Q. Exhibit 16 – Generation Planning Issues (PDF page 37) mentions a number of energy conservation programs and states their success, yet no metric of the impact is indicated. It further states (pdf page 39):

> "The impact of energy conservation measures resulting from the Five-Year Energy Conservation Plan will need to be evaluated to determine what, if any impact, it has on the decision for the next source. At this time, it is expected that the principal benefits will be the economic and environmental benefits of the reduced reliance on HTGS produced electricity and that he (sic) timing for the next decision will be unaffected."

Have any energy conservation measures, including demand side management, been taken into account in terms of the load forecasting that is being used to project energy demand in the future? Exhibit 16, pages 37 and 39 make reference to energy conservation plans, but there is no mention as to whether these conservation measures have been taken into account in terms of load forecasting.

A. There is no explicit reduction in the 2010 Planning Load Forecast (2010 PLF) to reflect the five year energy conservation plan targets. NLH has not incorporated these utility sponsored program savings targets into its planning load forecast due to the uncertainty of achieving dependable firm outcomes. Notwithstanding, the 2010 PLF did include energy and demand reductions for utility load based on the historical trends in energy and demand savings estimated in the load forecast statistical models. Sensitivity analyses addressing the economic impact on generation planning of achieving specific CDM targets have been included in Nalcor's submission to the Board.

Q. MHI-Nalcor-49 at 49.1 indicates a 2010 Holyrood Projection of 1,032.8 GWh. The 2010 demand as stated in Exhibit 1 is 7,585 GWh. Table 3.1 from Exhibit 16 – Generation Planning Issues puts the cumulative firm and average supplies from Newfoundland and Labrador Hydro Assets, Newfoundland Power Assets, Corner Brook Assets, and the PPAs at 5,957 and 6,847 GWh, which puts the Holyrood supply balance at 1,628 GWh under the firm supply case and 738 GWh under the average supply case.

a. Please explain how 1,032.8 GWh is derived and what scenario is used to determine the amount of thermal complement considered (average, firm, or a more complex seasonal statistical analysis).

b. Please elaborate on the supplies available from Corner Brook Pulp and Paper and Newfoundland Power Inc. and the corresponding demand they supply

c. Please confirm that the demands currently supplied by Corner Brook Pulp and Paper and Newfoundland Power Inc. are integrated in the demand projections.

A. a. The scenario used to determine the amount of thermal complement required from NLH sources is average energy. However, as noted on page 3 of *Exhibit 100 - Output from 2010 Isolated and Interconnected Island Strategist run.pdf*, the "expected average hydro production is down for 2010, 2011 and 2012 due to expected spill". Between October and April, Holyrood has to be online and generating at least at minimum levels for reasons of system security and load and voltage support, even if hydro sites are spilling water elsewhere. With the reduction

in load due to the shutdown of the Grand Falls paper mill in 2009, it is expected that NLH will be spilling water every year for the next several years. This will continue until load increases sufficiently, as expected when Vale comes in-service.

As can be seen on pages 1, 2 and 3 of *Exhibit 100*, for 2010:

Total Hydro and Wind	= 6480.8 GWh
Corner Brook Co-Gen PPA and other Thermal	= 71.4 GWh
Holyrood	**= 1032.8 GWh**
Total Forecast	= 7585.0 GWh

b. As given on page 25 of *Exhibit 10a Hydroelectric and Wind Energy - Monthly Energy Production Forecasts.pdf*, the forecasted production for Corner Brook Pulp and Paper (Deer Lake Power) and Newfoundland Power Inc. are as follows:

	2010	2011	2012-2014
	GWh	GWh	GWh
Newfoundland Power	428.8	429.7	431.6
Deer Lake Power	878.9	878.9	878.9

As can be seen from page 2 of *Exhibit 100,* Newfoundland Power's generation and Corner Brook Pulp and Paper's generation supply a corresponding amount of load.

c. The demand currently supplied by Corner Brook Pulp and Paper and Newfoundland Power Inc. is integrated in the demand projections.

The generation assets owned by Corner Brook Pulp and Paper and Newfoundland Power Inc. respectively are included in the island generation resources and their loads are included in the island demand forecast.

Q. Nalcor has provided a set of potential hydropower and wind resource supplies for the Isolated Island Option.

a. Please reference the documents outlining the comprehensive listing of available Island resources and opportunities. Are the listed island generation opportunities the only significant ones that can be considered? Are there additional island hydro opportunities, non-listed?

b. What is the time frame for major upgrades or refurbishment of Newfoundland and Labrador Hydro's existing assets and are there any opportunities to increase the installed capacity of existing infrastructure at the same time?

c. Similarly, are there any opportunities at Corner Brook Pulp and Paper and Newfoundland Power Inc.?

d. Is there room to increase the installed capacity of the existing on island system to increase the amount of wind penetration? It was noted that under the island scenario a continued increase in thermal capacity did not seem to be accompanied by a larger wind penetration allowance.

A. a. For a discussion of available Island hydropower and wind resources and opportunities please see *Section 4.2.8 Wind and Section 4.2.12 Island Hydroelectric (including Other Small Hydro starting on page 89)* of *Nalcor's Submission to the Board of Commissioners of Public Utilities with respect to the Reference from the Lieutenant-Governor in Council on the Muskrat Falls Project* November 10, 2011.

b. Opportunities to increase the installed capacity of existing infrastructure during major upgrades or refurbishment of Newfoundland and Labrador Hydro's existing assets are minimal. Unless allowed for in the original design of the facility, only minor increases would be technically possible. As these opportunities occur, they will be studied on an economic and technical basis.

c. The technical considerations associated with increasing and installing capacity at existing facilities of Corner Brook Pulp and Paper and Newfoundland Power Inc. are the same as those for NLH. NLH also expects these opportunities to be minimal.

d. As load increases, it is expected that there will be room to accommodate some additional wind generation on the existing Island Interconnected system. This has been addressed in Section 4.2.8 of Nalcor's Submission to the Board of Commissioners of Public Utilities with respect to the Reference from the Lieutenant-Governor in Council on the Muskrat Falls Project November 10, 2011. Nalcor has provided a sensitivity analysis for increased wind penetration and the result indicates that the Interconnected Island alternative remains the preferred option. The results of this sensitivity are provided in Section 7.2 of Nalcor's Submission.

Q. MHI-Nalcor-07 includes the updated cost estimate for the HVDC. MHI-Nalcor-19 states, "There is no definitive design report as this work was done internally however document CE 32 (Exhibit 23) HVDC System – Historical Summary outlines the sequence of events leading to the current project definition". Could a Bill of Quantities be provided to assess what has and has not been included in MHI-Nalcor-07?

A. Details of the basis of estimate for the Labrador-Island Link are contained in Exhibit CE-51 Rev. 1 (Public). For further clarity, the DG2 cost estimate includes provision for all components, including those for which detailed designed has yet to progress to the point of Material Take-offs being available.

A Bill of Quantities for the Labrador Island Link is being developed as part of detailed engineering; a preliminary list of material quantities is shown below. In addition, to assess what has been included in the capital cost estimate, Section 6 of Exhibit 30, Lower Churchill Project Design Progression 1998 -2011, provides a listing of the main equipment, key technical parameters for the main equipment, lengths of transmission, operating voltages, electrode sites, electrode lines, converter stations, system upgrades, SOBI marine crossing and transition compounds.

A preliminary list of material requirements is presented below:

- 2,200,000 m of conductor
- 345,000 dc insulators
- 3,640 steel towers and 18,000 foundations (mix of steel grillage and guy anchors)
- 1,100,000 m each of OPGW and counterpoise

- 520,000 m of guy wire
- 900,000 m of electrode conductor
- 120,000 m submarine cable
- 1,000,000 tonnes of rock

Electrical equipment and converter stations will be provided as turn key projects.

Q. What is the basis for the capital cost outlined in MHI-Nalcor-07?

A. An overview of DG2 capital cost and schedule estimates, including the methods used for escalation and contingency development is provided in MHI-Nalcor-07 is detailed in Exhibit CE-51 Rev. 1 (Public). Section 6 of Exhibit 30, Lower Churchill Project Design Progression 1998 -2011, provides a description of the equipment, equipment ratings, voltages, key technical parameters used to develop the capital cost estimate.

Q. Is the capital cost of (sic) O&M cost for the HVAC Transmission Systems described in Muskrat Falls Project – Exhibit 30, page 17 of 24 included in the HVDC?

A. Both the capital and O&M costs for the equipment referenced in Exhibit 30, page 17 of 24 are included in the overall DG2 estimate. Furthermore the specific costs are distributed as follows:

- Soldiers Pond Switchyard is included in the Labrador Island Transmission Link Project costs.
- 2 - 345 kV HVac transmission lines from Muskrat Falls Switchyard to HVdc Converter Station are included in the Labrador Island Transmission Link Project costs.
- 2 - 345 kV HVac overhead transmission lines from Muskrat Falls to Churchill Falls are included in the Muskrat Falls Project costs.
- 4 – 345 kV HVac Collector Lines to connect the high side of the step up transformers at Muskrat Falls to the Muskrat Falls switchyard are included in the Muskrat Falls Project costs.

Q. Has the transmission line from Muskrat Falls to Churchill Falls been included in the analysis and cost estimate? On what basis? (Synopsis of 2010 Generation Expansion Decision – Exhibit C, page 3 of 9 mentions the recall of 300 MW capacity from Upper Churchill as a basis for the 900 MW HDVC Link).

A. A transmission interconnection between Muskrat Falls and Churchill Falls is required to ensure effective water management on the Churchill River. The transmission interconnection is required to facilitate energy transfers between the two plants, and thus energy storage. Without water management, production at Muskrat Falls would be largely dependent on production at Churchill Falls.

A reliable transmission interconnection (two lines) is required in order to maintain the stability of the eastern Labrador power system (Muskrat Falls, TL240, and Happy Valley-Goose Bay) in the event of a fault on the transmission line interconnecting Muskrat Falls and Churchill Falls. Without the second interconnection, an AC transmission fault in Labrador may result in:

1) A substantial load rejection on the Island Interconnected system if Muskrat Falls is transferring energy to Churchill Falls, or

2) a substantial loss of generation on the Island Interconnected system if Churchill Falls is returning energy back to Muskrat Falls.

The Island Interconnected system will not survive a loss of several hundred megawatts of load or generation, and as a result, two 345 kV transmission lines between Churchill Falls and Muskrat Falls have been included in the Basis of Design and the capital cost estimate for analysis.

Q. Laying and protecting submarine cables was not included in the DC1010 – Voltage and Conductor Optimization, DC1020 – HVDC System Integration Study, DC1210 – HDVC System Sensitivity and VSC Risk Analysis scopes. Is there evidence to support the cost estimate by Nalcor? (Note in Exhibit 37, page 19, Nalcor indicates a high confidence in the seabed cost.)

A. Feasibility studies and conceptual designs for the Strait of Belle Isle cables, cable placement, and protection techniques are presented in the following confidential exhibits:

CE-40 Boskalis Shore Approach Feasibility Study Report
CE-41 Feasibility Study of HDD for the Strait of Belle Isle
CE-42 LCP Rock Berm Concept Development – Study Report
CE-43 Lower Churchill Project Shore Approach Feasibility Study Report
CE-44 SOBI Marine Crossing Phase 2 Conceptual Design

Public versions of these confidential exhibits have been posted to the Board's website.

Cost estimates have been developed through consultation with suppliers, contractors and the team's previous experience with marine projects in Atlantic Canada.

Q. Several alternative "Upgrades to the Island Interconnected System" are presented in Exhibit 23. Which one was selected?

A. The following upgrades to the Island Interconnected System are proposed prior to in-service of the Labrador – Island Transmission Link:

- 3 high inertia synchronous condensers installed at Soldiers Pond, with the final inertia and MVAR requirement to be determined in detailed engineering prior to Project Sanction;
- conversion of Holyrood units 1 and 2 to synchronous condenser operation; and
- 230 kV and 138 kV circuit breaker upgrades due to increased short circuit levels on the system.

As the Island Interconnected transmission system is currently unable to successfully recover from a 3 phase fault at Bay d'Espoir and other eastern locations, upgrades to permit this in the future are not contemplated.

The proposed 230 kV transmission line is required for both the Isolated Island and Interconnected Island alternatives, and is expected to be in place prior to in-service of the Labrador – Island Transmission Link.

Q. Are there costs born (sic) in anticipation of the development of a Maritime HVDC Link, that should be not included?

A. No costs incurred in relation to the Maritime Link have been included with Muskrat Falls or the Labrador Island Transmission Link costs.