Q. On pg. 7 of Exhibit 23 it is stated that significant modifications would have to be made to the existing under-frequency load shedding schemes to deal with the impact of the loss of both poles of the HVdc system. Explain, in detail, the required under-frequency load shedding schemes that would be required in the event of the loss of both poles of the HVdc system and what would comprise the approximately 750 MW of load that would have to be shed in such a contingency.

A. The existing under frequency load shedding (UFLS) scheme is set to arrest frequency decay following sudden loss of generation such that load shed, in conjunction with governor action, will restore the balance between generation and load, thereby returning the system frequency to normal (60 Hz) and avoiding system collapse. The existing UFLS scheme is set based upon a largest unit load of 175 MW.

By comparison the sudden loss of both poles of the bi-pole system at Soldiers Pond would result in approximately 750 MW of supply for an 800 MW HVdc system loading. The 575 MW difference in loss of supply between the two scenarios will therefore require modifications to the existing UFLS scheme. Studies underway in detailed design will address the sudden loss of the bi-pole at Soldiers Pond and parameters for a special protection scheme (SPS) for the contingency will be developed. At this stage it is envisioned that any exports via the Maritime Link will be curtailed for the loss of the bi-pole. In addition tripping of load centers on the Island to rebalance load with the remaining hydroelectric generation will result in an electrical island as opposed to a system wide blackout. It is expected that the Avalon Peninsula, and potentially the Burin Peninsula depending upon system load conditions and HVdc Link load conditions, will need to be tripped to maintain an electrically isolated island containing remaining hydroelectric resources.

Recovery of the interconnected island system from the operating hydroelectric resources will occur more quickly than if there was a complete island blackout for the event.

This is described in more detail in Exhibit 106 – Technical Note: Labrador Island HVdc Link and Island Interconnected System Reliability.

Q. Reference is made on pg. 7 of Exhibit 23 to 300 MW of available recall capacity from the Upper Churchill. How much of this is currently available and not sold under existing contracts? Please outline the terms of any contracts for sale of the recall capacity and energy, including the length of each contract.

A. The 300 MW block is sold to NL Hydro in its entirety. NL Hydro meets the needs of its non-industrial customers first and then makes any surplus energy available for sales to the mines in Labrador and for export sales.

In addition to its domestic and general service customers in Labrador, NL Hydro has contracts with:

- IOC for the supply of 62 MW of firm power, 5 MW interruptible, and secondary power if available. That contract is rolled over on a month-to-month basis, and
- DND for the supply of 23 MW of secondary power, if available.

In 2010, approximately 38% of the energy available under the 300 MW recall contract was sold for end-use in Labrador, with the unused balance being sold into export markets. In consideration of its obligations in Labrador, NL Hydro does not enter into long term contracts for the sale of surplus power from Labrador.

Q. On pg. 8 of Exhibit 23 it is stated that the HVdc link to the Maritimes would be capable of delivering up to 500 MW to the Island in the event of the loss of the HVdc system between Labrador and the Island.

Outline in detail the contractual arrangements that are in place or proposed to be put in place to purchase the required capacity and energy to be delivered over the Maritime Link in the event of the loss of the HVdc Labrador-Island system.

A. It is expected that there will be an interconnection agreement between the Newfoundland and Labrador System Operator and the Nova Scotia System Operator to facilitate reserve sharing and other emergency services typically provided by and shared between neighbouring systems. Reserve sharing and emergency services will be used to manage short term interruptions of the HVdc system between the Labrador and the Island System. The specifics of the short term reserve sharing and emergency services are under discussion with Nova Scotia and are expected to be consistent with industry practice and reflect the capability of the two systems.

In addition, for longer duration events, Nalcor or a subsidiary of Nalcor will hold market authorizations to sell and purchase energy in the Maritime Provinces and New England. With such authorizations, Nalcor will be able to purchase energy on the spot market in the unlikely event of a sustained failure of the HVdc system between Labrador and the Island systems. Nalcor or a subsidiary of Nalcor will also hold the necessary market authorizations to acquire short term transmission access for the duration of such events.

Given the remote possibility of loss of the Labrador-Island Transmission Link, the structured nature of electricity markets, and noting that the New England market is a summer peaking market with surplus capacity available during Newfoundland's winter peak, no advance contracts, other than those indicated above, are considered to be necessary.

Q. Outline in detail the contractual arrangements that are in place or proposed to be put in place for transmission capacity in Nova Scotia, New Brunswick and any other location to wheel power and energy for delivery from the source of purchase to the Maritime Link in the event of the loss of the HVdc Labrador-Island Link.

A. Please refer to the response to PUB-Nalcor-33. Given the unlikelihood and short term nature of the requirements for transmission, no contractual arrangements are required to be in place in advance to wheel power and energy to Newfoundland over the Maritime Link.

Q. It is stated in Exhibit 28 that engineering judgment was used to formulate the upgrade program for the Holyrood Thermal Generating Station and that the outlined plan gives a *"conservative order of magnitude representation of the sustaining capital"* required. What degree of accuracy is associated with the projected costs in Exhibit 28?

A. Without formal feasibility studies, the current cost estimate would be characterised as an AACE International Class 5 Screening or Scoping Level Estimate which would have an expected accuracy from -20 to -50% on the low side to +30 to +100% on the high side.

Q. It is stated in Exhibit 28 that the Provincial Energy Plan has committed to environmental improvements at Holyrood, should the plant continue to operate, including stack emissions clean-up equipment and the installation of low NO_x burners. Costs on pg. 5 of Exhibit 28 for these improvements total $599,476,000. Are there any current legislative or regulatory requirements that necessitate such environmental improvements to be made? If yes, outline in detail such requirements.

A. Although Nalcor is not aware of existing legislative or regulatory requirements that would dictate the environmental upgrades, there are indications from both the provincial and federal governments that legislation or regulation may be imposed in the future.

The *Energy Plan* states pollution controls in the form of scrubbers and electrostatic precipitators will be required if the Lower Churchill Project and the Labrador Island Transmission Link are not constructed. Based on the policy direction provided in the *Energy Plan*, Nalcor considers the inclusion of these costs in its Isolated Scenario to be an appropriate course of action.

The Government of Canada indicated its intent to require NOx emissions from electric power generating facilities in 2007. Please refer to page 13 of Exhibit 109 - “Clean Air Regulatory Agenda - Regulatory Framework for Industrial Air Emissions”. While the changes necessary to effect NO_x emissions reductions have yet to be implemented, Nalcor has included the cost of compliance in its modelling based on the intent stated by the Government of Canada.

Q. The response to PUB-Nalcor-6 states that it is public policy to install scrubbers and electrostatic precipitators at the Holyrood Plant which Exhibit 28 estimates at a cost of $581,976,000. Is the requirement to install low NO_x burners also a matter of public policy or Government directive?

A. Please refer to the response provided for PUB-Nalcor-21.

Q. Exhibit 28 states that the Holyrood Plant, in an Isolated Island scenario, would continue to operate as a generating station until the mid 2030's at which time it would be retired. The presentation by Nalcor dated July, 2011 on pg. 18 estimates the cost of future generation and replacement of the Holyrood Plant at $1.5 billion. What analysis or reports were completed to support this estimate? If no specific reports were completed, explain the basis for this projected cost and the degree of accuracy associated with the estimate.

A. The $1.5 billion referred to in the July 2011 presentation is based on in-service capital costs for generation additions from 2030 to 2036, when Holyrood is fully retired. These additions are:

Project	In Service Year	In Service Cost ($000)
GT 50	2030	102,617
CCCT 170G2	2033	346,330
CCCT 170G1	2033	464,883
Wind25	2034	98,478
CCCT 170G1	2036	491,888
Total		**1,504,197**

The detailed calculations that support these numbers are contained in the responses to MHI-Nalcor-1 and MHI-Nalcor-49.3.

Q. What final or cut-off date was used for the selection of project components for the Project Design described in Exhibit 30?

A. The Basis of Design for Muskrat Falls and the Labrador-Island Transmission Link presented in Section 6 of Exhibit 30 was approved as of DG2 in the fall of 2010. This Basis of Design represents the input into the DG2 capital cost estimate.

Q. What final or cut-off date was used for the selection of project components for the Project Design described in Exhibit 30?

A. The Basis of Design for Muskrat Falls and the Labrador-Island Transmission Link presented in Section 6 of Exhibit 30 was approved as of DG2 on November 16, 2010.

The capital cost estimate used for CPW analysis, however, was as of August 13, 2010.

Q. Explain in detail the work that has been undertaken on the project components since the final date stated in PUB-Nalcor-39 which could materially affect the project design and costs of any component.

A. The Basis of Design presented in Section 6 of Exhibit 30 reflects the DG2 capital cost estimate. Nalcor and SNC-Lavalin continue to advance phase 3 work activities, which include detailed engineering design for all project components and procurement activities in contemplation of sanction. These activities will result in the following deliverables for both Muskrat Falls and the Labrador Island Transmission Link for DG3 in the first half of 2012:

1. an updated Basis of Design optimized for DG3,
2. preparation of drawings, data sheets, specifications and coordination procedures for inclusion in the purchase orders and contracts required to meet the project schedule,
3. an updated capital cost estimate,
4. an updated project schedule,
5. an updated contingency recommendation, and
6. an updated risk analysis.

The detailed engineering and procurement work during phase 3 will culminate in an updated (DG3) project capital cost estimate and schedule, which along with other updated input data will be used in the DG3 economic modeling activities. Whilst the optimization of the design is continuing and not yet complete, Nalcor is not aware of any design changes which would result in major changes to the project design of components as described in the DG2 basis of Design.