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Utility and Review Board

**Tufts Cove 6 Waste Heat Recovery Project
CI 28098**

Application for Authority to Overspend

May 3, 2010

NOVA SCOTIA
POWER
An Emera Company

1 Enclosed, please find Nova Scotia Power Inc.'s (NSPI, Company) application for Authority to
2 Overspend (ATO) the Tufts Cove 6 Waste Heat Recovery Project (Capital Item 28098). The
3 scope of this project provides for the conversion of the Tufts Cove units 4 and 5 to combined
4 cycle mode with the addition of duct-firing to increase unit output. The forecast cost increase is
5 associated with changes to specific project cost elements unforeseen at the time of NSPI's
6 original capital filing with the Nova Scotia Utility and Review Board (UARB, Board).

7
8 The operational and economic merits of this project remain strong and support the increase in
9 costs. Capital expenditures for this project are forecast to total \$93 million, approximately 10
10 percent higher than the amount approved by the Board in 2008.

11
12 Included with this application are the following:

- 13
14 1. A breakdown of the forecast capital cost increase for the project, segregated
15 between the combined cycle and duct-fired components of the project
16 (Attachment 1);
17
18 2. The updated project economic analysis (Attachment 2); and
19
20 3. The NSPI approval sheet and Capital Item detail for the ATO (Attachment 3).

21
22 Capital Cost Increase
23

24 The information presented in Attachment 1 confirms that the cost increase is primarily
25 attributable to three items:

- 26
27 • Increased infrastructure required to construct and permit the harbour infill;
28
29 • Efficiency and automation complexities of the generator and its major
30 components; and
31

- Changes to the design specifications to ensure plant optimization.

Increases to the capital cost structure of this project represent plan and design updates. Assumptions were included in the original scope of the project, but final specification could not be determined until the project was initiated.

Project Economic Analysis

NSPI has updated the project economic analysis to incorporate the increased capital cost. The results are summarized in the table below and compared to the project benefits forecast in the original capital filing. The revised economic analysis reflects increased capital cost and the current forecast in-service date of December, 2010. Consistent with the Board approved filing, the NPV of the duct-firing option includes the benefits forecast in the 2008 study conducted by Hatch Ltd.

	NPV Benefit TUC 6 without Duct Firing vs No TUC 6 (Strategist) (\$M)	NPV Benefit TUC 6 with Duct Firing (DF) vs TUC 6 without DF (\$M)	NPV Benefit Total Project (\$M)
May 2008 Filing	43.84	31.60	75.44
2010 Revision	37.70	29.49	67.19

The project economics remain strong and support the increased capital cost. The combined cycle component is forecast to produce a positive net present value (NPV) of \$37.70 million. The addition of the duct-fired component increases the positive project NPV to \$67.19.

The reductions in NPV from the original filing for the combined cycle component and for the duct-fired component reflect the increased capital costs and additional operating costs associated with the revised in-service date, offset in part by tax savings associated with the higher capital value.

1 Project Benefit Update

2
3 While not analyzed yet, the recently announced Provincial Electricity Plan indicating an
4 increased renewable energy target of 40% by 2020 will likely require additional intermittent
5 resources which will further increase the benefits from this project.
6

7 The addition of Tufts Cove 6 also provides low carbon dioxide (CO₂) emitting generation to
8 respond to increases in load which supports the Company's plan to reduce its CO₂ emissions as
9 required by the provincial government's 2009 released CO₂ emission limits.
10

11 UARB Approval of ATO

12
13 The Company is cognizant of the Board's direction as provided in its September 18, 2008
14 Decision regarding a potential ATO and reproduced below:
15

16 "NSPI should be keenly aware that should the actual cost of this project exceed
17 that amount, the Board will scrutinize an application by NSPI to overspend that
18 amount carefully to ensure that this project continues to be economically
19 justifiable and in the best interest of ratepayers. This review will be conducted in
20 the usual manner, in accordance with the Board's responsibility pursuant to s. 35
21 of the *Act* which reads as follows:
22

23 35 No public utility shall proceed with any new construction,
24 improvements or betterments in or extensions or additions to its
25 property used or useful in furnishing, rendering or supplying any
26 service which requires the expenditure of more than twenty-five
27 thousand dollars without first securing the approval thereof by the
28 Board. R.S., c. 380, s. 35; 2001, c. 35, s. 30.
29

30 The Board wishes to point out that, given its authority under s. 35 noted above, in
31 the event an application for approval to overspend is filed in the future by NSPI,
32 the Board will determine at that time whether an opportunity for input by
33 interested parties is appropriate."
34

35 Consistent with this directive, NSPI has sought to compile the necessary cost information and
36 economic analysis support to allow the Board to approve the enclosed ATO. The Company

1 respectfully suggests the Board seek written input from the original participants in CI 28098 with
2 regard to this application.

3
4 Summary

5
6 The justification for the Tufts Cove 6 project is unchanged from that approved by the Board in
7 2008.

- 8
- 9 • The project will deliver significant savings for customers.
 - 10
 - 11 • The rapid response generation provided by the duct-fired addition will provide
12 power system benefits in terms of system stability and reliability.
 - 13
 - 14 • The project continues to support the addition of increased intermittent renewable
15 generation to the provincial power grid.
 - 16
 - 17 • The project continues to provide significant environmental benefits in terms of
18 improved energy efficiency, improved local air quality and lower emissions than
19 other fossil fuel generators.
 - 20

21 The cost increases forecast for this project are associated with specific cost drivers unforeseeable
22 at the time of filing the capital work order with the UARB. The variance is approximately 10
23 percent of the original approval amount. The economic case remains strongly in support of the
24 application.

25
26 NSPI requests Board approval of this ATO Application.

Tufts Cove 6 Waste Heat Recovery Project - Capital Cost Breakdown

Description	May Work Order Submission (Budget) (\$)	Forecast (\$)	Variance (\$)	Comments	Amount (\$)	Portion if Unfired (\$)	Attributed to Duct Firing (\$)
Harbour Infill, Site Prep & Foundations	3,818,800	7,863,711	4,044,911	Sheet piling required to allow for permitting rather than straight infill. - Discharge Weir added to design. - Circulating Water (CW) piping modified due to turbine. - Condenser design change.	2,923,383	2,923,383	0
				The intake structure construction placement was more difficult due to the rock ledge encountered. The CW piping required custom angles to avoid buried services and sheet piling anchors. Most of the increase is associated with piping installation and pumping costs during high tides.	644,218	644,218	0
				Bedrock was found to be less competent than indicated by the initial geotechnical investigations. Battered piles were added to accommodate lateral forces caused by the condenser / turbine design change.	338,696	338,696	0
				Removal of the existing underground structures and relocation of raw water lines was more extensive than planned due to large numbers of boulders encountered.	138,614	138,614	0
Environmental Assessment and Permits	641,966	670,183	28,217	Essentially completed on budget.	28,217	28,217	0
Buildings & Auxiliary Systems	3,398,441	5,026,163	1,627,722	Structural steel quantities increased due to design code changes. Added mezzanine floor to increase equipment access and laydown space for maintenance. A steel shield wall was added to meet the new standards for arc flash protection around 15 kV switchgear.	1,179,463	1,179,463	0
				Waste water and sewage systems design changed due to the decision to route wastes directly to the HRM collection system rather than through the existing Generating Plant Treatment facilities; reducing ongoing operational costs for the plant.	68,324	68,324	0
				Auxiliary systems are more extensive than planned. Some HVAC equipment was moved from the power house roof to inside the power house to manage external noise levels. Fire detection and fire fighting protection measures were increased to meet insurance requirements. Overhead crane costs increased due to the longer time span required resulting from increased building dimensions.	379,935	310,000	69,935

Description	May Work Order Submission (Budget) (\$)	Forecast (\$)	Variance (\$)	Comments	Amount (\$)	Portion if Unfired (\$)	Attributed to Duct Firing (\$)
Steam Turbine Generator & Major Components	29,427,431	35,025,858	5,598,427	STG on budget (firm price established before submission).	52,341	0	52,341
				The Turbine Bypass System increased from 35% unfired to 100% fired capacity. This change will manage external noise levels during start up and to conserve demin water to avoid on going operating expenses. Demin water conservation required capture of drain water. This involved an increase in complexity and also increased the amount of steam piping.	1,849,820	1,369,820	480,000
				Cooling loads for the turbine generator and other equipment were greater than expected.	407,882	202,000	205,882
				More expensive pump models were selected based on performance and reduced maintenance costs.	604,197	379,180	225,017
				The CW Piping layout was more complex due to changing the condenser to a split design. This will efficiently cover the full operating range of the steam turbine under all operating combinations planned for the combustion turbines.	1,126,903	820,000	306,903
				Electrical switchgear, motor control centers and associated cabling and cable tray increased due to increased automation.	1,557,284	1,307,284	250,000
Boilers, Duct Burners and Gas Systems	18,351,798	19,382,454	1,030,656	The budget assumed a salvage value for the existing stacks that cannot be realized under current market conditions for resale of used equipment or scrap. Stack removal will be done in a compressed timeline to minimize outage time for the LM6000s for system operating benefits	200,000	200,000	0
				Boiler modifications were selected to put gas skids on ductwork, conserving space and improving maintenance access. This will also involve modifying the access platforms.	830,656	522,000	308,656
Local Control System Integration with Main Plant	1,193,036	1,961,406	768,370	The extent of plant controls significantly increased from the original budget due to increased automation and initial underestimating the complexity of the combined cycle process.	768,370	563,370	205,000

Description	May Work Order Submission (Budget) (\$)	Forecast (\$)	Variance (\$)	Comments	Amount (\$)	Portion if Unfired (\$)	Attributed to Duct Firing (\$)
Generator Transformer, Cables, Protection & BOP	2,658,933	3,393,616	734,683	Cabling costs have increased.	658,257	355,000	303,257
				Small variances in a number of smaller balance of plant systems and the generator transformer combine to account for this variance.	76,426	76,426	0
Protection	621,938	621,938	0		0	0	0
Engineering Design, Procurement & Commissioning	6,541,256	9,041,714	2,500,457	EPCM consultant (AMEC) required engineering overspend due to a number of design changes to accommodate plant optimization.	716,061	530,000	186,061
				EPCM consultant required additional survey and geotechnical data to complete the detailed design.	84,715	84,715	0
				The controls consultant increased design cost due to increased automation and underestimating the complexity of the combined cycle process.	200,000	100,000	100,000
				Forecast includes costs for external personnel, experienced in combined cycle plants based on LM6000 combustion turbines, to assist with the commissioning and start up of the plant.	529,310	399,310	130,000
				NSPI costs are forecast above budget due to additional engineering and project management requirements.	809,243	670,000	139,243
				Site management costs increased due to increased contractor overtime to maintain schedule.	161,128	161,128	0
Insurance, AFUDC, Duty & A/O	9,819,573	9,399,201	(420,372)	Delayed spending results in lower AFUDC. Completion date is by year end 2010.	(420,372)	(420,372)	0
Studies and Preliminary Engineering	610,385	610,385	0		0	0	0
Contingency	7,213,207	0	(7,213,207)		(7,213,207)	(5,725,776)	(1,487,431)
Total	\$84,296,763	\$92,996,628	\$8,699,865		\$8,699,864	\$7,225,000	\$1,474,864

TUC 6 ATO - Summary of Results:

	NPV Benefit TUC 6 without Duct-Firing vs No TUC 6 (Strategist) \$M	NPV Benefit TUC 6 with Duct-Firing vs TUC 6 without DF \$M	Total Project NPV Benefit \$M
May 2008 Filing	43.84	31.60	75.44
2010 Revision	37.70	29.49	67.19

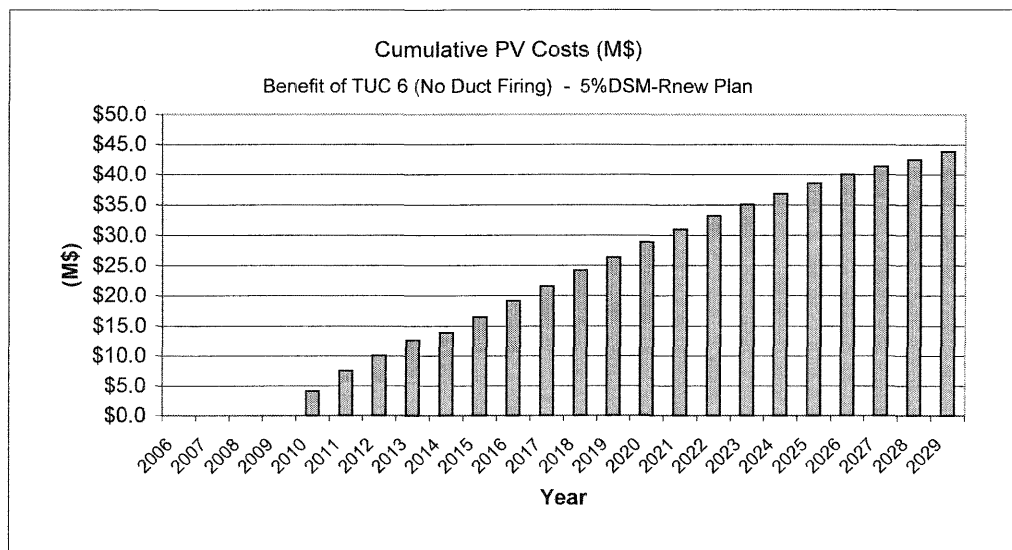
NPV Benefit of TUC 6 No Duct Firing

Year	Operating Costs TUC 6 No Duct Firing In-Service June/2010 (K\$)	Operating Costs No TUC 6 (K\$)	Operating Costs Nominal \$ (K\$)	Operating Cumulative PV Costs (K\$)	Year	Capital Costs TUC 6 No Duct Firing In-Service June/2010 (K\$)	Capital Costs No TUC 6 (K\$)	Capital Costs No DF Portion Nominal \$ (K\$)	Capital Costs Cumulative PV (K\$)	Total Benefits PV (K\$)	Total Benefits Cumulative PV (M\$)
2006	566,652.2	566,652.2	0	0	2006	232	232	0	0	0	0.0
2007	663,192.5	663,192.5	0	0	2007	1,282	1,282	0	0	0	0.0
2008	532,026.6	532,026.6	0	0	2008	2,710	2,710	0	0	0	0.0
2009	541,254.8	541,254.8	0	0	2009	6,053	6,053	0	0	0	0.0
2010	708,751.4	717,011.7	8,260	6,392	2010	14,321	11,290	-3,031	-2,345	4,047	4.0
2011	757,485.7	772,637.8	15,152	17,389	2011	21,828	11,487	-10,341	-9,851	3,492	7.5
2012	788,765.8	802,511.8	13,746	26,746	2012	21,709	11,697	-10,013	-16,666	2,541	10.1
2013	840,725.0	854,444.0	13,719	35,505	2013	21,106	11,318	-9,788	-22,916	2,510	12.6
2014	883,576.5	895,280.2	11,704	42,514	2014	20,562	11,037	-9,526	-28,620	1,304	13.9
2015	905,351.1	919,170.6	13,820	50,275	2015	20,035	10,734	-9,301	-33,843	2,538	16.4
2016	913,603.0	927,757.3	14,154	57,731	2016	19,478	10,439	-9,039	-38,604	2,695	19.1
2017	940,459.8	954,166.4	13,707	64,503	2017	18,936	10,160	-8,776	-42,940	2,436	21.6
2018	974,545.3	988,713.0	14,168	71,068	2018	18,409	9,857	-8,552	-46,903	2,602	24.2
2019	1,010,478.0	1,023,808.0	13,330	76,861	2019	17,849	9,560	-8,289	-50,505	2,191	26.4
2020	1,059,696.0	1,073,815.0	14,119	82,616	2020	48,531	40,504	-8,027	-53,777	2,483	28.8
2021	1,093,568.0	1,106,891.0	13,323	87,710	2021	61,715	53,951	-7,764	-56,746	2,125	31.0
2022	1,129,644.0	1,143,391.0	13,747	92,639	2022	59,827	52,325	-7,502	-59,436	2,239	33.2
2023	1,167,120.0	1,179,808.0	12,688	96,906	2023	58,079	50,839	-7,240	-61,871	1,832	35.0
2024	1,206,440.0	1,219,071.0	12,631	100,891	2024	56,191	49,214	-6,977	-64,071	1,783	36.8
2025	1,253,072.0	1,265,561.0	12,489	104,585	2025	54,442	47,728	-6,715	-66,058	1,708	38.5
2026	1,273,571.0	1,285,362.0	11,791	107,857	2026	52,370	45,917	-6,452	-67,848	1,481	40.0
2027	1,295,010.0	1,306,346.0	11,336	110,807	2027	50,585	44,395	-6,190	-69,459	1,339	41.3
2028	1,312,932.0	1,323,559.0	10,627	113,401	2028	48,803	42,913	-5,890	-70,897	1,156	42.5
2029	1,343,989.0	1,355,432.0	11,443	116,021	2029	46,909	41,282	-5,627	-72,185	1,331	43.8
NPV (Jan. '06 K\$)			116,021.0	(Discount Rate is 6.62%)	NPV (Jan. '06 K\$)			-72,185.2	(Discount Rate is 6.62%)		

Cumulative NPV Costs 2006-2029

43.84 M\$

NOTE: Operating Costs include fuel, variable O&M, net transaction costs and fixed thermal and hydro O&M costs
Capital Charges are the annual charges for the combination of alternatives added.



Assumptions:
- 5%DSM & Rnew Plan
- No TUC 6

5%DSM-RNEW_NO TUC6_JUN4.SAV
NPV = \$12,521.283 M

Assumptions:
- 5%DSM & Rnew Plan
- TUC 6 No Duct Firing
- In-service June/2010
- Capital Cost \$70.775M (\$2008)

TUC6 UNFIRED_\$70.775_MAY15-08.SAV
NPV = \$12,477.446 M

Incremental NPV Benefit of TUC 6 Duct Fired - Operating Cost Benefits from Hatch Analysis

Year	Operating Benefits Hatch Analysis (K\$)	Operating Cumulative PV Costs (K\$)	Year	Capital Costs TUC 6 Duct Fired In-Service June/2010 (K\$)	Capital Costs TUC 6 No Duct Firing In-Service June/2010 (K\$)	Capital Costs DF Portion (K\$)	Capital Costs Cumulative PV Costs (K\$)	Total Benefits Nominal \$ (K\$)	Total Benefits PV (K\$)	Total Benefits Cumulative PV (M\$)
2006	0	0	2006	232	232	0	0	0	0	0.0
2007	0	0	2007	1,282	1,282	0	0	0	0	0.0
2008	0	0	2008	2,710	2,710	0	0	0	0	0.0
2009	0	0	2009	6,053	6,053	0	0	0	0	0.0
2010	2,941	2,276	2010	14,900	14,321	-579	-448	2,362	1,828	1.8
2011	8,318	8,313	2011	23,804	21,828	-1,976	-1,882	6,342	4,603	6.4
2012	6,639	12,832	2012	23,623	21,709	-1,913	-3,185	4,726	3,217	9.6
2013	6,732	17,130	2013	22,976	21,106	-1,870	-4,379	4,862	3,104	12.8
2014	6,419	20,974	2014	22,382	20,562	-1,820	-5,469	4,599	2,754	15.5
2015	6,052	24,373	2015	21,813	20,035	-1,777	-6,467	4,275	2,401	17.9
2016	8,496	28,848	2016	21,205	19,478	-1,727	-7,377	6,768	3,565	21.5
2017	7,971	32,786	2017	20,613	18,936	-1,677	-8,206	6,294	3,110	24.6
2018	8,785	36,857	2018	20,043	18,409	-1,634	-8,963	7,151	3,314	27.9
2019	9,402	40,943	2019	19,433	17,849	-1,584	-9,652	7,818	3,398	31.3
2020	10,919	45,394	2020	50,065	48,531	-1,534	-10,277	9,385	3,825	35.1
2021	0	45,394	2021	63,199	61,715	-1,484	-10,844	-1,484	-567	34.6
2022	0	45,394	2022	61,261	59,827	-1,434	-11,358	-1,434	-514	34.0
2023	0	45,394	2023	59,462	58,079	-1,383	-11,823	-1,383	-465	33.6
2024	0	45,394	2024	57,524	56,191	-1,333	-12,244	-1,333	-421	33.2
2025	0	45,394	2025	55,726	54,442	-1,283	-12,624	-1,283	-380	32.8
2026	0	45,394	2026	53,603	52,370	-1,233	-12,966	-1,233	-342	32.4
2027	0	45,394	2027	51,768	50,585	-1,183	-13,274	-1,183	-308	32.1
2028	0	45,394	2028	49,928	48,803	-1,126	-13,548	-1,126	-275	31.8
2029	0	45,394	2029	47,985	46,909	-1,075	-13,794	-1,075	-246	31.6
	45,394.2	(Discount Rate is 6.62%)			NPV (Jan. '06 K\$)	-13,794.5		(Discount Rate is 6.62%)		

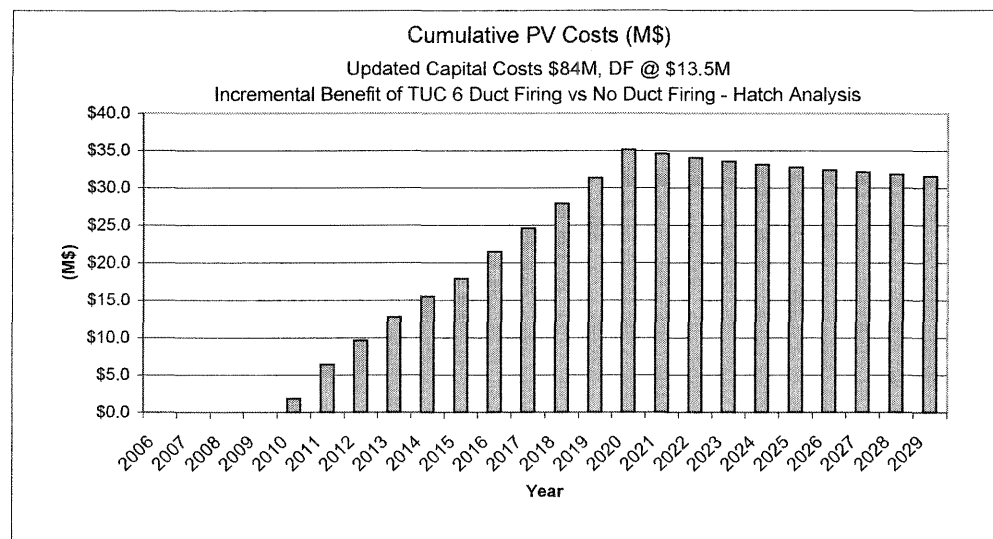
Cumulative NPV Costs 2006-2029	31.60 M\$
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Notes:

Operating Cost Benefits - Hatch Analysis (difference in system operating costs with TUC 6 at 125MW and 150MW)

- Hatch benefits calculated for 2010 were reduced by 50% because Hatch assumed TUC 6 in-service by Jan/2010 not Jun/2010.

Capital Costs are the annual charges for the combination of alternatives from Strategist.



Assumptions:

- 5%DSM & Rnew Plan
- TUC 6 Duct Fired
- In-service June/2010
- Capital Cost \$84.3M (\$2008)

TUC6 DF_\$84.3M_MAY15-08.SAV
NPV = \$12,479,524 M

Assumptions:

- 5%DSM & Rnew Plan
- TUC 6 No Duct Firing
- In-service June/2010
- Capital Cost \$70.775M (\$2008)

TUC6 UNFIRED_\$70.775_MAY15-08.SAV
NPV = \$12,477,446 M

NPV Benefit of TUC 6 No Duct Firing

Revised April/2010 - In-service Dec/2010 & Capital Cost \$78M

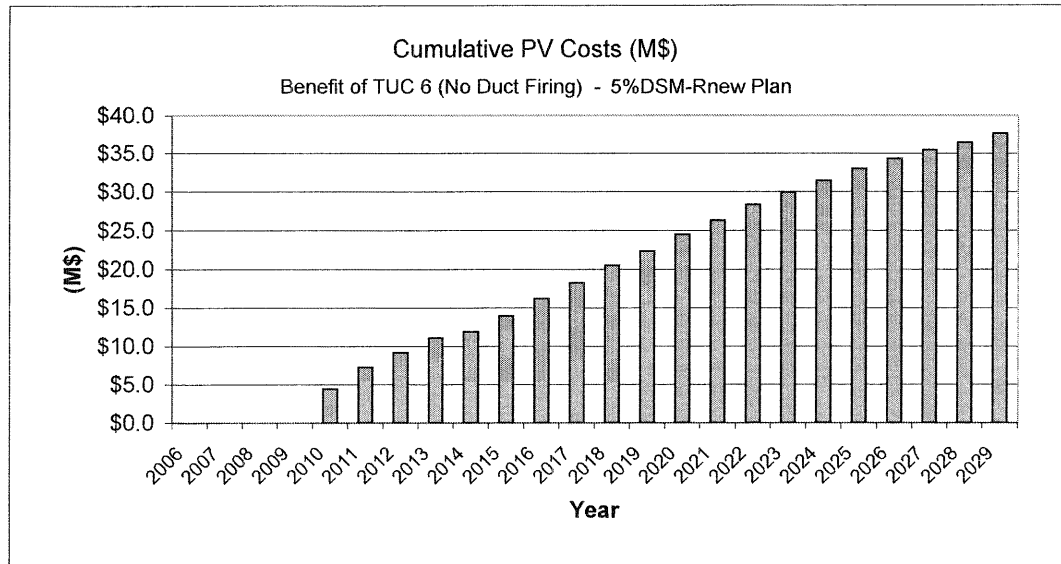
Year	Operating Costs TUC 6 No Duct Firing In-Service Dec/2010 (K\$)	Operating Costs No TUC 6 (K\$)	Operating Costs Nominal \$ (K\$)	Operating Cumulative PV Costs (K\$)
2006	566,652.2	566,652.2	0	0
2007	663,192.5	663,192.5	0	0
2008	532,026.6	532,026.6	0	0
2009	541,254.8	541,254.8	0	0
2010	715,821.1	717,011.7	1,191	921
2011	757,485.7	772,637.8	15,152	11,918
2012	788,765.8	802,511.8	13,746	21,276
2013	840,725.0	854,444.0	13,719	30,035
2014	883,576.5	895,280.2	11,704	37,043
2015	905,351.1	919,170.6	13,820	44,804
2016	913,603.0	927,757.3	14,154	52,260
2017	940,459.8	954,166.4	13,707	59,032
2018	974,545.3	988,713.0	14,168	65,597
2019	1,010,478.0	1,023,808.0	13,330	71,390
2020	1,059,696.0	1,073,815.0	14,119	77,146
2021	1,093,568.0	1,106,891.0	13,323	82,239
2022	1,129,644.0	1,143,391.0	13,747	87,169
2023	1,167,120.0	1,179,808.0	12,688	91,436
2024	1,206,440.0	1,219,071.0	12,631	95,420
2025	1,253,072.0	1,265,561.0	12,489	99,115
2026	1,273,571.0	1,285,362.0	11,791	102,386
2027	1,295,010.0	1,306,346.0	11,336	105,337
2028	1,312,932.0	1,323,559.0	10,627	107,931
2029	1,343,989.0	1,355,432.0	11,443	110,550
NPV (Jan. '06 K\$)			110,550.2	(Discount Rate is 6.62%)

Capital Cost \$78M

Year	Capital Costs TUC 6 No Duct Firing In-Service Dec/2010 (K\$)	Capital Costs No TUC 6 (K\$)	Capital Costs No DF Portion Nominal \$ (K\$)	Capital Costs Cumulative PV (K\$)	Total Benefits PV (K\$)	Total Benefits Cumulative PV (M\$)
2006	232	232	0	0	0	0.0
2007	1,282	1,282	0	0	0	0.0
2008	2,710	2,710	0	0	0	0.0
2009	6,053	6,053	0	0	0	0.0
2010	6,786	11,290	4,503	3,485	4,406	4.4
2011	22,761	11,487	-11,274	-4,698	2,815	7.2
2012	22,615	11,697	-10,918	-12,130	1,925	9.1
2013	21,993	11,318	-10,675	-18,946	1,943	11.1
2014	21,430	11,037	-10,394	-25,169	785	11.9
2015	20,885	10,734	-10,151	-30,870	2,060	13.9
2016	20,308	10,439	-9,869	-36,069	2,257	16.2
2017	19,747	10,160	-9,587	-40,805	2,035	18.2
2018	19,201	9,857	-9,344	-45,135	2,235	20.5
2019	18,622	9,560	-9,062	-49,074	1,855	22.3
2020	49,285	40,504	-8,780	-52,653	2,176	24.5
2021	62,450	53,951	-8,498	-55,902	1,844	26.3
2022	60,542	52,325	-8,217	-58,848	1,983	28.3
2023	58,774	50,839	-7,935	-61,517	1,599	29.9
2024	56,866	49,214	-7,653	-63,931	1,570	31.5
2025	55,098	47,728	-7,371	-66,111	1,514	33.0
2026	53,006	45,917	-7,089	-68,078	1,305	34.3
2027	51,202	44,395	-6,807	-69,850	1,179	35.5
2028	49,399	42,913	-6,486	-71,433	1,011	36.5
2029	47,486	41,282	-6,204	-72,853	1,199	37.7
NPV (Jan. '06 K\$)			-72,853.1	(Discount Rate is 6.62%)		

Cumulative NPV Costs 2006-2029 37.70 M\$

NOTE: Operating Costs include fuel, variable O&M, net transaction costs and fixed thermal and hydro O&M costs
Capital Charges are the annual charges for the combination of alternatives added.

**Assumptions:**

- 5%DSM & Rnew Plan
- No TUC 6

5%DSM-RNEW_NO TUC6_JUN4.SAV
NPV = \$12,521.283 M

Assumptions:

- 5%DSM & Rnew Plan
- TUC 6 No Duct Firing
- In-service Dec/2010
- Capital Cost \$78M (\$2010)

TUC6 UNFIRED_\$78(Dec)_Apr16-10.SAV
NPV = \$12,483.585 M

Incremental NPV Benefit of TUC 6 Duct Fired - Operating Cost Benefits from Hatch Analysis

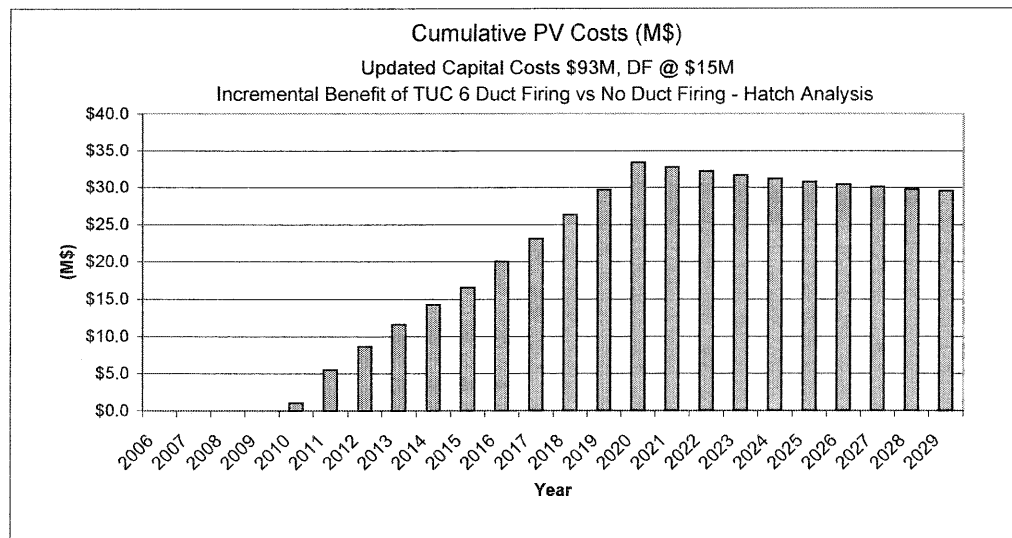
Revised April/2010 - In-service Dec/2010 & Revised Capital Cost

Operating Benefits			Capital Cost = \$93M			Capital Cost = \$78M			Capital Costs			Capital Costs			Capital Costs			Capital Costs			Capital Costs			Capital Costs			Capital Costs			Capital Costs			Capital Costs			Capital Costs			Capital Costs			Capital Costs			Capital Costs			Capital Costs			Capital Costs			Capital Costs			Capital Costs			Capital Costs			Capital Costs			Capital Costs			Capital Costs			Capital Costs			Capital Costs			Capital Costs			Capital Costs			Capital Costs			Capital Costs			Capital Costs			Capital Costs			Capital Costs			Capital Costs			Capital Costs			Capital Costs			Capital Costs			Capital Costs			Capital Costs			Capital Costs			Capital Costs			Capital Costs			Capital Costs			Capital Costs			Capital Costs			Capital Costs			Capital Costs			Capital Costs			Capital Costs			Capital Costs			Capital Costs			Capital Costs			Capital Costs			Capital Costs			Capital Costs			Capital Costs			Capital Costs			Capital Costs			Capital Costs			Capital Costs			Capital 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Cumulative NPV Costs 2006-2029 29.49 M\$

Notes:**Operating Cost Benefits - Hatch Analysis** (difference in system operating costs with TUC 6 at 125MW and 150MW)

- Hatch benefits calculated for 2010 were reduced by 11/12 because Hatch assumed TUC 6 in-service by Jan/2010 not Dec/2010, (\$5882/12)

Capital Costs are the annual charges for the combination of alternatives from Strategist.**Assumptions:**

- 5%DSM & Rnew Plan
- TUC 6 Duct Fired
- In-service Dec/2010
- Capital Cost \$93M (\$2010)

TUC6 DF_\$93M (DEC)_APR21.SAV

NPV = \$12,486.640 M

Assumptions:

- 5%DSM & Rnew Plan
- TUC 6 No Duct Firing
- In-service Dec/2010
- Capital Cost \$78M (\$2010)

TUC6 UNFIRED_\$78(Dec)_Apr16-10.SAV

NPV = \$12,483.585 M



UARB APPROVAL SHEET

Project Title: TUC 6 Waste Heat Recovery

CI Number: 28098

☐ Capital Project Authorization

Head Office Use:

☒ ATO

Project Number: S353

☐ Final Cost

Date : April 30, 2010

Location:

Division:

Expenditure Profile

Schedule

YEAR	Budget Estimate	Project Estimate		
2008	15,830,518	8,818,975		
2009	34,855,496	29,783,718	Estimated Start Date	2008-07
2010	33,610,748	54,393,935	Estimated In-Service Date	2010-11
			Estimated Close Date	2011-06
Total	\$84,296,762	\$92,996,628		

COMMENTS

Submitted on behalf of NOVA SCOTIA POWER INCORPORATED

Approved on behalf of NOVA SCOTIA UTILITY AND REVIEW BOARD

April 29/2010

Authorized Signatory

DATE

DATE

Mark Savory

VP Technical and Construction

CI Number : 28098-S353 - TUC 6 Waste Heat Recovery

Project Number S353

Parent CI Number :

Cost Centre : 396 - 396-Tufts Cove Unit 6

Budget Version - 2010 04/08 Forecast

	Forecast
Start :	07/01/2008
Operational :	11/30/2010
Final Cost :	06/30/2011
2008	\$8,818,974.53
2009	\$29,783,718.14
2010	\$54,393,935.14
2011.	\$0.00
Total :	\$92,996,627.81
Original Cost :	\$0.00

The project scope provides for the design, procurement, installation and commissioning in order to convert the Tufts Cove 4 and 5 to combined cycle operation, with duct firing to produce a total plant capacity of 150MW. The major elements of this work are: 2 Heat Recovery Boilers complete with natural gas duct burners; 50MW Steam Turbine Generator Island and sea water condenser; Steam Turbine Generator Building; Circulating Water System; Balance of Plant Systems; Low Pressure Gas Supply; Control Systems; Substation Transformer / Switchgear and Relays; Environmental Assessment and Permitting; Harbour Infill and Site Preparation.

CI Number : 28098-S353 - TUC 6 Waste Heat Recovery

Project Number S353

Parent CI Number : -

Approved Date 9/30/2008

Cost Centre : 396 - 396-Tufts Cove Unit 6

Budget Version 2010 04/08 Forecast

Capital Item Accounts

Acct	Actv	Account	Activity	Forecast Amount	Amount	Variance
001		001 - T&D Regular Labour		159	0	159
001		001 - THERMAL Regular Labour		89,387	0	89,387
001		001 - Regular Labour (No AO)		799,436	0	799,436
002		002 - Overtime Labour (No AO)		24,050	0	24,050
002		002 - THERMAL Overtime Labour		733	0	733
004		004 - THERMAL Term Labour		129	0	129
004		004 - Term Labour (NO AO)		2,273	0	2,273
011		011 - Travel Expense		120,472	0	120,472
012		012 - Materials		640,125	0	640,125
013		013 - POWER PRODUCTION Contracts		91,035	0	91,035
015		015 - Frt, Post & Delivery		1,789	0	1,789
016		016 - Tools & Equipment		5,914	0	5,914
021		021 - Telephones		10,660	0	10,660
028		028 - Consulting		4,534,018	0	4,534,018
041		041 - Meals & Entertainment		17,464	0	17,464
042		042 - Employee Benefits		21,433	0	21,433
043		043 - Insurance		377,546	0	377,546
066		066 - Other Goods & Services		262,568	0	262,568
092		092-Vehicle T&D Reg. Labour AO		1,544	0	1,544
094		094 - Interest Capitalized		6,413,217	0	6,413,217
095		095-Thermal Term Labour AO		1,319	0	1,319
095		095-Thermal & Hydro Contracts AO		1,119,294	0	1,119,294
095		095-COPS Regular Labour AO		462	0	462
095		095-COPS Contracts AO		22,944	0	22,944
095		095-Thermal Regular Labour AO		157,801	0	157,801
095		095-Thermal Overtime Labour AO		82	0	82
001	003	001 - Regular Labour (No AO)	003 - SGP - Bldg.,Struct.Grmd.	513	0	513
001	003	001 - THERMAL Regular Labour	003 - SGP - Bldg.,Struct.Grmd.	11,235	0	11,235
002	003	002 - THERMAL Overtime Labour	003 - SGP - Bldg.,Struct.Grmd.	107	0	107
004	003	004 - THERMAL Term Labour	003 - SGP - Bldg.,Struct.Grmd.	7,628	0	7,628
012	003	012 - Materials	003 - SGP - Bldg.,Struct.Grmd.	6,140,993	0	6,140,993
013	003	013 - POWER PRODUCTION Contracts	003 - SGP - Bldg.,Struct.Grmd.	4,610,346	0	4,610,346
001	004	001 - THERMAL Regular Labour	004 - SGP - Misc.Equipment	10,000	0	10,000
012	004	012 - Materials	004 - SGP - Misc.Equipment	896,385	0	896,385

CI Number : 28098-S353

- TUC 6 Waste Heat Recovery

Project Number S353

Parent CI Number :

-

Approved Date 9/30/2008

Cost Centre : 396

- 396-Tufts Cove Unit 6

Budget Version 2010 04/08 Forecast

Capital Item Accounts

Acct	Actv	Account	Activity	Forecast Amount	Amount	Variance
013	004	013 - POWER PRODUCTION Contracts	004 - SGP - Misc.Equipment	215,530	0	215,530
001	007	001 - Regular Labour (No AO)	007 - SGP - Environmental	20,693	0	20,693
001	007	001 - THERMAL Regular Labour	007 - SGP - Environmental	14,180	0	14,180
004	007	004 - Term Labour (NO AO)	007 - SGP - Environmental	11,002	0	11,002
012	007	012 - Materials	007 - SGP - Environmental	91,119	0	91,119
013	007	013 - POWER PRODUCTION Contracts	007 - SGP - Environmental	31,346	0	31,346
028	007	028 - Consulting	007 - SGP - Environmental	87,389	0	87,389
012	010	012 - Materials	010 - SGP - Turbo Gen.Instal.	19,580,041	0	19,580,041
013	010	013 - POWER PRODUCTION Contracts	010 - SGP - Turbo Gen.Instal.	3,279,713	0	3,279,713
066	010	066 - Other Goods & Services	010 - SGP - Turbo Gen.Instal.	870,000	0	870,000
001	011	001 - THERMAL Regular Labour	011 - SGP - Plant Control and Inst	34,000	0	34,000
012	011	012 - Materials	011 - SGP - Plant Control and Inst	1,460,526	0	1,460,526
013	011	013 - POWER PRODUCTION Contracts	011 - SGP - Plant Control and Inst	1,340,600	0	1,340,600
012	012	012 - Materials	012 - SGP - Fuel Hndlg.Natural Gas	184,000	0	184,000
013	012	013 - POWER PRODUCTION Contracts	012 - SGP - Fuel Hndlg.Natural Gas	183,200	0	183,200
012	013	012 - Materials	013 - SGP - Boiler	18,819,349	0	18,819,349
013	013	013 - POWER PRODUCTION Contracts	013 - SGP - Boiler	4,313,837	0	4,313,837
001	014	001 - THERMAL Regular Labour	014 - SGP - Circ.Water Sys.	0	0	0
012	014	012 - Materials	014 - SGP - Circ.Water Sys.	3,558,517	0	3,558,517
013	014	013 - POWER PRODUCTION Contracts	014 - SGP - Circ.Water Sys.	1,229,342	0	1,229,342
001	015	001 - THERMAL Regular Labour	015 - SGP - Waste Water	6,000	0	6,000
012	015	012 - Materials	015 - SGP - Waste Water	112,924	0	112,924
001	016	001 - THERMAL Regular Labour	016 - SGP - Feed Water Sys.	2,000	0	2,000
012	016	012 - Materials	016 - SGP - Feed Water Sys.	1,509,168	0	1,509,168
013	016	013 - POWER PRODUCTION Contracts	016 - SGP - Feed Water Sys.	606,755	0	606,755
012	022	012 - Materials	022 - SGP - Elec Contr.Equip.	2,697,301	0	2,697,301
013	022	013 - POWER PRODUCTION Contracts	022 - SGP - Elec Contr.Equip.	1,686,266	0	1,686,266
001	023	001 - T&D Regular Labour	023 - SGP - Power Equip.-Station S	322	0	322
001	023	001 - Regular Labour (No AO)	023 - SGP - Power Equip.-Station S	399	0	399
001	023	001 - THERMAL Regular Labour	023 - SGP - Power Equip.-Station S	55,000	0	55,000
012	023	012 - Materials	023 - SGP - Power Equip.-Station S	1,274,854	0	1,274,854
013	023	013 - POWER PRODUCTION Contracts	023 - SGP - Power Equip.-Station S	570,600	0	570,600
001	085	001 - Regular Labour (No AO)	085 Design	20,000	0	20,000
011	085	011 - Travel Expense	085 Design	6,000	0	6,000

CI Number : 28098-S353

- TUC 6 Waste Heat Recovery

Project Number S353

Parent CI Number :

-

Approved Date 9/30/2008

Cost Centre : 396

- 396-Tufts Cove Unit 6

Budget Version 2010 04/08 Forecast

Capital Item Accounts

Acct	Actv	Account	Activity	Forecast Amount	Amount	Variance
012	085	012 - Materials	085 Design	2,000	0	2,000
021	085	021 - Telephones	085 Design	3,600	0	3,600
028	085	028 - Consulting	085 Design	316,107	0	316,107
041	085	041 - Meals & Entertainment	085 Design	2,600	0	2,600
001	086	001 - THERMAL Regular Labour	086 Commissioning	300,000	0	300,000
011	086	011 - Travel Expense	086 Commissioning	16,000	0	16,000
012	086	012 - Materials	086 Commissioning	35,453	0	35,453
013	086	013 - POWER PRODUCTION Contracts	086 Commissioning	85,000	0	85,000
016	086	016 - Tools & Equipment	086 Commissioning	200	0	200
021	086	021 - Telephones	086 Commissioning	800	0	800
028	086	028 - Consulting	086 Commissioning	792,690	0	792,690
041	086	041 - Meals & Entertainment	086 Commissioning	4,000	0	4,000
001	087	001 - THERMAL Regular Labour	087 Field Super. & Ops.	103,500	0	103,500
012	087	012 - Materials	087 Field Super. & Ops.	161,695	0	161,695
013	087	013 - POWER PRODUCTION Contracts	087 Field Super. & Ops.	144,574	0	144,574
021	087	021 - Telephones	087 Field Super. & Ops.	4,372	0	4,372
028	087	028 - Consulting	087 Field Super. & Ops.	756,000	0	756,000
013	088	013 - POWER PRODUCTION Contracts	088 Survey/Mapping	3,000	0	3,000
Total Cost:				92,996,628	0	92,996,628
Original Cost:						

CI Number : 28098-S353

- TUC 6 Waste Heat Recovery

Project Number S353

Parent CI Number :

-

Approved Date 9/30/2008

Cost Centre : 396

- 396-Tufts Cove Unit 6

Capital Item Justification

Justification Criteria : THERMAL

Sub-Criteria :

Name of Report :

Document Location :

Person Responsible : DAN BAUR/GRAEME MACKENZIE

Why do this project?

The IRP Action Plan includes the following:

"NSPI will apply to the UARB for the approval of capital investments to optimize the capacity and environmental performance of existing generation assets."

The Tufts Cove 6 Waste Heat Recovery project is an important initial component of the IRP Action Plan item. The project:

- 1) Provides savings to NSPI customers;
- 2) Improves the environmental performance of our Tufts Cove units;
- 3) Enhances the flexibility and stability of the Province's power system, in support of intermittent wind generation.
- 4) Provides the opportunity to use steam for district heating or other commercial purposes; and
- 5) Adds generation at the Province's load centre.

Why do this project now?

This project will provide savings to NSPI customers over the planning period of approximately \$75.4 million. Approval to proceed in June will allow this project to be in service for the winter of 2010/2011 peak season. The sooner it is undertaken; the sooner NSPI customer will begin to realize these benefits.

In addition to the above, the Tufts Cove Environmental Permit requires NSPI to seek regulatory approval to convert the unit to combined cycle mode once the unit's annual capacity factor exceeds 20%, as occurred in 2005.

Why do this project this way?

NSPI operates two LM6000 combustion turbines at its generating facility at Tufts Cove. Currently energy in the form of heat generated from the combustion process for these units is exhausted to the environment. Recovery of this energy through the conversion of these units to combined cycle operation is economic and environmentally responsible.

Duct-firing provides additional cost savings, while also adding fast response load-following generation to support intermittent wind generation.

CI Number : 28098-S353 - TUC 6 Waste Heat Recovery
Parent CI Number : -
Cost Centre : 396 - 396-Tufts Cove Unit 6

Project Number S353
Approved Date 9/30/2008

Reason for Variance / Over Expenditure / Final Costing

13605161

Please see the enclosed cost support details.