Q. Has Nalcor received an updated report from Global Insight relating to estimates used in the Studies? Please provide a copy of the base Global insight report and revised reports?

A. Nalcor has provided the base report of Global Insight for its project capital cost escalation as of January 2010 in response to the Board's Proprietary Information Request #2, included in its June 12 letter to Nalcor. While revised reports from Global Insight have been received as part of the ongoing service retainer with Global Insight, these base forecasts have not yet been incorporated into the business case and CPW analysis. The escalation base forecasts are expected to be updated as a matter of course during analysis for the upcoming Gate 3 decision.

Q. What is the basis for using 10% rate of return on equity used in the studies?

A. Nalcor's derivation of the long run forecast cost of equity is contained in the Financing Rates worksheet contained in Exhibit 5e. The general approach is as follows: Nalcor obtains a long term forecast of risk free Government of Canada bonds from the Conference Board of Canada and then applies the cost of equity formulation as approved by the Board for Newfoundland Power and applicable to regulated Hydro at its next General Rate Application. These calculations result in a long run forecast average cost of equity of 9.94% which for analysis purposes was rounded to an even 10%.

Q. Have any guarantee fees, water rentals, land grants or dividend payments been factored into the cost of the options?

A. In the 2010 CPW analysis, the historical debt guarantee fee paid by Hydro to the Government of Newfoundland and Labrador was applied to all regulated capital in both the Isolated and Labrador supply options. For non-regulated capital (i.e. Muskrat Falls), no debt guarantee has been included in the cost of capital.

In the fall of 2009, Nalcor received a water lease from the Government of Newfoundland and Labrador for power generation on the Lower Churchill River. In consideration of those rights, Nalcor is directed to pay a water power royalty of $2.50 per MWh in 2009$ escalating at the consumer price index.

Royalty payments to Innu Nation have been included in the Interconnected alternative.

There are no land grants identified for the options.

There are no utility or project dividends payable to the Government of Newfoundland and Labrador that have been re-directed to impact the costs of options.

Q. With respect to Exhibit 5(b), Section 5.2, please provide details relating to the owner's costs (8.7% of Total Direct Costs) as set out in the cost estimates of Island Pond?

A. In consideration of the level of engineering and degree of project definition completed for Island Pond, the cost estimate for Island Pond is considered screening or feasibility level estimates. To this effect, the owner's cost has been estimated as a fixed percentage of total direct cost.

Q. Have the costs of the Muskrat Falls Option been included using a PPA approach as opposed to actual capital expenditure cash flow in the CPW? If so, please explain the rationale for doing so?

A. The costs of Muskrat Falls energy have been included as a PPA.

Nalcor's rationale for this approach for Muskrat Falls purchases has been outlined in the responses to Request #4 from the Board's July 12 2011 letter to Nalcor and MHI-Nalcor-18.

Q. Please provide unredacted cost estimates for each component of the Isolated Island Options, Strait of Belle Isle and all other reports.

A. Unredacted cost estimates for the Strait of Belle Isle have been submitted with CE-44. Island Pond, Portland Creek were filed under CE-48 and CE-49. The Round Pond information was filed under Exhibit 5d, and contained no redacted material.

Q. Please provide a document that describes the Newfoundland Hydro and Nalcor power system planning criteria.

A. The document "Newfoundland and Labrador Hydro 2009 Planning Criteria Review" dated December 2009 (see Exhibit 42) provides a summary of the Newfoundland and Labrador Hydro power system planning criteria for bulk transmission, radial transmission, distribution, Island interconnected generation and isolated diesel generation.

Q. Please provide specifications for the HVDC converter stations related to the current configuration.

A. Please refer to Section 6 in Exhibit 30 (LCP Design Progression, 1998-2011).

Q. Please provide the updated AC integrations studies for the 2011 HVDC configuration. This should include the AC system operational performance criteria, and any operational issues that need to be factored into the system design.

A. The AC integration studies for the 2011 HVdc configuration are underway with a scheduled completion date of November 2011 such that the HVdc system specification (including converter control requirements) will be completed for the project decision gate 3 in mid to late December 2011.

The objectives of integration study are:

- Develop an integrated model of the Newfoundland, Labrador and Maritime AC systems including the Labrador – Island and Maritime HVdc links;
- Identify all required upgrades to the Newfoundland and Labrador AC systems to meet the Newfoundland and Labrador Hydro System Planning Criteria. These upgrades may include additions to ensure sufficient system inertia, reactive power compensation and increased thermal capacity on the AC transmission systems to withstand specified contingencies;
- Identify the operating limits of the HVdc systems and specify high level control system requirements; and
- Identify requirements to modify existing protection and control schemes for the Newfoundland and Labrador AC systems. These modifications may include adjustment to the existing under frequency load shedding scheme, adjustment to protective relaying schemes and the addition of special protection schemes.

The steady state system criteria for the Newfoundland and Labrador AC systems are as follows:

- AC system bus voltages
  - 0.95 pu to 1.05 pu – all equipment in service
  - 0.90 pu to 1.10 pu – N-1 contingency
  - minimum permissible voltage at Come By Chance 230 kV bus is 0.922 pu under contingency
- Thermal loading on a transmission line or transformer should not exceed 100 % of:
  - Rate A – Summer season (30 ˚C ambient) – light load
  - Rate B – Spring/Fall season (15 ˚C ambient) – intermediate load
  - Rate C – Winter season (0 ˚C ambient) – peak load

  for all equipment in service and N-1 contingencies in steady state.

The transient system criteria for the Newfoundland and Labrador AC systems are as follows:

- Load shedding should not occur for the loss of the largest on line generator in the Newfoundland AC system;
- Load shedding should not occur for the temporary loss of a pole or bipole;
- System response should be stable and damped;
- Post fault recovery voltages on the AC system shall be as follows:
  - Transient under-voltages following fault clearing should not drop below 0.70 pu;
  - The duration of the voltage below 0.80 pu following fault clearing should not exceed 20 cycles;
- Post fault frequencies should not drop below 59 Hz and should not exceed 61.5 Hz; and

- Under frequency load shedding should be minimized

Operational philosophy of the Labrador – Island HVdc Link is as follows:

- Labrador – Island Link capacity is defined as 900 MW at Muskrat Falls
- Normal power flow will be from Muskrat Falls in Labrador to Soldiers Pond in Newfoundland;
- Reverse power flow is not required;
- The Labrador – Island Link will provide frequency control for the Newfoundland AC system.
- Reserve capacity for the Newfoundland AC system will be a combination of:
    - Operation of the Labrador – Island Link below rated 900 MW (i.e. generation reserve in Labrador); and
    - Operation of Newfoundland hydroelectric generation at economic operating points (i.e. spinning reserve being the difference between economic operating point and rated operating point)
- For sudden loss of a pole there shall be no under frequency load shedding on the Newfoundland AC system. From rated load in bipole mode, failure of one pole will move the Labrador – Island Link from bipolar mode operation to monopolar mode operation with earth return via shore pond electrodes. In monopolar mode the healthy pole is required to change its output from rated power (i.e. 450 MW) to twice rated power (i.e. 900 MW or 2 pu). The duration of the 2 pu operation in monopolar mode is set at 10 minutes to allow system operators in the Newfoundland and Labrador Hydro Energy Control Center time to start standby generation on the Newfoundland AC system and reduce loading on the Labrador – Island Link. To limit the amount of standby generation (i.e. fast start aero derivative combustion turbine) to be installed on the Newfoundland AC system, the continuous

monopolar rating of each pole has been set at one and one half times rated bipolar power (i.e. 675 MW or 1.5 pu);

- Labrador – Island Link monopolar mode 10 minute rating is defined as 900 MW at Muskrat Falls.
- Labrador – Island Link monopolar mode continuous rating using earth return is defined as 675 MW at Muskrat Falls.
- The sudden loss of the Labrador – Island Link bipole will result in the loss of in excess of 800 MW of generation to the Newfoundland AC system. A special protection scheme will be evaluated to address these conditions. (It should be noted that to address the sudden loss of generation under the Isolated Island scenario, an under-frequency load shedding scheme similar to the one currently in place will be required.)

The scope of the ongoing integration analysis includes:

- Load flow, short circuit and transient stability analysis using PSS/E version 32;
- Approximately 20 base case scenarios are to be assessed with Newfoundland AC system loads ranging from a minimum of 420 MW (summer night) to the future peak load case, the Newfoundland hydroelectric generation dispatch ranging from minimum through economic to maximum output, and the Labrador – Island Link loading ranging from 80 MW to 900 MW both bipole and monopole modes of operation;
- Contingencies include:
    - Temporary HVdc line faults near each converter;
    - Permanent pole failures on each link;
    - Temporary pole to pole faults on each link;
    - Temporary bipole failures on each link;

- Permanent bipole failures on each link;
- Permanent three phase faults in each of the Newfoundland and Labrador AC systems;
- Single phase 230 kV line faults with unsuccessful reclose on the Newfoundland AC system;
- Single phase 345 kV line faults with unsuccessful reclose on the Labrador AC system;
- Loss of generation in each of the Newfoundland and Labrador AC systems; and
- Loss of a synchronous condenser on the Newfoundland AC system.

Q. Please provide the AC Power System Integration Studies for the Isolated Island option.

A. The report "Island Transmission Outlook" dated December 2010 and filed as Exhibit 24 provides a description of the Newfoundland AC transmission system and outlines the near term requirements for load increase. In the context of the Isolated Island option the report provides the following:

- The 230 kV transmission system east of Bay d'Espoir is thermally constrained with respect to the start of the first oil-fired unit at Holyrood with start of the second and third units at Holyrood based on voltage constraints;
- Increased generation off the Avalon Peninsula as envisioned by the Isolated Island scenario (i.e. Portland Creek, Island Pond and Round Pond) will require additional transmission capacity between Bay d'Espoir and the Avalon Peninsula load center if the proposed hydroelectric resources are to be efficiently used prior to the start of units at Holyrood; and
- To this end the report outlines thermal uprating of 230 kV transmission lines TL202 and TL206 between Bay d'Espoir and Sunnyside Terminal Stations, four 230 kV capacitor banks totaling approximately 150 MVAR at Come By Chance Terminal Station for voltage support, a new 230 kV transmission line between Bay d'Espoir and Western Avalon Terminal Stations, and rebuild of 230 kV transmission line TL201 between Western Avalon and Hardwoods Terminal Stations to increase its thermal rating such that the required transmission capacity is in place to effectively deliver the proposed generation additions to the load center in the Isolated Island option.