Date : 10/20/2011 9:04:09 PM
From : "Bown, Charles W."
To : "Griffiths, Sharon"
Subject : FW: RFI's
Attachment : MHI-Nalcor-67 Final.doc;MHI-Nalcor-96 (hold for EM).doc;PUB-Nalcor-12 Final.doc;PUB-Nalcor-12 pgs2-4.pdf;PUB-Nalcor-22 final_GJB.doc;PUB-Nalcor-25 - READY (hold out of scope).doc;PUB-Nalcor-26- (READY) (hold out of scope).doc;PUB-Nalcor-36- (scope hold).doc;PUB-Nalcor-41 - (scope hold).doc;PUB-Nalcor-76 - (with Paul Harrington - is GB ok).doc;

Please print these for me and place them in a file folder

From: GBennett@nalcorenergy.com [mailto:GBennett@nalcorenergy.com]
Sent: Wednesday, October 12, 2011 11:08 PM
To: Bown, Charles W.
Subject: RFI's

Charles,

We're still finalizing wording, but I'd like you to consider both the question as well as the draft answers....

G

Q. In discussions with Nalcor, it was stated that the Voltage Source Converter (VSC) Option was discarded and the Line Commutated Converter (LCC) chosen. One reason the VSC option was discarded was because studies showed that the recovery from a DC fault was too slow at about 900 milliseconds, and also that the system still required an Effective Short Circuit Ratio (ESCR) of 1.5. Please provide copies of the studies performed by Siemens on the HVDC Plus fault recovery rate and the ABB PSS/E ESCR study.

A. It would be incorrect to characterize the choice of technology as specifically excluding the Voltage Source Converter (VSC) option. Rather, the current thinking is that either VSC or LCC may be the appropriate choice of technology pending the outcome of further technical work.

Integration studies to date (for example refer to CE-10) have demonstrated the need for high inertia synchronous condensers to prevent system collapse following a three phase fault on the 230 kV AC transmission system (excluding Bay d'Espoir) and for temporary pole to pole faults on the overhead dc transmission line. Screening level studies of the VSC option were undertaken to determine if the VSC offered performance benefits such that the high inertia synchronous condensers could be removed from the overall project cost.

The screening studies have shown that, while the VSC will ride through the three phase 230 kV transmission system faults without the application of high inertia synchronous condensers, the same high inertia synchronous condensers are required to avoid system collapse following a dc fault. Consequently, both options

require high inertia synchronous condensers to provide satisfactory system performance.

Based upon market information the Line Commutated Converter (LCC) option with high inertia synchronous condensers had a lower total cost when compared to the VSC option with high inertia synchronous condensers. As a result the Basis of Design includes the LCC option.

Nalcor will be preparing a functional specification for the converter equipment associated with the Labrador – Island Link as part of the detailed design. Should the manufacturer(s) choose to offer a VSC option that meets the technical requirements at a lower cost than the LCC option, Nalcor will consider the VSC option for the application.

The studies requested cannot be released pursuant to non-disclosure agreements with ABB and Siemens. Recognizing that Nalcor does not intend to restrict the choice of technology by the vendor, the information in these studies will not affect the outcome of the review.

Q. What changes have been made in the definition, cost estimate and schedule for the Muskrat Falls-HVDC link project since DG2? If changes have been made, how have these impacted the CPW analysis?

A. Decision Gate 2 confirmed the development option and execution strategy for the Muskrat Falls – HVDC link project forming the scope, time, and cost basis (i.e. baseline) upon which Gateway Phase 3 detailed design, procurement planning, and construction planning activities would mature in order to produce the Decision Gate 3 (DG 3) Project Sanction basis. The detailed engineering work required for the DG3 design basis is currently underway and inherent in that activity, the design is being established as detailed engineering design and analysis are completed. The final design basis of the Muskrat Falls and Labrador Island Transmission Link Projects will not be approved and issued until all the design deliverables required to meet DG3 are available. The CPW analysis will be revisited by Nalcor when all the inputs to that model are at the DG3 status, including capital cost, contingency, escalation, fuel cost projections, schedule etc.

As Gateway Phase 3 activities progress, and as part of ongoing detailed engineering, the identification of value-adding change is not only anticipated, but encouraged. All identified potential changes to the DG 2 design basis are reviewed to understand the benefit of the potential change, with a focus directed towards optimizing value enhancing opportunities.

Any potential changes will be evaluated, not in isolation, but in their entirety at DG3, as the proposed DG3 design basis. At DG 3 there will be a confirmation of the Project's scope, time and cost basis which forms the basis of a Project Sanction decision.

Q. With reference to the response to PUB-Nalcor-5, please provide the rate projections for both alternatives with the $20 million per year for Holyrood life extensions for the years 2012 to 2016, the $581.976 million for Holyrood ESP/scrubbers in 2015 and the $19.817 million for No_x burners eliminated from the costs for the Isolated Island Option.

A. Please see attached. In addition to removing the fixed costs associated with Holyrood life extensions, ESP/Scrubbers and low NOx burners, the operating and maintenance costs associated with the ESP/Scrubbers have been removed and the incremental fuel cost associated with maintaining a 0.7% fuel oil specification has been added.

Please note the following:

- the scenario described in this response is not in conformance with policy commitments made by the Government of Newfoundland and Labrador in its *Energy Plan*, and

- Nalcor views the removal of the $20 million per year for Holyrood life extensions as imprudent given the expectations for the long term operation of Holyrood in the Isolated Scenario.

(no detailed analysis undertaken on an alternative that is not preferred. – need to make the point that this detailed work will need to be undertaken in the event that Holyrood is to be maintained)

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Hydro's Wholesale and Retail Rate Estimates: Muskrat Falls - Labrador Island Transmission Link Electricity Supply Future

	Energy Delivered by Hydro at Transmission Level GWH	Island Interconnected Revenue Requirement $000	Island Interconnected Average Wholesale Rate $/MWh	Projected Wholesale Rate to Nfld Power $/MWh	Nfld Power Pass Through of Hydro Costs to Retail Rate %	Retail Rate Projections Cents per KWh
2010	6,044.8	377,584	62.46	68.77	66.8%	11.73
2011	6,124.7	416,470	68.00	64.24	66.8%	11.21
2012	6,493.0	475,478	73.23	70.75	66.8%	11.97
2013	6,886.3	557,459	80.95	82.75	66.8%	13.33
2014	6,984.6	584,408	83.67	86.20	66.8%	13.70
2015	7,103.7	624,440	87.90	91.68	66.8%	14.28
2016	7,119.7	648,177	91.04	95.64	66.8%	14.69
2017	7,153.7	765,135	106.96	112.62	66.8%	16.44
2018	7,222.4	781,387	108.19	114.56	66.8%	16.63
2019	7,291.3	804,891	110.39	117.83	66.8%	16.94
2020	7,353.1	810,652	110.25	118.05	66.8%	16.97
2021	7,446.9	797,548	107.10	115.12	66.8%	16.68
2022	7,538.7	803,229	106.55	114.79	66.8%	16.65
2023	7,644.1	810,483	106.03	114.42	66.8%	16.62
2024	7,706.7	818,746	106.24	114.90	66.8%	16.66
2025	7,764.0	830,467	106.96	115.88	66.8%	16.76
2026	7,845.5	847,435	108.02	117.12	66.8%	16.88
2027	7,933.4	863,679	108.87	118.15	66.8%	16.98
2028	8,013.8	880,782	109.91	119.39	66.8%	17.10
2029	8,093.1	905,310	111.86	121.54	66.8%	17.30
2030	8,168.9	923,845	113.09	122.87	66.8%	17.43
2031	8,244.7	936,319	113.57	123.37	66.8%	17.47
2032	8,320.5	955,667	114.86	124.72	66.8%	17.60
2033	8,396.3	970,062	115.53	125.44	66.8%	17.67
2034	8,472.1	990,836	116.95	126.92	66.8%	17.81
2035	8,540.3	1,004,607	117.63	127.68	66.8%	17.88
2036	8,608.5	1,019,329	118.41	128.45	66.8%	17.95
2037	8,676.8	1,048,463	120.84	130.95	66.8%	18.19
2038	8,745.0	1,098,597	125.63	136.03	66.8%	18.66
2039	8,813.2	1,118,794	126.95	137.45	66.8%	18.79
2040	8,873.9	1,134,591	127.86	138.47	66.8%	18.88
2041	8,934.5	1,156,525	129.44	140.20	66.8%	19.04
2042	8,995.2	1,176,540	130.80	141.67	66.8%	19.17
2043	9,055.9	1,199,891	132.50	143.54	66.8%	19.34
2044	9,116.5	1,222,613	134.11	145.32	66.8%	19.50
2045	9,177.2	1,247,059	135.89	147.29	66.8%	19.68
2046	9,237.8	1,279,704	138.53	150.11	66.8%	19.93
2047	9,298.5	1,317,695	141.71	153.54	66.8%	20.23
2048	9,359.2	1,343,291	143.53	155.54	66.8%	20.41
2049	9,419.8	1,370,029	145.44	157.66	66.8%	20.60
2050	9,472.9	1,401,310	147.93	160.36	66.8%	20.83
2051	9,526.0	1,439,880	151.15	163.87	66.8%	21.14
2052	9,579.1	1,467,830	153.23	166.18	66.8%	21.33
2053	9,632.2	1,491,959	154.89	168.07	66.8%	21.50
2054	9,685.3	1,526,614	157.62	171.01	66.8%	21.75
2055	9,738.4	1,572,215	161.44	175.17	66.8%	22.10
2056	9,791.5	1,604,820	163.90	177.89	66.8%	22.33
2057	9,844.6	1,634,189	166.00	180.25	66.8%	22.53
2058	9,897.7	1,663,605	168.08	182.57	66.8%	22.72
2059	9,950.8	1,700,336	170.87	185.70	66.8%	22.98
2060	10,003.9	1,724,130	172.35	187.45	66.8%	23.13
2061	10,057.0	1,749,757	173.98	189.39	66.8%	23.29
2062	10,110.1	1,776,956	175.76	191.48	66.8%	23.46
2063	10,163.2	1,813,751	178.46	194.48	66.8%	23.70
2064	10,216.3	1,856,229	181.69	198.11	66.8%	24.00
2065	10,269.4	1,887,383	183.79	200.54	66.8%	24.20
2066	10,322.5	1,936,347	187.59	204.66	66.8%	24.53
2067	10,375.5	1,941,406	187.11	204.53	66.8%	24.52

See accompanying notes.

PUB-Nalcor-12: Excludes Investments for Holyrood Pollution Controls and Life Extension Projects Prior to 2017
Hydro's Wholesale and Retail Rate Estimates: Isolated Island Electricity Supply Future

	Energy Delivered by Hydro at Transmission Level GWH	Island Interconnected Revenue Requirement $000	Island Interconnected Average Wholesale Rate $/MWh	Projected Wholesale Rate to Nfld Power $/MWh	Nfld Power Pass Through of Hydro Costs to Retail Rate %	Retail Rate Projections Cents per KWh
2010	6,044.8	377,584	62.46	68.77	66.8%	11.73
2011	6,124.7	416,470	68.00	64.24	66.8%	11.21
2012	6,493.0	475,393	73.22	70.74	66.8%	11.97
2013	6,886.3	557,048	80.89	82.68	66.8%	13.32
2014	6,984.6	578,719	82.86	85.39	66.8%	13.61
2015	7,103.7	610,993	86.01	89.73	66.8%	14.08
2016	7,119.7	617,613	86.75	91.35	66.8%	14.25
2017	7,153.7	635,558	88.84	93.91	66.8%	14.51
2018	7,222.4	671,749	93.01	98.29	66.8%	14.96
2019	7,291.3	695,376	95.37	101.35	66.8%	15.27
2020	7,353.1	736,008	100.09	106.44	66.8%	15.79
2021	7,446.9	746,143	100.19	106.89	66.8%	15.83
2022	7,538.7	792,159	105.08	112.08	66.8%	16.35
2023	7,644.1	850,976	111.32	118.69	66.8%	16.99
2024	7,706.7	880,041	114.19	121.78	66.8%	17.29
2025	7,764.0	913,972	117.72	125.61	66.8%	17.65
2026	7,845.5	945,264	120.49	128.55	66.8%	17.92
2027	7,933.4	983,655	123.99	132.23	66.8%	18.27
2028	8,013.8	1,032,854	128.89	137.30	66.8%	18.74
2029	8,093.1	1,076,928	133.07	141.76	66.8%	19.14
2030	8,168.9	1,117,909	136.85	145.59	66.8%	19.49
2031	8,244.7	1,156,076	140.22	148.99	66.8%	19.79
2032	8,320.5	1,191,747	143.23	152.06	66.8%	20.06
2033	8,396.3	1,264,114	150.56	159.36	66.8%	20.71
2034	8,472.1	1,451,054	171.28	180.00	66.8%	22.50
2035	8,540.3	1,488,080	174.24	183.25	66.8%	22.77
2036	8,608.5	1,561,575	181.40	190.56	66.8%	23.38
2037	8,676.8	1,665,017	191.89	201.16	66.8%	24.25
2038	8,745.0	1,711,351	195.70	205.18	66.8%	24.57
2039	8,813.2	1,758,743	199.56	209.22	66.8%	24.89
2040	8,873.9	1,804,355	203.33	213.10	66.8%	25.20
2041	8,934.5	1,850,446	207.11	217.00	66.8%	25.51
2042	8,995.2	1,902,314	211.48	221.48	66.8%	25.86
2043	9,055.9	1,963,807	216.85	227.05	66.8%	26.30
2044	9,116.5	2,017,256	221.27	231.63	66.8%	26.65
2045	9,177.2	2,072,887	225.87	236.40	66.8%	27.02
2046	9,237.8	2,135,516	231.17	241.87	66.8%	27.43
2047	9,298.5	2,205,816	237.22	248.15	66.8%	27.91
2048	9,359.2	2,276,412	243.23	254.33	66.8%	28.37
2049	9,419.8	2,358,008	250.32	261.71	66.8%	28.92
2050	9,472.9	2,444,020	258.00	269.67	66.8%	29.51
2051	9,526.0	2,539,689	266.61	278.67	66.8%	30.17
2052	9,579.1	2,631,276	274.69	286.99	66.8%	30.77
2053	9,632.2	2,725,039	282.91	295.62	66.8%	31.39
2054	9,685.3	2,792,223	288.29	301.23	66.8%	31.79
2055	9,738.4	2,863,450	294.04	307.25	66.8%	32.21
2056	9,791.5	2,953,921	301.68	315.16	66.8%	32.76
2057	9,844.6	3,069,537	311.80	325.76	66.8%	33.50
2058	9,897.7	3,137,887	317.03	331.25	66.8%	33.88
2059	9,950.8	3,206,819	322.27	336.76	66.8%	34.25
2060	10,003.9	3,280,837	327.96	342.73	66.8%	34.66
2061	10,057.0	3,357,168	333.81	348.90	66.8%	35.08
2062	10,110.1	3,437,914	340.05	355.47	66.8%	35.52
2063	10,163.2	3,576,582	351.92	367.70	66.8%	36.33
2064	10,216.3	3,726,984	364.81	381.30	66.8%	37.23
2065	10,269.4	3,829,054	372.86	389.77	66.8%	37.79
2066	10,322.5	3,952,156	382.87	400.18	66.8%	38.46
2067	10,375.5	4,116,129	396.71	414.62	66.8%	39.39

See accompanying notes.

Notes:

1. Energy delivered by Hydro at the transmission level represents Hydro's wholesale delivery requirement for the Island Interconnected System. Starting in 2014, it is derived by subtracting customer-based generation and transmission losses from Total Island Load as per 2010 PLF (Exhibit 1). Prior to 2014, it is derived from the short-term operating load forecast.

2. Hydro's Island Interconnected revenue requirement represents existing rate base plus incremental generation expansion costs as per the isolated or Muskrat Falls - LIL alternatives. The Isolated Island alternative has been adjusted to remove the following projects: Holyrood Life Extension ($100 million); Holyrood ESPs/Scrubbers ($581.976 million); and NOx Burners ($19.817 million).

3. Hydro's Island Interconnected wholesale rate is derived by dividing the revenue requirement by energy delivered at the transmission level. This $ per MWh illustrates the general electricity rate trends for costs on the Island under the alternative electricity supply futures.

4. The projected wholesale rate to Newfoundland Power is a function of Newfoundland Power's share of Hydro's total revenue requirement based on energy, demand and Rural deficit allocations, divided through by the Newfoundland Power's energy purchases from Hydro. It is intended to be a general estimate of the trend in the all-in wholesale average energy charge.

5. Hydro has estimated the impact of changes in its Island Interconnected revenue requirements on retail rates by assuming that the percentage pass through of Hydro costs applicable across Newfoundland Power in 2010 remains relevant in future periods. The starting retail rate was as of July 1, 2010 for the overall average consumption level applicable for the Island Interconnected system, inclusive of taxes.

Q. Has a cost benefit analysis been completed to compare the alternatives of lower sulphur No. 6 fuel versus the installation of electrostatic precipitations, scrubbers and No_x burners? If so, please provide a copy of the analysis. If not, why not?

A. Nalcor has not completed a cost-benefit analysis to compare the alternative of using lower sulphur No. 6 fuel (lower than the currently prescribed 0.7% S content) versus the installation of electrostatic precipitators, scrubbers, and low-NOx burners. [reverted to higher sulphur fuel in plan]

The Province's Energy Plan states that should the Labrador Interconnection not proceed and the Holyrood plant continue to operate, the installation of electrostatic precipitators, scrubbers and low NOx burners is required.

Nalcor constructed all of its generation expansion scenarios to comply with legislation and public policy direction. In this context, policy statements contained in the *Energy Plan* have been treated by Nalcor as explicit direction from the Government of Newfoundland and Labrador.

Q. Key Findings of the Review are outlined on pg. 6 of Exhibit 20. The second bullet on pg. 6 states: *"Team is highly experienced and highly involved but is misaligned on several key project elements which presents risks and challenges going forward…".* Please describe the "misalignment" referred to and the specific, several key project elements involved. Explain in detail what has been done to mitigate these issues.

A. The IPA Review considered team functionality issues that extended beyond the project itself and included higher management and strategic issues outside of Nalcor's project team direct involvement or control. The observations made by IPA identified the following issues when the review was undertaken:

1) not all members of the project team were familiar with all commercial and business issues associated with the Project.
2) opportunities to improve communications among different functional groups on the Project team existed.
3) not all of the project team was fully informed of the ongoing negotiations and market access initiatives

The IPA observations regarding the perceived misalignment reflect the necessity for strict confidentiality and keeping information regarding the market access negotiations on a need to know basis during the market access negotiations which were ongoing at the time of the IPA review. According to IPA this would lead to an inconsistent level of information to be available across the project team and in their view could lead to misalignment. Nalcor considered IPA's opinion and felt that some short term team misalignment whilst undesirable was necessary to maintain the confidentiality required. However following the completion of the negotiations

which lead to the Lower Churchill Project Decision Gate 2 announcements, the project team are now fully informed and this situation no longer exists.

Other factors regarding the challenges that occur during the development of a project team, which are not uncommon in any team, have been addressed since the IPA review through an increased focus on communications, definition of and communication of roles and responsibilities to all functional groups, and team building initiatives to ensure that group performance is optimised. In addition there has been an even greater emphasis on the integration of the project team with Nalcor Corporate functions including finance, insurance, health and safety, environmental, human resources, engineering, operations and maintenance.

Nalcor is of the view that the situation that caused the perceived misalignment based on an uneven distribution of commercially sensitive information across the project team no longer exists and the mitigating measures described above have been successful in improving team functionality such that the risks and challenges that IPA identified have been effectively managed.

Q. On pg. 6 of Exhibit 20, the last bullet states: *"As owner ramps-up the team and contractors mobilize in next few months, lingering team issues will magnify risks and potentially erode benefits of Best Practices applied thus far…".*

Please describe the "lingering team issues" referred to in this key finding. Explain in detail what has been done to mitigate these issues.

A. These issues are the same as those discussed in the response to PUB-Nalcor-25. The bullet was a statement that team functionality issues (the subject of PUB-Nalcor-25) need to be addressed in a timely manner.

The mitigation steps have been outlined in the response to PUB-Nalcor-25.

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. Nalcor is not aware of existing legislative or regulatory requirements that would dictate the environmental upgrades though it is clear in the Energy Plan that pollution controls would be required if the interconnection (or Lab Island Link??) does not occur. Rates policy direction may also be provided through an Order in Council pursuant to Section 5.1 of the Electrical Power Control Act, 1994. In the event that the interconnection (or Lab Island Link??) does not proceed, it is anticipated that legislative or regulatory requirements, and possibly rates directives under section 5.1 of the Electrical Power Control Act, 1994 (as shown below), would be brought into effect.

Based on the policy direction provided in the *Energy Plan*, Nalcor considers the inclusion of these costs in its Isolated Scenario to be a prudent course of action.

To the extent that the Interconnected Scenario is Nalcor's preferred alternative, more specific direction regarding pollution controls for Holyrood is not necessary, however Nalcor expects that specific direction would be provided if the preferred alternative were to see Holyrood remain in service.

Q. On pg. 3 of Exhibit 30 it is stated that the results of the studies outlined for Muskrat Falls were incorporated in the capital cost estimate in the fall of 2010. When will the results of the additional studies and analyses undertaken since the fall of 2010 to the present be incorporated in the capital cost estimates for the Muskrat Falls facilities, the HVac Transmission System in Labrador and the Labrador-Island Transmission Link including the Strait of Belle Isle Cable Crossing. If such updated project costs are available now, provide the most recent revised capital cost estimate for each major component described in Exhibit 30.

A. Revised capital cost estimates are expected to be completed in Quarter 1 of 2012-in contemplation of a sanction decision for the Project.

Q. What is the current anticipated date for project approval at DG3 or sanction?

A. The DG3 decision is dependent on the readiness of all work streams to proceed into the next phase of the project. There are a number of decisions (including Environmental Assessment and Ministers' approval, as well as this review) which are outside of Nalcor's direct control which will be determining factors when a decision to sanction can be made. It is difficult to accurately predict when these external decisions are provided, however current forecasts indicate that project approval will take place during the first half of 2012.