From: BrianCrawley@nalcorenergy.com
To: Paul Wilson; Mack Kast [redacted]; mkast@[redacted]
Cc: GBennett@nalcorenergy.com; PHumphries@nalcorenergy.com; Bown, Charles W.
Subject: CPW analysis
Date: Wednesday, August 8, 2012 1:56:04 PM
Attachments: PLF12 Iter1 CPW Analysis 2012Aug1.xlsx
2012 CPW Sensitivity Results Transmittal final.xlsx

Paul/Mack: Attached is the final CPW analysis + sensitivities.

I would like to draw your attention to the following with regards to the Interconnected option:

Since we discussed schedule, we have confirmed the following dates for the Interconnected option:

- LTA Ready for Power Transmission - June 2016
- LITL Ready for Power Transmission - June 2017
- Unit 1 Online - July 2017
- Unit 2 Online - September 2017
- Unit 3 Online - October 2017
- Unit 4 Online - December 2017
-

With regards to the Interconnected cost estimates, I note that Nalcor will no longer be converting Holyrood units 1 and 2 into synch condensers. Instead we will increase the Soldiers Pond units to 3 X 175 MVARS. This has been incorporated into the project capital cost estimate and the attached CPW analysis.

In addition, two changes were made to the Isolated Island capital costs following discussions with the authors of the reports. These changes relate to the Holyrood life extensions and the Holyrood Scrubbers and Precipitators as summarized in the table below.

Code	Description	Total Capital Cost ($2012) DG3 Rev1	Total Capital Cost ($2012) DG3 Rev2
ESP1	Holyrood ESP - Units 1&2	487,704,806	550,354,893
HRD1	Holyrood Refurbishment1	353,000,000	417,483,765

Scrubbers and Precipitators - This cost estimate update involved the addition of an additional 8.5% in Owners Costs and an increase in contingency from 15% to 20% and was provided by Stantec.

Holyrood Life Extensions - A contingency of 15% was added to the cost estimate by AMEC.

Lastly, the Isolated Generation Expansion Plan fully incorporates the recommendations of the Hatch wind study.

Pls. advise if you have any questions.
Thanks
Brian

Brian Crawley
Nalcor Energy - Lower Churchill Project
t. **709 737 - 1499** c. **709 725 - 9145**
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NEWFOUNDLAND AND LABRADOR HYDRO

Cumulative Present Worth Analysis - PLF12 Iteration #1 2012Aug1 - Interconnected Island Alternative

Discount	7.00%
RORB	7.00%
Insurance	0.030%
Operating cost escalat	2.50%
Capital cost sensitivity	0%

	2012 CPW ($000)	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
FIXED CHARGES	319,400	0	0	0	751	8,887	8,658	8,429	8,200	7,971	7,742
OPERATING COSTS	258,939	22,834	23,870	24,898	25,608	27,136	26,674	25,495	26,133	26,786	13,380
FUEL	1,320,530	197,608	243,194	278,784	286,654	325,225	205,382	83	84	87	87
POWER PURCHASES	6,467,127	50,668	52,794	52,556	52,710	52,999	264,632	491,950	473,598	481,296	488,807
Totals by Component	8,365,997	271,110	319,858	356,238	365,722	414,247	505,346	525,957	508,014	516,140	510,016
Totals per Strategist	8,365,996	271,114	319,864	356,241	365,729	414,254	505,342	525,956	508,013	516,139	510,015
Difference	1	(4)	(6)	(3)	(6)	(7)	4	0	1	1	1

NEWFOUNDLAND AND LABRADOR HYDRO
Cumulative Present Worth Analysis - PLF12 Iterati

Discount	7.00%
RORB	7.00%
Insurance	0.030%
Operating cost escalat	2.50%
Capital cost sensitivity	0%

	2012 CPW ($000)	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
FIXED CHARGES	319,400	7,974	12,774	12,471	12,168	11,865	11,927	15,615	15,253	14,891	14,529
OPERATING COSTS	258,939	8,993	9,218	9,448	9,685	6,100	6,253	6,413	5,676	5,821	5,970
FUEL	1,320,530	116	174	204	244	262	357	555	905	1,117	1,325
POWER PURCHASES	6,467,127	502,750	506,518	518,922	527,735	538,858	548,640	563,747	574,981	586,946	599,321
Totals by Component	8,365,997	519,833	528,684	541,045	549,832	557,084	567,177	586,330	596,815	608,775	621,145
Totals per Strategist	8,365,996	519,831	528,683	541,044	549,830	557,083	567,176	586,328	596,813	608,773	621,143
Difference	1	1	1	1	2	2	2	2	2	2	2

NEWFOUNDLAND AND LABRADOR HYDRO
Cumulative Present Worth Analysis - PLF12 Iterati

Discount	7.00%
RORB	7.00%
Insurance	0.030%
Operating cost escalat	2.50%
Capital cost sensitivity	0%

	2012 CPW ($000)	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041
FIXED CHARGES	319,400	15,520	29,833	29,087	28,341	28,870	42,157	43,507	43,710	58,571	69,353
OPERATING COSTS	258,939	6,200	7,215	7,400	7,589	7,870	9,016	9,246	9,575	10,834	11,112
FUEL	1,320,530	1,529	1,910	2,173	2,435	2,741	3,182	3,462	3,779	4,214	4,620
POWER PURCHASES	6,467,127	611,500	626,194	637,228	650,862	665,362	678,643	695,214	707,554	722,758	738,521
Totals by Component	8,365,997	634,749	665,153	675,889	689,228	704,843	732,998	751,428	764,618	796,378	823,606
Totals per Strategist	8,365,996	634,747	665,151	675,887	689,225	704,840	732,996	751,425	764,614	796,375	823,603
Difference	1	3	2	2	3	3	2	3	3	3	3

NEWFOUNDLAND AND LABRADOR HYDRO
Cumulative Present Worth Analysis - PLF12 Iterati

Discount	7.00%
RORB	7.00%
Insurance	0.030%
Operating cost escalat	2.50%
Capital cost sensitivity	0%

	2012 CPW ($000)	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051
FIXED CHARGES	319,400	67,820	70,362	84,996	82,700	80,404	78,400	79,291	78,716	95,525	92,643
OPERATING COSTS	258,939	11,396	11,788	13,206	13,546	13,891	14,246	14,610	15,103	16,783	17,214
FUEL	1,320,530	4,933	5,287	5,723	6,224	6,636	7,062	7,500	8,041	8,598	9,158
POWER PURCHASES	6,467,127	753,859	772,516	786,337	803,393	819,032	834,234	853,596	867,455	884,897	903,001
Totals by Component	8,365,997	838,007	859,952	890,261	905,863	919,964	933,942	954,996	969,315	1,005,803	1,022,015
Totals per Strategist	8,365,996	838,003	859,950	890,258	905,858	919,960	933,938	954,994	969,311	1,005,798	1,022,012
Difference	1	4	3	4	5	3	4	3	4	5	3

NEWFOUNDLAND AND LABRADOR HYDRO
Cumulative Present Worth Analysis - PLF12 Iterati

Discount	7.00%
RORB	7.00%
Insurance	0.030%
Operating cost escalat	2.50%
Capital cost sensitivity	0%

	2012 CPW ($000)	2052	2053	2054	2055	2056	2057	2058	2059	2060
FIXED CHARGES	319,400	90,092	90,818	89,888	108,674	105,128	103,711	123,232	119,317	123,392
OPERATING COSTS	258,939	17,653	18,109	18,708	20,649	21,175	21,725	22,284	22,857	24,157
FUEL	1,320,530	9,709	10,421	11,111	11,792	12,395	13,381	14,200	15,078	15,653
POWER PURCHASES	6,467,127	921,724	944,413	960,916	981,666	1,003,720	1,025,185	1,051,860	1,071,461	1,095,653
Totals by Component	8,365,997	1,039,178	1,063,761	1,080,623	1,122,780	1,142,418	1,164,002	1,211,577	1,228,714	1,258,855
Totals per Strategist	8,365,996	1,039,173	1,063,758	1,080,618	1,122,774	1,142,413	1,163,996	1,211,572	1,228,707	1,258,849
Difference	1	5	3	5	7	5	7	5	7	7

NEWFOUNDLAND AND LABRADOR HYDRO
Cumulative Present Worth Analysis - PLF12 Iterati

Discount	7.00%
RORB	7.00%
Insurance	0.030%
Operating cost escalat	2.50%
Capital cost sensitivity	0%

	2012 CPW ($000)	2061	2062	2063	2064	2065	2066	2067
FIXED CHARGES	319,400	205,746	195,179	194,120	187,879	178,969	196,850	191,617
OPERATING COSTS	258,939	32,491	31,590	32,402	33,055	32,047	32,874	33,722
FUEL	1,320,530	15,783	16,729	17,717	18,457	19,834	20,980	22,176
POWER PURCHASES	6,467,127	1,120,265	1,145,993	1,176,902	1,199,910	1,227,895	1,257,606	1,257,524
Totals by Component	8,365,997	1,374,286	1,389,491	1,421,140	1,439,302	1,458,746	1,508,309	1,505,040
Totals per Strategist	8,365,996	1,374,279	1,389,486	1,421,133	1,439,297	1,458,738	1,508,303	1,505,036
Difference	1	7	5	7	5	8	6	4

NEWFOUNDLAND AND LABRADOR HYDRO
Cumulative Present Worth Analysis - PLF12 Iteration #1 2012Aug1- Isolated Island Alternative

Discount	7.00%
RORB	7.00%
Insurance	0.030%
Operating cost escalator	2.50%
Capital cost sensitivity	0%

	2012 CPW ($000)	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
FIXED CHARGES	2,555,943	0	0	0	2,828	17,042	66,783	155,471	151,993	163,855	174,450	186,512	191,927	185,982	187,337	218,038
OPERATING COSTS	752,448	22,834	23,870	24,898	26,227	28,707	31,137	33,834	34,735	36,605	39,962	41,297	42,683	43,964	46,220	50,681
FUEL	6,706,178	197,612	243,194	278,784	314,079	332,397	343,365	317,721	323,704	302,834	297,326	293,476	319,564	337,379	343,927	340,114
POWER PURCHASES	763,770	50,668	52,794	52,556	54,997	61,931	62,139	62,260	62,478	62,666	62,812	62,999	55,712	55,148	55,284	55,423
Totals by Component	10,778,339	271,113	319,859	356,238	398,131	440,078	503,424	569,287	572,909	565,959	574,550	584,283	609,886	622,473	632,769	664,255
Totals per Strategist	10,778,363	271,116	319,864	356,241	398,139	440,083	503,418	569,282	572,915	565,958	574,553	584,281	609,891	622,468	632,766	664,255
Difference	(24)	(2)	(5)	(3)	(8)	(5)	6	5	(6)	1	(3)	2	(5)	5	3	0

NEWFOUNDLAND AND LABRADOR HYDRO
Cumulative Present Worth Analysis - PLF12 Iteration #1 2012Aug1- Is

Discount	7.00%
RORB	7.00%
Insurance	0.030%
Operating cost escalator	2.50%
Capital cost sensitivity	0%

	2012 CPW ($000)	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
FIXED CHARGES	2,555,943	213,027	236,225	258,641	267,001	275,223	270,211	308,419	333,132	332,356	356,943	343,749	333,838	323,927	321,137
OPERATING COSTS	752,448	52,208	54,906	59,655	63,066	67,621	69,896	66,298	62,357	65,549	68,432	72,532	74,949	77,442	80,012
FUEL	6,706,178	362,639	380,109	395,626	404,623	399,940	420,459	475,067	530,910	551,065	591,080	659,918	689,890	722,716	754,519
POWER PURCHASES	763,770	55,564	52,181	42,147	42,217	42,287	42,359	42,433	42,508	40,055	32,834	32,859	32,884	32,910	32,936
Totals by Component	10,778,339	683,438	723,422	756,070	776,906	785,072	802,924	892,217	968,907	989,024	1,049,289	1,109,057	1,131,561	1,156,994	1,188,605
Totals per Strategist	10,778,363	683,442	723,425	756,067	776,904	785,074	802,929	892,223	968,915	989,019	1,049,302	1,109,057	1,131,563	1,156,992	1,188,606
Difference	(24)	(5)	(3)	3	2	(2)	(4)	(6)	(8)	6	(13)	0	(2)	2	(1)

NEWFOUNDLAND AND LABRADOR HYDRO
Cumulative Present Worth Analysis - PLF12 Iteration #1 2012Aug1- Is

Discount	7.00%
RORB	7.00%
Insurance	0.030%
Operating cost escalator	2.50%
Capital cost sensitivity	0%

	2012 CPW ($000)	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054
FIXED CHARGES	2,555,943	341,093	332,093	337,668	326,734	322,596	331,553	321,879	336,664	347,999	349,691	428,523	414,381	401,827	406,475
OPERATING COSTS	752,448	82,663	85,493	89,398	92,332	95,357	98,476	101,802	106,346	109,795	113,666	120,823	124,697	128,689	132,802
FUEL	6,706,178	789,078	822,261	858,848	896,561	935,372	977,507	1,018,199	1,062,501	1,106,401	1,153,666	1,200,463	1,251,870	1,301,000	1,350,424
POWER PURCHASES	763,770	32,963	32,990	33,018	33,047	33,076	33,106	33,136	33,167	33,198	33,230	33,263	33,297	33,331	33,365
Totals by Component	10,778,339	1,245,796	1,272,837	1,318,932	1,348,674	1,386,402	1,440,642	1,475,016	1,538,678	1,597,393	1,650,253	1,783,073	1,824,245	1,864,847	1,923,067
Totals per Strategist	10,778,363	1,245,792	1,272,837	1,318,926	1,348,681	1,386,404	1,440,648	1,475,018	1,538,683	1,597,394	1,650,258	1,783,084	1,824,251	1,864,837	1,923,062
Difference	(24)	4	1	6	(7)	(2)	(6)	(1)	(6)	(1)	(6)	(11)	(6)	10	6

NEWFOUNDLAND AND LABRADOR HYDRO
Cumulative Present Worth Analysis - PLF12 Iteration #1 2012Aug1- Is

Discount	7.00%
RORB	7.00%
Insurance	0.030%
Operating cost escalator	2.50%
Capital cost sensitivity	0%

	2012 CPW ($000)	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067
FIXED CHARGES	2,555,943	422,833	446,695	433,336	441,240	425,060	420,760	454,282	446,753	541,938	612,213	605,265	649,165	712,728
OPERATING COSTS	752,448	137,041	141,409	146,051	152,262	157,082	162,049	166,862	171,975	178,851	184,143	189,587	195,188	200,768
FUEL	6,706,178	1,403,318	1,457,847	1,512,236	1,567,985	1,628,044	1,686,107	1,738,985	1,792,778	1,847,515	1,907,713	1,964,043	2,025,657	2,088,227
POWER PURCHASES	763,770	33,401	33,437	33,474	33,512	33,550	33,589	33,629	33,670	33,711	33,754	33,797	33,841	33,886
Totals by Component	10,778,339	1,996,593	2,079,388	2,125,097	2,194,999	2,243,736	2,302,505	2,393,758	2,445,176	2,602,015	2,737,822	2,792,692	2,903,850	3,035,610
Totals per Strategist	10,778,363	1,996,583	2,079,395	2,125,099	2,194,996	2,243,740	2,302,503	2,393,765	2,445,164	2,602,012	2,737,815	2,792,692	2,903,846	3,035,600
Difference	(24)	11	(8)	(3)	3	(4)	2	(7)	12	3	7	(0)	4	9

Summary of CPW Sensitivity Analysis 2012 NLH Generation Planning Analysis (Present Value 2012$, millions)			
	Isolated Island	Interconnected Island	Preference For Interconnected Island
Reference Case	10,778	8,366	2,412
World Oil Prices			
PIRA Expected Oil Market Prices at May 2012	11,391	8,376	3,015
PIRA Low Oil Market Prices at May 2012	8,584	8,000	584
PIRA High Oil Market Prices at May 2012	15,435	8,836	6,598
Lower Churchill Project (MF Plus LIL)			
Plus 10% LIL + MF Capex, w/FLG	10,778	8,850	1,928
Plus 25% LIL + MF Capex, w/FLG	10,778	9,574	1,204
Minus 10% LIL + MF Capex, w/FLG	10,778	7,869	2,909
Plus 50bps Interest Cost, w/FLG	10,778	8,593	2,185
Plus 100bps Interest Cost, w/FLG	10,778	8,829	1,949
Minus 25bps Interest Cost, w/FLG	10,778	8,256	2,522
Carbon Pricing Starting in 2020 (DOE/W-M Pricing)	11,360	8,368	2,992

Notes:

Reference Case reflects PIRA Energy reference forecast at May 2012.

Interconnected Island cases include Federal Loan Guranantee for Muskrat Falls and Labrador Island Transmission link.

Source: IE Nalcor Aug 1 2012 v2