Q. Please provide all historical energy (GW.h) information for distribution & transmission losses, total utility requirements, total island requirements, NLH energy deliveries and NLH net generation.

A. Please see Exhibit-58 that was provided in response to MHI-Nalcor-90.

Q. Please provide all historical demand (MW) information for the non-coincident utility peak demand, non-coincident industrial peak demand, coincident Island peak demand, NLH transmission losses peak demand and coincident NLH peak demand.

A. Please refer to the table on page 2. Please note that industrial demand information is only available from 1990 onwards and peak loss information is only available from 2000 onwards.

NL Island Interconnected System - Historical Demand Information (MW)

	NP Peak Demand	NLH Rural Peak Demand	Industrial Demand [1]	Estimated NLH Peak Demand Transmission	Island Interconnected System Peak Demand	NLH System Peak Demand
1967	156.3	-	-	-	-	-
1968	172.9	-	-	-	-	-
1969	188.8	-	-	-	-	-
1970	223.7	-	-	-	-	-
1971	267.5	-	-	-	-	-
1972	316.1	-	-	-	-	-
1973	336.3	-	-	-	-	-
1974	408.4	-	-	-	-	538
1975	488.2	-	-	-	-	527
1976	585.4	-	-	-	-	681
1977	584.2	-	-	-	-	679
1978	639.9	-	-	-	939	718
1979	664.1	-	-	-	997	821
1980	662.7	-	-	-	1030	836
1981	716.2	-	-	-	978	834
1982	731.8	-	-	-	1083	880
1983	742.6	49.2	-	-	1251	1040
1984	833.8	45.6	-	-	1186	1013
1985	825.6	48.4	-	-	1180	1009
1986	847.8	43.9	-	-	1291	1084
1987	886.0	54.6	-	-	1204	1065
1988	957.3	58.9	-	-	1435	1232
1989	1068.7	69.9	-	-	1383	1230
1990	1041.4	70.3	356.2	-	1500	1316
1991	1087.7	70.8	355.4	-	1488	1281
1992	1014.9	68.6	357.7	-	1457	1303
1993	1085.9	69.0	356.0	-	1452	1288
1994	1019.3	67.8	351.9	-	1492	1305
1995	1104.2	68.5	346.0	-	1429	1250
1996	1060.4	81.2	348.0	-	1563	1318
1997	1049.0	76.9	357.8	-	1418	1229
1998	1022.8	80.2	364.3	-	1491	1295
1999	995.7	84.8	358.3	-	1465	1265
2000	1025.5	80.1	358.3	39.1	1443	1240
2001	1175.9	82.3	359.5	43.5	1435	1262
2002	1118.3	81.3	363.7	51.4	1592	1403
2003	1099.5	87.3	364.5	40.5	1595	1402
2004	1167.3	82.2	371.2	44.1	1598	1405
2005	1130.9	80.2	366.0	36.9	1595	1361
2006	1142.3	81.4	293.0	48.6	1517	1310
2007	1180.5	81.5	291.0	46.4	1540	1323
2008	1218.6	88.9	280.0	40.9	1520	1323
2009	1205.8	81.7	197.5	39.2	1601	1390

Notes: (1) Industrial demand is the sum of customer owned capacity and industrial firm power requirement from NLH.

Q. Please provide the historical and forecast information for all variables used, but not provided (as yet), in the winter peak demand equation specified in Exhibit 45. This would include information on the following variables: WINDCHILL, NPTOTGSWA, NST and DECPEAK. The requested information should cover the 1967 – 2029 period similar to the information provided on page 7 of Exhibit 45.

A. Please see Exhibit 45 Rev 1.

Q. What changes have been made in the definition, cost estimate and schedule for the Muskrat Falls-HVDC link project since DG_2? If changes have been made, how have these impacted the CPW analysis?

A. Phase III activities in preparation for DG3 are ongoing, however these activities are not complete. The detailed engineering work required for the DG3 approved Basis of Design is proceeding and the design will be finalized when this work is completed.

At DG3 any changes will be evaluated and if appropriate approved and incorporated in the DG3 Basis of Design, which will then be used for construction. At DG3 there will be a confirmation of the Project's scope, time and cost basis which forms the basis of a Project Sanction decision.

All inputs to the DG3 CPW analysis will be updated with the latest available information in support of the DG3 sanction decision. These inputs include capital costs, schedule, operating costs, fuel prices, demand forecasts, interest rate, exchange rates, escalation, along with an updated risk analysis and contingency.

Q. Regarding 'Batch 6 MHI-Nalcor-49.1 Fuel Cost.xls'

a. In Exhibit 10a – Energy Balance, for years 2010-2014 the total energy generated by Holyrood is different than that indicated in the above-referenced response file for Holyrood Production (GWh). Please explain the difference.

b. Please provide the remaining Energy Balance tables following the table formats in Exhibit 10a, in Excel and PDF Files, for the years 2015-2067.

A. a. Holyrood production for years 2010-2014 is different in 'Exhibit 10a' than in 'Batch 6 MHI-Nalcor-49.1 Fuel Costs.xls' because different forecasts were used in each case.

The load forecast used for the 2010 generation expansion runs and thus for 'Batch 6 MHI-Nalcor-49.1 Fuel Costs.xls' was the *2010 Planning Load Forecast – May 2010*, as noted in 'Exhibit 1 _Total Island Interconnected Load Forecast.xls' and 'Exhibit 1 Addendum PLF Outline and Tables.pdf'. The forecast used in 'Exhibit 10a' was the *Operating Load Forecast – December 2009*, as noted on Page 1 of 25. The Operating Load Forecast was not used as the load input to Strategist.

The Planning Load Forecast is a long term annual forecast used to develop Hydro's generation expansion plans. The Operating Load Forecast is a short term (five years) monthly forecast used for budgeting purposes and system operation planning.

As noted in the title of 'Exhibit 10a – Hydroelectric and Wind Energy – Monthly Energy Production Forecasts', the purpose of 'Exhibit 10a' was to illustrate the monthly breakouts for hydroelectric and wind energy and detail how they were

input into Strategist. Differing total system energy requirements in the different forecasts led to different production levels for Holyrood.

The energy production numbers from Holyrood for 'Exhibit 10a' were not meant to be used in anywhere else in this exercise and were only given for 2010 – 2014, not for the full 2010 – 2067 period of the study.

b. Please refer to CE-59 and Exhibit 100 which illustrate that energy production figures from the Strategist runs for the Island Isolated and Island Interconnected alternatives, created using the 2010 PLF from Exhibit 1, match the energy production figures in 'Batch 6 MHI-Nalcor-49.1 Fuel Cost.xls' for the years 2010-2067.

Q. In document 'CE 39 MHI-Nalcor-1 CPWDetails.xls' (the CPW Summary workbook), 'Power purchase agreements – Other' for the Isolated case are provided by referencing 'Exhibit 6a PPA Listing and Rates.xls'. Please provide the equivalent detailed PPA listings and rates to support the 'Power purchase agreements – Other'line for the Infeed case. Please explain why the total 'power purchased from others' is different between the Isolated and Infeed Options.

A. 'Power purchase agreements – Other' for the Infeed case are also provided by referencing 'Exhibit 6a PPA Listing and Rates.xls'. The major difference is that "3rd Wind 2014" is not included in the Infeed case.

As well, while the output for the Corner Brook Co-Gen is currently targeted at 65.3 GWh per year, in the Strategist runs slightly different amounts were generated in the Isolated and Infeed cases because Strategist treats the Co-Gen PPA as a thermal unit. Also, there was a minor data entry error in escalation rates for Star Lake and Rattle Brook between the Isolated and Infeed cases. In both cases the effect on the cost comparisons was insignificant.

Please see Exhibit 70 for details.

Q. In the file 'Exhibit 6B Energy Over The Infeed 2010 PLF PUB Review.xls' the 'Total Energy Over Infeed' values multiplied by the 'PPA Energy Tariff' leads to a small but fixed percentage comparative difference from the 'Power Purchases' column for 2017 to 2056. Please explain the differences for these years. Why do the annual comparative differences increase substantially from 2057 to 2067?

A. Working within Exhibit 6B, and combining the energy over the infeed volumes with the PPA Energy Tariff of $75.82 /MWh in 2010$ escalating at 2% annually, Nalcor cannot identify "a small but fixed percentage comparative difference" from the Power Purchases column for the period 2017 to 2056 as indicated above.

The PPA Energy Tariff is applicable only on Muskrat Falls production for delivery to the Island. The data provided in MHI-Nalcor-49.2 for "Other" energy requirements and costs from 2057 to 2067, above Muskrat Falls output, were assumed to be sourced from Churchill Falls.

Q. Please provide updated and detailed documents that describe the methodology, data, and results of the probabilistic reliability evaluation of the Muskrat Falls and LIL HVDC Project, expressed in terms of the commonly used probabilistic indices LOLH, LOLE, and EUE. How does the probabilistic evaluation of the Muskrat Falls and LIL HVDC project compare with the Isolated Island Option?

A. For both the Isolated Island option and the Interconnected Island option, least-cost expansion plans were developed that met Hydro's reliability criteria, as noted in *Section 4.0 Planning Criteria* of Exhibit 16 *Generation planning Issues July 2010 Update*:

> To guide Hydro's planning activities the following have been adopted:
>
> **Capacity:** The Island Interconnected System should have sufficient generating capacity to satisfy a Loss of Load Hours (LOLH) expectation target of not more that 2.8 hours per year[1].
>
> **Energy:** The Island Interconnected System should have sufficient generating capability to supply all of its firm energy requirements with firm system capability[2].

[1] LOLH is a statistical assessment of the risk that the System will not be capable of serving the System's firm load for all hours of the year. For Hydro, an LOLH expectation target of not more than 2.8 hours per year represents the inability to serve all firm load for no more than 2.8 hours in a given year.
[2] Firm capability for the hydroelectric resources is the firm energy capability of those resources under the most adverse three-year sequence of reservoir inflows occurring within the historical record. Firm capability for the thermal resources (HTGS) is based on energy capability adjusted for maintenance and forced outages.

Please see *MHI-Nalcor-13* for an annual summary of forecast load versus firm energy capability from 2010 to 2067, as well as the LOLH for each year, for both the Island Isolated and Island Interconnected generation expansions plans.

For the transmission aspects of both the Interconnected Island and Isolated Island options analysis has been conducted to ensure that the established transmission planning criteria are met. By meeting the established transmission planning criteria, transmission system reliability is deemed to be met. Exhibits 24, 59 and 105 along with Confidential Exhibits CE-03 and CE-10 Rev.1 address the required system additions to meet the transmission planning criteria for both options.

Beyond the transmission planning criteria, Exhibit 106 provides an assessment of the level of exposure and unserved energy due to a transmission loss on a probabilistic basis for the Interconnected Island and the Isolated Island options on a comparable basis. Table 5 of Exhibit 106 provides the results of the analysis. In summary it indicates that between 2017 and 2027 the Interconnected Island option has less unserved energy for the worst case two week outage window than the existing system today. In terms of level of exposure the availability values for the Isolated Island and Interconnected Island are very similar in the long term with both options providing energy availability values in excess of 99% and unsupplied energy values less than 1% of the annual energy forecast in any year.