

1 Q. With respect to CA/KPL-Nalcor-7, please provide:

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- 3 • A measure of the increased reliability provided by a single transmission line
- 4 between Muskrat Falls and Churchill Falls
- 5 • A measure of the increased reliability provided by the twin transmission lines
- 6 between Muskrat Falls and Churchill Falls
- 7 • The expected and FIRM Muskrat Falls generation in the absence of an
- 8 agreement with Churchill Falls.

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11 A. As discussed in the response to CA/KPL-Nalcor-7, an interconnection between
12 Muskrat Falls and Churchill Falls is required to ensure effective water management
13 on the Churchill River. In addition, the link also ensures the reliable operation of the
14 power system.

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16 As part of the planning necessary to determine the preferred transmission voltage
17 between Muskrat Falls and Churchill Falls, stability analyses were undertaken to
18 assess system performance.

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20 The use of a single transmission line between Muskrat Falls and Churchill Falls is
21 precluded for the following reasons:

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- 23 • the system demonstrates angular instability with 4 units in service at
- 24 Muskrat and the HVdc link out of service, a scenario that could be expected
- 25 to occur during periods of high flows at Muskrat Falls and low demand on
- 26 the Island early each summer.

- 1 • a three phase 315 kV fault results in HVdc commutation failure, followed by
2 a complete load rejection at Muskrat Falls, and a permanent block on the
3 HVdc system. This would result in the loss of all supply from Labrador to
4 the Island. This same sequence of events would also be triggered by
5 temporary bipole fault on the HVdc system.

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7 Both of these issues are resolved with two transmission lines between Muskrat Falls
8 and Churchill Falls.

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10 Based on these analyses, two transmission lines are required between Muskrat Falls
11 and Churchill Falls.

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13 The expected and firm generation at Muskrat Falls in the absence of an agreement
14 with Churchill Falls does not assist consideration of the Reference Question, as
15 discussed in Nalcor's response to CA/KPL-Nalcor-78.

1 Q. What actions have been taken to increase the system resiliency / decrease the
2 duration of any likely outages? Additional spare parts were mentioned. Did long
3 term projected O&M costs include these measures?
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6 A. The design principles applicable to the Muskrat Falls facility and the Labrador Island
7 Transmission Link would generally be described in Nalcor's view as 'good utility
8 practice'¹. Specific principles are described in Section 2.3 of Nalcor's Submission to
9 the Board².

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11 From an operational perspective, Nalcor's approach to reliability has been to
12 consider the types of events and issues that would be expected to occur, establish
13 reasonable timeframes for recovery, and then to ensure that system performance
14 would be maintained within those timeframes. For example, the approach used to
15 evaluate HVdc reliability described in Exhibit 106 considers a two week repair
16 period, and then considers the impact on system reliability over that relatively long
17 timeframe. Nalcor's approach could be considered to be the opposite of that
18 suggested in the question – rather than decrease outage time, system reliability has
19 been evaluated in the context of performance over a relatively conservative outage
20 time.

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22 The reference to 'additional spare parts' provides insufficient detail and context to
23 comment specifically. In general, manufacturer recommended spare parts will be
24 provided. These will be specified during detailed engineering.

¹ Exhibit 30, page 8

² Nalcor's Submission, page 18

1 Nalcor's Transmission Planning Manual³ and Nalcor's response to PUB-Nalcor-140
2 provide insight into Nalcor's transmission performance requirements. Spare
3 synchronous condenser capacity will be available to provide for continued
4 operation through an equipment contingency, and a spare submarine cable has
5 been included in the Labrador Island Transmission Link capital cost estimate in
6 order to provide for reliable operation of the link in the unlikely event of a
7 submarine cable fault that may take some time to repair.

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9 With the exception of the spare submarine cable, no specific steps have been taken
10 to reduce the duration of outages. Nalcor's approach has been to expect the same
11 level of performance as is generally expected in the industry, and to plan for
12 contingencies that may arise.

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14 As a result, operating budgets are based on industry norms and benchmarks for
15 similar plants and transmission systems, including those presently operated by
16 Nalcor or its subsidiaries. Operating cost estimates include provisions for regular,
17 on-going system maintenance, including for spare parts, equipment and tools, as
18 well as third party specialist support.

³ Exhibit 105

1 Q. Response CA/KPL-Nalcor-15 states "Nalcor wished to ensure that future pricing for
2 transmission services on the Labrador Island Link (LIL) would be consistent with this
3 established model", as the reason for not including LIL in the MF PPA terms. Again
4 with regards to the reference question, the "open market" consideration were to
5 be neglected. Please indicate the unit cost of energy from MF and the LIL with the
6 LIL included.

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9 A. Nalcor is using a cost of service approach for the Labrador Island Transmission Link
10 for the reasons outlined in its response to CA/KPL-Nalcor-15. Further analysis of an
11 alternate pricing approach was not undertaken as it does not assist consideration of
12 the Reference Question.

1 Q. P 134 of the Submission discusses a two-week anticipated repair interval after an
2 event. Please provide a discussion of the expected duration of a curtailment event
3 in the context of an event in the interconnected island option and isolated island
4 scenario. Are the durations expected to be similar despite the complexity of the
5 LIL?

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8 A. Page 134 of the Submission discusses a two-week repair interval “in the context of
9 the analysis completed in the Technical Note¹ on reliability”², and specifically
10 discusses a specific event – a transmission line structural failure.

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12 Nalcor understands the “complexity of the LIL” to be in the context of the HVdc
13 converters installed on the link. Table 1 in Exhibit 106³ presents the average
14 duration of bipole faults for one converter per pole systems. The average duration
15 of bipole faults for the worst performing system (Square Butte) is 2.27 hours. Based
16 on the performance of HVdc systems globally, Nalcor does not expect converters to
17 contribute to extended outages.

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19 NL Hydro’s previous operational experience is used to support the two-week repair
20 interval⁴, and in either the Isolated Island or Interconnected Island alternative, the
21 event in question involves repairs to steel transmission structures. Nalcor is
22 therefore of the view that the worst-case repair time in either alternative would be
23 very similar.

¹ Exhibit 106
² Nalcor’s Submission, page 134 line 1
³ Exhibit 106, page 16 (Also PUB-Nalcor-165)
⁴ Exhibit 106, page 27

1 Q. Figure 8: Delivery strategy p.41 of 92 of Submission shows EA works done under
2 separate leadership from the EPC work. How will the commitments under the EA be
3 ensured and how will the EA ensure that it does not overcommit beyond optimal
4 choices from an EPC perspective?

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7 A. Commitments under the Environmental Assessment (EA) process, including
8 mitigation measures identified in the Environmental Impact Statement (EIS),
9 through the Joint Review Panel (JRP) Hearings and in responses to Information
10 Requests (IR's), become part of the project scope and as such are communicated to
11 the project team for inclusion in the project scope of work and the Basis of Design.
12 Nalcor is leading the Project Environmental Process with a dedicated group within
13 the overall Nalcor Project Management team.

14

15 Nalcor has also assigned resources to ensure the commitments identified above are
16 communicated and reflected in the design, purchasing and contract documents
17 which are produced by its engineering consultant, SNC-Lavalin, who have an
18 Engineering, Procurement and Construction Management (EPCM) contract with
19 Nalcor. Nalcor reviews the deliverables produced by the EPCM contractor and
20 ensures compliance with any commitments that Nalcor has made through the EA
21 process. During construction, the approved Environmental Protection Plan (EPP),
22 which contains the operational and construction related environmental protection
23 methods, shall apply. The EPP shall be in compliance with commitments made by
24 Nalcor and the EPP also flows through to any Contractors and Sub Contractors. It is
25 the responsibility of the Project Site team to ensure compliance in this regard.

1 All contracts and purchase orders will require compliance with the EIS, EPP,
2 specifications, design and contract documents, which in turn reflect the
3 commitments made by Nalcor regarding EA. As a result, compliance with
4 regulatory and legal requirements and Nalcor's commitments is required, with no
5 opportunity to over or under-commit.

1 Q. P 45 of 92 of the Submission describes the construction approach and sequencing.
2 Can a copy of the schedule from which the description was derived be provided?

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4

5 A. A detailed schedule for the Project was provided to the Board and its Consultant as
6 Confidential Exhibit CE-67, Project Control Schedule. A public or redacted version
7 cannot be made available.

1 Q. According to the schedule provided in the Submission p. 89 of 92 have all the 2011
2 activities already taken place, and are all the 2012 activities on track to take place?

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5 A. The referenced schedule reflects the planning basis at Decision Gate 2 (November
6 2010), which was hinged upon an anticipated release of the Generation Project
7 from Environmental Assessment by Q3-2011. Since EA release has not yet been
8 granted, the subsequent construction activities have not commenced. Nalcor is
9 focused towards undertaking engineering and project planning activities in order to
10 maintain the target first power date, while reflecting the requirement to have EA
11 release prior to commencement of any construction works.

1 Q. What is the impact to the online power date should the WTW award not be
2 complete by mid third quarter 2012?

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5 A. The turbine generator (TG) sets have been recognized as being on the project
6 critical path and Nalcor has been proactive in de-risking the schedule by advancing
7 the TG model testing, which was initiated in 2011 and continues into 2012. It is not
8 possible to accurately predict the schedule effect on the in-service (online power)
9 date should the WTW award not occur in Q3 2012 because the manufacturing
10 schedule of the successful bidder will not be known until procurement is concluded.
11 If the successful bidder's engineering and manufacturing schedule results in an
12 unacceptable impact to the critical path schedule Nalcor will negotiate with the
13 successful bidder to bring the TG schedule in line with the overall approved project
14 schedule.

1 Q. CE-13 page 156 discusses modified Churchill Falls operation to assist in lowering the
2 construction design floods. Will there be a cost to CF associated with this and has it
3 been accounted for (associated with the loss of generation from Churchill Falls)?
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6 A. CE-13 (Public) page 156 discusses the possibility of reducing output at Churchill Falls
7 during peak flood periods to assist in lowering maximum diversion flow
8 requirements. This study was based on a scenario where Muskrat Falls was
9 constructed after Gull Island. In 2011, the diversion flow requirement at Muskrat
10 Falls, where Muskrat Falls is constructed before Gull Island, was reviewed based on
11 updated hydrological data. Based on Canadian Dam Association guidelines, the
12 construction design flood for Muskrat Falls was determined to be $5,890 \text{ m}^3/\text{s}$ ¹,
13 including flow from the Churchill Falls plant. The Muskrat Falls spillway discharge
14 capacity was, therefore, set at $5,890 \text{ m}^3/\text{s}$ and, consequently, there is no
15 requirement to reduce production at Churchill Falls during the flood period.

¹ CE-23 (Public), page 16

1 Q. Consumer Question: There is considerable potential in Labrador West for iron ore
2 production that could provide large positive economic benefits for the Province.
3 Has Nalcor assessed the power demand from these potential iron producers in
4 Labrador West?

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7 A. Please refer to Nalcor's response to PUB-Nalcor-16.