

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5 A. Since Newfoundland and Labrador has not implemented legislation regarding
6 compliance with NERC standards, the NERC standards referenced in PUB-Nalcor-61
7 are not directly applicable to the Island Interconnected system. The design of the
8 Muskrat Falls facility and the Labrador Island Transmission Link ensures the level of
9 performance historically expected of the Island Interconnected system. Further the
10 design is in compliance with Newfoundland and Labrador Hydro operating and
11 design criteria.

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For comparative purposes, compliance with the NERC standards can be considered
in the project design for the Muskrat Falls–Labrador-Island Link Project as follows:

16 **NERC TPL (Transmission Planning) Standards**

17 Table I Transmission System Standards – Normal and Emergency Conditions of the
18 NERC TPL standards outlines the required system performance under various
19 contingencies. Transmission Planning for the project is compliant under the
20 following conditions:

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Category A – No Contingencies – It has been standard practice within NLH to
ensure that the power system is capable of supplying the forecast load with all
equipment in service such that the system is stable and both thermal and voltage
limits are within applicable rating. Each planning cycle peak and light load base
cases are developed for the coming five years. Voltage and/or load violations are
identified and appropriate system additions placed in the five year plan to return

1 the system to within limits with all equipment in service. System integration studies
2 for the Labrador-Island Transmission Link have identified the required system
3 additions under Category A. These additions have been incorporated in the Basis of
4 Design.

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6 **Category B – Event resulting in loss of a single element (with no loss of load) – NLH**
7 is not fully compliant in Category B today and is not planning to be compliant with
8 the addition of the Labrador Island Transmission Link.

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10 Areas of compliance in Category B include:

- 11 • Single line to ground faults with successful reclose of transmission line
- 12 • Switching of transmission circuits and transformers without a fault
- 13 • Single pole block with normal clearing has been a criterion used in
14 integration studies for the HVdc link. The system is planned to survive the
15 sudden loss of a pole with no load loss on the Island Interconnected system.

16 Non-compliance issues include:

- 17 • Loss of a generator today results in under frequency load shed. With the
18 Labrador Island Transmission Link completed it is expected that under
19 frequency load shed for loss of on Island generation will be reduced
- 20 • 3-phase faults with loss of transmission today will result in loss of Holyrood
21 for faults between Bay d’Espoir and St. John’s. With the Labrador Island
22 Transmission Link a 3-phase fault at Bay d’Espoir will result in loss of load
- 23 • Many 230 kV transformers are connected to the 230 kV bus via a motor
24 operated disconnect switch and not a 230 kV circuit breaker. A fault on a
25 230 kV power transformer will result in tripping of a section of 230 kV bus
26 with short term loss of load until the faulted transformer can be isolated and
27 the 230 kV bus restored. Historically this has been deemed acceptable given

1 the low probability of transformer fault. Breaker and one half arrangements
2 are being used for terminal stations associated with the project to eliminate
3 this issue.

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5 ***Category C – Events resulting in the loss of two or more elements***

6 ***(planned/controlled load loss)*** – NLH is generally compliant with the contingencies
7 in this category, however, the magnitudes of load loss have not been identified for
8 each possible contingency. For the bi-pole failure an SPS is envisioned to isolate
9 central and west coast generation with sufficient load to maintain a stable isolated
10 system. NLH does not use multiple circuit towers as a rule. For the Muskrat Falls ac
11 interconnection multiple circuit towers have been deemed acceptable for station
12 entrances and river crossing only.

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14 ***Category D – Extreme event resulting in two or more elements removed or***

15 ***cascading out of service*** – this category has not historically been evaluated by NLH
16 as it requires joint evaluation with other neighbouring systems and to date the
17 Island Interconnected system has been isolated. System integration studies
18 involving Island Interconnected system disturbances with impacts in Nova Scotia
19 and vice versa are being evaluated with respect to the Maritime Link. Due to the
20 HVdc interconnection between the Island Interconnected system and Nova Scotia,
21 ac disturbances (i.e. over/under voltage or frequency) on the Island system are
22 unable to propagate over the Maritime Link to Nova Scotia. In essence, the Nova
23 Scotia electrical system is “firewalled” from disturbances in the Island
24 Interconnected system.

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26 **NERC Protection and Control System (PRC) Standards**

27 FERC Order 693 states:

1 P 1436. ... we note that while the PRC Reliability Standards do not specifically
2 require protection systems consisting of redundant and independent protection
3 groups for each critical element in the Bulk-Power System, such requirements are
4 included as one potential solution in the TPL Reliability Standards.

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6 In keeping with the spirit of NERC PRC standards and FERC Order 693, redundant
7 systems, denoted protection group A and protection group B, are being used for the
8 Muskrat Falls Labrador Island Transmission Link Project. In addition each separate
9 protection group will be supplied by a separate dc battery bank system to ensure
10 reliable operation of the protection and control scheme. Beyond the NERC PRC
11 standards and FERC Order 693, critical clearing time requirements on the ac
12 transmission systems in both Labrador and on the Island require high speed
13 protection such that redundant high speed protection systems are required to
14 maintain power system stability.

1 Q. Further to the response to MHI-Nalcor-57, is the correct reference to Exhibit 44, not
2 43?

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5 A. Further to the response to MHI-Nalcor-57 - *The AMEC report on Thermal*
6 *Generation Life Extensions at Holyrood*, the correct reference is to Exhibit 44, not
7 Exhibit 43.

1 Q. Further to the response to MHI-Nalcor-103, is the correct reference to Exhibit CE-
2 56, not CE-61?

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5 A. Further to the response to MHI-Nalcor-103, the correct reference is to Exhibit CE-
6 56, not CE-61.

1 Q. Please confirm the date on which the Gull Island Development Multiterminal HVdc
2 Line and the HVdc link to New Brunswick Project was abandoned for not meeting
3 Nalcor's financial targets?
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6 A. Nalcor's Decision Gate process follows a decision making practice that is the
7 opposite of that suggested by the question. Both Gull Island and Muskrat Falls were
8 considered at DG2. Nalcor elected to advance Muskrat Falls and the Labrador
9 Island Link through DG2 and to begin undertaking the work in anticipation of
10 sanction.
11

12 Work continues on Gull Island and a decision to advance Gull Island through a
13 separate DG2 milestone will be considered as market and market access planning
14 for that development proceeds.

1 Q. Please confirm the date on which the Gull Island Development Multiterminal HVdc
2 Line and the HVdc link to New Brunswick Project was abandoned for not meeting
3 Nalcor's financial targets?
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6 A. Both Gull Island and Muskrat Falls have been included as part of Nalcor's current
7 planning for the lower Churchill for several years.
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9 In 2004, the Government of Newfoundland and Labrador initiated an Expression of
10 Interest process for development of the Lower Churchill River, at which time both
11 Gull Island and Muskrat Falls were included in the process.¹ The completion of this
12 process led to direction from the Province to NLH on May 8, 2006 to lead planning
13 activities for the project.²
14

15 Nalcor has planned a variety of market access alternatives for both sites, including
16 transmission access through the Hydro Quebec transmission system³, as well
17 through a new HVdc link from Labrador to Newfoundland and ultimately to the
18 Maritime provinces and beyond.
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20 With the Hydro Quebec OATT application, Gull Island was the primary focus.
21 However, throughout the course of its planning, Nalcor has maintained flexibility in
22 the sequence of Muskrat Falls and Gull Island, as well as flexibility in the final
23 selection of its market access portfolio.

¹ <http://www.releases.gov.nl.ca/releases/2004/exec/0920n05.htm>

² <http://www.releases.gov.nl.ca/releases/2006/exec/0508n03.htm>

³ <http://www.releases.gov.nl.ca/releases/2006/exec/0120n03.htm>

1 The formal decision to select the preferred development concept (Gull Island vs.
2 Muskrat Falls) and preferred market access alternative (Labrador Island
3 Transmission Link vs. HQ OATT vs. Gull Island multi-terminal HVdc) was made at
4 DG2 on November 16, 2010.

1 Q. Further to PUB-Nalcor-65, please confirm the date when analysis of the Muskrat
2 Falls-Labrador-Island Link and Nova Scotia Link Project was commenced?

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5 A. As indicated in PUB-Nalcor-65, all projects have been under analysis in parallel up to
6 DG2.

1 Q. Further to PUB-Nalcor-65, please confirm the date when analysis of the Muskrat
2 Falls-Labrador-Island Link and Nova Scotia Link Project was commenced?

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5 A. As indicated in Nalcor's response to PUB-Nalcor-65 (Revision 1), planning for
6 Muskrat Falls and Gull Island has been taking place since May 8, 2006, in
7 accordance with direction from the Province of Newfoundland and Labrador.

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9 With the HQT OATT application in January of 2006, Nalcor's primary focus was on
10 Gull Island, and the HVdc link was considered as an alternative in Hydro's
11 generation expansion plans since that date.

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13 With the May 11, 2010 decision by the Quebec Regie de l'energie to dismiss NLH's
14 complaints against Hydro Quebec, priority was then given to Muskrat Falls in
15 conjunction with the Labrador Island Transmission Link as an interconnected
16 solution to meet the island's needs.

1 Q. Using the long term planning forecast for 2000, please provide a table comparing
 2 the forecast fuel price for the Holyrood Thermal Generating Station versus the
 3 average fuel price actually paid for the years 2000 to 2010.

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6 A. Please see table below.

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	Holyrood Fuel Price Forecast - October 1999			Actual Holyrood Consumption Price (Cdn\$/Bbl)
	#6 0.7%S (\$Cdn/bbl)	#6 1.0%S (\$Cdn/bbl)	#6 2.2%S (\$Cdn/bbl)	
2000	27.92	27.40	24.47	30.92
2001	28.26	27.47	24.46	29.69
2002	28.04	27.05	23.86	30.59
2003	27.82	26.84	23.63	37.34
2004	27.90	27.00	23.78	31.02
2005	28.16	27.35	24.12	37.59
2006	28.71	27.88	24.61	50.50
2007	29.27	28.42	25.11	52.51
2008	29.85	28.97	25.62	71.59
2009	30.43	29.53	26.14	52.02
2010	31.03	30.11	26.67	73.86

8 Notes: Holyrood switched from 2.2%S fuel to 1.0%S fuel in March 2006.
 Holyrood switched from 1.0%S fuel to 0.7%S fuel in April 2009.

1 Q. Please provide the detailed document Gate 2 Capital Cost Estimate Report –
2 Muskrat Falls Generating Facilities.

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5 A. Please refer to Confidential Exhibit CE-65, “Gate 2 Capital Cost Estimate Report –
6 Muskrat Falls Generation Facility”.

1 Q. Please provide the detailed document Gate 2 Capital Cost Estimate Report – LIL
2 HVdc System.

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5 A. Please refer to Confidential Exhibit CE-66, “Gate 2 Capital Cost Estimate Report –
6 Island Link”.

1 Q. Please provide the document Project Control Schedule Report.

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4 A. Please refer to Confidential Exhibit CE-67, "Project Control Schedule".