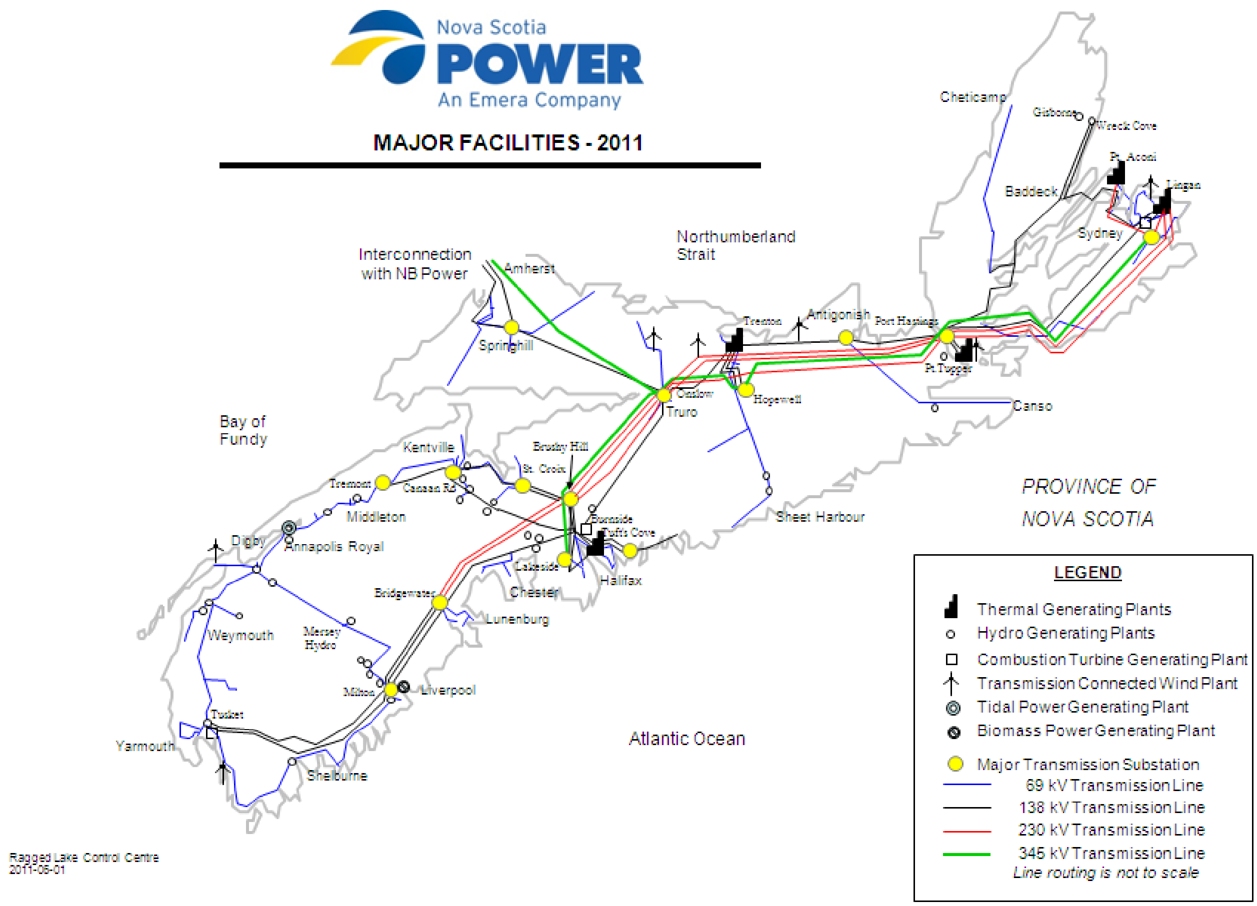
Nova Scotia Power Inc.
2012 Annual Capital Expenditure Plan



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November 2, 2011

ACE Plan Foreword

Nova Scotia Power's (NSPI, the Company) Annual Capital Expenditure (ACE) Plan reflects the Company's long-term objective to transform our business to a cleaner generation mix in order to meet evolving emission standards and to improve the reliability of the power system.

The Company remains focused on its transition to a generation portfolio that includes a greater portion of long-term, stable-priced renewable energy. However, electricity from fossil fuels and existing hydro generation continue to provide the majority of energy to the system. Maintaining and improving the dependability and operation of NSPI's thermal and hydro generating units assists in preserving lower current fuel prices and optionality as well as power system stability.

Preserving the current hydro generation fleet is also necessary for the Company to achieve Renewable Energy Standards (RES) compliance targets for 2015 and beyond as well as provincial and federal greenhouse gas (GHG) regulations. In addition, a significant portion of the capital investment in hydro is specifically related to risk management associated with dam structures.

While Nova Scotia Power's strategic direction remains consistent with generation portfolio transformation and customer reliability, the ACE Plan capital investment outlook for 2012 - 2016 reflects the uncertainty the Company is managing in terms of energy demand and increasingly restrictive air emission regulations. At the time of this filing, the NewPage Port Hawkesbury paper mill is not operating. Like all Nova Scotians, we are hopeful that the mill, which we believe is a valuable asset to Nova Scotia, will resume operations in the near term. The prudent course of action, though, is to have plans in place should the mill remain closed.

This potential industrial load reduction, coupled with pending federal GHG regulations that include prescribed retirements for fossil-fueled generating plants, has resulted in a number of changes to our 5 year capital outlook, as compared to 2011. Key changes include:

- Nova Scotia Power's planned investment in wind energy will shift by two years, so that any new wind would be developed in 2014/2015, and be in service in 2015, consistent with existing Renewable Energy Standard regulations.
- Investments in the Lingan Generating Station's Unit #2 will be minimized to reflect the fact that this would be the most likely unit to close under the scenario of reduced load, coupled with proposed federal GHG regulations.
- The plan includes deferral of future fast acting generation until the renewable energy integration study work is completed and increased certainty around the introduction of additional wind generation is apparent.

Nova Scotia Power continues to advance capital investments to improve customer reliability such as the new Harbour East transmission line, which involved extensive stakeholder consultation to resolve a load growth challenge and additions of redundant transformers into large customer density substations.

Similar to last year's ACE Plan, the 2012 plan includes detailed justification for all projects for which Nova Scotia Power is seeking approval. Where appropriate, these detailed justifications include cost support, economic analysis and detailed estimates.

Continuing to invest in our existing assets means better reliability, enhanced efficiency and improved customer service. Our customers will benefit from existing and future renewable generation that reduces our dependence on foreign solid fuels and saves customers money in the medium to long term.

Our company recognizes that transforming our power generation fleet to more renewable energy and investing in our transmission and distribution assets to improve reliability is a significant investment on behalf of our customers. In preparing and delivering this program we are focused on safety, environmental regulations, cost control and operational excellence over the long term. Our 2012 ACE Plan also includes our estimate of the effect of the Plan on future revenue requirement, as requested by the UARB and various stakeholders.

Nova Scotia Power respectfully requests UARB approval of the 2012 ACE Plan.

How the ACE Plan is Structured

The **Overview** section of this document provides the reader with a view of NSPI's overall capital expenditure plan.

It begins by providing a graph detailing the previous year's capital investments, projections for the current year and a forecast of the company's capital spend for the next four years.

A chart is provided to illustrate the breakdown of NSPI's 2012 ACE Plan. The budget for 2012 is separated into the following components:

- Capital item approval sought through the ACE 2012 process (including routine capital projects)
- A forecast of capital items to be submitted for approval later in 2012
- 2012 Carryover Projects; these are multi-year projects approved in prior years with spending occurring in 2012.
- Capital Items Less Than $250k. Pursuant to a legislative change to the Public Utilities Act effective May 11, 2010, capital expenditures with a value up to $250,000 may be made by a public utility, without formal approval of the Nova Scotia Utility and Review Board (Section 35 of the Public Utilities Act).
- Point Aconi Capital Items. Pursuant to Section 36 of the Public Utilities Act, investment in the Point Aconi Generating Station does not require Board approval.

Following this graphical summary of NSPI's ACE Plan, the Company provides lists of projects which are included in each of these sections. The 2012 capital investment of the Company is further categorized by Justification Criteria and by spending category (i.e. new spending, carryover spending and routine capital spending).

Following this summary view, the capital items are then presented in the ACE Plan by functional area in the **Capital Functions** section of the document.

Additionally, the Company's Routine Capital program is provided in this area of the Plan. NSPI's Routine Capital program is an annual allocation of capital to fund repetitive individual capital replacements. These are capital spending items that are regularly needed for routine capital maintenance of the utility's assets. Routine Capital programs are included in the capital program in a pooled approach to reduce the administrative costs associated with identifying and approving individual Routine Capital projects and to provide NSPI with the flexibility required to effectively manage smaller, consistent scope utility capital projects from one year to the next. The overall Routine Capital Program is presented along with a breakdown of each project within the program and a multi-year overview of the program.

The next five sections, **Generation, Integrated Customer Service, Transmission, Distribution and General Plant** provide the reader with details of each capital project for which the Company is seeking Board approval in 2012.

A Glossary of Terms follows the presentation of NSPI's capital projects. The **NSPI 2012 Quick Reference Sheet** provides the reader with the Company's Allowance for Funds Used During Construction and Overhead rates used in the development of the 2012 capital budget.

The Plan concludes with a final section providing, for reference only, NSPI's **2012 Depreciation Rates.**

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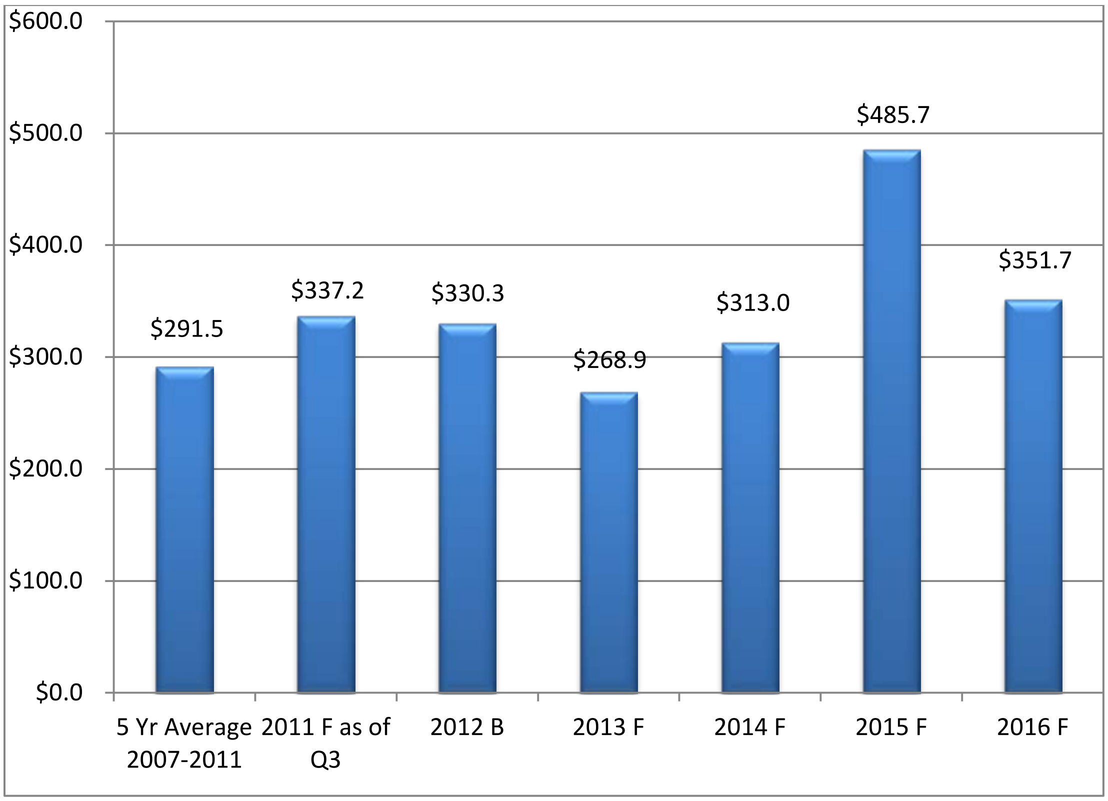
1 Overview

1.1 Annual Capital Expenditure (ACE) Plan for 2012-2016

(Millions of Dollars)



F = Forecast, B=Budget in above figure

Highlights of Nova Scotia Power Inc.'s (NSPI) 2012 to 2016 capital plan:

- The proposed capital budget for 2012 is $330.3 Million, which includes several items that have a subsequent approval process and includes items that do not specifically require UARB approval.

- The 2012 ACE Plan is comprised of new, carry-over and routine capital items. The ACE Plan includes capital items submitted for Nova Scotia Utility and Review Board (UARB, Board) approval through the ACE Plan proceeding, capital items that NSPI anticipates submitting for individual approval in 2012 and capital items that do not require UARB approval.

- 2012 capital spend for new capital items (including routines) submitted for UARB approval in this ACE Plan totals $142.8 Million. The total capital investment for these capital items is $144.1 Million. Detailed descriptions and justification for each new item are included in this document, summarized by capital function.

- Routine Capital spending represents $81.6 Million of total spending in 2012 and is for replacement of equipment ("like-for-like" replacement), additions to existing equipment base resulting from system growth and the addition of customers to the system.

- The total investment for 2012 capital items that do not require UARB approval is $21.4 Million. These investments include projects totaling less than $250 Thousand and capital investments in the Point Aconi Generating Station.

- Carryover projects comprise $85.8 Million of total spending in 2012. The Port Hawkesbury Biomass Project constitutes approximately $56 Million of the carryover spend. This project was approved by the UARB in 2010.

- Projects totaling an additional $80.4 Million of spend in 2012 ($212.6 Million Project Total Forecast) will be brought forward later in 2012 for separate approval.

Capital item justifications are based on the Capital Expenditure Justification Criteria (CEJC) as approved by the Board in 1995 with minor revisions per the 1997 filing. The CEJC provides the Board with assurance that NSPI is using sound economic, financial and technical criteria to ensure that its capital expenditures provide the maximum benefit to its customers. NSPI is working with UARB staff to update the CEJC.

NOTE: Figures presented in the ACE document reflect whole numbers, which may cause $0.1 Million in rounding differences on some line items.

1.2 Summary of 2012 ACE Plan Spending by Approval Category for 2012

The following table provides the proposed 2012 capital investment by approval category for NSPI's ACE filing. This Application seeks UARB approval of the 2012 capital routines and other 2012 projects, which total $142.8M of spend in 2012. Certain items do not require UARB approval, but are included in the Company's annual capital plan for context. The 2012 ACE Budget also includes spending on multi-year projects that were previously approved by the UARB.

2012 ACE Budget *(Millions of Dollars)*	**2012 UARB Approval Request ($M)**	**UARB Approval Not Required ($M)**	**Capital Items Forecast for Later Filing & Approval in 2012 ($M)**	**Capital Projects with 2012 Carryover ($M)**	**2012 ACE Plan ($M)**
Capital Item Approval Sought through the 2012 ACE Process (Including Routine Capital Projects)	142.8				**142.8**
Capital Items Submitted for Later Approval in 2012			80.4		**80.4**
2012 Carryover Projects				85.8	**85.8**
Capital Items Less Than $250K		10.9			**10.9**
Point Aconi New Capital Spend		10.4			**10.4**
2012 ACE Plan	**$142.8**	**$21.4**	**$80.4**	**$85.8**	**$330.3**

* Figures represent 2012 spend

1.3 2012 ACE Plan Capital Items Submitted for Approval

This table provides the list of Capital Items for which NSPI seeks UARB Approval by this Application, totaling $142.8M of spending in 2012 and total spending of $144.1M.

Tab #	CI#	Project Title	2012 Budget	Project Total
Hydro				
G01	40282	HYD- St Margaret's Bay - Coon Pond Dam Refurbishment	$2,595,361	$2,595,361
G02	31204	HYD - Dickie Brook - Donahoe Lake Dam Refurbishment	1,597,494	1,597,494
G03	41143	HYD - St Margarets Bay - Tidewater Surge Tank Refurbishment	1,211,641	1,211,641
G04	39042	HYD - Sheet Harbour - Ten Mile Lake Dam Decommissioning	1,018,923	1,018,923
G05	41138	HYD - Black River - Hollow Bridge Surge Tank Refurbishment	930,048	930,048
G06	23125	HYD - Sissiboo Falls - Electrical Equipment Replacement	845,755	845,755
G07	41127	HYD - Nictaux - Headcover Replacement	219,362	525,680
G08	41145	HYD - Mersey - Upper Lake Falls Rip Rap Replacement	516,420	516,420
G09	41140	HYD Sissiboo Falls - Tailrace Concrete Refurbishment	314,412	314,412
Total New Hydro Spending			**$9,249,417**	**$9,555,735**
Steam				
G10	41229	LIN - Cable Spreading Rooms Fire Protection	$918,292	$918,292
G11	41228	TUC - Unit 3 Turbine HP Impulse Blades Replacement	882,152	882,152
G12	28674	TRE6 - Human Machine Interface (HMI) Upgrade	867,805	867,805
G13	39923	TUC - Generator Excitation and AVR System Replacement	141,183	844,543
G14	37611	LIN3 - Generator Excitation & AVR System Replacement	819,469	819,469
G15	41441	TRE - Siding Replacement (Phase 2)	608,916	608,916
G16	41507	TRE6 - Air Heater Refurbishment	553,438	553,438
G17	41303	TRE6 - Waterwall Panel Replacements	548,225	548,225
G18	41549	TRE5- Main Steam Attemperator Replacement	535,227	535,227
G19	40655	LIN - Pulverizer Refurbishment	461,279	461,279
G20	41121	LIN - Cooling Water (CW) Pump Refurbishment	447,687	447,687
G21	40256	POT - Plant Siding Replacement	392,601	392,601
G22	41511	TRE6 - Condenser Waterbox and Cooling Water (CW) Piping Refurbishment	392,172	392,172
G23	41503	TRE6 - Steam Turbine Control Valve Refurbishment	359,507	359,507
G24	41508	TRE6 - Turbine/Generator Fire Protection	347,079	347,079
G25	41584	POT Vacuum Pump Replacement	332,994	332,994
G26	28645	TRE6 - Turbine Controls Power Supplies Replacement	321,691	321,691
G27	38163	TRE6 Pulverizer Refurbishments	311,074	311,074
G28	41251	TUC3 - Turbine High Pressure (HP) Cylinder Fastener Replacement	275,729	275,729
G29	41620	TUC3 Turbine Generator Fire Protection	272,743	272,743
G30	41561	POT - Maintenance Facilities Refurbishment	258,558	258,558
G31	41124	LIN-Cooling Water (CW) Screen Refurbishment	251,544	251,544
Total New Steam Spending			**$10,299,366**	**$11,002,726**
Total New Generation Spending			**$19,548,783**	**$20,558,461**

Tab #	CI#	Project Title		2012 Budget
Transmission				
T01	41387	2012 Transmission Line Insulator Replacements	$3,619,166	$3,619,166
T02	41432	L7009 Lidar Upgrades & Maintenance	2,942,809	2,942,809
T03	41517	L6535 Lidar Upgrades & Maintenance	$2,361,250	$2,361,250
T04	41348	2012 Protection Upgrades Onslow	2,274,015	2,274,015
T05	41430	2012 Substation Recloser Replacement	2,120,686	2,120,686
T06	41426	2012 Transmission Switch & Breaker Upgrades	2,000,849	2,000,849
T07	41429	2012 Substation PCB Equipment Removal	1,854,665	1,854,665
T08	41535	2012 Steel Tower Painting	1,270,605	1,270,605
T09	41844	Reinsulate Transmission Lines L8004 & L7005	1,139,264	1,139,264
T10	41434	Procure Additional 42 MVA Spare Transformer	1,043,984	1,043,984
T11	41399	2012 Substation Insulator & Cutout Replacements	800,013	800,013
T12	41437	104H-T62 Kempt Road Transformer Rewind	790,201	790,201
T13	41589	22N-Church St Replace 25 kV Bus and Feeder Exit	734,302	734,302
T14	41386	2012 Pole Retreatment	556,017	556,017
T15	41551	Glentosh Substation Footing Remediation	552,201	552,201
T16	41391	L6025 Spar Arm Reinforcement	489,925	489,925
T17	41422	Onslow Spares Storage Upgrades	415,661	415,661
T18	41439	Mobile Refurbishments 5P & 6P	367,409	367,409
T19	41438	85S-Wreck Cove Cable Termination Replacement	291,194	291,194
T20	41362	7H Beaufort Switchgear Retirement	278,071	278,071
T21	41390	7V Methals Hydro Transformer Replacement	258,506	258,506
Total New Transmission Spending			**$26,160,795**	**$26,160,795**
Distribution				
D01	41392	2012 Distribution Cutout Replacements	$2,596,796	$2,596,796
D02	41349	2012 Off Road To Roadside	884,869	884,869
D03	41398	2012 Padmount Transformer Replacements	827,340	827,340
D04	41359	79V-402 Feeder Load Reduction	797,378	797,378
D05	41383	2012 Halifax Underground Feeder Replacement	596,760	596,760
D06	41351	2012 Distribution Automation	553,965	553,965
D07	41353	2012 Downline Recloser Additions	543,284	543,284
D08	41355	2012 Remote Communication on Reclosers	536,258	536,258
D09	41339	2012 Distribution Feeder Ties	492,873	492,873
D10	41325	Replacement of 3H and 6H Reclosers	465,327	465,327
D11	41360	82V-423 Hardwood Lands Deteriorated Plant Replacement	437,192	437,192
D12	41389	8H Fairview Conversion	417,695	417,695
D13	41384	2012 Feeder Exit Cable Replacement	374,542	374,542
D14	41338	20H-301 Targeted Feeder Replacement	371,361	371,361
D15	41333	16N-301 Stewiacke Reconductor	353,467	353,467
D16	41327	103W-311 Gold River Reconductor Phase 2	310,296	310,296
D17	41393	2012 Automatic Sleeve Replacements	287,831	287,831
D18	41337	1N-405 Targeted Feeder Replacement	283,892	283,892
D19	41341	1H-Water Street New Feeder	280,657	280,657
D20	41363	88W New Feeder	269,616	269,616
D21	41356	35V-312 Windsor Causeway	252,137	252,137
Total New Distribution Spending			**$11,933,535**	**$11,933,535**

Tab #	CI#	Project Title		2012 Budget	Project Total
General Plant					
GP01	40649	PeopleSoft (Human Resource Management)		$403,131	$633,487
GP02	41424	PeopleSoft Self Service Module		413,859	413,859
GP03	41425	Cognos Upgrade		186,933	254,413
Total New Computers Spending				**$1,003,923**	**$1,301,759**
Outage Performance					
GP04	41433	2012 New RTU Deployment	$1,062,700		$1,062,700
GP05	41428	2012 RTU Capital Replacement	314,026		314,026
Total Outage Performance			**$1,376,725**		**$1,376,725**
Furniture & Fixtures					
GP06	41763	Warehouse Racking System	$262,402		$262,402
Total Furniture & Fixtures			**$262,402**		**$262,402**
Telecommunications					
GP07	41419	2012 Replace Microwave Radio System	$601,339		$601,339
GP08	41420	Upgrade Multiplexer Network Manager	294,571		294,571
Total New Telecommunications Spending			**$895,910**		**$895,910**
Total New General Plant Spending			**$3,538,960**		**$3,836,796**
Total Routine Capital Spending			**$81,606,479**		**$81,606,479**
Total Capital Items for which Approval is Sought			**$142,788,552**		**$144,096,067**

1.4 2012 ACE Plan Capital Items Forecast for Subsequent Approval

The following table identifies projects that are not yet ready for submission to the UARB, and that NSPI anticipates will be filed for approval in late 2011 and throughout 2012, totaling $80.4 Million of 2012 spending on projects that are currently estimated at approximately $212.6 Million. The budget numbers indicated below are estimates – NSPI requires additional time and effort to develop specific project budget proposals. This aspect of the Company’s filing is designed to provide a general indication of anticipated 2012 projects as requested by the Board.

CI#	Project Title	2012 Budget	Project Total
Hydro			
38868	HYD Marshall Falls Hydro Station	$2,815,495	$18,233,184
40309	HYD - St. Margaret's Bay - Tidewater Pipeline Replacement	7,704,424	7,704,424
31245	HYD - St. Margaret's Bay - Sandy Lake Dam Refurbishment	5,579,410	5,579,410
39543	HYD - U&U Ladder Upgrades	364,417	1,132,830
41126	HYD Annapolis - Sluiceway and Powerhouse Stop Log Refurbishment	1,115,739	1,115,739
41806	HYD - Big Falls - #6 Refurbishment	497,566	497,566
	Total New Hydro Spending for Subsequent Approval	**$18,077,053**	**$34,263,154**
Steam			
39932	TRE - Ash Site Phase 2 Development	$4,563,325	$5,783,337
18448	TUC - Cooling Water System Biofouling Control	2,752,157	2,752,157
39566	LIN2 Steam Turbine Last Stage Blades Replacement	601,589	1,815,030
31583	LIN2 L-1 Steam Turbine Blading Replacement	833,163	1,077,882
39926	TUC - Unit 3 Generator Excitation and AVR System Replacement	742,715	881,456
40330	LIN2 HT Fastener Replacement	532,691	760,741
41233	LIN3 Boiler Refurbishment	755,711	755,711
41235	LIN1 Boiler Refurbishment	749,186	749,186
41595	POT - Sternson PLC Replacement	596,976	596,976
41234	LIN4 Boiler Refurbishment	494,102	494,102
41248	TUC - Lube Oil Storage Building	288,657	288,657
41516	TRE6 - Stack Breaching Inlet Ductwork Refurbishment	252,948	252,948
	Total New Steam Spending for Subsequent Approval	**$13,163,219**	**$16,208,182**
	Total New Generation Spending for Subsequent Approval	**$31,240,272**	**$50,471,336**

CI#	Project Title	2012 Budget	Project Total
Transmission			
41519	Harbour East 138 kV Transmission Line	$ 211,410	$7,859,669
40317	Additional Water Street Transformer & Low Side 25 kV Breakers	2,367,466	3,947,034
41520	Harbour East Substation - Eastern Passage	394,305	3,490,007
40322	New Prospect Road Substation	3,153,291	3,184,409
41537	Amherst 138kV Substation	1,808,362	2,781,762
41555	Spare Wind Farm Generator Transformer	2,535,465	2,535,465
41553	Dartmouth East Transformer Addition	2,307,615	2,307,615
40321	Install Canaan Road to Prospect Road Transmission Line	2,104,620	2,182,578
40323	Canaan Road Line Terminal	967,187	1,004,202
41552	131H Lucasville Transformer Addition	1,893,150	1,893,150
41536	2012 Reliability Technologies Transmission	877,747	958,276
41550	Spare 30MVA 69KV 25/12KV Transformer	728,999	859,852
41522	138kV Line Terminal at Dartmouth East Substation	40,743	788,149
40310	Circuit Switcher Additions	680,990	680,990
	Total New Transmission Spending for Subsequent Approval	**$20,071,349**	**$34,473,158**
Distribution			
40320	LED Street Light Conversion	$5,739,651	$100,000,000
41534	2012 Reliability Technologies Distribution	2,423,179	2,496,069
41540	99V Highbury Rd New Feeders	1,093,229	1,093,229
41797	Brier Island Crossing	1,006,642	1,006,642
40224	78W-301 Second Peninsula	406,598	406,598
	Total New Distribution Spending for Subsequent Approval	**$10,669,298**	**$105,002,537**
General Plant			
40314	Capital Improvements Data Centre	$7,176,866	$8,128,617
41845	Residential AMI Pilot	2,959,853	3,493,557
41766	Commercial AMI Pilot	2,528,394	3,109,132
40278	OMS Upgrade 2011	1,870,590	2,602,516
40648	Field Mobility System	1,704,810	1,704,810
40365	MS Sharepoint Platform Upgrade	359,501	886,957
40299	Field Office Phone System Replacement	833,051	833,051
41557	Street Light & Area Management & Sustainability	809,104	809,104
40743	NSPI Intranet	70,151	649,205
41403	GIS Enterprise License Agreement	90,643	418,128
	Total New General Plant Spending for Subsequent Approval	**$18,402,964**	**$22,635,077**
	Total Capital Items for Subsequent Approval	**$80,383,884**	**$212,582,109**

1.5 2012 ACE Plan Capital Items with Estimated Total Project Cost of Less Than $250,000

This table includes capital items with a total project cost of less than $250,000. In accordance with Section 35 of the Public Utilities Act, these projects do not require UARB approval.

CI#	Project Title	2012 Budget	Project Total
Hydro			
41141	HYD - Sissiboo Grand Lake Spillway Refurbishment	$181,972	$181,972
41133	HYD - Standby Generator Replacement	153,699	153,699
17653	HYD Uniacke Lake Dam Decomissioning	119,266	119,266
41137	HYD - Gulch Powerhouse Window Replacement	102,978	102,978
41131	HYD - Relay Testing Equipment	67,727	67,727
41136	HYD - Gisborne Roof Hatch Replacement	38,552	38,552
	Total Hydro Items Less Than $250,000	**$664,194**	**$664,194**
Steam			
41226	LIN Boiler Feed Pump Recirculation Piping and Valve Replacement	$233,206	$233,206
41238	TUC - Asbestos Abatement Program	227,423	227,423
41122	LIN 4 Battery & Charger Replacement	210,704	210,704
41514	TRE6 - Condenser Actuator Replacements	208,589	208,589
41125	LIN - Common Water (CW) Piping Replacement	198,076	198,076
41236	TUC - Cooling Water (CW) Piping Refurbishment	197,626	197,626
41523	TRE6 - 6F and 6G Conveyor Belt Replacement	193,117	193,117
41524	TRE6 - Motor control Centre (MCC) Room Fire Protection	173,605	173,605
41157	LIN4 Air Heater Baskets Replacement	173,236	173,236
41525	TRE5 - 5-1 Pulverizer Refurbishment	170,873	170,873
41446	POT- Emergency response team (ERT) room upgrade	165,646	165,646
41531	TRE - Asbestos Abatement	160,565	160,565
31262	LIN - Unit 1-2 Stack Insulation Replacement	158,427	158,427
28697	TRE6 - Stack Lighting System Upgrade	155,535	155,535
39950	TRE5 - 5-2 Cooling Water (CW) Screen Refurbishment	154,308	154,308
41250	TUC2- South Boiler Feed Pump (BFP) Refurbishment	153,940	153,940
41527	TRE6 - 4kV Switchgear Room Fire Protection	151,152	151,152
38643	TRE6 - 6B Fly Ash Compressor Replacement	150,984	150,984
41150	LIN 4160V and 600V Motor Refurbishment	150,049	150,049
41528	TRE6 - Bottom Ash Chain Replacement	148,251	148,251
41526	TRE - Ash Site Management	147,833	147,833
41484	POT - Ash Cell Capping Cell D	143,979	143,979
41245	TUC2 - Cooling Water (CW) Pump Refurbishment	140,001	140,001
39953	TRE6 - Coal Feeder Valve Replacement	136,516	136,516
41239	TUC6- West Gas Compressor Refurbishment	136,399	136,399
39951	TRE5 - Coal Bunkerette Replacement	135,329	135,329
41560	POT E-belt Fire Protection System Refurbishment	132,088	132,088
41266	TUC2 - CEM Upgrade	131,642	131,642
41260	TUC2- H2 Dryer Replacement	127,932	127,932
41448	POT - Screen Wash System Refurbishment	121,385	121,385
41444	POT - Asbestos Abatement	120,755	120,755
41645	TRE6 - Bottom Ash Seal Replacement	120,240	120,240
41149	LIN - 4kV and 600V Breaker Refurbishment	116,470	116,470
41275	TUC2- ACW Strainer Replacement	114,909	114,909

CI#	Project Title	2012 Budget	Project Total
37402	POT - Coal Crusher Vibratory Feeder Refurbishment	$114,191	$114,191
41669	POT - HVAC Equipment Replacement	106,848	106,848
40060	TRE5 - 4kV Motor Refurbishment	103,806	103,806
14521	POT - Biofoulant Control System Upgrade	98,986	98,986
41594	POT - Lab Upgrades Phase 2	97,943	97,943
41267	TUC - Fire Protection System Foam Tank Replacement	94,872	94,872
41568	POT - Electrostatic Precipitator Supervisory System Upgrade	94,848	94,848
41278	TUC2- Condensate Extraction Pump Refurbishment	93,871	93,871
41261	TUC1- Direct Current (DC) Exciter Refurbishment	91,617	91,617
41532	TRE6 - 4kV Motor Refurbishment	85,048	85,048
41151	LIN3 - Polisher Resin Replacement	82,777	82,777
28152	TRE6 - Bottom Ash Overhead Door Replacement	81,004	81,004
41543	TRE6 - Motor Control Centre (MCC) Starter Replacements	80,558	80,558
41274	TUC3 - Water Treatment Plant Anion & Cation Tank Refurbishment	76,878	76,878
41268	TUC - 4kV and 600V Breaker Refurbishment	75,267	75,267
41279	TUC - 4KV Motor Refurbishment	74,826	74,826
37022	POT - 129V Battery Charger Replacement	74,578	74,578
30862	TRE5 - Boiler Thermoprobe Upgrade	74,366	74,366
41533	TRE6 - Boiler Thermoprobe Upgrade	74,126	74,126
41544	TRE6 - O2 Sensor Replacement	72,171	72,171
41277	TUC2 - Stack Breeching Seal Replacement	61,402	61,402
41545	TRE5 - O2 Sensor Replacement	56,924	56,924
41271	TUC2 - Instrument Air Receiver Replacement	55,180	55,180
41272	TUC2 - Turning Gear Worm Shaft Replacement	54,508	54,508
41591	POT - Induced Draft (ID) Fan Bearings Cooling System Upgrade	53,805	53,805
41585	POT - Pulverizer Exhauster Lubrication Cooling System Upgrade	51,072	51,072
41546	TRE5 - 4kV Breaker Refurbishment	40,854	40,854
41547	TRE6 - 4kV Breaker Refurbishment	40,854	40,854
	Total Steam Items Less Than $250,000	**$7,523,966**	**$7,523,966**
	Total Generation Items Less Than $250,000	**$8,188,160**	**$8,188,160**
Transmission			
41395	8H Fairview Switchgear Retirement	$213,288	$213,288
41592	88W New Recloser and Relocate 88W-322	111,171	111,171
	Total Transmission Items Less Than $250,000	**$324,459**	**$324,459**
Distribution			
40219	2011 Recloser Control Replacements	$216,786	$216,786
41334	16N-301 Targeted Feeder Replacement	214,378	214,378
41388	7H Beaufort Conversion	174,253	174,253
41340	5N-301 Targeted Feeder Replacement	172,695	172,695
41354	519N-201 Partial Feeder Voltage Conversion to 25KV	164,814	164,814
41431	1C-411/22C-404 Transfer Scheme	149,850	149,850
41329	11W-202 Voltage Conversion to 12 kV	98,382	98,382
41343	81S-302 Targeted Feeder Replacements	96,642	96,642
41344	81S-305 Targeted Feeder Replacements	80,992	80,992
41326	103C-311 Targeted Feeder Replacements	74,612	74,612
41332	15S-302 Targeted Feeder Replacements	73,023	73,023
41397	2012 Padmount Switchgear Replacement	67,738	67,738

CI#	Project Title	2012 Budget	Project Total
41345	82S-303 Targeted Feeder Replacements	61,625	61,625
41342	81S-301 Targeted Feeder Replacements	50,632	50,632
41328	103W-312 Targeted Feeder Replacements	47,851	47,851
	Total Distribution Items Less Than $250,000	**$1,744,274**	**$1,744,274**
General Plant			
40651	Fuelworx (Fuel Management)	$219,874	$219,874
41404	Multiplexer Group Replacement	146,131	146,131
41421	Telecommunication 48VDC Battery & Charger Replacements	114,694	114,694
41443	Web Filtering Security	99,161	99,161
41442	Advanced Laptop Security Encryption and Firewalls	98,380	98,380
	Total General Plant Items Less Than $250,000	**$678,240**	**$678,240**
	Total Capital Items Less Than $250,000	**$10,935,132**	**$10,935,132**

1.6 2012 ACE Plan Capital Items – Point Aconi Generating Station

This table provides the Pt. Aconi capital projects for 2012. These projects do not require UARB Approval.

CI#	Project Title	2012 Budget	Project Total
41074	POA - Ash Cell Site Capping	$4,652,680	$4,652,680
41045	POA - Boiler Refractory Replacement	710,539	710,539
41563	POA-Combustor Watwall Panel Replacement	505,357	505,357
41079	POA - Structural Steel Refurbishment	405,364	405,364
41054	POA - Turbine Vibration Monitoring Replacement	308,939	308,939
41566	POA - Center Drain Replacement	302,188	302,188
41078	POA-Sidewall Feeder Replacement	297,394	297,394
41588	POA - Cooling Water (CW) Pump Refurbishment	278,820	278,820
41567	POA - Loop Seal Fluidizing Nozzle Replacement	246,949	246,949
41051	POA - HV Bushing Capital Spare	235,399	235,399
40032	POA - Boiler Feed Pump Refurbishment	220,641	220,641
41569	POA - DCMS Upgrades	194,780	194,780
41055	POA - UPS Inverter Chargers Replacement	162,865	162,865
41621	POA-Turbine Thrust Bearing Replacement	136,159	136,159
41084	POA - Boiler Arrowhead Replacement	124,728	124,728
41570	POA- Reverse Air Fan Replacement	107,983	107,983
41080	POA - Coal Gate Upgrade	102,912	102,912
41081	POA - Coal Road Paving Replacement	101,050	101,050
41587	POA - HVAC Equipment Replacement	100,661	100,661
41077	POA- Auxiliary Boiler Mud Drum Steam Coil Upgrade	100,254	100,254
41053	POA - Carbon Sulphur Analyzer Replacement	91,100	91,100
41073	POA - Plant Industrial Vaccum System	90,064	90,064
41056	POA - Plant Access Upgrade	88,031	88,031
41050	POA - Screw Cooler Cover and Trough Replacement	80,103	80,103
41048	POA - Cooling Water (CW) Screen Refurbishment	80,061	80,061
41571	POA-High Pressure Piping and Valve Insulation Upgrade	79,123	79,123
41082	POA-2012 Valve Refubishment Program	76,443	76,443
41066	POA - Heated Storage Upgrade	71,275	71,275
41047	POA - 4KV & 600V Breaker Refurbishment	64,756	64,756
41071	POA - Bottom Ash Drag Chain Replacement	62,741	62,741
41083	POA - Boiler Expansion Joint Replacement	61,821	61,821
41076	POA - B Train Cation and Anion Resin Replacement	60,501	60,501
41046	POA - 4KV Motor Refurbishment	53,816	53,816
41059	POA - Coal Chute and Reclaim Refurbishment	50,040	50,040
41052	POA - Cracker Soft Start Installation	42,434	42,434
41057	POA - Sootblower Refurbishment	40,143	40,143
41597	POA - Inline Sodium Analyzer Replacement	40,131	40,131
	Total Point Aconi New Spending	**$10,428,244**	**$10,428,244**
	Point Aconi Carryover Spending	-	-
	Point Aconi Routine Spending (Included in overall Routine Program)	$458,588	$458,588
	Total Point Aconi Capital Spending	**$10,886,832**	**$10,886,832**

1.7 2012 Capital Spending by Justification Criteria

(Millions of Dollars)

Items in the 2012 ACE Plan have been developed using the Capital Expenditure Justification Criteria documents of 1995 and 1997. Definitions of the various criteria referenced in the following table are included in these documents.

Justification Criteria	2012 Budget	Individual Project Approval	Routine Spend	Less than $250K	Items for Later Filing	Carryover	Pt. Aconi
Distribution System**	$72.5	$ 11.9	$ 48.0	$ 1.7	$ 10.7	$ 0.1	$ -
Thermal	41.3	8.2	4.7	5.2	7.8	5.1	10.3
Work Support**	34.7	3.5	14.6	0.7	12.9	3.0	-
Hydro	29.8	6.7	2.4	0.5	17.7	2.5	-
Health and Safety	7.8	4.7	-	1.6	0.9	0.6	-
Transmission Plant	68.1	26.2	11.1	0.3	20.1	10.4	-
Environmental	64.0	-	0.7	0.9	4.9	57.5	-
Metering Equipment	6.9	-	-	-	5.5	1.3	0.1
System Design	3.4	-	-	-	-	3.4	-
Facilities/Land & Right-of-Way	2.0	-	0.2	-	-	1.8	-
Total	**$ 330.3**	**$ 61.2**	**$ 81.6**	**$ 10.9**	**$ 80.4**	**$ 85.8**	**$ 10.4**

** Details of justification sub-criteria are provided on the following page.

1.7.1 2012 Capital Spending by Justification Sub-Criteria
(Millions of Dollars)

Justification Sub-Criteria	2012 Budget	Individual Project Approval	Routine Spend	Less than $250K	Items for Later Filing	Carryover
Distribution System						
Requirement to Serve	$ 29.7	$ 0.3	$ 28.1	$ 0.2	$ 1.1	$ -
Pole Strength	8.6	-	8.6	-	-	-
Joint Use	0.9	-	0.9	-	-	-
Deteriorated Conductor	2.3	1.3	-	-	1.0	-
Equipment Replacement	11.1	4.6	-	0.3	6.1	-
Outage Performance	7.5	4.1	-	1.0	2.4	-
Overloaded Equipment	1.8	1.6	-	0.2	-	-
System Protection	0.1	-	-	-	-	0.1
Other Distribution System	10.4	-	10.4	-	-	-
Total	**$ 72.5**	**$ 11.9**	**$ 48.0**	**$ 1.7**	**$ 10.7**	**$ 0.1**
Work Support						
Buildings	$ 4.3	$ -	$ 3.0	$ -	$ -	$ 1.4
Furniture & Fixtures	0.3	0.3	-	-	-	-
Telecommunications	6.4	0.9	0.9	0.3	4.4	-
Computers / IT	13.5	1.0	2.6	0.4	8.5	1.0
Tools & Equipment	1.3	-	1.3	-	-	-
Vehicles	6.8	-	6.8	-	-	-
Equipment Replacement	2.0	1.4	-	-	-	0.6
Other	0.1	-	0.1	-	-	-
Total	**$ 34.7**	**$ 3.5**	**$ 14.6**	**$ 0.7**	**$ 12.9**	**$ 3.0**

1.8 Capital Categories

NSPI classifies capital expenditures by Function and/or Justification Criteria. NSPI also classifies capital expenditures by Category: New Items, Carryover Items, and Routine Capital Items. For further clarification, each of these latter categories is divided into sub-categories.

1. New Items

   This category includes new, non-routine capital items.

   (a) New Items with 2012 Completion - This category includes all new, non-routine capital items scheduled to start in 2012 and finish in 2012.

   (b) New Items with Subsequent Completion - This category includes all new, non-routine capital items scheduled to start in 2012, but which will be completed beyond 2012.

2. Carryover Items

   This category includes items that have been previously approved by the UARB.

   (a) Carryover Items with 2012 Completion - Includes items that will be completed during 2012.

   (b) Carryover Items with Subsequent Completion - Includes items that will be completed beyond 2012.

3. Routine Capital Items

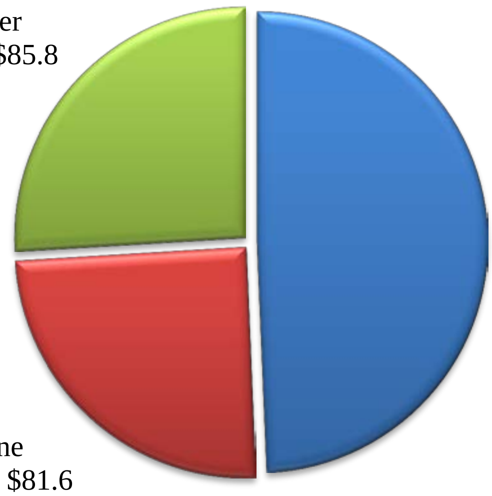
   This category is for recurring annual capital expenditures.

   (a) Replacement equipment (like-for-like replacement).

   (b) Additions to existing equipment base resulting from power system growth.

   (c) The addition of customers to the power system.

1.8.1 2012 Capital Spending by Category
(Millions of Dollars)



2012 ACE Budget Estimated Commitment

	Previous Spending	2012 ACE Budget	Subsequent Spending	Total Estimated Commitment
New Items				
With 2012 Completion	-	$137.7	-	$137.7
With Subsequent Completion	-	25.3	$34.9	60.2
	0.0	162.9	34.9	197.8
Carryover Items				
With 2012 Completion	308.4	20.9	-	329.3
With Subsequent Completion	147.9	64.9	12.5	225.4
	458.9	85.8	12.5	557.2
Routine Items	-	81.6	-	81.6
Total	**$456.3**	**$330.3**	**$47.5**	**$834.0**

Please refer to category definitions on the previous page.

1.9 Capital Functions

Capital expenditures are categorized into functions for accounting and depreciation purposes. Each category has a different service life.

Generation Generation includes all items for NSPI's generation facilities. This includes replacements and additions to Thermal, Hydro, Wind, Tidal and Gas Turbine plants.

Transmission Transmission includes items for replacement, reinforcement or expansion of the transmission system, which transmits electrical energy from the generation plants, the NB/NSPI interconnection and throughout the province. Transmission includes energy transmitted at 69 kV level or higher.

Distribution Distribution includes replacement of and additions to equipment for delivering electric energy from points on the transmission system to customers served at voltages below 69 kV.

General Plant General Plant includes computer infrastructure and communication equipment, which comprise the majority of capital expenditures incurred under this function. Other items such as furniture, office equipment and capital tools are also included under this function.

The General Plant function also includes vehicles, that is, replacement and additions to transportation and work vehicles, and construction equipment.

The General Plant function also includes all buildings except generating and substation facilities. It primarily pertains to customer service, work depot and head office facilities.

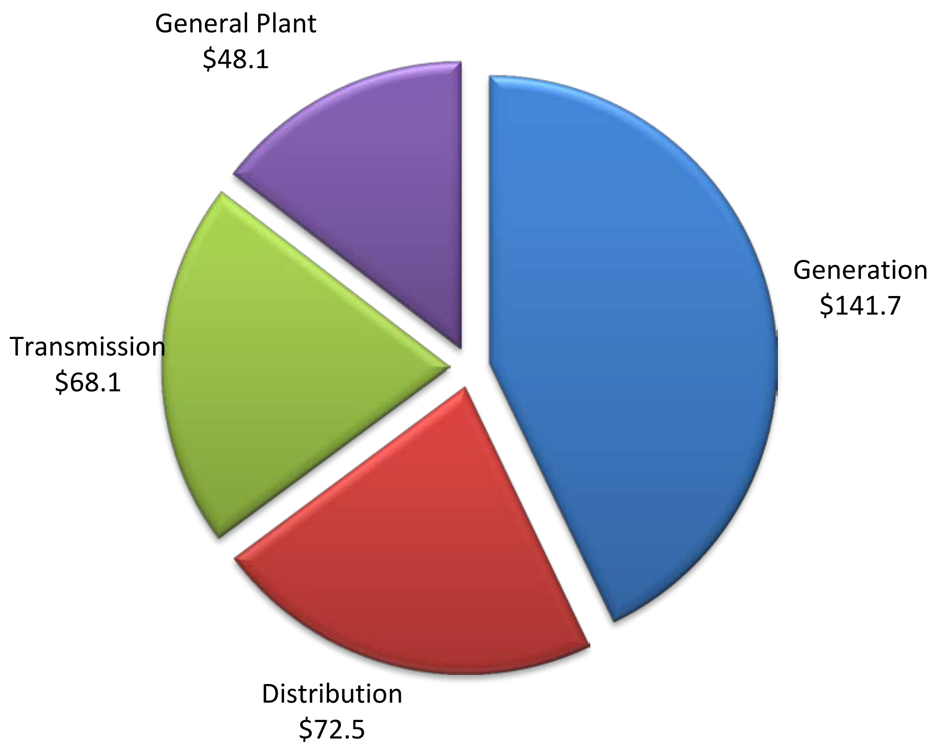
1.9.1 Total Annual Capital Expenditures by Function

(Millions of Dollars)

Year	Actuals 2007	2008	2009	2010	Forecast 2011 (as of Q3)	ACE Plan 2012	Forecast 2013	2014	2015	2016
Generation	$47.2	$78.5	$165.0	$385.0	$157.7	$141.7	$97.3	$132.1	$300.3	$132.6
Transmission	19.4	18.0	22.7	45.1	62.0	68.1	69.4	79.4	90.8	121.2
Distribution	44.5	47.6	52.3	59.6	61.0	72.5	80.0	81.0	73.9	76.9
General Plant	14.5	23.2	39.6	58.1	56.5	48.1	22.2	20.5	20.6	20.9
Total	**$125.6**	**$167.3**	**$279.7**	**$547.8**	**$337.2**	**$330.3**	**$268.9**	**$313.0**	**$485.7**	**$351.7**

1.9.2 2011 Capital Spending by Function

(Millions of Dollars)



1.10 2011 ACE Capital Items Deferred / Cancelled

CI Number	Project Title	2011 ACE Project Total	Cancelled / Deferred
Generation			
38947	**Co-Firing Biomass** NS government policy change on biomass co-firing eliminated the opportunity to advance this project as previously contemplated.	$11,998,380	Cancelled
40555	**Baghouse #1** The completion of the mercury emission compliance plan in the first half of 2011 indicated the addition of baghouses was not the least cost alternative based on current air pollutant regulations.	6,944,483	Cancelled
40557	**Baghouse #2** The completion of the mercury emission compliance plan in the first half of 2011 indicated the addition of baghouses was not the least cost alternative based on current air pollutant regulations.	6,521,853	Cancelled
37611	**LIN3 - Generator Excitation & AVR System Replacement** The original execution plan for this project included equipment supply and installation by the Original Equipment Manufacturer (OEM). The project was deferred to investigate options for non-OEM solutions that provided the same or better performance in a cost-effective manner. NSPI is planning to proceed with a non-OEM solution in 2012.	1,254,995	Deferred
31583	**LIN2 L-1 Steam Turbine Blading Replacement** The proposed Reduction of Carbon Dioxide Emissions from Coal-Fired Generation of Electricity Regulations are Federal Government Regulations that are anticipated to come into effect on July 1, 2015. The proposed Regulations, made under the Canadian Environmental Protection Act,1999 (CEPA 1999), would apply a performance standard to new coal-fired electricity generation units and to old units that have reached the end of their useful life. New units are units that start producing electricity commercially on or after July 1, 2015. Old units are, in general, defined as units that have reached their end of useful life date, which is the later of 45 years from the units' commissioning dates or the end of their power purchase agreement (PPA). As a result of these proposed Regulations and their potential impact to Lingan Unit #2, this project has been cancelled.	1,028,340	Cancelled
39566	**LIN2 Steam Turbine Last Stage Blades Replacement** The proposed Reduction of Carbon Dioxide Emissions from Coal-Fired Generation of Electricity Regulations are Federal Government Regulations that are anticipated to come into effect on July 1, 2015. The proposed Regulations, made under the Canadian Environmental Protection Act,1999 (CEPA 1999), would apply a performance standard to new coal-fired electricity generation units and to old units that have reached the end of their useful life. New units are units that start producing electricity commercially on or after July 1, 2015. Old units are, in general, defined as units that have reached their end of useful life date, which is the latter of 45 years from the units' commissioning dates or the end of their power purchase agreement (PPA). As a result of these proposed Regulations and their potential impact on Lingan Unit #2, this project has been deferred until an inspection is performed in late 2011.	1,025,771	Deferred

38944	**LIN - Unit 2 Rotor Rewind** The proposed Reduction of Carbon Dioxide Emissions from Coal-Fired Generation of Electricity Regulations are Federal Government Regulations that are anticipated to come into effect on July 1, 2015. The proposed Regulations, made under the Canadian Environmental Protection Act,1999 (CEPA 1999), would apply a performance standard to new coal-fired electricity generation units and to old units that have reached the end of their useful life. New units are units that start producing electricity commercially on or after July 1, 2015. Old units are, in general, defined as units that have reached their end of useful life date, which is the latter of 45 years from the units' commissioning dates or the end of their power purchase agreement (PPA). As a result of these proposed Regulations and potential impact to Lingan Unit #2, this project has been deferred and may be cancelled pending an upcoming inspection.	675,528	Deferred
40032	**POA - Boiler Feed Pump Refurbishment** A pump performance test completed in 2011 determined that refurbishment of this pump could be deferred until 2012.	216,815	Deferred
37885	**POT - Lubrication and Chemical Storage** Bids received were higher than budgeted and resulted in re-evaluation of the project scope. Re-evaluation of the project scope and detailed project estimate is ongoing and the project will be brought forward for approval once this re-evaluation is complete.	191,666	Deferred
40297	**TRE5 - Boiler House Tundish Drains** Upon further investigation, it was determined that replacement of the drains is not required at this time.	133,979	Cancelled
38108	**POT - AVR Refurbishment** The original execution plan for this project included equipment supply and installation by the Original Equipment Manufacturer (OEM). The project was deferred due to investigating options for non-OEM solutions that provided the same or better performance in a cost-effective manner. Investigation of non-OEM options and completion of preliminary engineering will be completed in 2012 and NSPI is planning to bring this capital item forward for approval in 2013.	128,270	Deferred
30044	**POT - Ash cell capping Cell C** Cell C is currently being used for coal storage, which prohibits the capping process. The project has been deferred until such time that Cell C is no longer used for coal storage.	117,423	Deferred
37544	**TRE5 - Coal MCC Transformer Replacement** Further evaluation of this project determined that the level of PCBs in the transformers does not support replacement of the transformers at this time.	85,361	Deferred
28152	**TRE6 - Bottom Ash Overhead Door Replacement** The scope of this project was finalized in 2011 and the project will be completed in 2012.	61,066	Deferred
38542	**TRE - Service Air Compressor** Other sources of service air were evaluated and eliminated the need for an additional service air compressor.	40,333	Cancelled

Transmission

40322	**New Prospect Road Substation** NSPI Expects to file the Application for this Project in November, 2011.	3,068,581	Deferred
40311	**50MVA Mobile Substation Transformer** This project is being re-evaluated to determine the type and size of the mobile.	1,598,007	Deferred
40321	**Install Canaan Road to Prospect Road Transmission Line** NSPI Expects to file the Application for this Project in November, 2011.	2,024,763	Deferred
40285	**2011 Transmission Substation Insulator & Cutout** NSPI Expects to file the Application for this Project in November, 2011.	1,500,000	Deferred
40296	**2011 Transmission Steel Tower Painting** This work was cancelled due to dissatisfaction with the market response. In 2012 NSPI plans to expand market solicitation.	587,142	Cancelled
40323	**Canaan Road Line Terminal** NSPI Expects to file the Application for this Project in November, 2011.	738,632	Deferred
25575	**Reliability Keltic Drive New Feeder** NSPI Expects to file the Application for this Project in November, 2011.	1,205,023	Deferred
40203	**103W-311 Gold River Phase 1** NSPI Expects to file the Application for this Project in November, 2011.	434,415	Deferred

Distribution

40224	**78W-301 Second Peninsula** This project was deferred pending a decision by a new customer as to whether 3 phase service is required.	1,010,713	Deferred
40219	**2011 Recloser Control Replacements** This project was deferred as work focused on addressing failures realized at substations.	216,786	Deferred
40227	**2011 Off Road to Roadside** NSPI Expects to file the Application for this Project in November, 2011.	2,500,000	Deferred
40320	**LED Street Light Conversion** This project was deferred pending issuance of NS Government Regulations.	100,000,000	Deferred

General Plant

40314	**Data Centre** Further evaluation of this project determined that the scope requires review. NSPI expects to bring this project forward for approval in 2012.	4,800,000	Deferred
32304	**AMI Hardware and Software Installation** Further evaluation of this project determined that the scope requires refinement. In 2012, NSPI expects to bring 2 separate AMI projects forward for Board approval.	30,694,639	Cancelled

40278	**OMS Upgrade 2011** The project scope is being currently being reviewed and NSPI expects to file the appliction for this project by year end, 2011.	2,050,951	Deferred
40299	**Field Office Phone System Replacement** This projevct has been deferred until a wireless strategy for field workers is completed. An interim solution will be implemented for more rural locations that have reached end of life.	833,557	Deferred
40373	**CIS Replacement** A review of the system performance and business requirements for the Customer Information System has determined that the current system did not require the original investment proposed in 2011.	204,100	Cancelled
40302	**Extended Video Conference Systems** This project was cancelled as new internet based applications are currently being trialed.	190,467	Cancelled
40365	**MS Sharepoint Platform Upgrade** NSPI Expects to file the Application for this Project in November, 2011.	908,174	Deferred

1.11 2011 ACE Plan UARB Directives

1.11.1 Directive 7 - Approximate Impact of 2012 ACE Plan on Revenue Requirement

In accordance with the 2011 ACE Plan UARB Directive, NSPI has developed an estimate of the impact that the 2012 ACE Plan would have on Revenue Requirement over the time frame 2013 - 2016.

In order to prepare this, NSPI used the General Rate Application 2012 Test Year filed with the Board in the spring of 2011 and adjusted only the numbers affected by the capital program: Capital costs, Depreciation, Capital Cost Allowance, Applied Overhead (AO) and AFUDC. While this does provide an approximate Revenue Requirement, it is important to note the limitations of this methodology. This narrow revenue calculation does not show other things occuring in the business that could have a significant impact on the Revenue Requirement.

One important consideration that is not addressed in the Revenue Requirement below is the impact on Revenue Requirement should capital projects not be completed (e.g. increased fuel costs may result if a particular item were not completed). The Economic Analysis Models (EAM) used to decide whether a capital project is the best option for customers includes this type of analysis; this is not included in the calculations provided below.

In calculating the Revenue Requirement, no changes were made to any other assumptions from the 2012 GRA filing including the following: load, fuel, OMG except capital related, regulatory amortizations, tax rates and depreciation rates. The only changes related to the capital program are involving Depreciation, AFUDC, Capital Cost and Capital Cost Allowance.

Year	Estimated revenue requirement increase based on full capital program including capital already approved	Estimated revenue requirement increase based on 2012 ACE Plan capital items not approved
2013	$58M	$11M
2014	$30M	$16M
2015	$9M	$13M
2016	$23M	($6M)

A large part of the Revenue Requirement associated with 2013 is related to projects that have already been approved by the Board in past ACE Plan applications, the largest being the Port Hawkesbury Biomass Project. It is anticipated that in 2013 this project will be in service, increasing depreciation, reducing AFUDC significantly and lowering Capital Cost Allowance.

Caution should be exercised as changes in assumptions or actual experience can have a material effect on the revenue requirements provided in this forecast.

1.11.2 Directive 9- Summary of 2012 ACE Plan Capital Items Related to NERC and/or NPCC Standards

CI#	Project Title	2012 ACE Plan	Total Estimate	Related Capital items2012 & +/- 2 Years
40233	2011 Protection Upgrades TUC	$2,513,370	$3,998,885	2010 - 38266 2010 Protection Upgrades $313,331 2011 - 40231 Protection Upgrades Lakeside $1,609,905 2012 41348 Protection Upgrades Onslow $2,274,015 2013 - 41347 Protection Upgrades Brushy Hill $1,873,614
41348	2012 Protection Upgrades Onslow	2,274,015	2,274,015	2010 - 38266 2010 Protection Upgrades $313,331 2011 - 40231 Protection Upgrades Lakeside $1,609,905 2011 - 40233 2011 Protection Upgrades TUC $3,928,932 2013 - 41347 Protection Upgrades Brushy Hill $1,873,614
40231	2011 Protection Upgrades LAK	1,536,649	1,579,848	2010 - 38266 2010 Protection Upgrades $313,331 2011 - 40231 Protection Upgrades Lakeside $1,609,905 2011 - 40233 2011 Protection Upgrades TUC $3,928,932 2013 - 41347 Protection Upgrades Brushy Hill $1,873,614
Regulatory Compliance Total		**$6,324,034**	**$7,852,748**	

1.11.3 Directive 11 – Project Rankings

NSPI Capital Projects are ranked according to the following criteria:

- Health and Safety: Operating Permits, Personnel Safety
- Regulatory Compliance: Renewable Energy Standards, GHG Regulations, Air
- Emission Regulations, NERC/ NPCC Requirements
- Customer Reliability: SAIDI, SAIFI, CAIDI
- Requirement to Serve
- Business Sustainability (Economics): Based on Net Present Value of the Project, Levelized Cost Analysis, $/ Avoided Customer Hours of Interruption (ACHI)

Each year, the capital program includes those projects which are essential for health and safety objectives, regulatory compliance, and those which are required to provide service to an area. Projects which serve to improve customer reliability are evaluated based on factors related to performance targets (SAIDI, SAIFI, CAIDI, etc.). Business sustainability initiatives are evaluated based on their economic ranking.

The capital program can be constrained by a number of factors including the ability to effectively execute the annual program with the available time and resources, the maintenance cycle of the generating facilities and Company cash flow.

The following tables identify the projects included in the 2012 ACE Plan, their Ranking Category and ranking value where applicable.

1.11.3.1 Hydro – 2012 ACE Plan Capital Item Rankings

		Project Estimate	Project Type, Category & Ranking		
CI	Project Title	2012 ACE Budget	Project Type	Ranking Category	Project Ranking
Hydro Capital Items Included in 2012 ACE Plan					
17583	HYD - BER-GUL - Electrical Refurbishment	$805,646	CO	Safety	NA
12079	HYD - SHH - RUF 1&2 Runner Replacement	744,394	CO	Business Sustainability	NA
28678	HYD Renewable In-Stream Tidal Generation Project	400,000	CO	Business Sustainability	NA
40316	HYD - Barteaux Culvert Refurbishment	376,162	CO	Safety	NA
16387	HYD- Ruth Falls #3 Runner Replacement	373,086	CO	Business Sustainability	NA
17853	HYD - STM-Sandy Lake #4 Runner Replacement	248,157	CO	Business Sustainability	NA
40309	HYD - St. Margaret's Bay - Tidewater Pipeline Replacement	7,704,424	New	Business Sustainability	9.00
31245	HYD - St. Margaret's Bay - Sandy Lake Dam Refurbishment	5,579,410	New	Safety	9.00
40282	HYD- St Margaret's Bay - Coon Pond Dam Refurbishment	2,595,361	New	Safety	9.00
31204	HYD - Dickie Brook - Donahoe Lake Dam Refurbishment	1,597,494	New	Safety	9.00
41143	HYD - St Margarets Bay - Tidewater Surge Tank Refurbishment	1,211,641	New	Business Sustainability	9.00
41126	HYD Annapolis - Sluiceway and Powerhouse Stop Log Refurbishment	1,115,739	New	Business Sustainability	9.00
39042	HYD - Sheet harbour - Ten Mile Lake Dam Decommissioning	1,018,923	New	Safety	9.00
41138	HYD - Black River - Hollow Bridge Surge Tank Refurbishment	930,048	New	Business Sustainability	9.00
23125	HYD - Sissiboo Falls - Electrical Equipment Replacement	845,755	New	Safety	9.00
41145	HYD - Mersey - Upper Lake Falls Rip Rap Replacement	516,420	New	Safety	9.00
41806	HYD - Big Falls - #6 Refurbishment	497,566	New	Business Sustainability	8.00
39543	HYD - U&U Ladder Upgrades	364,417	New	Safety	9.00
41140	HYD Sissiboo Falls - Tailrace Concrete Refurbishment	314,412	New	Safety	9.00
41127	HYD - Nictaux - Headcover Replacement	219,362	New	Safety	9.00
41141	HYD - Sissiboo Grand Lake Spillway Refurbishment	181,972	New	Safety	9.00
41133	HYD - Standby Generator Replacement	153,699	New	Safety	9.00
17653	HYD Uniacke Lake Dam Decomissioning	119,266	New	Safety	9.00
41137	HYD - Gulch Powerhouse Window Replacement	102,978	New	Safety	6.00
41131	HYD - Relay Testing Equipment	67,727	New	Business Sustainability	6.00
41136	HYD - Gisborne Roof Hatch Replacement	38,552	New	Safety	6.00
20706	HYD - Security Improvements	750,000	Routine	Routine	NA
11622	HYD - Equipment Replacment	750,000	Routine	Routine	NA
35584	HYD - Gate Refurbishment Routine	400,000	Routine	Routine	NA
35583	HYD Oil Release Risk Assessment Remediation	270,000	Routine	Routine	NA
27867	HYD-Roofing Routine	200,000	Routine	Routine	NA
11611	Hydro Production Tools, Test Equipment	75,000	Routine	Routine	NA

1.11.3.2 Steam – 2012 ACE Plan Capital Item Rankings

		Project Estimate	Project Type, Category & Ranking		
CI	Project Title	2012 ACE Budget	Project Type	Ranking Category	Project Ranking
Steam Capital Items Included in 2012 ACE Plan					
30954	LIN3-ESP Gas Flow Modification	$1,608,606	CO	Business Sustainability	NA
35083	LIN 2011 Ash Site Sealing and Capping	973,936	CO	Environment	NA
40363	LIN3 High Voltage Bushing Refurbishment	433,360	CO	Business Sustainability	NA
39542	U&U Generator Protection Improvements	338,518	CO	safety	NA
28393	POT 2A Mill and Feeder Refurbishment	287,344	CO	Business Sustainability	NA
26472	TRE - 6A Cooling Water Pump Refurbishment	218,564	CO	Business Sustainability	NA
39944	TRE6 - Fly Ash Line Replacement	216,127	CO	Business Sustainability	NA
39940	TRE5 - Bottom Ash Refurbishment	205,214	CO	Business Sustainability	NA
38602	TRE - Fire System Upgrades	176,387	CO	Safety	NA
39946	TRE - Wastewater Treatment Plant Upgrades	176,099	CO	Environment	NA
39762	TUC - Unit 3 CW Intake Steel Sheet Piling Refurbish	176,007	CO	Business Sustainability	NA
39939	TRE - Security Improvements (Phase 1)	144,449	CO	Safety	NA
40207	TUC- CO2 Purge System Upgrade	139,842	CO	Business Sustainability	NA
40319	TRE - HVAC Replacements (2011)	131,597	CO	Business Sustainability	NA
40334	POT - Refurbish Underground Valves & Hydrants	131,398	CO	Business Sustainability	NA
30283	POT - Tupper Marine Coal Terminal Vessel Access	129,272	CO	Environment	NA
37824	TRE5 - Common Water Pipe Replacement	128,289	CO	Business Sustainability	NA
40371	LIN Training Facilities Upgrade	117,447	CO	Business Sustainability	NA
40337	POT - Replace WTP and WWTP Valves	102,091	CO	Business Sustainability	NA
28457	TRE Ash Lagoon Closure	93,494	CO	Environment	NA
34203	LIN Unit #3 Mercury Abatement Project	75,883	CO	Environment	NA
34223	POT Mercury Abatement Project	75,528	CO	Environment	NA
34224	TRE Unit#5 Mercury Abatement Program	75,528	CO	Environment	NA
34242	TRE Unit #6 Mercury Abatement	75,528	CO	Environment	NA
34222	LIN Unit #4 Mercury Abatement Project	75,528	CO	Environment	NA
34182	LIN Unit #1 Mercury Abatement Project	75,203	CO	Environment	NA
34202	LIN Unit #2 Mercury Abatement	74,995	CO	Environment	NA
39982	TRE - Gauge Replacements	73,230	CO	Safety	NA
38850	LIN-Flyash System Upgrade Hopper Level Indicator	56,003	CO	Environment	NA

1.11.3.2 Steam – 2012 ACE Plan Capital Item Rankings Cont'd

		Project Estimate	Project Type, Category & Ranking		
CI	Project Title	2012 ACE Budget	Project Type	Ranking Category	Project Ranking
Steam Capital Items Included in 2012 ACE Plan					
28697	TRE6 - Stack Lighting System Upgrade	155,535	New	Safety	9.00
38643	TRE6 - 6B Fly Ash Compressor Replacement	150,984	New	Business Sustainability	7.00
28152	TRE6 - Bottom Ash Overhead Door Replacement	81,004	New	Safety	7.00
30862	TRE5 - Boiler Thermoprobe Upgrade	74,366	New	Business Sustainability	8.00
41074	POA - Ash Cell Site Capping	4,652,680	New	Environment	9.00
39932	TRE - Ash Site Phase 2 Development	4,563,325	New	Environment	7.50
18448	TUC - Cooling Water System Biofouling Control	2,752,157	New	Business Sustainability	7.00
41228	TUC - Unit 3 Turbine HP Impulse Blades Replaceme	882,152	New	Business Sustainability	8.00
28674	TRE6 - Human Machine Interface (HMI) Upgrade	867,805	New	Business Sustainability	7.50
37611	LIN3 - Generator Excitation & AVR Replacement	819,469	New	Business Sustainability	8.25
39926	TUC - Unit 3 Generator Excitation and AVR System I	742,715	New	Business Sustainability	7.50
41045	POA - Boiler Refractory Replacement	710,539	New	Business Sustainability	7.50
41441	TRE - Siding Replacement (Phase 2)	608,916	New	Safety	7.50
39566	LIN2 Steam Turbine Last Stage Blades Replacement	601,589	New	Business Sustainability	7.50
41595	POT - Sternson PLC Replacement	596,976	New	Business Sustainability	7.25
41507	TRE6 - Air Heater Refurbishment	553,438	New	Business Sustainability	7.75
41303	TRE6 - Waterwall Panel Replacements	548,225	New	Business Sustainability	7.25
41549	TRE5- Main Steam Attemperator Replacement	535,227	New	Business Sustainability	7.00
40330	LIN2 HT Fastener Replacement	532,691	New	Business Sustainability	7.50
41563	POA-Combustor Watwall Panel Replacement	505,357	New	Business Sustainability	8.50
40655	LIN - Pulverizer Refurbishment	461,279	New	Business Sustainability	7.75
41121	LIN - Cooling Water (CW) Pump Refurbishment	447,687	New	Business Sustainability	7.50
41079	POA - Structural Steel Refurbishment	405,364	New	Business Sustainability	8.50
40256	POT - Plant Siding Replacement	392,601	New	Business Sustainability	7.50
41511	TRE6 - Condenser Waterbox and Cooling Water (CV	392,172	New	Business Sustainability	7.00
41503	TRE6 - Steam Turbine Control Valve Refurbishment	359,507	New	Business Sustainability	8.00
41508	TRE6 - Turbine/Generator Fire Protection	347,079	New	Safety	9.00
41584	POT Vacuum Pump Replacement	332,994	New	Business Sustainability	6.50
28645	TRE6 - Turbine Controls Power Supplies Replaceme	321,691	New	Business Sustainability	8.25
38163	TRE6 Pulverizer Refurbishments	311,074	New	Business Sustainability	7.00

1.11.3.2 Steam – 2012 ACE Plan Capital Item Rankings Cont'd

		Project Estimate	Project Type, Category & Ranking		
CI	Project Title	2012 ACE Budget	Project Type	Ranking Category	Project Ranking
Steam Capital Items Included in 2012 ACE Plan					
41054	POA - Turbine Vibration Monitoring Replacement	308,939	New	Business Sustainability	8.00
41566	POA - Center Drain Replacement	302,188	New	Business Sustainability	8.50
41078	POA-Sidewall Feeder Replacement	297,394	New	Business Sustainability	7.50
41248	TUC - Lube Oil Storage Building	288,657	New	Environment	9.00
41588	POA - Cooling Water (CW) Pump Refurbishment	278,820	New	Business Sustainability	7.50
41251	TUC3 - Turbine High Pressure (HP) Cylinder Fasten	275,729	New	Safety	8.00
41620	TUC3 Turbine Generator Fire Protection	272,743	New	Safety	7.50
41561	POT - Maintenance facilities Refurbishment	258,558	New	Safety	7.75
41516	TRE6 - Stack Breaching Inlet Ductwork Refurbishme	252,948	New	Business Sustainability	8.25
41124	LIN-Cooling Water (CW) Screen Refurbishment	251,544	New	Business Sustainability	7.50
41567	POA - Loop Seal Fluidizing Nozzle Replacement	246,949	New	Business Sustainability	8.50
41051	POA - HV Bushing Capital Spare	235,399	New	Business Sustainability	8.50
41226	LIN Boiler Feed Pump recirculation Piping and valve	233,206	New	Business Sustainability	7.50
41238	TUC - Asbestos Abatement Program	227,423	New	Safety	9.00
40032	POA - Boiler Feed Pump Refurbishment	220,641	New	Business Sustainability	8.50
41122	LIN 4 Battery & Charger Replacement	210,704	New	Business Sustainability	7.50
41514	TRE6 - Condenser Actuator Replacements	208,589	New	Business Sustainability	7.25
41125	LIN - Common Water (CW) Piping Replacement	198,076	New	Business Sustainability	7.50
41236	TUC - Cooling Water (CW) Piping Refurbishment	197,626	New	Business Sustainability	7.00
41569	POA - DCMS Upgrades	194,780	New	Business Sustainability	8.50
41523	TRE6 - 6F and 6G Conveyor Belt Replacement	193,117	New	Business Sustainability	8.25
41524	TRE6 - Motor control Centre (MCC) Room Fire Prote	173,605	New	Safety	9.00
41525	TRE5 - 5-1 Pulverizer Refurbishment	170,873	New	Business Sustainability	7.00
41446	POT- Emergency response team (ERT) room upgrad	165,646	New	Safety	9.00
41055	POA - UPS Inverter Chargers Replacement	162,865	New	Business Sustainability	8.25
41531	TRE - Asbestos Abatement	160,565	New	Environment	8.00
39950	TRE5 - 5-2 Cooling Water (CW) Screen Refurbishme	154,308	New	Business Sustainability	7.00
41250	TUC2- South Boiler Feed Pump (BFP) Refurbishmen	153,940	New	Business Sustainability	7.00

1.11.3.2 Steam – 2012 ACE Plan Capital Item Rankings Cont'd

		Project Estimate	Project Type, Category & Ranking		
CI	Project Title	2012 ACE Budget	Project Type	Ranking Category	Project Ranking
Steam Capital Items Included in 2012 ACE Plan					
41527	TRE6 - 4kV Switchgear Room Fire Protection	151,152	New	Safety	9.00
41150	LIN 4160V and 600V Motor Refurbishment	150,049	New	Business Sustainability	8.00
41528	TRE6 - Bottom Ash Chain Replacement	148,251	New	Business Sustainability	8.00
41526	TRE - Ash Site Management	147,833	New	Environment	9.25
41484	POT - Ash Cell Capping Cell D	143,979	New	Environment	9.00
39923	TUC - Generator Excitation and AVR System Replac	141,183	New	Business Sustainability	7.00
41245	TUC2 - Cooling Water (CW) Pump Refurbishment	140,001	New	Business Sustainability	7.00
39953	TRE6 - Coal Feeder Valve Replacement	136,516	New	Business Sustainability	7.25
41239	TUC6- West Gas Compressor Refurbishment	136,399	New	Business Sustainability	8.00
41621	POA-Turbine Thrust Bearing Replacement	136,159	New	Business Sustainability	8.50
39951	TRE5 - Coal Bunkerette Replacement	135,329	New	Business Sustainability	7.00
41560	POT E-belt Fire Protection System Refurbishment	132,088	New	Safety	9.00
41266	TUC2 - CEM Upgrade	131,642	New	Environment	9.00
41260	TUC2- H2 Dryer Replacement	127,932	New	Business Sustainability	7.00
41084	POA - Boiler Arrowhead Replacement	124,728	New	Business Sustainability	8.00
41448	POT - Screen Wash System Refurbishment	121,385	New	Business Sustainability	8.00
41444	POT - Asbestos Abatement	120,755	New	Safety	9.00
41645	TRE6 - Bottom Ash Seal Replacement	120,240	New	Business Sustainability	7.00
41149	LIN - 4kV and 600V Breaker Refurbishment	116,470	New	Business Sustainability	8.00
41275	TUC2- ACW Strainer Replacement	114,909	New	Business Sustainability	7.50
37402	POT - Coal Crusher Vibratory Feeder Refurbishment	114,191	New	Business Sustainability	7.50
41570	POA- Reverse Air Fan Replacement	107,983	New	Environment	9.00
41669	POT - HVAC Equipment Replacement	106,848	New	Safety	7.00
40060	TRE5 - 4kV Motor Refurbishment	103,806	New	Business Sustainability	7.00
41080	POA - Coal Gate Upgrade	102,912	New	Safety	7.50
41081	POA - Coal Road Paving Replacement	101,050	New	Business Sustainability	7.50
41587	POA - HVAC Equipment Replacement	100,661	New	Business Sustainability	7.50
41077	POA- Auxiliary Boiler Mud Drum Steam Coil Upgrad	100,254	New	Business Sustainability	8.50
14521	POT - Biofoulant Control System Upgrade	98,986	New	Safety	6.50
41594	POT - Lab Upgrades Phase 2	97,943	New	Environment	6.50

1.11.3.2 Steam – 2012 ACE Plan Capital Item Rankings Cont'd

		Project Estimate	Project Type, Category & Ranking		
CI	Project Title	2012 ACE Budget	Project Type	Ranking Category	Project Ranking
Steam Capital Items Included in 2012 ACE Plan					
41267	TUC - Fire Protection System Foam Tank Replaceme	94,872	New	Safety	7.50
41568	POT - Electrostatic Precipitator Supervisory System	94,848	New	Environment	9.00
41278	TUC2- Condensate Extraction Pump Refurbishment	93,871	New	Business Sustainability	8.00
41261	TUC1- Direct Current (DC) Exciter Refurbishment	91,617	New	Business Sustainability	8.00
41053	POA - Carbon Sulphur Analyzer Replacement	91,100	New	Environment	8.00
41073	POA - Plant Industrial Vaccum System	90,064	New	Business Sustainability	8.50
41056	POA - Plant Access Upgrade	88,031	New	Safety	8.00
41532	TRE6 - 4kV Motor Refurbishment	85,048	New	Business Sustainability	8.00
41151	LIN3 - Polisher Resin Replacement	82,777	New	Business Sustainability	7.00
41543	TRE6 - Motor Control Centre (MCC) Starter Replace	80,558	New	Business Sustainability	7.25
41050	POA - Screw Cooler Cover and Trough Replacement	80,103	New	Business Sustainability	8.25
41048	POA - Cooling Water (CW) Screen Refurbishment	80,061	New	Business Sustainability	8.25
41571	POA-High Pressure Piping and Valve Insulation Up	79,123	New	Safety	8.25
41274	TUC3 - Water Treatment Plant Anion & Cation Tan	76,878	New	Business Sustainability	7.00
41082	POA-2012 Valve Refubishment Program	76,443	New	Business Sustainability	7.50
41268	TUC - 4kV and 600V Breaker Refurbishment	75,267	New	Business Sustainability	7.00
41279	TUC - 4KV Motor Refurbishment	74,826	New	Business Sustainability	7.00
37022	POT - 129V Battery Charger Replacement	74,578	New	Business Sustainability	7.00
41533	TRE6 - Boiler Thermoprobe Upgrade	74,126	New	Business Sustainability	8.00
41544	TRE6 - O2 Sensor Replacement	72,171	New	Environment	7.75
41066	POA - Heated Storage Upgrade	71,275	New	Business Sustainability	7.5
41047	POA - 4KV & 600V Breaker Refurbishment	64,756	New	Business Sustainability	7.50
41071	POA - Bottom Ash Drag Chain Replacement	62,741	New	Business Sustainability	8.00
41083	POA - Boiler Expansion Joint Replacement	61,821	New	Business Sustainability	8.00
41277	TUC2 - Stack Breeching Seal Replacement	61,402	New	Environment	7.75
41076	POA - B Train Cation and Anion Resin Replacement	60,501	New	Business Sustainability	7.50
41545	TRE5 - O2 Sensor Replacement	56,924	New	Environment	7.75
41271	TUC2 - Instrument Air Receiver Replacement	55,180	New	Safety	7.00
41272	TUC2 - Turning Gear Worm Shaft Replacement	54,508	New	Business Sustainability	7.00
41046	POA - 4KV Motor Refurbishment	53,816	New	Business Sustainability	8.00
41591	POT - Induced Draft (ID) Fan Bearings Cooling Syst	53,805	New	Business Sustainability	7.75
41585	POT - Pulverizer Exhauster Lubrication Cooling Syst	51,072	New	Business Sustainability	7.50

1.11.3.2 Steam – 2012 ACE Plan Capital Item Rankings Cont'd

		Project Estimate	Project Type, Category & Ranking		
CI	Project Title	2012 ACE Budget	Project Type	Ranking Category	Project Ranking
Steam Capital Items Included in 2012 ACE Plan					
41059	POA - Coal Chute and Reclaim Refurbishment	50,040	New	Business Sustainability	8.00
41052	POA - Cracker Soft Start Installation	42,434	New	Business Sustainability	7.50
41546	TRE5 - 4kV Breaker Refurbishment	40,854	New	Business Sustainability	7.25
41547	TRE6 - 4kV Breaker Refurbishment	40,854	New	Business Sustainability	7.25
41057	POA - Sootblower Refurbishment	40,143	New	Business Sustainability	8.00
41597	POA - Inline Sodium Analyzer Replacement	40,131	New	Environment	8.50
41229	LIN - Cable Spreading Rooms Fire Protection	918,292	New	Safety	8.50
41233	LIN3 Boiler Refurbishment	755,711	New	Business Sustainability	8.00
41235	LIN1 Boiler Refurbishment	749,186	New	Business Sustainability	7.50
41234	LIN4 Boiler Refurbishment	494,102	New	Business Sustainability	7.50
41157	LIN4 Air Heater Baskets Replacement	173,236	New	Business Sustainability	7.00
31262	LIN - Unit 1-2 Stack Insulation Replacement	158,427	New	Business Sustainability	7.50
27857	LIN-ROOFING ROUTINE	960,476	Routine	Routine	NA
10626	LIN - Routine Capital Program	566,267	Routine	Routine	NA
10621	TUC - ROUTINE PLANT SPENDING	560,648	Routine	Routine	NA
10673	TRE - Routine Capital	333,799	Routine	Routine	NA
27856	TRE-ROOFING ROUTINE	298,201	Routine	Routine	NA
27855	POT-ROOFING ROUTINE	290,743	Routine	Routine	NA
10645	POT - ROUTINE CAPITAL	259,586	Routine	Routine	NA
10718	POA - Routine Capital Program	245,546	Routine	Routine	NA
33863	LIN - Heat Rate Routine	206,473	Routine	Routine	NA
27858	POA-ROOFING ROUTINE	161,551	Routine	Routine	NA
27854	TUC-ROOFING ROUTINE	151,630	Routine	Routine	NA
10634	CT'S - Routine Spending	137,630	Routine	Routine	NA
33869	TRE - Heat Rate Routine	87,237	Routine	Routine	NA
11648	LIN- Plant Tools	78,725	Routine	Routine	NA
33867	POT - Heat Rate Routine	75,570	Routine	Routine	NA
25646	DCMS Equipment Replacement Routine	71,400	Routine	Routine	NA
33871	TUC - Heat Rate Routine	66,194	Routine	Routine	NA
25626	DCMS Equipment Replacement Routine	59,103	Routine	Routine	NA
11589	TUC - Plant Tools	55,000	Routine	Routine	NA

1.11.3.2 Steam – 2012 ACE Plan Capital Item Rankings Cont'd

		Project Estimate	Project Type, Category & Ranking		
CI	Project Title	2012 ACE Budget	Project Type	Ranking Category	Project Ranking
Steam Capital Items Included in 2012 ACE Plan					
21484	POA - PLANT TOOLS	52,530	Routine	Routine	NA
11621	TRE - Tools and Equipment	52,377	Routine	Routine	NA
33865	POA - Heat Rate Routine	51,491	Routine	Routine	NA
11627	POT - TOOLS & EQUIPMENT	51,000	Routine	Routine	NA
25668	DCMS Equipment Replacement Routine	51,000	Routine	Routine	NA
25667	DCMS Equipment Replacement Routine	30,000	Routine	Routine	NA
25647	POA - DCMS ROUTINE COMPUTER REPLACEME	28,283	Routine	Routine	NA
21485	POA - KELLY ROCK LIMESTONE QUARRY (CAPI'	28,263	Routine	Routine	NA
38899	CT'S Tooling Routine	25,000	Routine	Routine	NA
28522	CT'S Dcms Routine	17,340	Routine	Routine	NA

1.11.3.3 Integrated Customer Service– 2012 ACE Plan Capital Item Rankings

		Project Estimate	Project Type, Category & Ranking		
CI Number	Project Title	2012 ACE Budget	Project Type	Ranking Category	Project Ranking
Transmission Capital Items Included in 2012 ACE Plan					
33624	Spare Generator Transformer	$3,682,026	CO		
40233	2011 Protection Upgrades TUC	$2,513,370	CO		
40231	2011 Protection Upgrades LAK	$1,536,649	CO		
41005	Parrsboro Tidal Interconnection	$1,522,568	CO		
40868	64V-T1 Transformer Replacement U&U - Greenwood	$391,662	CO		
40862	101H-T61 Transformer Refurbishment U&U - Cobequid	$255,853	CO		
40867	59C-T61 Transformer Refurbishment U&U - St. Peter's	$208,039	CO		
40266	L6002 Deteriorated Replacements	$157,029	CO		
40281	2011 Transmission Line Insulator Replacement	$150,000	CO		
41387	2012 Transmission Line Insulator Replacements	$3,619,166	New	Customer Reliability	8.0
40322	New Prospect Road Substation	$3,153,291	New	Load Growth	7.5
41432	L7009 Lidar Upgrades & Maintenance	$2,942,809	New	System Reliability	8.0
41555	Spare Wind Farm Generator Transformer	$2,535,465	New	System Reliability	7.0
40317	Additional Water Street Transformer & Low Side 25 kV Breakers	$2,367,466	New	System Reliability	7.0
41517	L6535 Lidar Upgrades & Maintenance	$2,361,250	New	Deteriorated Plant	8.0
41553	Dartmouth East Transformer Addition	$2,307,615	New	Customer Reliability	7.0
41348	2012 Protection Upgrades Onslow	$2,274,015	New	Regulatory Requirement	9.0
40321	Install Canaan Road to Prospect Road Transmission Line	$2,104,620	New	Load Growth	7.5
41426	2012 Transmission Switch & Breaker Upgrades	$2,000,849	New	Customer Reliability	7.0
41552	131H Lucasville Transformer Addition	$1,893,150	New	Customer Reliability	7.0
41429	2012 Substation PCB Equipment Removal	$1,854,665	New	Regulatory Requirement	9.0
41537	Amherst 138kV Substation	$1,808,362	New	Requirement to Serve	9.0
41535	2012 Steel Tower Painting	$1,270,605	New	Deteriorated Plant	6.5
41844	Reinsulate Transmission Lines L8004 & L7005	$1,139,264	New	System Reliability	8.0
41434	Procure Additional 42 MVA Spare Transformer	$1,043,984	New	Customer Reliability	6.0
40323	Canaan Road Line Terminal	$967,187	New	New	7.5
41536	2012 Reliability Technologies Transmission	$877,747	New	System Reliability	7.0
41399	2012 Substation Insulator & Cutout Replacements	$800,013	New	Customer Reliability	7.0
41437	104H-T62 Kempt Road Transformer Rewind	$790,201	New	System Reliability	8.0
41589	22N-Church St Replace 25 kV Bus and Feeder Exit	$734,302	New	Customer Reliability	9.0
41550	Spare 30MVA 69KV 25/12KV Transformer	$728,999	New	Customer Reliability	6.0
41386	2012 Pole Retreatment	$556,017	New	Regulatory Requirement	8.5
41551	Glentosh Substation Footing Remediation	$552,201	New	System Reliability	9.0
41391	L6025 Spar Arm Reinforcement	$489,925	New	Deteriorated Plant	7.5
41422	Onslow Spares Storage Upgrades	$415,661	New	Deteriorated Plant	6.5
41520	Harbour East Substation - Eastern Passage	$394,305	New	Load Growth	8.0
41439	Mobile Refurbishments 5P & 6P	$367,409	New	System Reliability	9.0
41438	85S-Wreck Cove Cable Termination Replacement	$291,194	New	Deteriorated Plant	8.0
41362	7H Beaufort Switchgear Retirement	$278,071	New	Deteriorated Plant	8.5
41390	7V Methals Hydro Transformer Replacement	$258,506	New	Deteriorated Plant	8.5
41395	8H Fairview Switchgear Retirement	$213,288	New	Deteriorated Plant	8.5
41519	Harbour East 138 kV Transmission Line	$211,410	New	Load Growth	8.0
41592	88W New Recloser and Relocate 88W-322	$111,171	New	Overloaded Equipment	8.0
41522	138kV Line Terminal at Dartmouth East Substation	$40,743	New	Load Growth	8.0

1.11.3.3 Integrated Customer Service– 2012 ACE Plan Capital Item Rankings Cont'd

		Project Estimate	Project Type, Category & Ranking		
CI Number	Project Title	2012 ACE Budget	Project Type	Ranking Category	Project Ranking
Distribution Capital Items Included in 2012 ACE Plan					
40211	2011 3H/6H Replacement Program	$110,711	CO	Customer Reliability	
40320	LED Street Light Conversion	$5,739,651	New	Regulatory Requirement	8.5
41392	2012 Distribution Cutout Replacements	$2,596,796	New	Customer Reliability	8.0
41534	2012 Reliability Technologies Distribution	$2,423,179	New	Customer Reliability	7
41430	2012 Substation Recloser Replacement	$2,120,686	New	Customer Reliability	9.0
41540	99V Highbury Rd New Feeders	$1,093,229	New	Load Growth	8.0
41797	Brier Island Crossing	$1,006,642	New	Deteriorated Plant	8.5
41349	2012 Off Road To Roadside	$884,869	New	Customer Reliability	8.0
41398	2012 Padmount Transformer Replacements	$827,340	New	Deteriorated Plant	7.5
41359	79V-402 Feeder Load Reduction	$797,378	New	Overloaded Equipment	7.0
41383	2012 Halifax Underground Feeder Replacement	$596,760	New	Customer Reliability	6.0
41351	2012 Distribution Automation	$553,965	New	Customer Reliability	8.0
41353	2012 Downline Recloser Additions	$543,284	New	Customer Reliability	8.0
41355	2012 Remote Communication on Reclosers	$536,258	New	Customer Reliability	7.0
41339	2012 Distribution Feeder Ties	$492,873	New	Customer Reliability	8.0
41325	Replacement of 3H and 6H Reclosers	$465,327	New	Customer Reliability	8.0
41360	82V-423 Hardwood Lands Deteriorated Plant Replacement	$437,192	New	Deteriorated Plant	6.5
41389	8H Fairview Conversion	$417,695	New	Deteriorated Plant	8.5
40224	78W-301 Second Peninsula	$406,598	New	Customer Reliability	7.0
41384	2012 Feeder Exit Cable Replacement	$374,542	New	Customer Reliability	7.0
41338	20H-301 Targeted Feeder Replacement	$371,361	New	Customer Reliability	8.0
41333	16N-301 Stewiacke Reconductor	$353,467	New	Deteriorated Plant	6.5
41327	103W-311 Gold River Reconductor Phase 2	$310,296	New	Load Balancing	7.0
41393	2012 Automatic Sleeve Replacements	$287,831	New	Customer Reliability	7.0
41337	1N-405 Targeted Feeder Replacement	$283,892	New	Customer Reliability	8.0
41341	1H-Water Street New Feeder	$280,657	New	Overloaded Equipment	8.0
41356	35V-312 Windsor Causeway	$252,137	New	Overloaded Equipment	7.0
40219	2011 Recloser Control Replacements	$216,786	New	Customer Reliability	9.0
41334	16N-301 Targeted Feeder Replacement	$214,378	New	Customer Reliability	8.0
41388	7H Beaufort Conversion	$174,253	New	Deteriorated Plant	8.5
41340	5N-301 Targeted Feeder Replacement	$172,695	New	Customer Reliability	8.0
41354	519N-201 Partial Feeder Voltage Conversion to 25KV	$164,814	New	Overloaded Equipment	8.0
41431	1C-411/22C-404 Transfer Scheme	$149,850	New	Customer Reliability	7.0
41329	11W-202 Voltage Conversion to 12 kV	$98,382	New	Deteriorated Plant	7.5
41343	81S-302 Targeted Feeder Replacements	$96,642	New	Customer Reliability	8.0
41344	81S-305 Targeted Feeder Replacements	$80,992	New	Customer Reliability	8.0
41326	103C-311 Targeted Feeder Replacements	$74,612	New	Customer Reliability	8.0
41332	15S-302 Targeted Feeder Replacements	$73,023	New	Customer Reliability	8.0
41397	2012 Padmount Switchgear Replacement	$67,738	New	Deteriorated Plant	7.5
41345	82S-303 Targeted Feeder Replacements	$61,625	New	Customer Reliability	8.0
41342	81S-301 Targeted Feeder Replacements	$50,632	New	Customer Reliability	8.0
41328	103W-312 Targeted Feeder Replacements	$47,851	New	Customer Reliability	8.0
40310	Circuit Switcher Additions	$680,990	New	Customer Reliability	7.0
41363	88W New Feeder	$269,616	New	Overloaded Equipment	7.0

1.11.3.3 Integrated Customer Service– 2012 ACE Plan Capital Item Rankings Cont'd

		Project Estimate	Project Type, Category & Ranking		
CI Number	Project Title	2012 ACE Budget	Project Type	Ranking Category	Project Ranking
Routine Capital Items Included in 2012 ACE Plan					
39766	New Customers - Residential	$11,401,508	Routine	Distribution	9.0
23158	D005 Unplanned Replace Deteriorated Plant	$8,000,000	Routine	Distribution	9.0
23137	D055 - Planned Replacement Of Distribution Assets	$7,603,178	Routine	Distribution	9.0
26716	New Customer Upgrades	$5,858,803	Routine	Distribution	9.0
39770	New Customers - Commercial	$5,724,324	Routine	Distribution	9.0
23118	PROVINCIAL - PLANNED TRANS LINE REPLACEMENTS	$5,515,513	Routine	Transmission	9.0
26496	Meter Routine	$2,857,014	Routine	Distribution	9.0
23120	PROVINCIAL-TRANS SUBSTATION PRIMARY EQUIPMENT REPLACEMENTS	$2,575,000	Routine	Transmission	9.0
23361	D008 Provincial Storm	$2,371,335	Routine	Distribution	9.0
23135	D006 Regulatory Replacements - Provincially	$1,699,100	Routine	Distribution	9.0
23121	PROVINCIAL- SUBSTATION ADDITIONS & MODIFICATIONS	$1,236,366	Routine	Transmission	9.0
23127	D010 Provincially Widening	$969,058	Routine	Distribution	9.0
23136	D007 Contractual Replacemens (Joint Use) - Provincial	$906,693	Routine	Distribution	9.0
23115	PROVINCIAL TRANSMISSION LINE REPLACEMENTS	$755,000	Routine	Transmission	9.0
14841	PROTECTION MODIFICATIONS AND REPLACEMENTS	$699,194	Routine	Transmission	9.0
29038	System Performance Improvement Routine	$458,585	Routine	Distribution	9.0
14973	PRIMARY EQUIPMENT SPARES	$300,000	Routine	Transmission	9.0
23511	Primary Equipment Spares - Distribution Plant	$150,000	Routine	Distribution	9.0

1.11.4 Directive 12 - 2012 to 2014 Forecasted ACE Expenditures by Functional Class and Spending Program

The ACE 2011 Board Directive requested the forecast for 2013 and 2014 to include a breakdown by materiality and justification criteria. NSPI does not currently include these classifications in the modeling for capital investments beyond 2012. The Company does not anticipate a significant change in the investment level under $250,000, or the Routine program in 2013 and 2014. Justifications for projects determined as capital investments are scoped on an annual basis. Capital investment on the basis of health and safety, environmental compliance and requirement to serve remains non-discretionary. The table below identifies anticipated sustaining capital by function and specific strategic investments included in this ACE Plan.

	Capital Spend Forecast			
Sustaining Capital Investments	**2012**	**2013**	**2014**	**Project Totals**
Thermal Generation	$52.0	$42.4	$43.2	
Hydro Generation	20.4	20.4	20.8	
Transmission	40.8	20.0	20.4	
Distribution	54.2	48.0	49.0	
General Property	38.0	15.0	15.3	
Strategic Capital Investments				
AMI Investment	$5.5	$5.0	$5.0	$25.5
CEF Load Control Project	1.3	2.0	0.2	4.1
Power Production Asset & Work Management	3.4	0.2	0.0	5.8
Additional Reliability Investment Distribution	12.6	10.0	10.0	32.6
Additional Reliability Investment Transmission	9.4	10.0	9.0	28.4
Wind Farm	0.0	0.0	30.0	220.0
Other Wind	0.5	0.1	0.1	0.7
Marshall Falls Hydro Development	2.8	1.0	3.0	27.8
Hydro Infrastructural Renewal	10.0	20.0	20.0	88.0
Second Transmission Line to New Brunswick	0.0	2.0	20.0	202.0
Transmission Reinforcement	0.0	15.0	20.0	75.0
Harbour East 138kV Transmission	0.6	12.4	0.0	13.0
Transmission Reliability	17.3	10.0	10.0	57.3
Fast Acting generation #1	0.0	5.0	15.0	60.0
Port Hawkesbury 60 MW Biomass Project	56.0	8.4	0.0	206.9
LED Lighting Replacement	5.7	22.0	22.0	100.0
Total Annual Capital Investmemt	**$330.3**	**$268.9**	**$313.0**	

2 Routine Capital Items

2.1 Routine Capital Spending by Function

This category includes recurring annual expenditures for replacement of equipment (like-for-like replacement), additions to existing equipment base resulting from system growth and addition of customers to the system.

2012 Routine Capital Spending by Function

Generation	
Generation Equipment Replacements*	$5,176,075
Generation Other Hydro	670,000
Generation Other Thermal	486,965
	$6,333,040
Transmission	
Transmission Substation Replacement, Additions/Modifications	$3,811,365
Primary Equipment Spares	300,000
Protection Modification & Replacement	699,194
Transmission Line Replacement, Additions/Modifications	6,270,513
	$11,081,072
Distribution	
Meters	$2,857,014
Distribution Upgrades and Replacement	20,132,197
New Customers	23,134,635
Joint Use	906,693
Right-of-Way Widening	969,058
	$47,999,597
General Plant	
Work Vehicles	$6,806,696
Tools and Test Equipment	1,380,977
Telecommunications	880,597
Computing Asset Management	2,727,738
Property Improvements and Furniture	2,585,000
Other	1,811,763
	$16,192,770
Total 2012 Routine Capital Spending	**$ 81,606,479**

* In 2012 NSPI has included project W001 Wind Equipment Replacements in the Generation Equipment Replacement Routine. This project will address any like-for-like equipment replacements required for the existing in-service wind farms.

2.2 Routine Capital Spending by Function Yr/Yr

	2010 Actual	2011 Budget	2011 Forecast	2012 ACE Plan
Generation				
Generation Equipment Replacements	$3,458,529	$4,315,240	$4,552,074	$5,176,075
Generation Other Hydro	261,683	519,148	408,203	670,000
Generation Other Thermal	443,159	374,834	355,361	486,965
	$4,163,371	$5,209,222	$5,315,638	$6,333,040
Transmission				
Transmission Substation Replacement, Add'ns/Mod'ns	$2,348,552	$3,700,355	$3,632,665	$3,811,365
Primary Equipment Spares	30,099	188,649	188,649	300,000
Protection Modification & Replacement	203,759	841,216	390,248	699,194
Transmission Line Replacement, Add'ns/Mod'ns	5,082,524	6,210,003	6,209,797	6,270,513
	$7,664,933	$10,940,223	$10,421,359	$11,081,072
Distribution				
Meters	$2,016,126	$2,409,631	$2,488,923	$2,857,014
Distribution Upgrades and Replacement	21,229,727	19,269,971	20,541,113	20,132,197
New Customers	20,412,891	24,139,678	21,489,227	23,134,635
Joint Use	757,528	856,694	1,624,719	906,693
Right-of-Way Widening	738,513	940,833	1,440,843	969,058
	$45,154,786	$47,616,807	$47,584,825	$47,999,597
General Plant				
Work Vehicles	$116,119	$7,156,591	$6,860,850	$6,806,696
Tools and Test Equipment	1,617,837	1,773,500	1,771,817	1,380,977
Telecommunications	1,140,361	869,481	907,105	880,597
Computing Asset Management	2,545,114	2,374,312	2,360,448	2,727,738
Property Improvements and Furniture	1,378,384	2,311,145	2,250,668	2,585,000
Other	455,505	2,032,265	520,788	1,811,763
	$7,253,319	$16,517,294	$14,671,676	$16,192,770
Total Routine Capital Spending	**$64,236,409**	**$80,283,546**	**$77,993,498**	**$81,606,479**

2.3 2012 Routine Capital Spending Project Breakdown Yr/Yr

Project	CI#	Project Title	2010 Actual	2011 Budget	2011 Forecast	2012 ACE Plan
G001	10634	CT'S - Routine Spending	139,079	138,000	110,459	137,630
H001	11622	HYD - Equipment Replacement	648,610	685,000	684,272	750,000
H004	27867	HYD-Roofing Routine	115,665	113,259	297,836	200,000
S001	23428	GS - Equipment Replacement	114,961	135,000	135,161	135,000
	10718	POA - Equipment Replacement	237,342	239,143	239,064	245,546
	10645	POT - Equipment Replacement	240,992	257,989	257,398	259,586
	10673	TRE - Equipment Replacement	324,053	325,964	321,784	333,799
	10621	TUC - Equipment Replacement	331,398	360,000	365,850	560,648
	10626	LIN - Equipment Replacement	529,519	556,182	555,481	566,267
S004	27856	TRE-Roofing	124,049	499,880	492,764	298,201
	27855	POT-Roofing	42,211	0		290,743
	27854	TUC-Roofing	125	483,912	480,745	151,630
	27857	LIN-Roofing	489,438	445,073	452,226	960,476
	27858	POA - Roofing	106,500		99,593	161,551
G008	38899	CT'S Tooling	14,588	75,838	59,441	25,000
W001	41830	Wind - Equipment Replacement	0	0	0	100,000
		Generation Equipment Replacements Total	**$3,458,529**	**$4,315,240**	**$4,552,074**	**$5,176,075**
H005	35583	HYD - Oil Release Risk Assessment	110,861	269,148	208,287	270,000
H006	35584	HYD - Gate Refurbishment	150,822	250,000	199,916	400,000
		Generation Hydro Total	**$261,683**	**$519,148**	**$408,203**	**$670,000**
S005	33871	TUC-Heat Rate	25,067	61,485	60,181	66,194
	33865	POA-Heat Rate	-8,586	49,997	35,091	51,491
	33867	POT-Heat Rate	54,927	73,149	58,995	75,570
	33869	TRE-Heat Rate	57,391	89,988	89,304	87,237
	33863	LIN-Heat Rate	314,360	100,215	111,791	206,473
		Generation Thermal Total	**$443,159**	**$374,834**	**$355,361**	**$486,965**
T003	23120	Provincial-Trans Substation Primary	1,703,479	2,500,000	2,708,767	2,575,000
T004	23121	Provincial - Substation Additions & Replacements	645,072	1,200,355	923,898	1,236,366
		Transmission Subs Replace, Adds/Mods Total	**$2,348,552**	**$3,700,355**	**$3,632,665**	**$3,811,365**

2.3 2012 Routine Capital Spending Project Breakdown Yr/Yr Cont'd

Project	CI #	Project Title	2010 Actual	2011 Budget	2011 Forecast	2012 ACE Plan
T018	14973	Primary Equipment Spares	30,099	188,649	188,649	300,000
		Primary Equipment Spares Total	**$30,099**	**$188,649**	**$188,649**	**$300,000**
T016	14841	Protection Modification & Replacement	203,759	841,216	390,248	699,194
		Protection Modification & Replacement Total	**$203,759**	**$841,216**	**$390,248**	**$699,194**
T001	23115	Provincial Transmission Line Replace	945,834	751,319	877,633	755,000
T011	23118	Provincial - Planned Trans Line Replacement	4,136,689	5,458,684	5,332,165	5,515,513
		Transmission Line Replacements Total	**$5,082,524**	**$6,210,003**	**$6,209,797**	**$6,270,513**
D009	26496	Meter Routine	2,016,126	2,409,631	2,488,923	2,857,014
		Meters Total	**$2,016,126**	**$2,409,631**	**$2,488,923**	**$2,857,014**
D005	23158	Unplanned Replace Deteriorated	6,480,226	7,998,369	8,570,387	8,000,000
D006	23135	Regulatory Replacements - Province	1,697,129	838,500	1,026,621	1,699,100
D008	23361	Provincial Storm	3,868,027	2,371,335	3,684,443	2,371,335
D051	29038	System Performance Improvement	313,647	458,585	458,585	458,585
D055	23137	Planned Replacement Of Distribution Plant	8,870,699	7,603,182	6,801,077	7,603,178
		Distribution Upgrades and Replacement Total	**$21,229,727**	**$19,269,971**	**$20,541,113**	**$20,132,197**
D002	26715	New Primary Services	1,045,841	0	-10,557	
D004	26716	New Customer Upgrades	4,675,924	5,858,803	5,434,056	5,858,803
D016	26717	New Customers - Unmetered Services	327,138	0	0	
D017	26718	New Customers - Metered Services	4,557,239	0	-23,579	
D018	23511	Primary Equipment Spares - Distribution	26,337	150,043	174,633	150,000
D021	26719	New Customers - Line Extensions	1,023,819	0	-58,414	
D022	26720	New Customers - Underground Service	9,082	0	-35,275	
D061	39766	New Customers - Residential	7,034,910	12,701,508	10,396,972	11,401,508
D062	39770	New Customers - Commercial	1,712,601	5,429,324	5,611,390	5,724,324
		New Customers Total	**$20,412,891**	**$24,139,678**	**$21,489,227**	**$23,134,635**
D007	23136	Contractual Replacemens (Joint Use)	757,528	856,694	1,624,719	906,693
		Joint Use Total	**$757,528**	**$856,694**	**$1,624,719**	**$906,693**
D010	23127	Provincially Widening	738,513	940,833	1,440,843	969,058
		Right of Way Widening Total	**$738,513**	**$940,833**	**$1,440,843**	**$969,058**

2.3 2012 Routine Capital Spending Project Breakdown Yr/Yr Cont'd

Project	CI #	Project Title	2010 Actual	2011 Budget	2011 Forecast	2012 ACE Plan
P006	20945	Replacement and Additional Work Vehicles	101,445	151,521	151,521	151,081
P009	16192	Mobile Transformer & Track	14,674	383,930	200,680	387,225
P063	39304	Class 3 Work Vehicle Replacements		865,640	872,389	446,173
P062	39305	Work Vehicle Replacements		3,840,000	3,720,585	4,051,173
P061	40236	Transportation Vehicle Replacements		1,915,500	1,915,675	1,771,044
		Work Vehicles Total	**$116,119**	**$7,156,591**	**$6,860,850**	**$6,806,696**
P002/P016		Meter Shop - Tools and Equipment	1,564,861	1,713,500	1,713,272	1,305,977
P015	11611	Hydro Production Tools, Test Equipment	52,975	60,000	58,545	75,000
		Tools and Test Equipment Total	**$1,617,837**	**$1,773,500**	**$1,771,817**	**$1,380,977**
P025	16365	Mobile Radio	94,549	87,369	98,477	87,953
P027	16551	Telecommunication Radio and Fibre Optics	290,227	155,610	157,071	159,370
P028	16550	Telecommunication Systems Replace & Modif	569,810	451,502	476,557	453,024
P814	38243	Telecommunications Spares	185,775	175,000	175,000	180,250
		Telecommunications Total	**$1,140,361**	**$869,481**	**$907,105**	**$880,597**
P010	16073	SCADA Improvements	62,542	125,968	123,825	129,747
P020	10632	NSPI/CGI Infrastructure	2,026,330	302,000	679,266	
P031	29114	NSPI Non-CGI Infrastructure	254,044	1,716,785	1,340,276	2,340,865
P040	28522	CT'S Dcms Routine	9,380	17,000	11,772	17,340
	25647	POA - DCMS Routine Computer Replace	24,652	27,638	23,609	28,283
	25667	POT - DCMS Equipment Replacement	8,028	30,000	30,600	30,000
	25626	TRE - DCMS Equipment Replacement	32,879	34,921	36,057	59,103
	25646	TUC - DCMS Equipment Replecement	62,578	70,000	68,747	71,400
	25668	LIN - DCMS Equipment Replacement	64,681	50,000	46,296	51,000
		Computing Asset Management Total	**$2,545,114**	**$2,374,312**	**$2,360,448**	**$2,727,738**
P001/P030		Property Improvement and Furniture	1,378,384	2,311,145	2,250,668	2,585,000
		Property Improvement and Furniture Total	**$1,378,384**	**$2,311,145**	**$2,250,668**	**$2,585,000**
P012/P041		HYD - Security Improvement & FAC - Land Acquisition	430,803	517,395	493,960	900,000
P035	21485	POA - Kelly Rock Limestone Quarry	24,703	27,728	26,828	28,263
P816	38897	FAC Enviro Property Remediation		954,004		304,000
P815	38896	FAC Environment Site Assessment		233,138		179,500
P032	38848	Purchasing Equip & Warehouse		300,000		400,000
		Other Total	**$455,505**	**$2,032,265**	**$520,788**	**$1,811,763**
2012 Routine Capital Spending			**$64,236,409**	**$80,283,546**	**$77,993,498**	**$81,606,479**

2.4 Routine Capital Spending Variances

Routine Function	ACE 2011 ($M)	ACE 2012 ($M)	Variance Inc/ (Dec)
Generation	5.21	6.33	1.12
Transmission	10.94	11.08	0.14
Distribution	47.62	48.00	0.38
General Plant	16.52	16.19	(0.32)
Total	80.28	81.61	1.32

Routine Function	Increase/ (Decrease) $ M	Variance Explanation
Generation	1.05	Roofing: Point Aconi, Point Tupper, Lingan, Hydro
	(0.53)	Roofing: Trenton & Tufts Cove
	0.39	Equipment Replacements: All Plants & Hydro
	0.11	Heat Rate: All Plants
	0.15	Oil Release Risk Assessment & Gate Refurbishment: Hydro
	(0.05)	Tooling
	1.12	
Transmission	0.06	Transmission Line Replacements (T001 & T011)
	0.11	Transmission Substation Replacements
	(0.14)	Protection Modifications
	0.11	Primary Equipment
	0.14	
Distribution	(1.01)	New Customers
	0.86	Distribution Upgrades and Replacements (D006)
	0.03	Right of Way Widening
	0.05	Joint Use
	0.45	Meters
	0.38	
General Property	0.01	Telecommunications
	0.23	Security improvements: Hydro
	(0.39)	Tools & Test Equipment
	(0.55)	Environmental Assessment & Remediation
	0.10	Purchasing Equipment and Warehouse
	0.27	Property Improvement & Furniture
	(0.35)	Work Vehicles
	0.35	Computing Asset Management
	(0.32)	
Total	**1.32**	

2.5 Routine Capital Spending Project Details

Project #	Project Title	2012 ACE Plan
Generation		
G001	CTs - Equipment Replacement	$137,630
H001	HYD - Equipment Replacement	750,000
H004	HYD-Roofing	200,000
S001	POA - Equipment Replacement	245,546
	GS - Equipment Replacement	135,000
	POT - Equipment Replacement	259,586
	TRE - Equipment Replacement	333,799
	TUC - Equipment Replacement	560,648
W001	Wind - Equipment Replacement	100,000
	LIN - Equipment Replacement	566,267
S004	TRE-Roofing	298,201
	POT-Roofing	290,743
	TUC-Roofing	151,630
	POA-Roofing	161,551
	LIN-Roofing	960,476
G008	CTs Tooling	25,000
	Generation Equipment Replacements Total	**$5,176,075**
H005	HYD Oil Release Risk Assessment	$270,000
H006	HYD - Gate Refurbishment	400,000
	Generation Hydro Total	**$670,000**
S005	TUC-Heat Rate	$66,194
	POA-Heat Rate	51,491
	POT-Heat Rate	75,570
	TRE-Heat Rate	87,237
	LIN-Heat Rate	206,473
	Generation Thermal Total	**$486,965**
	Generation Total	**$6,333,040**

Transmission

Transmission Substation Replacements, Additions and Modifications

T003 Provincial: Transmission Substation Primary Equipment	**2012 ACE Plan**
Unplanned failures	$1,287,000
113H-D41 replace batteries and charger	38,000
131H-D41 Batteries	15,000
2H-D41 Batteries	15,000
50N-D32 replace batteries and charger	25,000
50N-D42 replace charger only	8,000
74N-D41 replace batteries and charger	38,000
20V-D41 replace batteris (6-8 cracked posts)	15,000
43V-D31 Batteries and charger	38,000
4V-D31 replace gel cell battery	15,000
50V-D41 replace charger only	8,000
22V- Replace battery charger only	5,000
4S Replaces batteries and charger	38,000
103H-T81 Surface refurbishment and painting	90,000
100H- Bedford substation site removal/retirement	25,000
113H-C41 & C42 replace capacitor bank fuse tubes and fuses	5,000
101H-C41 & C42 replace capacitor bank fuse tubes and fuses	5,000
16W-T51 - Replace Rads	95,000
Milton- Replace Rads	125,000
81S -T2 Replace Rads	95,000
Sydney Replace Rads	120,000
Crushed Stone Replacement (bring to standard depth) - Regional supervisor to arrange	70,000
11W-T51 Surface refurbishment and painting	18,000
99W-T71 Surface refurbishment and painting	65,000
36V-T1 Surface refurbishment and painting	18,000
Fence and ground replacements/Additions NE	55,000
Fence and ground replacements/Additions West	40,000
Fence and ground replacements/Additions Sydney	35,000
Fence and ground replacements/Additions Metro	30,000
Replace/re-surface concrete footings (1N Onslow, 90H Sackville and 43VCannan Rd)	75,000
79N Replace station service and grounding transformers	32,000
3C replace station service and grounding transformer	32,000
Total T003 Provincial: Transmission Substation Primary Equipment	**$2,575,000**

T004 Provincial- Substation Additions & Relacements	2012 ACE Plan
Unknown additions	$423,066
10 On-Line Oil Filtration Units	236,269
10 On-Line Gas Monitors	207,030
A/C units 3 sites Shop/Engineering TBD	180,000
Oil containment 51V-T51	18,000
Oil containment 51V-T1	22,000
Wildlife insulation protective cover-up (1N, 104H, and TBD)	150,000
Total T004 Provincial- Substation Additions & Relacements	**$1,236,365**
Total Transmission Substation Replacements, Additions and Modifications	**$3,811,365**

Primary Equipment Spares

T018 Primary Equipment Spares	2012 ACE Plan
2 Sets of Spare Surge Arrestors	$170,000
Spare 69 kV Metering Unit	50,000
Unidentified Items	80,000
Total Primary Equipment Spares	**$300,000**

Protection Modification & Replacement

T016 Protection Modification & Replacement	2012 ACE Plan
L-6537 Install Fault Location at 5S	$33,366
Replace LFCB on L-6048	93,852
L-5563/L-5560 Add Fault Location at 2S	36,532
L-5537 Pilot Wire Replacement	61,709
Replace Fault Recorder at Milton	50,669
Replace Fault Recorder at Canaan Rd	38,706
Replace Fault Recorder at 2C	38,706
Add Reclose Block to 9W-512, 515	6,000
Add Reclose Block to 2S-573	19,206
Add MOD Indication, lockout alarm, metering at 81S	19,206
L-5548 Add Fault Location at Macaan	26,558
Replace Sync Check relay at 5S	19,206
3S Replace CAG Relay	23,206
L-5532 at 3W Fault Location Relay Phasing	7,623
Add Satelite Clocks at 50W, 9W, 99W, 2S	31,729
L-6025 Add Fault Location at 99W	26,558
L-6531 Add Fault Location at 99W	26,558
L-6006 Add Fault Location at 99W	26,558
L-5028 Revise Polarizing on 2PG-10 Relay	7,623
Unplanned Relay Replacement	105,626
Total Protection Modification & Replacement	**$699,194**

Transmission Line Replacement, Additions / Modifications

T001 Provincial Transmission Line Replacement (Unplanned)	**2012 ACE Plan**
The forecast funding for T001 is generally held at approximately $700k/year. This may vary dependant on things like storms.	**$755,000**

T011 Provincial- Planned Transmission Line Replacement

LINE #	Description	2012 ACE Plan
5004	Sackville to Rockingham	$30,000
5012	Tufts Cove to Imperial Oil	10,000
5025	Paradise to Tremont	22,000
5031	Hubbards to Robinsons Corner	253,000
5035	Hells Gate to Canaan Road	64,000
5054	Weymouth to Saulnierville	87,000
5057	Tap to Cornwallis	11,000
5510	Bridge Avenue to Malay Falls	225,000
5511	Trafalfar to Musquodoboit	5,000
5521	Onslow to Willow Lane	23,000
5539	Milton to Liverpool	20,000
5544	Big Falls to Upper Lower Lake Falls	21,000
5547	Westhavers Elbow to Lunenburg	190,000
5560	Victoria Junction to Townsend St.	62,000
5563	Victoria Junction to Townsend St.	51,000
5564	Victoria Junction to Keltic Drive	73,000
5572	Victoria Junction to Seaboard	77,000
5575	Whitney Pier to New Waterford	146,000
5576	Gannon Road to Keltic Drive	40,000
6003	Tufts Cove to Scakville	4,000
6004	Sackville to Cannan Road	430,000
6012	St. Croix to Cannan Road	24,000
6021	Souriquois to Tusket	221,000
6024	Milton to Tusket	155,000
6510	Whycocomagh to Aberdeen	18,000
6511	Trenton to Glen Dhu	270,000
6521	Tupper to Tupper Terminals	24,000
6523	Tupper to New Page	65,000
6539	Gannon Road to Victoria Junction	320,000
6545	Glen Tosh to Wreck Cove	54,000
6552	Glen Dhu to Lochaber Road	282,000
7001	Onslow to Brushy Hill	341,000
7003	Onslow to Port Hastings	135,000
7009	Bridgewater to Brushy Hill	440,000
7012	Port Hastings to Lingan	690,513
5027A	Tusket to Lower Woods Harbour	12,000

T011 Provincial- Planned Transmission Line Replacement

LINE #	Description	2012 ACE Plan
5027B	Souriquois to Lower Woods Harbour	64,000
5530A	Milton to Broad River	200,000
5530B	Broad River to East Green Harbour	37,000
5530C	East Green Harbour to Souriquois	29,000
5545B	Auburndale to High Street	25,000
5547A	Mahone Bay Tap	50,000
5564A	Terrace Street Tap	5,000
6005B	Sackville to Lucasville	210,000
	T011 Provincial- Planned Transmission Line Replacement	**$5,515,513**
	Transmission Line Replacement Total	**$6,270,513**
	Transmission Total	**$11,081,072**

Distribution: Meters

Item#	Prg#	Meters Meter Type	Meter Style	Description	2012 Forecast	Current Unit Cost	Capital for meters
1.0 Element, 120-240 volt							
1	94	A1D+	ZQB20000R	240V, 10A, 2W, 4 Jaw, 4 dial	200	154.24	$30,848.00
2	20	A1T+	QB20130R	T/R, 2W, 4Jaw, TOU (KWH) c/w L.C. (ETS)	100	200.73	$20,073.00
3	30	A1R+	QB20200R	T/R, 2W, 4Jaw, KW/KVA dmd	140	164.65	$23,051.00
4	39	A1TL+	QB20D3DR	T/R, 2W, 4Jaw, TOU(KWH) c/w modem, L.P,L.C. (ETS)	4	465.76	$1,863.04
5	40	A!RL+	QB20F0DR	T/R, 2W, 4Jaw, KW/KVA dmd, c/w modem, L.P.	4	415.76	$1,663.04
1.5 Element, 120-240 volt				**Description**	**2012 Forecast**		
	N/A	C1S	Centron	240V, 200A, 3W,4 Jaw, 5 dial	20000	26.50	$530,000.00
6	19	A1T+	QC30130R	S/C, 3W, 4Jaw, TOU(KWH) c/w L.C. (ETS)	1200	174.28	$209,136.00
7	31	A1R+	QC30200R	S/C, 3W, 4Jaw, KW/KVA dmd	240	164.65	$39,516.00
8	32	A1R+	QD50200R	T/R, 3W, 4Jaw, KW/KVA dmd	60	164.65	$9,879.00
	36	A1TL+	ZQC30D0DR	S/C, 3W, 4Jaw, (KWH) c/w modem & L.P.	40	415.76	$16,630.40
2.0 Element, 120-480 volt				**Description**	**2012 Forecast**		
9	N/A	R2S	ZF532000000	120V,200A,3W,5Jaw(9o,clock pos:), 5 dial	1000	97.00	$97,000.00
10	26	A1R+	Q530200R	S/C, 3W, 5Jaw(9 o,clock pos:) KW/KVA dmd,(Mult: 25)	100	168.17	$16,817.00
11	33	A1T+	Q530130R	S/C, 3W, 5Jaw(9 o,clock pos:)TOU(KWH) c/w L.C.(ETS)	100	204.25	$20,425.00
12	35	A1RL+	Q220F0DR	T/R, 3W, 8Jaw, KW/KVA dmd, c/w modem, L.P.	4	474.78	$1,899.12
13	72	A1RL+	Q220F3DR	T/R , 3W, 8Jaw, kW/kVA dwd, Modem, LP (5-min int) KYZ	4	474.78	$1,899.12
27	97	A1R+	ZQ220200R	T/R, 3W, 8Jaw, KW/KVA dmd	250	168.17	$42,042.50
2.5 Element, 120-347 volt				**Description**	**2012 Forecast**		
14	81	A1D+	Q820000R	T/R,4W, 13Jaw, 120-480V, 0.1-10A (KWH)	40	148.74	$5,949.60
15	28	A1R+	Q820200R	T/R, 4W, 13Jaw, KW/KVA dmd	200	168.17	$33,634.00
16	29	A1R+	Q820230R	T/R, 4W, 13Jaw, KW/KVA dmd, c/w KYZ	20	218.17	$4,363.40
17	34	A1RL+	Q820F0DR	T/R,4W, 13Jaw, KW/KVA dmd c/w modem, L.P.	20	424.78	$8,495.60
18	73	A1RL+	Q820F0DR	T/R, 4W, 13 Jaw, kW/kVA dmd, modem, LP (5 min int)	4	424.78	$1,699.12
19	74	A1RL+	Q820F3DR	T/R, 4W, 13 Jaw, kW/kVA dmd, modem, LP (5 min int), KYZ	4	474.78	$1,899.12
3.0 Element, 120-347 volt				**Description**	**2012 Forecast**		
20	47	A1D+	Q330000R	S/C, 4 W, 7Jaw, (KWH)	500	148.74	$74,370.00
21	48	A1D+	Q320000R	T/R, 4W, 13Jaw, (KWH)	20	148.74	$2,974.80
22	18	A1RL+	Q320F0DR	T/R, 4W, 13Jaw, KW/KVA dmd, c/w modem, L.P.	20	424.78	$8,495.60
23	22	A1R+	Q330200R	S/C, 4W, 7Jaw, KW/KVA dmd, (Mult 25)	800	168.17	$134,536.00
24	23	A1R+	Q320200R	T/R, 4W, 13Jaw, KW/KVA dmd	400	168.17	$67,268.00
25	75	A1RL+	Q320F0DR	T/R, 4W, 13 Jaw, kW/kVA dmd, modem, LP (5 min int)	4	424.78	$1,699.12
26	76	A1RL+	Q320F3DR	T/R, 4W, 13 Jaw, kW/kVA dmd, modem, LP (5 min int), KYZ	4	474.78	$1,899.12
	43	A1RL+	ZQ320F3DR	T/R, 4W, 13Jaw, KW/KVA, dmd, c/w modem, L.P, KYZ	20	474.78	$9,495.60
				TWACS Modules	500	72.00	$36,000.00
				Total Meters	**26002**		**1,455,521**
				Misc Meters "ION"	10	5,000.00	**$50,000**
				CT and PT requirements			**121,569**
				Wire Adapters and switches			**70,000**
				Total Materials			**1,697,090**
				Vehicle Allocation (2011 - 50.67%)			**257,936**
				Construction Overhead (2011 - 77.19%)			**392,937**
				Labour			**509,051**
				D009 Meters Total			**2,857,014**

Distribution Upgrades and Replacement

		2012 ACE Plan
D005 Unplanned Replacement Deteriorated Equipment	The forecast was developed based on an estimated 3,410 mandays of work at a unit cost of $2,346/manday	**$8,000,000**
D006 Regulatory Replacements	The forecast is developed based on past experiences or information from various government agencies. This amount could vary based on current year decisions by these agencies.	**$1,699,100**
D008 Provincial Storm	This forecast is developed based on past experience. There can be significant variation in this amount based on yearly storm activity.	**$2,371,335**
D051 System Performance Improvement		
	3S-307 Circuit Re-configuration	$75,000
	3S-303 Change Loop	60,000
	62N-411 and 62N-414 Transfer Scheme, Lawrence Boul. & MacGregor Ave	174,585
	59C-402 Route 4 Sectionalizers	30,000
	2H-412 / 1H-429 Grace Hospital Switching	50,000
	Sectionalizer installations	69,000
Total D051 System Performance Improvement		**$458,585**
D055 Planned Replacement of Distribution Equipment		
	Bin Work	$1,973,178
	Streetlight/service removal	1,600,000
	Padmount replacement	750,000
	Field Driven Work	600,000
	Voltage Regulator Replacement	225,000
	CBRM Abandoned Pole Removals	80,000
	14C-211 Re-Build	175,000
	NW Secondary	125,000
	85S-401 Ingonish Insulator Replacement	225,000
	1S - Seaboard Line Removal	100,000
	62N-414 - Spring Garden Road Rebuild	200,000
	62H-302 - Mic Mac Mall Vault Upgrades	75,000
	74N-411 Springhill Junction Removal	20,000

	Barrington Street Tower Switch Upgrades	50,000
	70W-313 - LeHave River - Reconductor - pt 1	200,000
	102W-312 - Bellville Rd. - Reconductor	200,000
	63V-313 - Palmer Rd - Reconductor	215,000
	16V-315 - Lewistion Rd. - Reconductor	205,000
	509V-301 - Central Grove - Rebuild	165,000
	70V-311 - Port Lorne - Rebuild	70,000
	36V-302 - North Ave. Habitant - Reconductor/Rebuild	350,000
Total D055 Planned Replacement of Distribution Equipment		**$7,603,178**
	Distribution Upgrades and Replacement Total	**$20,132,197**

New Customers

		2012 ACE Plan
D004 New Customer Upgrades	This forecast developed as a % of D061 and D062 including capital contributions. In 2012 this is estimated to be 32%.	**$5,858,803**
D018 Primary Equipment Spares Distribution	This forecast is developed based on the probable amount of distribution spare equipment required during the year.	**$150,000**
D061 New Customers- Residential	This forecast is for the costs associated with new residential customers including capital contributions. Costs include metered services, unmetered services, line extensions and underground services.	**$11,401,508**
D062 New Customers- Commercial	This forecast is for the costs associated with new commercial customers including capital contributions. Costs include metered services, unmetered services, line extensions and underground services.	**$5,724,324**
	Total New Customers	**$23,134,635**

		2012 ACE Plan
Joint Use Total		
	This forecast is developed from discussions with communication utilities and may vary depending on their level of activity	**$906,693**
Right of Way Widening Total		
	This forecast is developed based on the known level of widening in the current year.	**$969,058**
	Distribution Total	**$47,999,597**

General Plant

Work Vehicles

P006 Replacement and Additional Work Vehicles	**Quantity**	**Unit Price**	**2012 ACE Plan**
Nova M/D Heavy Duty Pole Trailer	5	$26,516	$132,581
Honda Trx350, 500cc ATV with Ramps	1	18,500	18,500
Total P006 Replacement and Additional Work Vehicles			**$151,081**
P009 Mobile Transformer & Track			
This forecast is developed based on a possible repairs or modifications to track machines or the mobile transformers.			**$387,225**
P061 Transportation Vehicle Replacements	61	$29,034	**$1,771,044**
P062 Work Vehicle Replacements	16	$253,198	**$4,051,173**
P063 Class 3 Work Vehicle Replacements	3	$148,724	**$446,173**
	Total Work Vehicles		**$6,806,696**

Tools and Equipment

Description	Quantity	Estimated Unit Cost	2012 ACE Plan
Metre Shop Tools and Equipment			**$45,000**
Provincial Line Tools & Equipment			
Western Territory			
2/0 grounds	6	$1,300	$7,800
Portable Generator	4	1,600	6,400
Gator Tail reel and rope	4	3,810	15,240
Poleboss payout pole mount	4	1,100	4,400
Hydraulic Drills	4	1,500	6,000
Fibreglass Tubs	1	1,300	1,300
Hydraulic Stick saws	4	2,225	8,900
6 ton Battery Operated Press	5	1,700	8,500
Fibreboard Lawn Mats	4	1,200	4,800
Regular Amp Probe	1	1,900	1,900
Western Territory Total			**$65,240**
Eastern Territory			
Medium sized fiberglass tubs for leaking tx (2-PHA, 2- SYD)	4	$1,000	$4,000
Large fiberglass tubs for leaking tx (1- RIV, 1-BAD, 1-ING, 1-CHC, 1-MAB, 2-PHA)	7	1,300	9,100
UG Primary termination tool for ANT depot and BAD depot	1	2,000	2,000
Traction Mats for trucks (to prevent damage to property) 1 set of 4 mats for PHA, 1 set for STE	4	1,200	4,800
Gator Tail reel and rope	1	3,810	3,810
New Hastings, yellow, 2/0 ground sets (Complete set) -2-SYD, 2-BAD, 2-PHA, 2-STE	8	1,300	10,400
URD box locator for ANT, 1 for BAD, 1 for SYD	2	2,000	4,000
Hydraulic long hot stick saws	4	1,600	6,400
Fork type, High voltage ammeters,	6	1,800	10,800
6 ton Battery Operated Press	4	1,700	6,800
Eastern Territory Total			**$62,110**

Description	Quantity	Estimated Unit Cost	2012 ACE Plan
Central Territory			
Hydraulic Chain saw	3	$1,600	$4,800
Grounding set (2/0 grounds, transmission)	7	1,300	9,100
6 ton press	8	1,695	13,560
12 ton press	6	3,900	23,400
Sets of Dies for y-35 Press for New Sleeves	10	1,400	14,000
3 Phase Patten Jumper Sets - 15' - 2/0	4	4,800	19,200
Ground tester	1	6,000	6,000
U/G large corner guide 5X11" for significant cable pulls	1	1,500	1,500
Load pickup device (set)	5	2,000	10,000
Cable Locator	1	6,500	6,500
Live Line Phasing Sticks	2	2,000	4,000
Cable locating sonde fish tape	1	2,000	2,000
Box locator	1	2,000	2,000
Hydraulic Cutters	2	2,000	4,000
Battery powered cable cutters	2	1,000	2,000
Oil Pump and accessories	1	2,000	2,000
TDR	1	10,000	10,000
TTR - Transformer Tested 3/0	1	2,500	2,500
Air Monitors	4	2,000	8,000
Man hole Retractor	1	3,000	3,000
AMP Probe with universal attachment	4	1,900	7,600
DRA's for engineering	1	7,000	7,000
Central Territory Total			**$162,160**
T&D Asset			
Breakdown Allowance	1	$50,698	$50,698
Hot Stick Sets for New Trucks	10	2,500	25,000
Hydraulic Drills - Boom Tip	34	1,675	56,950
Handheld Data Collection Units - PETC	4	2,500	10,000
Portable Ground Sets	100	1,300	130,000
Climbing Belts (New Technology)	220	375	82,500
Rope Tester	4	2,918	11,672
Dielectric Rope	4	2,200	8,800
T&D Asset Total			**$375,620**
Fleet			
Snap on Boroscope Kit	1	$1,350	$1,350
Pressure washer (gas powered)	1	1,280	1,280
Wheel Balancer	1	9,100	9,100
Digital Dynamometer	1	1,500	1,500
Plasma Cutter	1	2,600	2,600
OTC air jack stands	1	1,495	1,495
Fleet Total			**$17,325**

Description	Quantity	Estimated Unit Cost	2012 ACE Plan
Telecom			
Electromagnetic Interference Detector	2	$4,500	$9,000
Fibre Optic Cable Test Set	2	4,000	8,000
Electro Sonic Power Sensor, model N8485A	2	2,000	4,000
Voice Test Set Electrodata ATS2	2	2,500	5,000
Frequency Power Meter with Power Sensor	1	15,000	15,000
Bird Technologies Analyzer model SA-6000EX	1	10,000	10,000
Installation, cable kits and connectors for SA-6000EX	1	2,500	2,500
Telecom Total			**$53,500**
System Maintenance			
Relay test set (i.e. Manta MTS-5000)	1	$52,000	$52,000
SF6 Gas Recovery Unit GRU-7	2	22,500	45,000
Phasing Sticks 2 sets	1	10,000	10,000
CT Test Set	2	17,500	35,000
Phase Angle Meter	1	2,000	2,000
70KV DC Bibble Test Set (Hipot)	1	10,000	10,000
Asea Current Measuring Test Plug	1	18,000	18,000
Current Injection Test Set	1	6,000	6,000
Winding Resistance Test Set	1	5,000	5,000
289 Fluke Multi-Meters (2 required)	2	1,000	2,000
12Ton Presses	2	3,900	7,800
Die Sets for 12 Ton Press	2	5,500	11,000
Meggers 10000Volt	4	2,300	9,200
Battery operated cutters Description : Huskie #REC-S540 ROBO CUT Tool	3	4,600	13,800
Sine Wave Inverters, 3000W	0	2,750	0
Truck Ramps	2	1,295	2,590
Retracta Jacks for ATV's	2	1,800	3,600
Cable Height Meter	2	1,200	2,400
System Maintenance Total			**$235,390**
P002 Tools and Equipment Total			**$971,345**

P015 Hydro Production Tools & Test Equipment	**$75,000**

	2012 ACE Plan
P016 Thermal Production Tools & Test Equipment	
POT Tools & Equipment	$51,000
POA Tools & Equipment	52,530
TUC Tools & Equipment	55,000
TRE Tools & Equipment	52,377
LIN Tools & Equipment	78,725
P016 Thermal Production Tools & Test Equipment Total	**$289,632**
Tools and Test Equipment Total	**$1,380,977**

Telecommunications

	2012 ACE Plan
P025 Mobile Radio	
Spare Parts	$38,778
Replacement Radio Equipment	30,000
Test MTR2000 Repeater Spares & Allocate	5,875
Equipment Repairs	13,300
P025 Mobile Radio Total	**$87,953**
P027 Telecommunication Radio & Fibre Ops	
HVAC and Generator Replacements	$112,435
Dartmouth East, Shelburne Site Repairs	23,460
Caledonia Building Repairs	4,660
Reconfigure Generator Alarms	4,820
Misc. repairs	13,995
P027 Telecommunication Radio & Fibre Ops Total	**$159,370**
P028 Telecommunication Systems Replace & Modifications	
Replace DM21 Equipment	$61,433
Upgrade Site Access Equipment	61,620
Install Newbridge Shelves	32,430
Removal of old Bayly Equipment	2,938
Batteries and chargers - replacement for failures	15,822
Misc. Power Supplies	5,000
UPS Repairs/Replacements	5,000
Misc. Newbridge eqpt.	18,820
Upgrade Network Access to Sites	14,550
Misc. Telecom Equipment	12,500
Cable & Entrance Protection	15,000
Switched Communications	5,000
Misc. Fibre Optics	52,373
Replace Ethernet Spread Spectrum Radios	19,520
Network Monitoring - replace net guardians	37,975

2012 ACE Plan

TLNX and Alarm Commissioning	11,750
Upgrade and Review System Drawings	39,900
Upgrade MDR8000 Capacity	16,930
Install Net Guardians at South Shore sites	24,463
P028 Telecommunication Systems Replace & Modifications Total	**$453,024**

P814 Telecommunications Spares

Alcatel-Lucent MDR8000 Microwave Radio spares	$80,000
Net Guardian Alarm Monitoring Equipment spares	24,000
MDS LEDR Radio spares	43,200
MDS SD9, Transnet, iNet spares	7,200
SEL2505, 2506 spares	8,000
Battery Charger Spares	10,000
Misc. spares	7,850
P814 Telecommunications Spares Total	**$180,250**
Telecommunications Total	**$880,598**

Computing and Asset Management

P010 SCADA Improvements		**2012 ACE Plan**
	This forecast is developed based on SCADA equipment/operator interfaces failures or modifications	
P010 SCADA Improvements Total		**$129,747**

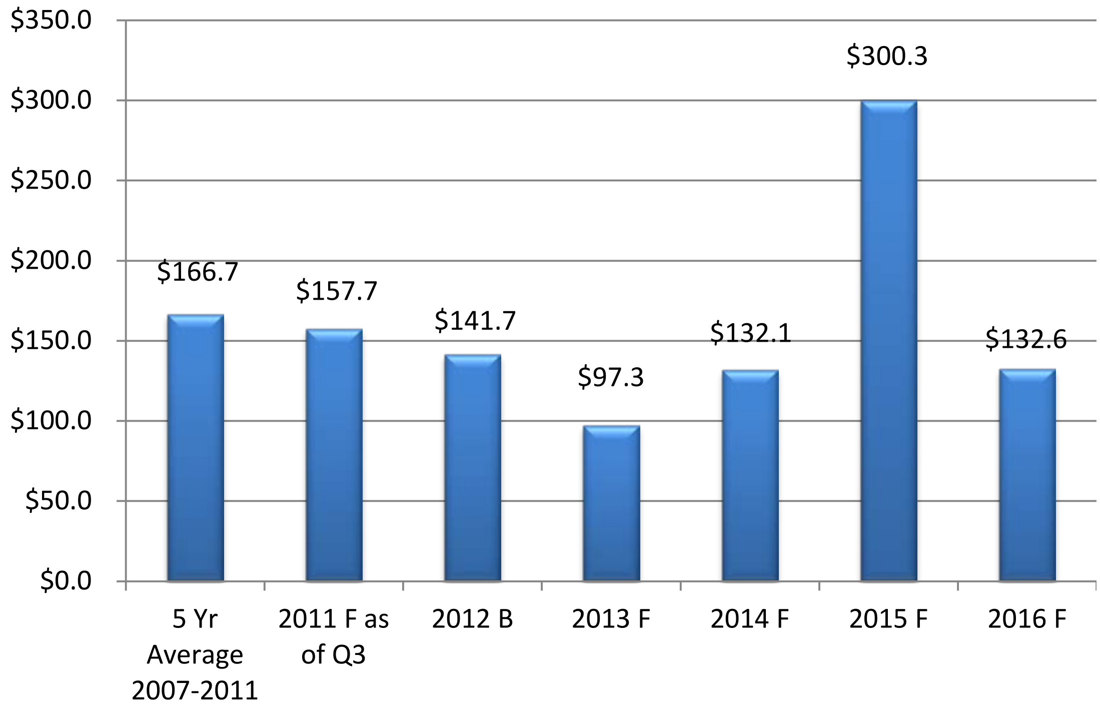
P031 NSPI IT Infrastructure

Infrastructure Component	Asset Management Plan	Volume to be Refreshed	2012 ACE Plan
Voice and Data Network	Network equipment that has or will reach seven (7) years old. (Measured in number of network ports)	1,635	$668,531
Servers	Servers that have or will reach six (6) years old	16	406,000
Laptop and Desktop Computers	Computers that have or will reach four (4) years old	450	743,162
	New laptop or desktop computers	100	308,172
	New software licenses	50	25,000
Monitors	Part of laptop/desktop refresh	400	125,000
Power Supplies	Replaced after 10 years	2	40,000
Accessories			25,000
P031 NSPI IT Infrastructure Total			**$2,340,865**

		2012 ACE Plan
P040 DCMS Equipment Replacement		
	CT's DCMS Equipment Replacement	$17,340
	LIN DCMS Equipment Replacement	51,000
	POA DCMS Equipment Replacement	28,283
	POT DCMS Equipment Replacement	30,000
	TRE DCMS Equipment Replacement	59,103
	TUC DCMS Equipment Replacement	71,400
		$257,126
	Computing and Asset Management Total	**$2,727,738**
Property Improvement and Furniture		
P001	FAC - Property Improvements	$2,410,000
P030	FAC - Lower Water Street	175,000
	Property Improvement and Furniture Total	**$2,585,000**
Other		
P012	HYD - Security Improvement	$750,000
P041	FAC - Land Acquisition Routine	150,000
P035	POA - Kelly Rock Limestone Quarry	28,263
P816	FAC - Environment Property Remediation	304,000
P815	FAC - Environment Site Assessment	179,500
P032	FAC - Equipment & Warehouse	400,000
	Other Total	**$1,811,763**
	Other Total	**$16,192,770**

3 Generation

(Millions of Dollars)



3.1 Generation Five Year Plan and Highlights

The focus for Generation capital investments in 2012 is renewable generation expansion and sustaining the current asset base. The Generation capital investment plan for 2012 is comprised of the following:

(i)	New 2012 capital spending for projects with total estimated project spend greater than $250K and for which approval is sought	$19.5
(ii)	New 2012 capital spending for projects with total estimated project spend greater than $250K for subsequent approval for which approval is not sought	31.2
(iii)	New capital spending for projects with total estimated spend less than $250K for which approval is not sought	8.2
(iv)	New capital spending for Point Aconi Generating Station	10.4
(v)	Carry-over capital spending	65.9
(vi)	Routine capital spending	6.3
	Total 2012 Generation Capital Investment Plan	**$141.7M**
	Request for ACE approval (Items i + vi)	**$25.9M**

3.2 Generation Carry-over Capital Spending Summary

Project Number	CI#	Project Title	Start Date	Final Date	Previous Expenditure	2012 Budget	Subsequent Spending	Total Estimate
Hydro Generation Plant								
H547	28678	HYD Renewable In-Stream Tidal Gen	2008/09	2013/12	$2,292,881	$400,000	$654,498	$3,347,378
	12079	SHH - RUF 1&2 RUNNER REPLACEMENT	2011/10	2012/10	78,460	744,394	0	822,853
H611	17583	HYD - BER-GUL - Electrical Refurbis	2011/01	2012/12	0	805,646	0	805,646
H602	16387	HYD- Ruth Falls #3 Runner Replmt	2010/12	2012/12	300,867	373,086	0	673,953
H608	40316	HYD - Barteaux Culvert Refurbish	2011/02	2012/10	91,698	376,162	0	467,860
H601	17853	HYD - STM-SAL #4 Runner	2010/12	2012/12	180,657	248,157	0	428,814
		Total Hydro Generation Plant			**$2,944,562**	**$2,947,444**	**$654,498**	**$6,546,504**
Steam Generation Plant								
S661	39029	Port Hawkesbury Biomass Project	2010/11	2013/08	$142,540,616	$55,971,533	$8,430,056	$206,942,205
S353	28098	TUC 6 Waste Heat Recovery	2008/07	2012/01	92,938,895	57,734	0	92,996,628
S428	34203	LIN Unit #3 Mercury Abatement	2009/04	2012/12	4,836,417	75,883	0	4,912,300
S430	34223	POT Mercury Abatement Project	2009/05	2012/12	2,848,440	75,528	0	2,923,968
S432	34242	TRE Unit #6 Mercury Abatement	2009/05	2012/12	2,146,121	75,528	0	2,221,649
S426	34182	LIN Unit #1 Mercury Abatement	2009/05	2012/12	2,064,489	75,203	0	2,139,692
S429	34222	LIN Unit #4 Mercury Abatement	2009/05	2012/12	1,994,723	75,528	0	2,070,251
S427	34202	LIN Unit #2 Mercury Abatement	2009/05	2012/12	1,984,954	74,995	0	2,059,949
S431	34224	TRE Unit#5 Mercury Abatement	2009/05	2012/12	1,885,911	75,528	0	1,961,439
S613	30954	LIN3-ESP Gas Flow Modification	2010/06	2012/07	18,881	1,608,606	0	1,627,487
	35083	LIN 2011 Ash Site Sealing and Cappi	2011/07	2012/10	63,911	973,936	0	1,037,847
S262	28457	TRE Ash Lagoon Closure	2007/10	2013/12	187,054	93,494	257,177	537,724
S672	39542	Generator Protection Improvements	2010/05	2012/12	182,280	338,518	0	520,798
	40363	LIN3 High Voltage Bushing Refurbish	2011/07	2012/10	67,469	433,360	0	500,829
S711	28393	POT 2A Mill and Feeder Refurbishmen	2011/06	2012/09	162,499	287,344	0	449,843
S849	38602	TRE - Fire System Upgrades	2011/09	2012/08	201,717	176,387	0	378,104
S877	39946	TRE - Wastewater Treatment Plant Up	2011/04	2012/10	158,913	176,099	0	335,013
S778	39939	TRE - Security Improvements (Phase	2011/05	2012/07	183,923	144,449	0	328,372
S714	40319	TRE - HVAC Replacements (2011)	2011/03	2012/06	180,413	131,597	0	312,010
S665	30283	POT - Tupper Vessel Access	2010/02	2012/08	141,959	129,272	0	271,231
	39940	TRE5 - Bottom Ash Refurbishment	2011/08	2012/12	50,820	205,214	0	256,034
	40371	LIN Training Facilities	2011/04	2012/04	132,761	117,447	0	250,208
S842	26472	TRE - 6A CW Pump Refurbishment	2011/12	2012/03	19,998	218,564	0	238,562
S826	39944	TRE6 - Fly Ash Line Replacement	2011/06	2012/07	17,222	216,127	0	233,349
S873	38850	LIN Flyash System Upgrade	2011/10	2012/06	160,320	56,003	0	216,322
S699	39762	TUC #3 CW Intake SSP Refurbishment	2011/03	2012/12	15,976	176,007	0	191,984
	40207	TUC- CO2 Purge System Upgrade	2011/05	2012/12	12,138	139,842	0	151,979
S782	40334	POT Refurbish Underground Valves	2011/04	2012/10	0	131,398	0	131,398
	37824	TRE5 - Common Water Pipe Replacement	2011/01	2012/12	0	128,289	0	128,289
	39982	TRE - Gauge Replacements	2011/09	2012/06	36,884	73,230	0	110,114
S783	40337	POT Replace WTP and WWTP Valves	2011/04	2012/07	0	102,091	0	102,091
		Total Steam Generation Plant			**$255,235,704**	**$62,614,734**	**$8,687,232**	**$326,537,670**

3.2 Generation Carryover Capital Spending Summary Cont'd

Project Number	CI#	Project Title	Start Date	Final Date	Previous Expenditure	2012 Budget	Subsequent Spending	Total Estimate
Wind Generation Plant								
W107	36882	Nuttby Mountain Wind Project	2009/12	2012/12	$111,437,284	$168,000	$0	$111,605,284
W115	39323	Digby Wind Project	2010/11	2012/12	65,687,997	206,184	0	65,894,181
		Total Wind Generation Plant			**$177,125,282**	**$374,184**	**$0**	**$177,499,466**
Total Generation Carry Over Spending					**$435,305,548**	**$65,936,362**	**$9,341,730**	**$510,583,640**

3.3 Generation New 2012 Capital Items for ACE Approval

Tab #	CI#	Project Title	2012 Budget	Project Total
	Hydro Generation Plant			
G01	40282	HYD- St Margaret's Bay - Coon Pond Dam Refurbishment	$2,595,361	$2,595,361
G02	31204	HYD - Dickie Brook - Donahoe Lake Dam Refurbishment	1,597,494	1,597,494
G03	41143	HYD - St Margarets Bay - Tidewater Surge Tank Refurbishment	1,211,641	1,211,641
G04	39042	HYD - Sheet Harbour - Ten Mile Lake Dam Decommissioning	1,018,923	1,018,923
G05	41138	HYD - Black River - Hollow Bridge Surge Tank Refurbishment	930,048	930,048
G06	23125	HYD - Sissiboo Falls - Electrical Equipment Replacement	845,755	845,755
G07	41127	HYD - Nictaux - Headcover Replacement	219,362	525,680
G08	41145	HYD - Mersey - Upper Lake Falls Rip Rap Replacement	516,420	516,420
G09	41140	HYD Sissiboo Falls - Tailrace Concrete Refurbishment	314,412	314,412
		Total Hydro Generation Plant	**$9,249,417**	**$9,555,735**
	Steam Generation Plant			
G10	41229	LIN - Cable Spreading Rooms Fire Protection	$918,292	$918,292
G11	41228	TUC - Unit 3 Turbine HP Impulse Blades Replacement	882,152	882,152
G12	28674	TRE6 - Human Machine Interface (HMI) Upgrade	867,805	867,805
G13	39923	TUC - Generator Excitation and AVR System Replacement	141,183	844,543
G14	37611	LIN3 - Generator Excitation & AVR System Replacement	819,469	819,469
G15	41441	TRE - Siding Replacement (Phase 2)	608,916	608,916
G16	41507	TRE6 - Air Heater Refurbishment	553,438	553,438
G17	41303	TRE6 - Waterwall Panel Replacements	548,225	548,225
G18	41549	TRE5- Main Steam Attemperator Replacement	535,227	535,227
G19	40655	LIN - Pulverizer Refurbishment	461,279	461,279
G20	41121	LIN - Cooling Water (CW) Pump Refurbishment	447,687	447,687
G21	40256	POT - Plant Siding Replacement	392,601	392,601
G22	41511	TRE6 - Condenser Waterbox and Cooling Water (CW) Piping Refurbishment	392,172	392,172
G23	41503	TRE6 - Steam Turbine Control Valve Refurbishment	359,507	359,507
G24	41508	TRE6 - Turbine/Generator Fire Protection	347,079	347,079
G25	41584	POT Vacuum Pump Replacement	332,994	332,994
G26	28645	TRE6 - Turbine Controls Power Supplies Replacement	321,691	321,691
G27	38163	TRE6 Pulverizer Refurbishments	311,074	311,074
G28	41251	TUC3 - Turbine High Pressure (HP) Cylinder Fastener Replacement	275,729	275,729
G29	41620	TUC3 Turbine Generator Fire Protection	272,743	272,743
G30	41561	POT - Maintenance Facilities Refurbishment	258,558	258,558
G31	41124	LIN-Cooling Water (CW) Screen Refurbishment	251,544	251,544
		Total Steam Generation Plant	**$10,299,366**	**$11,002,726**
	Total Generation New Spending		**$19,548,783**	**$20,558,461**

3.4 Generation Capital Items Presented by Investment Category and Asset Class

In addition to the capital categories described in section 1.4, Generation investments can further be described by investment category and asset class. Generation projects are included within one of the following investment categories:

- Renewable Energy Investments
- Mercury Abatement
- Regulatory Compliance
- Equipment Replacement
- Equipment Refurbishment
- Equipment Upgrade
- Asset Retirement
- Capital Spare Parts

The breakdown of 2012 generation capital projects by investment category is illustrated below in figure 3.4.1.

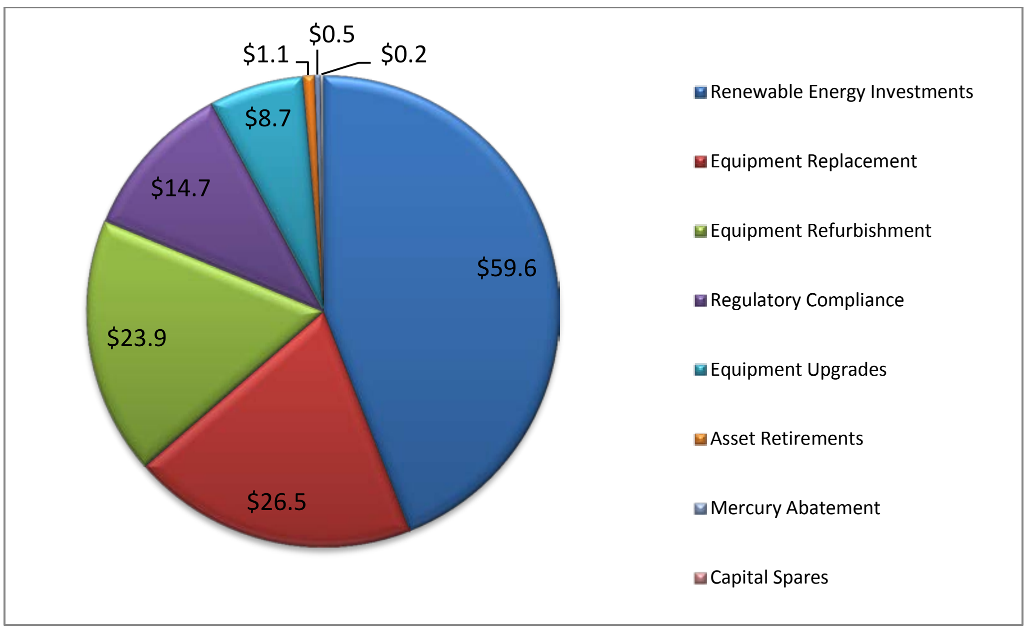


Figure 3.4.1: 2012 Generation Capital Spending Plan by Investment Category
(Millions of Dollars)

Renewable Energy Investments

The projects included in this investment category are part of NSPI's transformation from fossil fuel-based generation to renewable generation sources such as wind, hydro, biomass and tidal. An example of a capital project in this investment category is the

Port Hawkesbury Biomass Project. All projects in this investment category are included in Table 3.4.1.

Mercury Abatement

These projects include the installation of mercury-capture equipment designed to remove mercury from the flue-gas stream of coal-burning generating units and ensure mercury emissions are within Nova Scotia's air quality regulations. As illustrated in Table 3.4.2, the majority of the work related to mercury abatement has already been completed. The remaining investment planned for 2012 is for completion of these projects based on initial operating experience.

Regulatory Compliance

In certain cases, capital investments are made in order to comply with environmental and health and safety regulations as well as codes or standards. Examples of generation projects in this investment category include ash site management projects at thermal stations and projects that are required to comply with North American Electric Reliability Corporation (NERC) standards. All generation projects in this investment category are included in Table 3.4.3.

Equipment Replacement

Over the course of time, equipment experiences normal wear and degradation and eventually reaches the end of its design life and must be replaced. Equipment may also become obsolete and require replacement because it is no longer supported by the Original Equipment Manufacturer (OEM) and spare replacement parts are no longer available. As such, this investment category is further broken down into Equipment Replacement (End of Life) and Equipment Replacement (Obsolescence). Replacing equipment that has reached the end of its useful life or has become obsolete mitigates the risk of equipment failure and unplanned generating unit outages.

Examples include steam turbine blade replacements, replacement of heating ventilating and air conditioning (HVAC) equipment and replacement of Distributed Control and Management System (DCMS) equipment. All projects in this investment category are included in Tables 3.4.4.1, 3.4.4.2, 3.4.5.1 and 3.4.5.2.

Equipment Refurbishment

Over the course of time, equipment experiences normal wear and degradation and must be refurbished in order to maximize the operating life of the equipment and ensure continued reliable operation. The option to refurbish existing equipment is selected over replacing whenever it is economically feasible to do so. Equipment refurbishments typically include replacement or refurbishment of individual equipment components; and not complete replacement of a piece of equipment. For example, replacing a number of cooling water (CW) pump components that have reached end of life would constitute refurbishment of the CW pump.

Equipment that is commonly refurbished includes, boilers, pulverizers, boiler feed pumps, cooling water (CW) pumps and CW screens. All projects in this investment category are included in Table 3.4.6.1 and 3.4.6.2.

Equipment Upgrade

Modifications to existing equipment and additions of new equipment that improve an existing process, efficiency or reliability of the generating Unit and add economic value are considered to be equipment upgrades. Projects that involve upgrading equipment to current-day standards are also included in this investment category.

Examples of equipment upgrades include the addition of new biofouling control equipment to improve condenser efficiency and generating unit heat rate, replacing a boiler steam coil with upgraded materials with a longer design life than the existing coil and upgrade turbine control power supplies to current-day standards. All projects in this investment category are included in Table 3.4.7.1 and 3.4.7.2.

Asset Retirement

There are circumstances in which an asset or equipment has reached the end of its useful life and is no longer required or beneficial to the operation of the generating unit. In these cases, it is more beneficial to remove and retire the asset or equipment than it is to replace or refurbish it.

An example of this is the decommissioning and removal of the Ten Mile Lake Dam on the Sheet Harbour hydro system. It is more economical to decommission and remove the dam than it is to refurbish it. All projects in this investment category are included in Table 3.4.8.

Capital Spare Parts

As part of the operation of NSPI's generating assets, capital spare parts must be on hand to ensure the safe, effective and reliable provision of service to customers. A capital spare part satisfies each of the following three guidelines:

1. The part or component must be used or utilized for greater than one year;

2. The part or component meets the materiality threshold identified in the Company's Accounting Policies and Procedures.

3. The part or component is critical to the safe, reliable and effective operation of the system and is required to mitigate a moderate, high or catastrophic risk of asset failure.

All projects in this investment category are included in Table 3.4.9.

ASSET CLASSES:

Each of the preceding investment categories have been further broken down by asset class to illustrate the makeup of the capital investments within each investment category. For example, all equipment replacement projects related to steam turbines are grouped together in Table 3.4.4.2 to provide insight into the total estimated 2012 equipment replacement capital spend related to NSPI's steam turbines.

Turbines:

Description
Steam turbines couple to the main electrical generator, which together, convert mechanical energy to electrical energy and enable the generation of power. Turbines are critical to the operation of the generating unit

Quantity
There are 12 steam turbines in the NSPI generation fleet.

Size Range
50MW to 190 MW

Operating Environment
All Turbines operate in a well-controlled and clean environment.

Design
All turbines include multiple pressure sections into steam condensers. Original Equipment Manufacturers (OEMs) include: Toshiba (five units), Siemens (four units), Alstom (three unit), Hitachi (one unit) and Mitsubishi (one unit).

Expected Life
All turbines are original to each generating unit's construction and are generally designed to last the life of the generating unit. It is expected that major component replacements will be required approximately 25 years after the in-service date. As there are many components and a variety of operating regimes, major components require a Life Cycle Plan which includes inspections, assessment, and planned repairs and replacements.

Service
Historically, NSPI turbines have been base loaded units. However, with the introduction of renewable sources of generation, many units are experiencing increased cycling and reduced loading service.

Major Overhauls
Major maintenance cycles are nominally eight years. Actual cycles are based on operating hours and condition assessment which determines duration between outage cycles. Known issues or predictive analysis can also prompt a major overhaul activity. As the turbine fleet continues to age, Life Cycle Management and End of Life Planning are becoming influencing forces in outage cycles.

Criticality and Condition Assessment:

Criticality: Very high

Condition Assessment is based on the following factors:

- History
- Vibration and turbine performance data
- Hours of service
- OEM inspection results and recommendations
- Industry experience
- Expert support

Steam Generators:

Description:
Electrical generators coupled to steam turbines convert mechanical energy to electrical energy thereby enabling the generation of power. Their function is critical to the operation of the generating unit

Quantity:
There are 12 steam-coupled electrical generators in the NSPI generation fleet.

Size Range:
50MW to 190 MW

Operating Environment:
All Turbines operate in a well-controlled and clean environment.

Design:
All Generators are 3600 rpm, hydrogen-cooled, 4160V output machines. OEMs include: Toshiba (five Units), Siemens (three Units), Alstom(one Unit), Hitachi (one Unit), Mitsubishi (one Unit).

Expected Life:
All but one of the generators (Trenton Unit #5) are original to each generating unit's construction and it is anticipated that all generators will last for the remaining life of each plant.

It is expected that major component replacements will be required once a generator has reached approximately 30 years of service. As there are many components and a variety of operating regimes, major components require a Life Cycle Plan, including inspections, assessment, and planned repairs and replacements.

Service:
Historically, NSPI's steam generators have been base loaded units. With the introduction of renewable sources of generation, many units are experiencing increased cycling and reduced loading service.

Major Overhauls:
Major overhaul cycles are historically in the range of eight to ten years. Actual cycles are based on operating hours which may influence duration between outage cycles. Known issues or Predictive Analysis can also prompt a major overhaul activity. As the fleet continues to age, Life Cycle Management and End of Life Planning are becoming influencing forces in outage cycles.

Criticality and Condition Assessment:

Criticality: Very high

Condition Assessment is based on the following factors:

- History
- Vibration and turbine performance data
- Hours of service
- OEM inspection results and recommendations
- Industry experience
- Expert support

Generator Excitation System & Automatic Voltage Regulator (AVR):

Description:
Each generator requires an excitation system to deliver excitation to the generator field winding (rotor winding). The excitation system responds to generator conditions and controlling inputs to control generator voltage and power factor. The excitation system is essential to the operation of the generating unit.

Quantity:
All 12 thermal plant generators, 53 hydro generators and combustion turbine generators have an excitation system.

Size Range:
Excitation systems are sized to match the requirements of the mated generator.

Operating Environment:
All generators and excitations systems operate in a well-controlled and clean environment.

Design:
There are several designs in use within NSPI, however all excitation systems have a supply source (excitation transformer or independent rotating exciter) and a field control system (electrical and electronic devices which control the electrical supply to the field winding).

Expected Life:
While the electrical sources typically have long lives, the electrical/electronic devices (breakers, power electronics and controllers) would likely require replacement near midlife (approximately 25years).

Service:
As predominantly electrical systems, exciters tend to function well with modest maintenance for a known service life. Aside from the field breaker, most other components would not be expected to have their life limited by the service condition.

Major Overhauls:
It would be expected to have major overhaul and component replacement near the midlife of an exciter, power electronics would require replacement, breakers would be refurbished or replaced and windings would be reinsulated.

Criticality and Condition Assessment:

Criticality: Very high

Condition Assessment is based on the following factors:

- Maintenance History
- Hours of service
- OEM recommendations on service life
- Industry experience

Boilers:

Description:
Water from high-pressure (HP) feedwater systems enters the boiler and is heated past its boiling temperature to produce superheated steam. The superheated steam produced in

the boiler enters the steam turbine, causing the shaft of the turbine to rotate when the steam passes over the turbine blades.

The boilers in NSPI's fleet are fired with a variety of solid, liquid and gaseous fuels, including coal, petroleum coke, heavy fuel oil, natural gas and light oil fuel oil for start-up purposes. Only the three Tufts Cove generating units are designed to fire natural gas. The boiler, steam turbine and generator act together to produce electrical energy and are some of the most important elements of NSPI's five thermal generating stations.

Quantity:
There are 12 steam boilers currently in operation in the NSPI generation fleet. The Port Hawkesbury Biomass Unit will result in 13 operational steam boilers once this generating unit is fully commissioned.

Size Range:
Nominal steaming capacity ranges from 50 to 190MW.

Environment:
Located in the main builder of the thermal plant, boilers are typically housed in a dedicated structure or boiler house. In coal units, the boiler house is considered a moderate environment. Due to the nature of fuel and ash, it is a continuous effort to maintain moderate temperatures and cleanliness within the boiler house. While these environmental conditions do not impact the boiler iteself, there is an impact on associated equipment (motors, pumps, electrical equipment and instruments).

The internal components of the boiler are subjected to an environment of extremely high gas temperatures approaching 1,000 degrees Celcius and steam temperatures greater than 500 degrees Celcius.

Design:

Firing Methods

- Tangentially- Fired
- Front-Fired
- Cyclone
- Circulating Fluidized Bed (CFB)
- Multi-level Heavy Oil Firing
- Duel Fuel (Oil and Gas)

Major Components include:

- Steam Drum
- Headers
- Boiler Tubes (Water Wall, Superheater, Reheater, Economizer)

Expected Life:
Generally the same as the expected life of the plant. However, Boilers require significant refurbishment and select component replacements over their lives in response to the effects of long-term exposure to elevated temperatures, temperature cycling, erosion and corrosion.

Service:
Historically, NSPI Boilers have been base-loaded units. However, with the introduction of renewable sources of generation, many units are experiencing increased cycling and reduced loading service.

Refurbishments and Component Replacements:

- Boiler Tube wastage rates are monitored and used to determine timing and scope of component replacements (waterwalls, reheaters, superheaters and econimizer sections).
- Typical refurbishment cycle is in the order of five to ten years, but is highly dependent on fuel and unit utilization. Gas units would have a much less frequent rate of refurbishment and component replacements.
- Refurbishments are completed in stages. Sections of waterwalls are replaced on a rotating basis as opposed to all at once.
- Selective Replacements: Smaller sections of boiler tubes are replaced annually based on inspection results.

Criticality and Condition Assessment:

Criticality: Very High. Failure of any internal component results in loss of generation. Furthermore, the elevated design temperature and pressures within the boilers result in higher potential consequences in the event of a failure.

Condition Assessment is based on the following factors:

- Operating and maintenance history
- Non-destructive testing (NDT)
- Hours of service
- Fuel
- Engineering assessments

Condensers:

Description:
Each generating unit includes a condenser (part of the condensing system) which serves two purposes:

- Converts turbine exhaust steam to water for reuse as boiler feed water. Large quantities of processed water are utilized in the steam cycle and the condenser is vital to minimizing the consumption and treatment of water.

- The condensing process creates a vacuum within the condenser thereby increasing the pressure drop across the turbine (low-pressure section of the turbine) and increasing the energy extracted from the steam.

The condenser is essentially a large heat exchanger. Cooler seawater is pumped through the tubes in the condenser which results in extraction of energy from turbine exhaust steam, thereby condensing the steam for delivery to the feed water system.

Quantity:
There are 12 condensers in the NSPI generation fleet.

Size Range:
Physically, condensers are very large and their footprint is comparable to the turbine itself. The condenser is designed and sized to service the condensing requirements of the steam turbine.

Operating Environment:
Condensers are subjected to harsh salt-water operating environments. The salt-water on one side of the condenser creates issues with biofouling and corrosion, while the condensing steam on the other side of the condenser introduces issues related to erosion.

Design:
Each condenser is designed to meet the condensing needs of its mated steam turbine. Material specification, cooling water source, volume of cooling water required and operating pressure are all considered in the unique design of each condenser.

Condensers contain a series of large valves which allow the manipulation of cooling water flow to enable 50 percent operation in support of trouble shooting and maintenance as well as backwashing (regular on-line cleaning).

Expected Life:
All condensers are generally designed to last the life of the generating unit. It is expected that major component replacements will be required approximately 25 years after the in-service date. In particular, it is common to have a major condenser tube replacement near midlife as a result of a particularly aggressive salt-water operating environment (bio-fouling or chemical attack).

Service:
Historically, NSPI's generating units have been base-loaded. With the introduction of renewable sources of generation, many units are experiencing increased cycling and reduced loading service. Although this operating mode will reduce effects of steam-side erosion, condenser biofouling and electrochemical concerns will need to be monitored to understand the effects on the cooling water side of the condenser.

Major Overhauls:
Condensers require annual inspection and maintenance. Tube plugging and tube inserts are the most common activities to reduce the incidence and effect of condenser tube leaks. It is anticipated that condensers will require a major re-tubing retrofit during the typical like of a unit. While tube failures are common, repair and mitigation methods are relatively inexpensive. Over time, accumulating failures will diminish condenser performance such that re-tubing is required.

Condensers require ongoing refurbishments to valves, waterboxes and associated piping and it should be anticipated to perform more major refurbishments to the condenser waterbox structure, waterbox lining, pipe lining, and valves several times throughout the life of the unit.

Criticality and Condition Assessment:
Criticality: High. Essential to the operation of the generating unit. However, most common failures can be remediated quickly and with modest expense.

Condition Assessment is based on the following factors:

- Maintenance History
- NDT (Eddy Current Testing) to detect tube anomalies
- Annual Inspections of Water Boxes, Tube Sheets, Valves and Steam Space

Cooling Water (CW) Pumps:

Description:
Cooling Water (CW) Pumps supply cooling water (sea water) to the condensers, and their function is critical to the operation of the generating Unit. It is typical for each generating Unit to have two CW pumps. During winter operation, the cooling water

temperature is low enough that only one pump is typically required to service the condensing requirements. During the warm water season, both pumps must operate together to supply a higher volume of warmer water to service the condensing requirements.

Quantity:
There are 24 CW Pumps in NSPI's thermal generation fleet.

Size Range:
CW pumps have motors that range from 500HP to 1,000 HP depending on the condensing system design. There are considerable condensing system design differences from plant to plant.

Operating Environment:
In many plants, the CW pumps operate in a very harsh salt-water environment. At Lingan, for example, sea water, sea water spray, seaweed, and heat all contribute to a severe operating environment. Point Aconi on the other hand, has a sophisticated seawater inlet system which provides for a much less harsh operating environment for the CW pumps.

Design:
Low speed, vertical, submersed pumps.

Expected Life:
Pumps are typically designed to last for the life of a plant and several refurbishments are required over the life of the pumps. In the most extreme service conditions, replacement versus refurbishment may be recommended provided that economic analysis supports this option.

Service:
The service varies by plant location, but generally, CW pump service is considered to be severe, as the pumps are often exposed to large matts of seaweed or mussels.

Refurbishments and Overhauls:
The average refurbishment cycle for a CW pump is approximately eight to ten years. Major midlife overhauls may include shaft and impeller refurbishment or replacement, bearing replacement, and extensive casing refurbishment. Refurbishment costs from plant to plant vary as a result of failure mechanisms specific to each plant, and difference in size of the pumps and design of the pumps and pump houses.

Criticality and Condition Assessment:

Criticality:
High. CW pumps are essential and pump redundancy is seasonal (winter months only).

Condition Assessment is based on the following factors:

- Pump operating history
- Vibration data
- Hours of service
- Engineering Assessments

Boiler Feed Pumps:

Description:
Boiler Feed Pumps (BFPs) supply water to the boiler. Their function is critical and it is typical for each Generating Unit to have two pumps, or 100% redundancy.

Quantity:
There are 24 BFPs in the NSPI generation fleet.

Size Range:
One of the largest rotating equipment elements in each Plant, with an average motor size of approximately 3,000HP

Environment:
Located in the plant and typically in a protected environment.

Design:

Multistage pumps of various designs.

Expected Life:
Generally the same as the expected life of the plant.

Service:

- Extremely high pressures.
- Historically base loaded, but an increasing number of BFPs are becoming exposed to cycling conditions.

Refurbishments:

- Infrequent but typically very costly.
- Rotating components (cartridge) requires rebuild approximately every 10 years depending on duty (cycling, start/stop, Unit upsets).

- Mid-life overhauls are typically required to manage effects of FAC (Flow-Assisted Corrosion) on the pump body, covers, and nozzles.

Criticality and Condition Assessment:

Criticality:
High - Redundancy is built in which moderates criticality.

Condition Assessment is based on the following factors:

- Operating history
- Vibration data
- Oil analysis
- Non-destructive testing (NDT)
- Hours of service
- Balance pressure analysis
- Engineering assessments

Coal Pulverizers:

Description:
Pulverizers are used to size solid fuel (coal) for optimum combustion within the boiler. Most pulverizers within the fleet are table and roll design with the exception of Trenton Unit #5 and Unit#6, which utilizes ball mill pulverizers to pulverize the fuel.

Quantity:
There are 27 pulverizers throughout the fleet (Lingan, Point Tupper and Trenton Generating Stations). There are no pulverizers at Pt. Aconi or Tufts Cove.

Size Range:
Generally, each unit has excess pulverizing capability to enable maintenance on one pulverizer while maintaining full load capability of the generating unit. There are circumstance related to fuel blend or fuel quality during which all pulverizers are required to support full generating unit loading.

Environment:
Pulverizers are located within the Boiler House in close proximity to the boiler. By its very nature, pulverizing creates a very harsh operating environment.

Design:
The most common design is table and roll. Large rollers crush the coal on the table to a particle size small enough that the attached fan (exhauster) can lift the pulverized fuel from the pulverizer and deliver the fuel to the boiler.

Major Components include:

- Table
- Rolls
- Exhauster Fan
- Worm Gear
- Shafts
- Air Dampers

Expected Life:
Generally the same as the expected life of the plant. However, pulverizers require frequent refurbishments at approximately 10,000 hours of service. This service period varies widely dependent on the nature of the coal. In recent years, the upgrade to ceramic components has resulted in a dramatic increase in service life (approximately doubled) for key components.

Service:
It is typical to operate three of four pulverizers at high load while having reserve capability to address planned pulverizer outages. Frequent short outages to make adjustments and minor repairs is common, given the harsh operating environment.

Refurbishments:

- Pulverizer rebuilds typically include:

  - Roll and table weld overlay
  - Bearing repair and replacements
  - Exhauster fan repair
  - Exhauster body repair

Criticality and Condition Assessment:

Criticality: Medium. There is generally excess pulverizing capacity, so the consequence of a single failure is usually marginal.

Condition Assessment is based on the following factors:

- Operating and maintenance history
- Non-destructive testing (NDT)
- Hours of service
- Fuel
- Inspection results

Electrostatic Precipitators:

Description:
Electrostatic precipitators (ESP) are connected to the outlet of the steam generator (boiler) and are used to remove the flyash particulate resulting from the combustion of coal and heavy fuel oil. ESPs are critical to the operation of the steam generator to meet the plant operating permit for stack opacity and particulate emissions. A loss in performance of the ESP will result in a loss of generation capacity and/or a forced unit outage until the ESP is repaired.

Quantity:
There are 10 ESPs in the NSPI generation fleet.

Size Range:
See Table 1 for information on ESP location and design information.

Operating Environment:
ESPs treat hot dust-laden flue gas as it exits the generating unit and remove the flyash prior to the flue gas exiting the stack to the environment.

Design:
The NSPI ESPs all operate on the same principles. The ESP produces a high voltage (45,000 to 65,000 volts), low current DC charge on a series of electrodes which emit electrons to produce an electrostatic charge on the flyash particles. The charged particulate particles are then attracted to corresponding collector plates which are electrically connected to ground. The collector plates are then periodically rapped to dislodge the dust which then falls into collection hoppers for removal and transportation to flyash storage silo.

ESPs are rated based on their relative size for the amount of flue gas being treated. The rating is characterized as SCA (specific collection area) which is the ratio of the number of square feet of collecting surface per 1000 actual cubic feet per minute of flue gas.

Expected Life:
ESPs were designed to last the life of the generating unit. However, they operate in harsh, dirty and corrosive conditions and require regular inspection and repair to maintain their intended performance levels.

ESP controls are constructed of electronic modules, that much lie like personal computers, become obsolete and require replacement and/or upgrade after five to ten years of service.

Service:
ESPs were designed for specific fuels in use at the time of the original plant construction. Changes in the fuel characteristics can result in significant changes in the

performance of the ESP and the corresponding stack opacity. For example, the Lingan ESPs were designed for high sulphur, low resistivity flyash coals. Current low sulphur coals produce high resistivity flyash which is harder to collect which requires the ESP to maintain a higher level of performance and availability than when they were first constructed in order to maintain the stack opacity within the plant operating permit requirements

Refurbishments:

- Structural repairs to precipitator building and ash vessels
- Transport System (valve, piping) replacements

Major Overhauls:

ESPs require inspection and maintenance repairs at each regular unit maintenance outage.

ESP modifications and up-grades are sometimes required when fuel and plant operating conditions change from the original design conditions.

Condition Assessment is based on the following factors:

- Operating history
- Internal inspection
- External inspection
- Electrical equipment testing
- External expert technical support

Criticality and Condition Assessment:

Criticality: High

Precipitators are required in order to meet emissions requirements. They can be operated at partial load but this often results in a unit derating to maintain emission compliance.

Equipment failure impact:
Loss of generation capacity up to and including a forced unit outage.

Ash Management:

Description:
Ash is a byproduct of the combustion process at all of NSPI's thermal generating stations using fossil fuels to generate electricity. The quantity of ash generated through the combustion of solid fuels such as coal is much greater than that produced from liquid fuels such as heavy fuel oil.

Ash is captured in combustion process in the form of:

1. Bottom Ash: heavy ash that drops out of the combustion process in the combustor or front end of the boiler.

2. Fly Ash: Ash that is carried in the flue gas to the back end of the combustor and is extracted in the precipitators or baghouses.

Ash is transported to ash sites where it is landfilled. Ongoing investment in ash sites is essential to ensure the ash sites are in compliance with environmental regulations as well as ensuring there is sufficient landfill capacity to sustain continued operation of the generating units. In addition to ash management, all ash-contacted water must also be captured and treated.

Quantity:
Each of NSPIs coal-fired generating stations operate and maintain ash handling sites and associated water management facilities.

Size Range:
The footprint of the ash management sites is a function of the amount of fuel consumed, the quantity of ash in the fuel and, in the case of Point Aconi, the quantity of limestone required to capture sulfur. Ash sites typically occupy many acres.

Environment:
Ash sites consist of very large outdoor ash management areas. They are exposed to the elements and therefore need to be managed through a range of environmental effects including: heavy rains - resulting in potential water management issues, dry weather - resulting in potential airborne ash issues.

Design:
Ash sites are typically designed in large cells with consideration for expansion to meet future ash management needs. Modern ash site development includes fabric or other barriers beneath the ash deposition areas. This ensures all ash-contacted water is captured, managed, reused where possible and treated before being releases to the environment.

Expected Life:
An ash site is generally selected to service the ash management needs of a generating station through its life. However, individual ash cells within each ash site are developed as required to provide an area for ash deposition over a five to ten year period.

Service:
Ash site utilization is a function of generating station operation and volume of ash created through the combustion process. The volume of ash generated is dependent on the quantity fuel used to generate electricity. A minimum level of monitoring and

maintenance of ash sites is required regardless of the volume of ash produced.

Refurbishments:

- Cell repairs to berms, liners
- Repairs to piping, valves, silos

Criticality and Condition Assessment:

Criticality: High. Ash sites rate high, as failures have potential to impact the environment and development of new ash cells is required to support ongoing operation of the generating station.

Condition Assessment is based on the following factors:

- Environmental monitoring
- Inspection
- Maintenance history

Dams:

Description:
The purpose of dams is to capture and store water during periods of rainfall and snowmelt, and use that water to generate electricity by channeling the water through a hydro turbine-generator located in the powerhouse. Dams typically consist of earthfill, rockfill, concrete, timber crib, or a combination of these materials.

Quantity:
NSPI owns and operates approximately 155 dams ranging in size from 3 feet to165 feet in length. These dams range in age from a few years old to more than 90 years old.

Service Life:
The anticipated service life of dams is dependent on their initial construction, the materials they are composed of and the service environment to which they are exposed. In general, a service life of greater than 60 years is expected.

Design Assessment / Performance Monitoring:
All of NSPI's dams are inspected semi-annually; once in the spring and once in the fall, by trained NSPI operating personnel. Data from instrumentation installed in the dams is also recorded and reviewed. In addition, a detailed condition assessment and design adequacy assessment of the dams is reviewed every seven years by external independent dam safety experts. These reviews are termed "Dam Safety Reviews".

Refurbishments:
The design and refurbishment of dams is carried out in accordance with the design

criteria of the Canadian Dam Association's Dam Safety Guidelines. Usually, refurbishments arise from findings of the Dam Safety Reviews, or from the semi-annual dam inspections. Refurbishments usually consist of revising the discharge facilities to increase their flood handling capacity, rehabilitating the structure to address material deterioration (concrete structures),or modifying the structures to address stability deficiencies in either the earthfill structures or concrete structures.

Pipelines:

Description:
Pipelines convey water from the reservoir (lake) to the hydro turbine-generator located in the powerhouse. Pipelines may be constructed of rolled plate steel, spiral-wound steel, fibre-reinforced plastic, plastic (high density polyethylene), reinforced concrete, or wood staves. In addition, pipelines may be buried below ground level, partially exposed, or fully exposed above grade supported on blocks or "saddles".

Quantity:
NSPI owns and operates approximately 20 sites where pipelines form a part of the water conveyance system. These pipelines range in age from a few years old to more than 90 years old.

Service Life:
Similar to dams, the anticipated service life of pipelines is dependent on their initial construction quality, the materials they are composed of and the service environment to which they are exposed. In general, a service life of 40 to 60 years is considered average.

Condition Assessments:
All of NSPI's pipelines are inspected periodically by NSPI operating personnel. Where issues are suspected, detailed engineering condition assessments are performed by either NSPI engineering personnel or external consultants specializing in this field of work.

Refurbishments and Replacements:
The refurbishment of pipelines usually consist of removal of vegetation near the pipeline, improvements to the surface drainage of the surrounding ground, improvements to the supporting elements (cradles), blasting and coating the exterior and interior of steel pipelines and replacement of deteriorated wood staves and pipe banding on wood stave pipelines. In some cases, complete removal and replacement of the entire pipeline is required.

Surge Tanks:

Description:
Surge tanks are vertical "chimney-like" water towers that form part of a pipeline. They are typically located close to the powerhouse and are only required on relatively long pipelines. The purpose of surge tanks is twofold: a) they reduce the rise in water

pressure inside the pipeline (limit the upsurge) when the generating unit shuts down and the water in the pipeline decelerates from its normal supply velocity to zero, and b) they provide a temporary volume of water for the unit when it first starts up (limit the downsurge) until the water in the pipeline accelerates from zero to its normal supply velocity.

Quantity:
NSPI owns and operates 14 sites with surge tanks. These surge tanks range in age from a few years old (Dickie Brook development) to more than 90 years old (Sandy Lake and Coon Pond developments).

Service Life:
Similar to pipelines, the anticipated service life of surge tanks is dependent on their initial construction quality, the materials they are composed of and the service environment to which they are exposed. In general, a service life of 40 to 60 years is considered average.

Condition Assessments:
All of NSPI's surge tanks are inspected periodically by NSPI operating personnel. In addition, detailed condition assessments are performed every seven years by external consultants specializing in this field of work.

Refurbishments:
The refurbishment of surge tanks usually consists of blasting and coating the exterior and interior of the surge tanks. In some cases, replacement of deteriorated concrete footings is required and for more advanced deterioration, complete removal and replacement of the entire surge tank.

Electrical Equipment:

Description:
The electrical equipment in the powerhouse generally refers to oil-filled circuit breakers, power cables, control relays, protective relays, and voltage regulators. This equipment is the link between the electrical generator in the powerhouse and the substation in the powerhouse yard. It provides protection and controls to the generator.

Quantity:
Electrical equipment of this nature is present at all 33 hydro generating powerhouses.

Service Life:
The service life of electrical equipment of this nature is in the 25 to 40 year range. However, this equipment generally becomes obsolete sooner, resulting in difficulty in obtaining spare parts and troubleshooting.

Condition Assessments:
A condition and risk assessment of the medium voltage switchgear at a number of NSPI powerhouses was undertaken by an external consultant. The assessment revealed the existing oil-filled circuit breakers, power cables, control relays, protective relays, and voltage regulators at five NSPI powerhouses are obsolete and have reached the end of their safe working life.

Refurbishments:
The refurbishments of electrical equipment generally consists of complete replacement of existing circuit breakers, power cables, control relays, protective relays, and voltage regulators with modern protection and control equipment.

Runners

Description:
A runner is the component of the mechanical equipment in the water passage which the water strikes and causes to turn, converting the static and kinetic energy of the water into mechanical energy. This turns the shaft in the generator, which generates electricity. There are typically three main types of runners: Kaplan, Francis, and Pelton. NSPI's runners are Kaplan and Francis style runners.

Quantity:
NSPI owns and operates 53 hydro generators and, therefore, 53 runners. These runners range in age from new to more than 90 years old.

Service Life:
The service life of a hydro runner is typically in the range of 40 years, depending on the actual run time on the runner, and the maintenance history.

Condition Assessments:
Annual mechanical inspections are carried out on all of NSPI's generating units, including the runners. The runners are checked for signs of cracking, cavitation, mechanical contact damage from debris in the water, seal clearances, etc. Repairs are undertaken in-situ where access allows for it. Significant repairs may require the turbine to be removed for repair in a machine shop.

Refurbishments and Replacements:
Runners are typically replaced rather than refurbished. Runners are usually replaced due to cracking or considerable cavitation (which both result from the older design of the original runners). Since modern runners are much more efficient than runners from several decades ago, runners may also be replaced to take advantage of efficiency increases.

3.4.1 Generation – Renewable Energy Investment

Table 3.4.1: Generation – Renewable Energy Investment Capital Items

CI#	Project Title	2012 Estimate	Total Estimate	Related Capital Items 2012 & +/- 2 years
Wind Generation				
36882	Nuttby Mountain Wind Project Development	$168,000	$111,605,284	2009 - CI 37942 – Nuttby Wind Project Substation- $2,895,574 2009 - CI 37944 – Nuttby Wind Project Transmission Interconnection- $516,173
39323	Digby Wind Project	206,184	65,894,181	2010 - CI 39626 – Digby Wind Project Substation- $4,586,277 2010 - CI 39627 – Digby Wind Project Network Upgrades- $4,156,325 2010 - CI 39628 – Digby Wind Project Interconnection- $3,270,060
Wind Generation Plant - Renewable Energy Investments Total		**$374,184**	**$177,499,466**	
Hydro Generation				
38868	HYD Marshall Falls Hydro Station	$2,815,495	$18,233,184	NA
28678	HYD Renewable In-Stream Tidal Generation Project	400,000	3,347,378	2011 - CI 41005 – Parrsboro Tidal Interconnection U&U- $1,734,780
Hydro Generation Plant - Renewable Energy Investments Total		**$3,215,495**	**$21,580,563**	
Steam Generation				
39029	Port Hawkesbury Biomass Project	$55,971,533	$206,942,205	NA
Steam Generation Plant - Renewable Energy Investments Total		**$55,971,533**	**$206,942,205**	
Generation- Renewable Energy Investment Total		**$59,561,212**	**$406,022,233**	

3.4.2 Generation – Mercury Abatement Capital Items

Table 3.4.2: Generation – Mercury Abatement Capital Items

CI#	Project Title	2012 Estimate	Total Estimate	Related Capital Items 2012 & +/- 2 years
34203	LIN Unit #3 Mercury Abatement Project	$75,883	$4,912,300	NA
34223	POT Mercury Abatement Project	75,528	2,923,968	NA
34242	TRE Unit #6 Mercury Abatement	75,528	2,221,649	NA
34182	LIN Unit #1 Mercury Abatement Project	75,203	2,139,692	NA
34222	LIN Unit #4 Mercury Abatement Project	75,528	2,070,251	NA
34202	LIN Unit #2 Mercury Abatement	74,995	2,059,949	NA
34224	TRE Unit#5 Mercury Abatement Program	75,528	1,961,439	NA
Steam Generation Plant - Mercury Abatement Total		**$528,192**	**$18,289,249**	

3.4.3 Generation – Regulatory Compliance

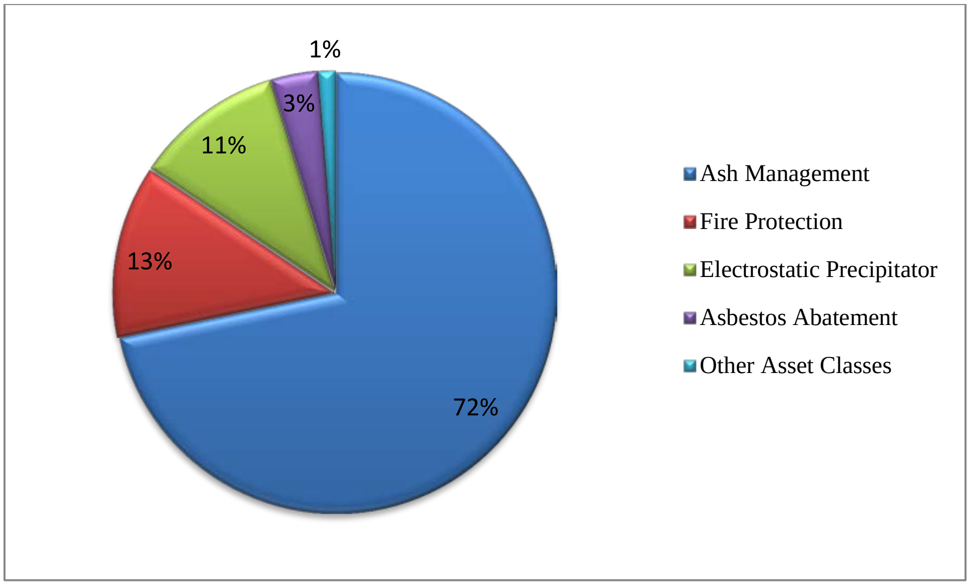


Figure 3.4.3 Steam Generation - Regulatory Compliance Capital Items: 2012 Spending Forecasted by Asset Class

Table 3.4.3 Steam Generation Regulatory Compliance Capital Items

CI#	Project Title	2012 Estimate	Total Estimate	Related Capital Items 2012 & +/- 2 years
Ash Management				
39932	TRE - Ash Site Phase 2 Development	$4,563,325	$5,783,337	NA
41074	POA - Ash Cell Site Capping	4,652,680	4,652,680	NA
35083	LIN 2011 Ash Site Sealing and Capping	973,936	1,037,847	NA
28457	TRE Ash Lagoon Closure	93,494	537,724	NA
41526	TRE - Ash Site Management	147,833	147,833	2010 - CI 34506 - TRE Ash Site Management - $113,560 2011 - CI 39948 - TRE Ash Site Management - $200,351
41484	POT - Ash Cell Capping Cell D	143,979	143,979	2011 - CI30082 POT Develop New Ash Cells $377,117
Ash Management Total		**$10,575,248**	**$12,303,401**	

CI#	Project Title	2012 Estimate	Total Estimate	Related Capital Items 2012 & +/- 2 years
Fire Protection				
41229	LIN - Cable Spreading Rooms Fire Protection	$918,292	$918,292	2010 - CI 38846 - LIN1 Fire Protection / Turbine - $293,207 2011 - 40184 LIN2 Fire Protection Turbine Hall $343,611 2011 – 40427 LIN3 Fire Protection Turbine Hall $348,710 2011 - 40212 LIN 3,4 Burner Fronts Fire Protection $ 51,889
41508	TRE6 - Turbine/Generator Fire Protection	347,079	347,079	Note 1
41620	TUC3 Turbine Generator Fire Protection	272,743	272,743	2010 - CI39563 - TUC U&U Burner Front Sprinkler System - $48,678
41524	TRE6 - Motor control Centre (MCC) Room Fire Protection	173,605	173,605	Note 1
41527	TRE6 - 4kV Switchgear Room Fire Protection	151,152	151,152	Note 1

Note 1: All of the 2012 TRE6 Fire Protection Capital Items (CI 41508, CI41524, CI41527) are related projects. Total estimated spending on fire protection for TRE6 in 2012 is $671,863. The following capital items are also related to each of the preceding TRE6 Fire Protection Capital Items:

2011 - CI 40444 - TRE6 Burner Front Fire Protection - $56,915
2010 - CI40483 - TRE U&U Burner Front Fire Protection - $55,252

CI#	Project Title	2012 Estimate	Total Estimate	Related Capital Items 2012 & +/- 2 years
Fire Protection Total		**$1,862,871**	**$1,862,871**	
Electrostatic Precipitators				
30954	LIN3-ESP Gas Flow Modification	$ 1,608,606	$ 1,627,487	NA
Electrostatic Precipitators Total		**$1,608,606**	**$1,627,487**	

CI#	Project Title	2012 Estimate	Total Estimate	Related Capital Items 2012 & +/- 2 years
Asbestos Abatement				
41238	TUC - Asbestos Abatement Program	$227,423	$227,423	2010 - CI 34484 - TUC Asbestos Abatement - $200,672 2011 - CI 39760 - TUC Asbestos Abatement $384,297
41531	TRE - Asbestos Abatement	160,565	160,565	2010 - CI 34502 - TRE Asbestos Abatement - $253,199 2011 - CI 39945 - TRE Asbestos Abatement - $250,928
41444	POT - Asbestos Abatement	120,755	120,755	2010 - CI 34545 - POT Asbestos Abatement - $103,470 2011 - CI 40331 - POT Asbestos Abatement - $214,520 2013 - CI 41483 - POT Asbestos Abatement - $117,780
Asbestos Abatement Total		**$508,743**	**$508,743**	
Other Asset Classes				
Stacks				
41266	TUC2 - CEM Upgrade	$131,642	$131,642	NA
Instrument Air System				
41271	TUC2 - Instrument Air Receiver Replacement	55,180	55,180	NA
Other Asset Classes Total		**$186,822**	**$186,822**	
Steam Generation Plant - Regulatory Compliance Total		**$14,742,289**	**$16,489,323**	

3.4.4: Generation – Equipment Replacement (End of Life)

Hydro Generation: Equipment Replacement (End of Life)

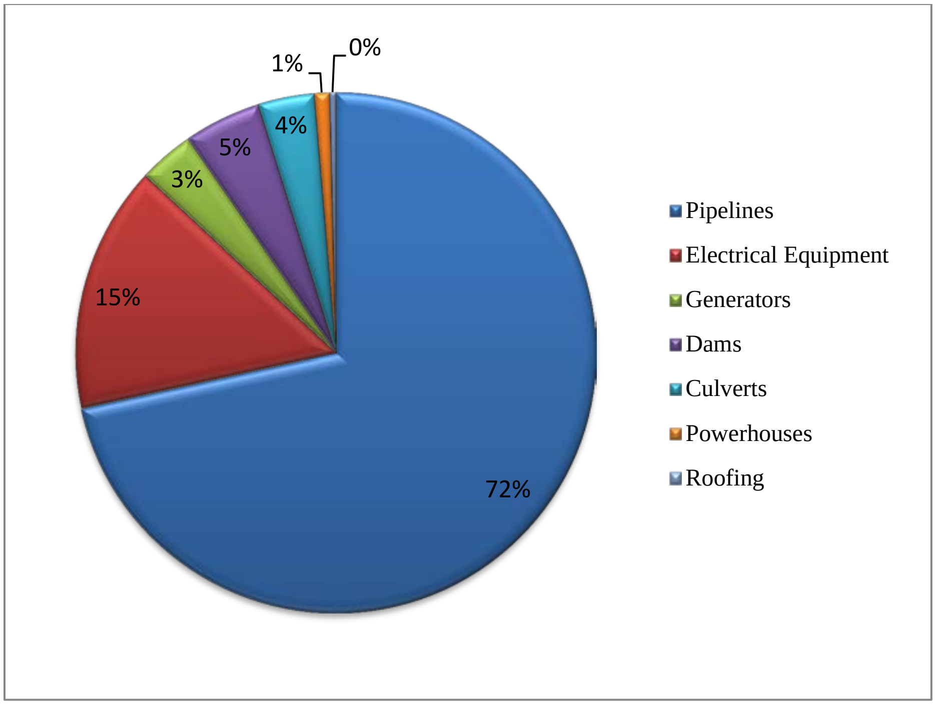


Figure 3.4.4.1 Hydro Generation - Equipment Replacement (End of Life): 2012 Spending Forecasted by Asset Class

Table 3.4.4.1 Hydro Generation – Equipment Replacement (End of life) Capital Items

CI#	Project Title	2012 Estimate	Total Estimate	Related Capital items 2012 & +/- 2 years
Pipelines				
40309	HYD - St. Margaret's Bay - Tidewater Pipeline Replacement	$7,704,424	$7,704,424	2011 - CI 41110 - U&U Tidewater pipeline repairs - $243,303
Pipelines Total		**$7,704,424**	**$7,704,424**	
Electrical Equipment				
23125	HYD - Sissiboo Falls - Electrical Equipment Replacement	$845,755	$845,755	NA
17583	HYD - BER-GUL - Electrical Refurbishment	805,646	805,646	NA
Electrical Equipment Total		**$1,651,401**	**$1,651,401**	

CI#	Project Title	2012 Estimate	Total Estimate	Related Capital items 2012 & +/- 2 years
Generators				
41127	HYD - Nictaux - Headcover Replacement	$219,362	$525,680	2010 - CI 39082- U&U Nictaux Headcover - $429,815
41133	HYD - Standby Generator Replacement	153,699	153,699	NA
Generators Total		**$373,061**	**$679,379**	
Dams				
41145	HYD - Mersey - Upper Lake Falls Rip Rap Replacement	$516,420	$516,420	NA
Dams Total		**$516,420**	**$516,420**	
Culverts				
40316	HYD - Barteaux Culvert Refurbishment	$376,162	$467,860	NA
Culverts Total		**$376,162**	**$467,860**	
Powerhouses				
41137	HYD - Gulch Powerhouse Window Replacement	$102,978	$102,978	2011 - CI 40824 - HYD Powerhouse Civil and Architecture Assessment - $73,685
Powerhouses Total		**$102,978**	**$102,978**	
Roofing				
41136	HYD - Gisborne Roof Hatch Replacement	$38,552	$38,552	NA
Roofing Total		**$38,552**	**$38,552**	
Hydro Generation Plant - Equipment Replacement (End of Life) Total		**$10,762,998**	**$11,161,014**	

Steam Generation: Equipment Replacement (End of Life)

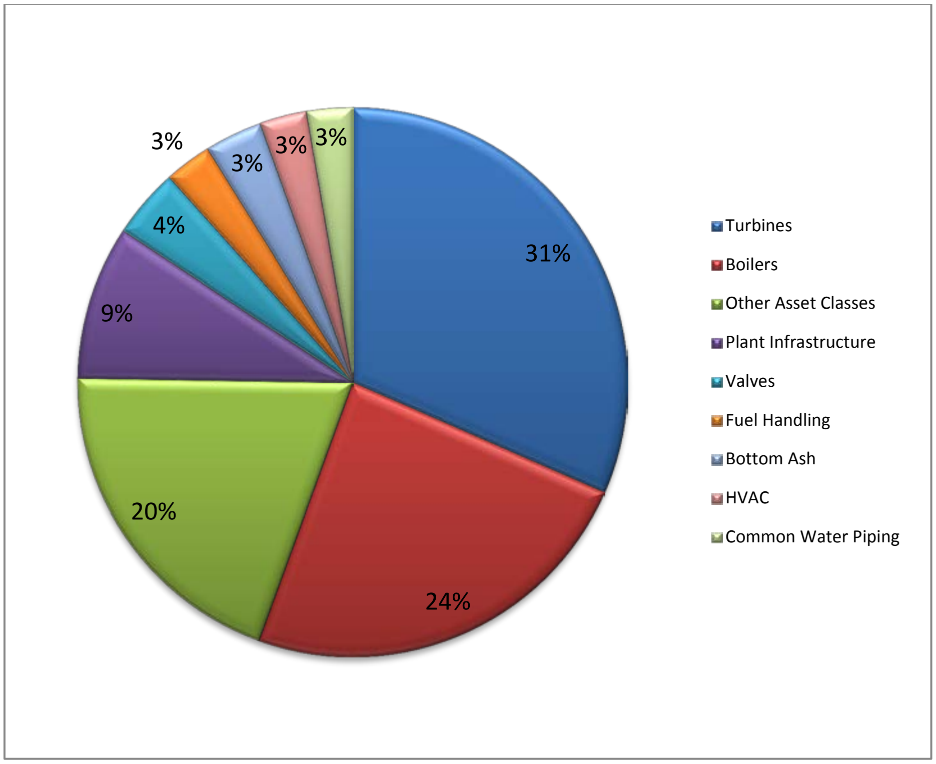


Figure 3.4.4.2 Steam Generation - Equipment Replacement (End of Life): 2012 Spending Forecasted by Asset Class

Table 3.4.4.2 Steam Generation - Equipment Replacement (End of Life) Capital Items

CI#	Project Title	2012 Estimate	Total Estimate	Related Capital items 2012 & +/- 2 years
Turbines				
39566	LIN2 Steam Turbine Last Stage Blades Replacement	$601,589	$1,815,030	2012 - CI 31583- LIN L-1 Steam Turbine Blading Replacement - $1,077,882, 2011 - CI 40330 - HT Fastener Replacement - $760,740
31583	LIN2 L-1 Steam Turbine Blading Replacement	$833,163	$1,077,882	NA
41228	TUC - Unit 3 Turbine HP Impulse Blades Replacement	882,152	882,152	2012 - CI 41251 - TUC3 Turbine High Pressure Cylinder Fastener Replacement - $265,925
40330	LIN2 HT Fastener Replacement	532,691	760,741	2012- CI 31583- LIN L1 Steam Turbine Blading Replacement - $1.185,579, 2012 - CI39566 - LIN2 Steam Turbine Last Stage Blade Replacement - $1,077,882
41549	TRE5- Main Steam Attemperator Replacement	535,227	535,227	NA
41251	TUC3 - Turbine High Pressure (HP) Cylinder Fastener Replacement	275,729	275,729	2012 - CI 41228 - TUC Unit 3 Turbine High Pressure (HP) Impulse Blades Replacement - $882,152
41621	POA-Turbine Thrust Bearing Replacement	136,159	136,159	2012 - CI41054 - Turbine Vibration Monitoring replacement - $308,93 2011- CI 40406 - POA L0 Low Pressure Turbine Blade Replacement - $2,989,721
41272	TUC2 - Turning Gear Worm Shaft Replacement	54,508	54,508	NA
Turbines Total		**$3,851,219**	**$5,537,429**	

CI#	Project Title	2012 Estimate	Total Estimate	Related Capital items 2012 & +/- 2 years
Boilers				
41045	POA - Boiler Refractory Replacement	$710,539	$710,539	Reference Note 1
41303	TRE6 - Waterwall Panel Replacements	548,225	548,225	2010 – CI 34504 – TRE6 Waterwall Panel Replacements $425,086 2012 -CI41544 - TRE6 O2 Sensor Replacement - $72,171 2012 - CI41513 - TRE Unit 1-4 Stabilization - $307,987
41563	POA-Combustor Watwall Panel Replacement	505,357	505,357	Reference Note 1
41566	POA - Center Drain Replacement	302,188	302,188	Reference Note 1
41078	POA-Sidewall Feeder Replacement	297,394	297,394	Reference Note 1
41567	POA - Loop Seal Fluidizing Nozzle Replacement	246,949	246,949	Reference Note 1
41084	POA - Boiler Arrowhead Replacement	124,728	124,728	Reference Note 1
41544	TRE6 - O2 Sensor Replacement	72,171	72,171	2012- CI41303 - TRE6 Waterwall Panel Replacements - $548,224 2012- CI41533 - TRE6 Boiler Thermoprobe Upgrade - $74,126
41083	POA - Boiler Expansion Joint Replacement	61,821	61,821	Reference Note 1
41545	TRE5 - O2 Sensor Replacement	56,924	56,924	

Note 1: *All of the 2012 POA Boiler Capital Items (CI 41045, CI 41563, CI 41566, CI 41078, CI 41567, CI 41084 & CI 41083,CI 41057, CI41077) are all related projects. Total estimated spending on the POA Boiler in 2012 is $2,889,372. The following capital items are also related to each of the preceding POA Boiler Capital Items:*

2010 - CI 34367 - POA 2010 Refractory Program - $484,142
2010 - CI 40523 - POA U&U Arrowhead Replacements - $125,193
2010 - CI 36567 - POA Auxiliary Control Upgrade - $53,967
2011 - CI 40034 - POA 2011 Refractory Program - $692,044
2011 - CI 41105 - POA U&U Superheater 3 Boiler Tube Refurbishment - $197,380
2011 - CI 40027 - POA Arrowhead Replacement Program - $104,271
2011 - CI 31725 - POA Boiler Expansion Joint Replacement - $49,674

Boilers Total	**$2,926,296**	**$2,926,296**	

CI#	Project Title	2012 Estimate	Total Estimate	Related Capital Items 2012 & +/- 2 years
Plant Infrastructure				
41441	TRE - Siding Replacement (Phase 2)	608,916	608,916	2011 - CI 39933 - TRE Siding Replacement - $603,707 2013 - CI TBD - TRE Siding Replacement (Phase 3) - $350,000
40256	POT - Plant Siding Replacement	392,601	392,601	NA
41081	POA - Coal Road Paving Replacement	101,050	101,050	NA
Plant Infrastructure Total		**$1,102,567**	**$1,102,567**	
Fuel Handling				
41523	TRE6 - 6F and 6G Conveyor Belt Replacement	193,117	193,117	NA
39951	TRE5 - Coal Bunkerette Replacement	135,329	135,329	NA
39982	TRE - Gauge Replacements	73,230	110,114	NA
41053	POA - Carbon Sulphur Analyzer Replacement	91,100	91,100	NA
Fuel Handling Total		**$492,777**	**$529,661**	
Heating Ventilation and Air Conditioning (HVAC) Equipment				
40319	TRE - HVAC Replacements (2011)	131,597	312,010	NA
41669	POT - HVAC Equipment Replacement	106,848	106,848	NA
41587	POA - HVAC Equipment Replacement	100,661	100,661	NA
HVAC Total		**$339,105**	**$519,518**	
Valves				
41226	LIN Boiler Feed Pump Recirculation Piping and Valve Replacement	233,206	233,206	NA
39953	TRE6 - Coal Feeder Valve Replacement	136,516	136,516	NA

CI#	Project Title	2012 Estimate	Total Estimate	Related Capital items 2012 & +/- 2 years
40334	POT - Refurbish Underground Valves & Hydrants	131,398	131,398	NA
Valves Total		**$501,120**	**$501,120**	
Bottom Ash				
41528	TRE6 - Bottom Ash Chain Replacement	148,251	148,251	Reference Note 2 2010- CI 37563 - TRE6 Bottom Ash System Refurbishment - $401884
41645	TRE6 - Bottom Ash Seal Replacement	120,240	120,240	Reference Note 2 2011- CI 37563 - TRE6 Bottom Ash System Refurbishment - $636,729
28152	TRE6 - Bottom Ash Overhead Door Replacement	81,004	81,004	Reference Note 2 2011- CI 37563 - TRE6 Bottom Ash System Refurbishment - $636,729
41071	POA - Bottom Ash Drag Chain Replacement	62,741	62,741	2011- CI37422 - POA BA Drag Chain Replacement - $40,779

Note 2: *All of the 2012 TRE6 Bottom Ash Capital Items (CI 41528, CI41645, CI28152) are related projects. Total estimated spending on the TRE6 Bottom Ash System in 2012 is $349,494.*

Bottom Ash Total		**$412,236**	**$412,236**	
Common Water Piping				
41125	LIN - Common Water (CW) Piping Replacement	198,076	198,076	2010 - CI37610 - LIN Common Water Upgrades- $205,184 2011 -CI40225 -LIN Common Water Lines Upgrade - $201,890 2013 -CI TBD - $TBD
37824	TRE5 - Common Water Pipe Replacement	128,289	128,289	2013 - CI TBD - $TBD
Common Water Piping Total		**$326,364**	**$326,364**	

CI#	Project Title	2012 Estimate	Total Estimate	Related Capital items 2012 & +/- 2 years
Other Asset Classes				
Vacuum Pumps				
41584	POT Vacuum Pump Replacement	332,994	332,994	NA
Ash Handling				
39944	TRE6 - Fly Ash Line Replacement	216,127	233,349	NA
Actuators				
41514	TRE6 - Condenser Actuator Replacements	208,589	208,589	2010 - CI28685 - TRE5 Actuator Upgrade - $128,178
Stacks				
31262	LIN - Unit 1-2 Stack Insulation Replacement	158,427	158,427	NA
41277	TUC2 - Stack Breeching Seal Replacement	61,402	61,402	NA
Cooling Water				
41236	TUC - Cooling Water (CW) Piping Refurbishment	197,626	197,626	NA
Air Heaters				
41157	LIN4 Air Heater Baskets Replacement	173,236	173,236	NA
Compressors				
38643	TRE6 - 6B Fly Ash Compressor Replacement	150,984	150,984	NA
Dryers				
41260	TUC2- H2 Dryer Replacement	127,932	127,932	NA
Cooling Water (CW) Strainers				
41275	TUC2- ACW Strainer Replacement	114,909	114,909	NA
Fans				
41570	POA- Reverse Air Fan Replacement	107,983	107,983	NA
Fire Protection				
41267	TUC - Fire Protection System Foam Tank Replacement	94,872	94,872	2010 - CI39563 - TUC U&U Burner Front Sprinkler System - $48,678
Polishers				
41151	LIN3 - Polisher Resin Replacement	82,777	82,777	NA

CI#	Project Title	2012 Estimate	Total Estimate	Related Capital items 2012 & +/- 2 years
Starters				
41543	TRE6 - Motor Control Centre (MCC) Starter Replacements	$80,558	$80,558	NA
Screw Coolers				
41050	POA - Screw Cooler Cover and Trough Replacement	80,103	80,103	2010 - CI34368 - POA Screw Cooler rotor Replacement - 136,618
High Pressure (HP) Piping				
41571	POA-High Pressure Piping and Valve Insulation Upgrade	79,123	79,123	NA
Power Supplies				
37022	POT - 129V Battery Charger Replacement	74,578	74,578	NA
Water Treatment				
41076	POA - B Train Cation and Anion Resin Replacement	60,501	60,501	NA
Other Asset Classes Total		**$2,402,721**	**$2,419,943**	
Steam Generation Plant - Equipment Replacement (End of Life) Total		**$12,354,405**	**$14,275,134**	
Generation Equipment Replacement (End of life) Total		**$23,117,403**	**$25,436,148**	

3.4.5 Generation - Equipment Replacement (Obsolescence)

Hydro Generation: Equipment Replacement (Obsolescence)

Table 3.4.5.1 Hydro Generation - Equipment Replacement (Obsolescence) Capital Item

CI#	Project Title	2012 Estimate	Total Estimate	Related Capital items 2012 & +/- 2 years
Electrical Equipment				
41131	HYD - Relay Testing Equipment	$67,727	$67,727	NA
Electrical Equipment Total		67,727	67,727	NA
Hydro Generation Plant - Equipment Replacement (Obsolescence) Total		**$67,727**	**$67,727**	

Steam Generation: Equipment Replacement (Obsolescence)

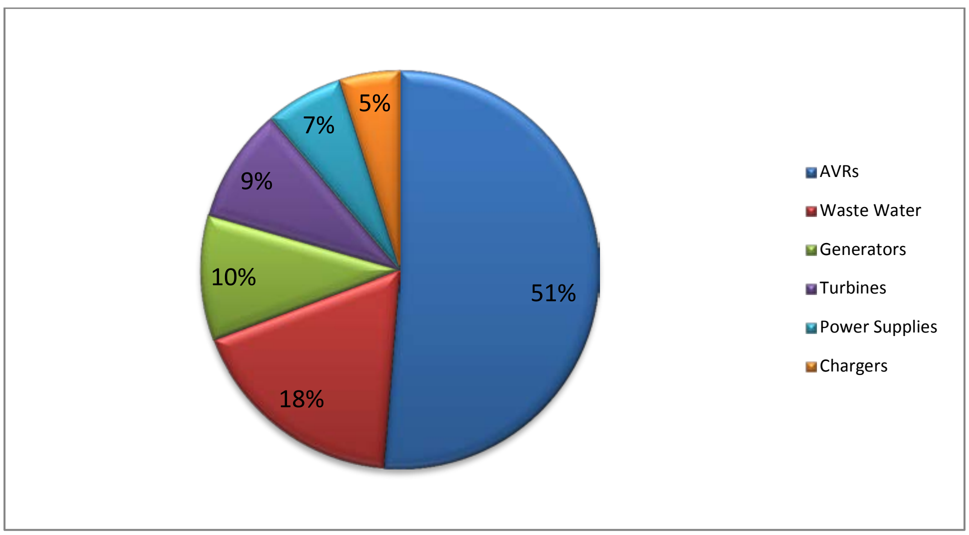


Figure 3.4.5.1 Steam Generation - Equipment Replacement (Obsolescence): 2012 Spending Forecasted by Asset Class

Table 3.4.5.2 Steam Generation - Equipment Replacement (Obsolescence) Capital Items

CI#	Project Title	2012 Estimate	Total Estimate	Related Capital items 2012 & +/- 2 years
Automatic Voltage Regulators (AVRs)				
39926	TUC - Unit 3 Generator Excitation and AVR System Replacement	$742,715	$881,456	NA
39923	TUC - Generator Excitation and AVR System Replacement	141,183	844,543	NA
37611	LIN3 - Generator Excitation & AVR System Replacement	819,469	819,469	NA
AVR Total		**$1,703,366**	**$2,545,468**	
Other Asset Classes				
Waste Water				
41595	POT - Sternson PLC Replacement	$596,976	$596,976	NA
Generators				
39542	U&U Generator Protection Improvements	338,518	520,798	2012 - CI 40363 - LIN3 High voltage Bushing Refurbishment - $500,829
Turbines				
41054	POA - Turbine Vibration Monitoring Replacement	308,939	308,939	2011- CI 40406 - POA L0 Low Pressure Turbine Blade Replacement - $2,989,721 2011 - CI41107 - POT U&U Turbine Control Valve Refurbishment -$99,441 2012 - CI 41621 - POA Turbine Thrust Bearing Replacement - $ 136,192
Power Supplies				
41122	LIN 4 Battery & Charger Replacement	210,704	210,704	NA
Chargers				
41055	POA - UPS Inverter Chargers Replacement	162,865	162,865	NA
Other Assets Classes Total		**$1,618,002**	**$1,800,282**	
Steam Generation Plant - Equipment Replacement (Obsolescence) Total		**$3,321,368**	**$4,345,750**	
Total Generation Equipment Replacment (obsolecence)		**$3,389,095**	**$4,413,476**	
Generation - Equipment Replacement Total		**$26,506,498**	**$27,530,879**	

3.4.6: Generation – Equipment Refurbishment

Hydro Generation: Equipment Refurbishment

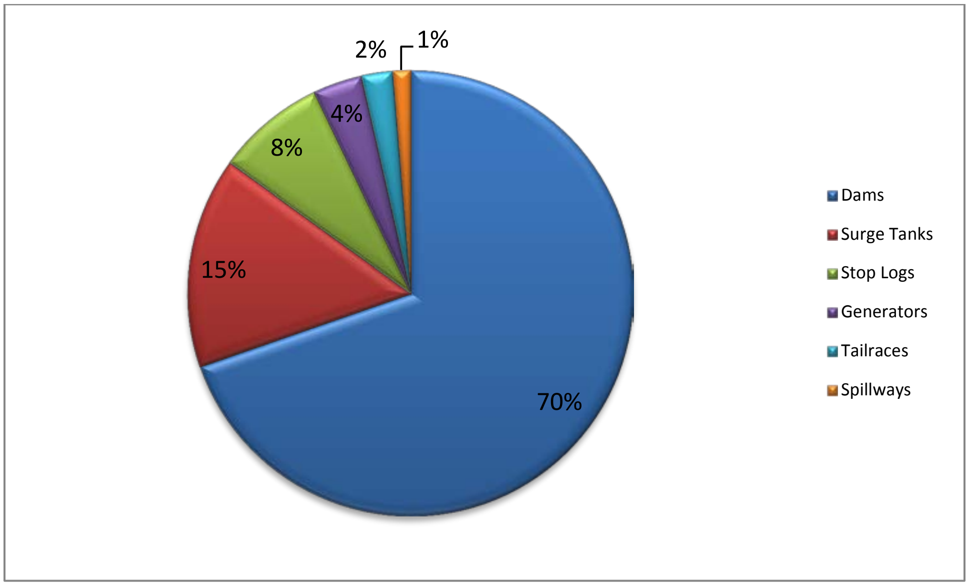


Figure 3.4.6.1: Hydro Generation - Equipment Refurbishment: 2012 Spending Forecasted by Asset Class

Table 3.4.6.1 Hydro Generation - Equipment Refurbishment Capital items

CI#	Project Title	2012 Estimate	Total Estimate	Related Capital Items 2012 & +/- 2 years
Dams				
31245	HYD - St. Margaret's Bay - Sandy Lake Dam Refurbishment	$5,579,410	$5,579,410	NA
40282	HYD- St Margaret's Bay - Coon Pond Dam Refurbishment	2,595,361	2,595,361	NA
31204	HYD - Dickie Brook - Donahoe Lake Dam Refurbishment	1,597,494	1,597,494	NA
Dams Tota		**$9,772,265**	**$9,772,265**	
Surge Tanks				
41143	HYD - St Margarets Bay - Tidewater Surge Tank Refurbishment	$1,211,641	$1,211,641	NA
41138	HYD - Black River - Hollow Bridge Surge Tank Refurbishment	930,048	930,048	NA
Surge Tanks Total		**$ 2,141,689**	**$2,141,689**	

CI#	Project Title	2012 Estimate	Total Estimate	Related Capital Items 2012 & +/- 2 years
Stop Logs				
41126	HYD Annapolis - Sluiceway and Powerhouse Stop Log Refurbishment	$1,115,739	$1,115,739	NA
Stop Logs Total		**$1,115,739**	**$1,115,739**	
Generators				
41806	HYD - Big Falls - #6 Refurbishment	$497,566	$497,566	NA
Generators Total		**$497,566**	**$497,566**	
Tailraces				
41140	HYD Sissiboo Falls - Tailrace Concrete Refurbishment	$314,412	$314,412	NA
Tailraces Total		**$314,412**	**$314,412**	
Spillways				
41141	HYD - Sissiboo Grand Lake Spillway Refurbishment	$181,972	$181,972	NA
Spillways Total		**$181,972**	**$181,972**	
Hydro Generation Plant - Equipment Refurbishments Total		**$14,023,644**	**$14,023,644**	

Steam Generation: Equipment Refurbishment

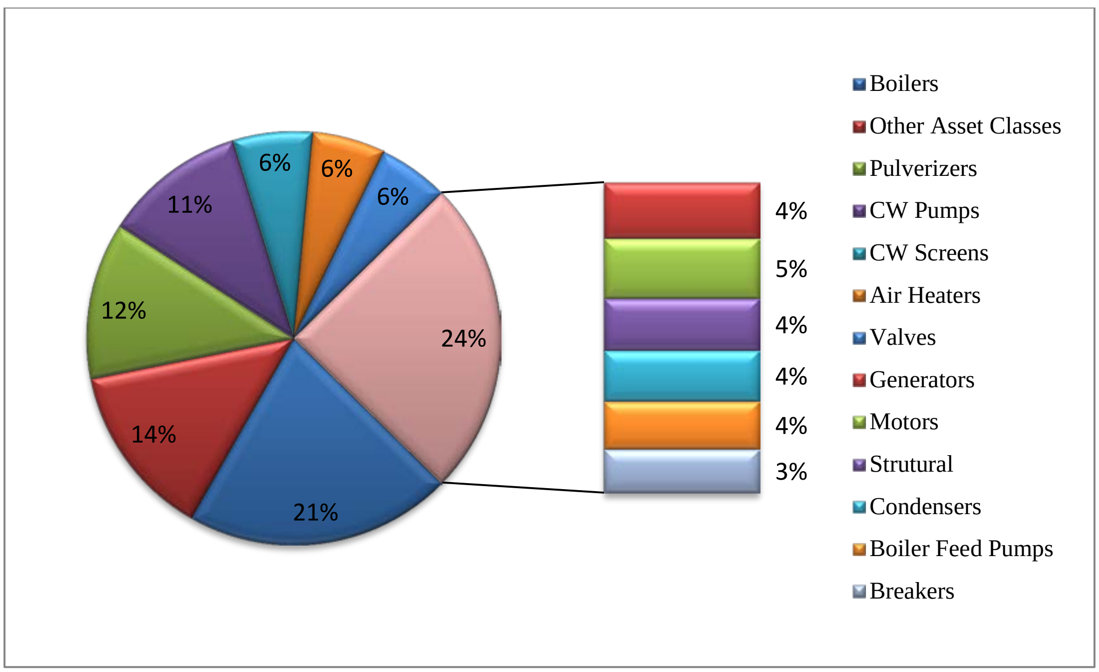


Figure 3.4.6.2: Steam Generation - Equipment Refurbishment: 2012 Spending Forecasted by Asset Class

Table 3.4.6.2 Steam Generation - Equipment Refurbishment Capital Items

CI#	Project Title	2012 Estimate	Total Estimate	Related Capital items 2012 & +/- 2 years
Generators				
40363	LIN3 High Voltage Bushing Refurbishment	$433,360	$500,829	2010 - CI39542 Generator Protection Improvements - $458,840 2012 - CI37611 - LIN3 Generator Excitation and AVR Replacement - $819,582
Generators Total		**$433,360**	**$500,829**	
Boilers				
41233	LIN3 Boiler Refurbishment	$755,711	$755,711	2011 -CI40422 - LIN3 Boiler Refurbishment - $738,274
41235	LIN1 Boiler Refurbishment	749,186	749,186	2011 CI 38943- LIN1 Boiler Refurbishment - $1,658,592
41234	LIN4 Boiler Refurbishment	494,102	494,102	2011 -CI40423 - LIN4 Boiler Refurbishment - $752,329
41057	POA - Sootblower Refurbishment	40,143	40,143	Refer to Note 1 Table 1.3
Boilers Total		**$2,039,141**	**$2,039,141**	
Pulverizers				
40655	LIN - Pulverizer Refurbishment	$461,279	$461,279	2011- CI39903 - LIN 2011 Mill Refurbishment - $760,079
28393	POT 2A Mill and Feeder Refurbishment	287,344	449,843	2012 -CI41585 - POT Pulverizer Exhauster Lubrication - $51,072
38163	TRE6 Pulverizer Refurbishments	311,074	311,074	2010- CI38622 - TRE6 Pulverizer Refurbishment - $277,432
41525	TRE5 - 5-1 Pulverizer Refurbishment	170,873	170,873	NA
41585	POT - Pulverizer Exhauster Lubrication Cooling System Upgrade	51,072	51,072	2011 - CI28393 - POT 2A Mill and Feeder Refurbishment - $424,712
Pulverizers Total		**$1,281,642**	**$1,444,141**	

CI#	Project Title	2012 Estimate	Total Estimate	Related Capital items 2012 & +/- 2 years
Cooling Water (CW) Pumps				
41121	LIN - Cooling Water (CW) Pump Refurbishment	$447,687	$447,687	NA
41588	POA - Cooling Water (CW) Pump Refurbishment	278,820	278,820	NA
26472	TRE - 6A Cooling Water Pump Refurbishment	218,564	238,562	2011- CI 26472 - TRE 6A CW Pump Refurbishment - $349,690
41245	TUC2 - Cooling Water (CW) Pump Refurbishment	140,001	140,001	NA
CW Pump Total		**$1,085,073**	**$1,105,070**	
Cooling Water (CW) Screens				
41124	LIN-Cooling Water (CW) Screen Refurbishment	$251,544	$251,544	NA
39950	TRE5 - 5-2 Cooling Water (CW) Screen Refurbishment	154,308	154,308	NA
41448	POT - Screen Wash System Refurbishment	121,385	121,385	NA
41048	POA - Cooling Water (CW) Screen Refurbishment	80,061	80,061	NA
CW Screens Total		**$607,298**	**$607,298**	

CI#	Project Title	2012 Estimate	Total Estimate	Related Capital items 2012 & +/- 2 years
Air Heaters				
41507	TRE6 - Air Heater Refurbishment	$553,438	$553,438	2010 – CI 38582 – TRE6 Air Heater Refurbishment - $501,532 2014 – CI TBD – TRE6 Air Heater Refurbishment - $TBD
Air Heaters Total		**$553,438**	**$553,438**	
Valves				
41503	TRE6 - Steam Turbine Control Valve Refurbishment	$359,507	$359,507	NA
40337	POT - Replace WTP and WWTP Valves	102,091	102,091	
41082	POA-2012 Valve Refubishment Program	76,443	76,443	2011 - CI40847 - U&U POA Misc. Valve Refurbishment - $75,169
Valves Total		**$538,041**	**$538,041**	
Motors				
41150	LIN 4160V and 600V Motor Refurbishment	$150,049	$150,049	NA
40060	TRE5 - 4kV Motor Refurbishment	103,806	103,806	NA
41532	TRE6 - 4kV Motor Refurbishment	85,048	85,048	NA
41279	TUC - 4KV Motor Refurbishment	74,826	74,826	NA
41046	POA - 4KV Motor Refurbishment	53,816	53,816	NA
Motors Total		**$467,544**	**$467,544**	
Strutural Components				
41079	POA - Structural Steel Refurbishment	$405,364	$405,364	NA
Strutural Total		**$405,364**	**$405,364**	
Condensers				
41511	TRE6 - Condenser Waterbox and Cooling Water (CW) Piping Refurbishment	$392,172	$392,172	NA
Condensers Total		**$392,172**	**$392,172**	
Boiler Feed Pumps (BFP)				
40032	POA - Boiler Feed Pump Refurbishment	$220,641	$220,641	NA
41250	TUC2- South Boiler Feed Pump (BFP) Refurbishment	153,940	153,940	NA
Boiler Feed Pumps Total		**$374,581**	**$374,581**	

CI#	Project Title	2012 Estimate	Total Estimate	Related Capital items 2012 & +/- 2 years
Breakers				
41149	LIN - 4kV and 600V Breaker Refurbishment	$116,470	$116,470	2010 - CI36222 - TUC #2 U&U Generator Refurbishment - $1,654,783 2011 - CI40234 - LIN 4160V and 600V Breaker Refurbishment - $91,572
41268	TUC - 4kV and 600V Breaker Refurbishment	75,267	75,267	NA
41047	POA - 4KV & 600V Breaker Refurbishment	64,756	64,756	2012 -CI36563 - POA 4kV Breaker Refurbishment - $37,589 2011 - CI40033 - POA 4KV Breaker Refurbishment - $47,067
41546	TRE5 - 4kV Breaker Refurbishment	40,854	40,854	2010 - CI37645 - TRE 4kV Breakers - $60,398
41547	TRE6 - 4kV Breaker Refurbishment	40,854	40,854	2010 - CI37645 - TRE 4kV Breakers - $60,398
Breakers Total		**$338,200**	**$338,200**	
Other Asset classes				
Bottom Ash				
39940	TRE5 - Bottom Ash Refurbishment	$205,214	$256,034	2011 - CI22954 - TRE5 Bottom Ash/Boiler Seal Replacement - $294,996
Stacks				
41516	TRE6 - Stack Breaching Inlet Ductwork Refurbishment	252,948	252,948	2012 - CI28697 - TRE6 Stack Lighting system upgrades - $155,535
Cooling (CW) Systems				
39762	TUC - Unit 3 CW Intake Steel Sheet Piling Refurbishment	176,007	191,984	2011 - CI39762 - TUC 3 CW Intake SSP Refurbishment - $191,832
Fuel Handling				
41560	POT E-belt Fire Protection System Refurbishment	132,088	132,088	NA
41059	POA - Coal Chute and Reclaim Refurbishment	50,040	50,040	NA
Compressors				
41239	TUC6- West Gas Compressor Refurbishment	136,399	136,399	NA
Crushers				
37402	POT - Coal Crusher Vibratory Feeder Refurbishment	114,191	114,191	NA

CI#	Project Title	2012 Estimate	Total Estimate	Related Capital items 2012 & +/- 2 years
Condensate Extraction Pumps				
41278	TUC2- Condensate Extraction Pump Refurbishment	93,871	93,871	NA
Exciters				
41261	TUC1- Direct Current (DC) Exciter Refurbishment	$91,617	$91,617	NA
Tanks				
41274	TUC3 - Water Treatment Plant Anion & Cation Tank Refurbishment	76,878	76,878	NA
Other Asset Classes Total		**$ 1,329,253**	**$ 1,396,049**	
Steam Generation Plant - Equipment Refurbishments Total		**$ 9,845,106**	**$10,161,868**	
Generation - Equpment Refurbishment Total		**$23,868,750**	**$24,185,512**	

3.4.7: Generation – Equipment Upgrades

Hydro Generation: Equipment Upgrades

Table 3.4.7.1 Hydro Generation - Equipment Upgrades Capital Items

CI#	Project Title	2012 Estimate	Total Estimate	Related Capital Items 2012 & +/- 2 years
Runners				
12079	HYD - SHH - RUF 1&2 Runner Replacement	$744,394	$822,853	NA
16387	HYD- Ruth Falls #3 Runner Replacement	373,086	673,953	NA
17853	HYD - STM-Sandy Lake #4 Runner Replacement	248,157	428,814	NA
Runner Total		**$1,365,637**	**$1,925,620**	
Ladders & Climbing Equipment				
39543	HYD - U&U Ladder Upgrades	$364,417	$1,132,830	NA
Ladders & Climbing Equipment Total		**$364,417**	**$1,132,830**	
Hydro Equipment Upgrade Total		**$1,730,054**	**$3,058,450**	

Steam Generation: Equipment Upgrades

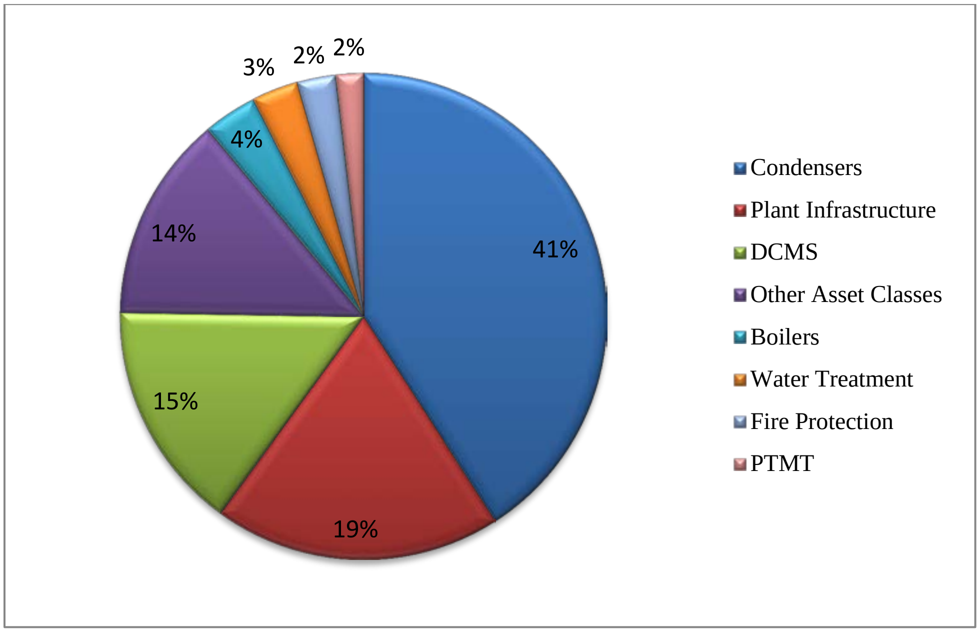


Figure 3.4.7.1: Steam Generation - Equipment Upgrades: 2012 Forecasted Spending by Asset Class

Table 3.4.7.2 Steam Generation - Equipment Upgrades

CI#	Project Title	2012 Estimate	Total Estimate	Related Capital items 2012 & +/- 2 years
Condensers				
18448	TUC - Cooling Water System Biofouling Control	$2,752,157	$2,752,157	2011 - CI40378 - TUC Condenser Drain Improvements - $81,190 , 2010 - CI 39606 - TUC U&U #3 Condenser Pit Refurbishment
14521	POT - Biofoulant Control System Upgrade	98,986	98,986	2010 - CI22467 - POT Condenser Waterbox Replacement - $250,497, 2011 -CI41485 - POT U&U Condenser Refurbishment- $535,177
Condenser Total		**$2,851,143**	**$2,851,143**	
Plant Infrastructure				
39939	TRE - Security Improvements (Phase 1)	$144,449	$328,372	date TBD - CI 41510 - TRE - Security Improvements (Phase 2)
41248	TUC - Lube Oil Storage Building	288,657	288,657	NA
41561	POT - Maintenance Facilities Refurbishment	258,558	258,558	NA

CI#	Project Title	2012 Estimate	Total Estimate	Related Capital items 2012 & +/- 2 years
40371	LIN Training Facilities Upgrade	117,447	250,208	NA
41446	POT- Emergency response team (ERT) room upgrade	165,646	165,646	NA
41080	POA - Coal Gate Upgrade	102,912	102,912	NA
41594	POT - Lab Upgrades Phase 2	97,943	97,943	2011 -CI27116 - POT Lab Upgrades - $53,238
41056	POA - Plant Access Upgrade	88,031	88,031	NA
41066	POA - Heated Storage Upgrade	71,275	71,275	NA
Plant Infrastructure Total		**$1,334,917**	**$1,651,602**	
Distributed Control & Management System (DCMS)				
28674	TRE6 - Human Machine Interface (HMI) Upgrade	$867,805	$867,805	NA
41569	POA - DCMS Upgrades	194,780	194,780	NA
DCMS Total		**$1,062,585**	**$1,062,585**	
Fire Protection				
38602	TRE - Fire System Upgrades	$176,387	$378,104	NA
Fire Protection Total		**$176,387**	**$378,104**	
Water Treatment				
39946	TRE - Wastewater Treatment Plant Upgrades	$176,099	$335,013	NA
41597	POA - Inline Sodium Analyzer Replacement	40,131	40,131	NA
Water Treatment Total		**$216,231**	**$375,144**	
Point Tupper Marine Terminal (PTMT)				
30283	POT - Tupper Marine Coal Terminal Vessel Access	$129,272	$271,231	NA
PTMT Total		**$129,272**	**$271,231**	

CI#	Project Title	2012 Estimate	Total Estimate	Related Capital items 2012 & +/- 2 years
Boilers				
41077	POA- Auxiliary Boiler Mud Drum Steam Coil Upgrade	$100,254	$100,254	See note 1 POA Boiler Repl End Life
30862	TRE5 - Boiler Thermoprobe Upgrade	$74,366	$74,366	2012 -CI41545 - TRE5 O2 Sensor Replacement - $56,924
41533	TRE6 - Boiler Thermoprobe Upgrade	74,126	74,126	2012 - CI41303 - TRE6 Waterwall Panel Replacement - $548,224, 2012 - CI41544 - TRE6 O2 Sensor Replacement - $72,186
Boilers Total		**$248,746**	**$248,746**	
Other Asset Classes				
Turbines				
28645	TRE6 - Turbine Controls Power Supplies Replacement	$321,691	$321,691	NA
Ash Handling				
38850	LIN-Flyash System Upgrade Hopper Level Indicators	56,003	216,322	NA
Stacks				
28697	TRE6 - Stack Lighting System Upgrade	155,535	155,535	2012 -CI41516 - TRE6 Stack Breaching inlet Ductwork - $252,942
Generators				
40207	TUC- CO2 Purge System Upgrade	139,842	151,979	2010- CI39542 - Generator Protection Improvements - $458,840
Electrostatic Precipitators				
41568	POT - Electrostatic Precipitator Supervisory System Upgrade	94,848	94,848	2011 -CI40342 - POT Refurbish Unit2 Precipitator - $35,444
Misc. Equipment				
41073	POA - Plant Industrial Vaccum System	90,064	90,064	NA
Fans				
41591	POT - Induced Draft (ID) Fan Bearings Cooling System Upgrade	53,805	53,805	2011 - CI41624 - POT U&U ID Fan Structural Steel - $79,689
Coal Crackers				
41052	POA - Cracker Soft Start Installation	42,434	42,434	NA
Other Asset Classes Total		**$954,221**	**$1,126,678**	
Steam Generation Plant - Equipment Upgrades Total		**$6,973,503**	**$7,965,233**	
Generation - Equipment Upgrades Total		**$8,703,558**	**$11,023,684**	

3.4.8: Generation – Asset Retirements

Hydro Generation: Hydro Asset Retirements

Table 3.4.8 Hydro Asset Retirements Capital Items

CI#	Project Title	2012 Estimate	Total Estimate	Related Capital items 2012 & +/- 2 years
Dams				
39042	HYD - Sheet Harbour - Ten Mile Lake Dam Decommissioning	$1,018,923	$1,018,923	NA
17653	HYD Uniacke Lake Dam Decomissioning	119,266	119,266	NA
Dams Total		**$1,138,189**	**$1,138,189**	
Asset Retirements Total		**$1,138,189**	**$1,138,189**	

3.4.9: Generation – Capital Spare Parts

Table 3.4.9 Generation Capital Spare Parts

CI#	Project Title	2012 Estimate	Total Estimate	Related Capital items 2012 & +/- 2 years
Generators				
41051	POA - HV Bushing Capital Spare	$235,399	$235,399	NA
Generators Total		**$235,399**	**$235,399**	
Capital Spares Total		**$235,399**	**$235,399**	

Generation CIs 1 – 31

Generation

Hydro CIs 1 – 9

CI Number: 40282

Title: **HYD – St. Margaret's Bay - Coon Pond Dam Refurbishment**

Start Date: 2012/04
Final Cost Date: 2012/12
Function: Generation
Forecast Amount: $2,595,361

DESCRIPTION:

This project consists of refurbishing the Coon Pond dam and spillway to meet the Canadian Dam Safety Guidelines. The project scope includes increasing the length and stability of the spillway structure and raising the dam crest. The external Consultant Dam Safety report pertaining to this work was filed with the Board on June 30, 2010.

Summary of Related CI's +/- 2 years:
No projects for 2010, 2011, 2012, 2013 & 2014

JUSTIFICATION:

Justification Criteria: Health & Safety

Sub Criteria: Equipment Replacement

Why do this project?

In 2009, Nova Scotia Power completed a Flood Study and Dam Safety Review of the structures in the St. Margaret's Bay Hydro System in accordance with the Canadian Dam Association's (CDA) Dam Safety Guidelines.

The Dam Safety Review of Coon Pond concluded that there is presently insufficient freeboard to meet the minimum freeboard requirements and the spillway and dam structures do not meet the criteria for stability. At Coon Pond, the Inflow Design Flood (IDF) is the Probable Maximum Flood (PMF).

Why do this project now?

Since 1986, NSPI has carried out dam safety related work on a priority basis based on risk .The work at Coon Pond is scheduled for 2012, based on the downstream risk associated with the dam's breaching or overtopping.

Why do this project this way?

Refurbishing the dam and spillway is the only practical means of addressing the freeboard and stability deficiencies and is consistent with the previous projects of a similar nature approved by the UARB.

CI Number : 40282-H614 - HYD- St. Margaret's Bay - Coon Pond Dam Refurbishment **Project Number** H614

Parent CI Number : -

Cost Centre : 440 - 440-St.Margaret's Hydro System **Budget Version** 2012 ACE Plan

Capital Item Accounts

Acct	Actv	Account	Activity	Forecast Amount	Amount	Variance
094		094 - Interest Capitalized		43,803	0	43,803
095		095-Thermal & Hydro Contracts AO		[redacted]	0	[redacted]
095		095-Hydro Term Labour AO		[redacted]	0	[redacted]
095		095-Hydro Regular Labour AO		[redacted]	0	[redacted]
095		095-Hydro Overtime Labour AO		2,309	0	2,309
001	007	001 - HYDRO Regular Labour	007 - HGP - Environmental	2,000	0	2,000
001	028	001 - HYDRO Regular Labour	028 - HGP - Dams & Spillways	700	0	700
011	028	011 - Travel Expense	028 - HGP - Dams & Spillways	700	0	700
012	028	012 - Materials	028 - HGP - Dams & Spillways	0	0	0
013	028	013 - POWER PRODUCTION Contracts	028 - HGP - Dams & Spillways	[redacted]	0	[redacted]
001	085	001 - HYDRO Regular Labour	085 Design	20,000	0	20,000
011	085	011 - Travel Expense	085 Design	600	0	600
028	085	028 - Consulting	085 Design	[redacted]	0	[redacted]
002	087	002 - HYDRO Overtime Labour	087 Field Super.& Ops.	25,000	0	25,000
004	087	004 - HYDRO Term Labour	087 Field Super.& Ops.	35,000	0	35,000
011	087	011 - Travel Expense	087 Field Super.& Ops.	28,000	0	28,000
041	087	041 - Meals & Entertainment	087 Field Super.& Ops.	7,000	0	7,000
066	087	066 - Other Goods & Services	087 Field Super.& Ops.	1,000	0	1,000
			Total Cost:	2,595,361	0	2,595,361
			Original Cost:	193,684		

Capital Project Detailed Estimate

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Location: Hydro
FP#: 40282
Title: HYD - St. Margaret's Bay - Coon Pond Dam Refurbishment

Item	Description	Unit	Quantity	Unit Estimate	Total Estimate	Cost Support Reference	Completed Similar Projects (FP#'s) Note 1
1	**001 Regular Labour**						
1.1	Hydro Regular Labour	lot	1	20,700	20,700		
1.2	Environmental Services	lot	1	2,000	2,000		
1.3					-		
				Sub-Total	22,700		
2	**012 Materials**						
2.1							
2.2							
2.3							
2.4							
				Sub-Total			
3	**013 Power Production Contracts**						
3.1	Construction Costs	lot	1	[redacted]	[redacted]	Cost Support Item #1	
3.2	Contingency	%	[redacted]	[redacted]	[redacted]		
3.3					-		
				Sub-Total	[redacted]		
4	**002 Overtime Labour**						
4.1	Overtime Labour	lot	1	25,000	25,000		
4.2							
4.3							
				Sub-Total	25,000		
5	**004 Term Labour**						
5.1	Term Labour	lot	1	[redacted]	[redacted]		
5.2							
5.3							
				Sub-Total	[redacted]		
6	**011 Travel Expenses**						
6.1	Travel Expenses	lot	1	29,300	29,300		
6.2							
6.3							
				Sub-Total	29,300		
7	**028 Consulting**						
7.1	Preliminary Engineering	lot	1	[redacted]	[redacted]	Cost Support Item #2 (Page 6)	
7.2	Detailed Design	lot	1	[redacted]	[redacted]		17830 - STM Big Indian Dam Safety
7.3	Environmental Consulting	lot	1	[redacted]	[redacted]		
				Sub-Total	[redacted]		
8	**041 Meals and Entertainment**						
8.1	Meals and Entertainment	lot	1	7,000	7,000		
8.2							
8.3							
				Sub-Total	7,000		
9	**066- Other Goods and Services**						
9.1	Other Goods and Services	lot	1	1,000	1,000		
9.2							
9.3							
				Sub-Total	1,000		
9	**094 Interest Capitalized**						
9.1	Interest				43,803		
9.2					-		
9.3					-		
				Sub-Total	43,803		
10	**095 Administrative Overhead**						
10.1	Hydro Regular Labour AO				4,193		
10.2	Hydro OT Labour AO				2,309		
10.3	Hydro Term Labour AO				[redacted]		
10.4	Thermal & Hydro Contracts AO				[redacted]		
				Sub-Total	118,992		
Project Cost Estimate				**Total**	2,595,362		
11	**Original Cost**						
11.1					$193,684		

Note 1: Reference to "Completed similar projects (FP#'s)" is to be provided when the item estimate is based on work of similar scope for a recently completed project

Print Summary Sheet

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Coon Pond Dam Refurbishment
Summary of Alternatives

Budget Year :	**2012**	**Date :**	**18-Oct-11**
Division :	Power Production	**CI Number:**	40282
Department :	Hydro Production	**Project No. :**	H614
Originator :			

	Alternative	After Tax WACC	PV of EVA / NPV	Rank	IRR	Disc Pay
A	Coon Pond Dam Refurbishment	6.67%	29,469	1	6.87%	25.3 years
	0	6.67%	NA	NA	#NUM!	0.0 years
	0	6.67%	NA	NA	#NUM!	0.0 years
	0	6.67%	NA	NA	#NUM!	0.0 years

Recommendation :

Based on positive NPV, it is recommended that the Coon Pond Dam be refurbished

Notes/Comments :

Coon Pond Dam Refurbishment

Assumptions and Inputs:

Capital cost for dam refurbishment = $2,595,361 and avoided Capital Cost to Decommission Dam = $1,000,000

2012 Operating costs = $35,000
2013 Operating costs = $35,700

Incremental replacement energy costs and annual operating costs in the years following 2013 are escalated at 2% annually.
Calculations:
Total annual avoided cost = [Replacement energy costs] - [Annual operating costs]

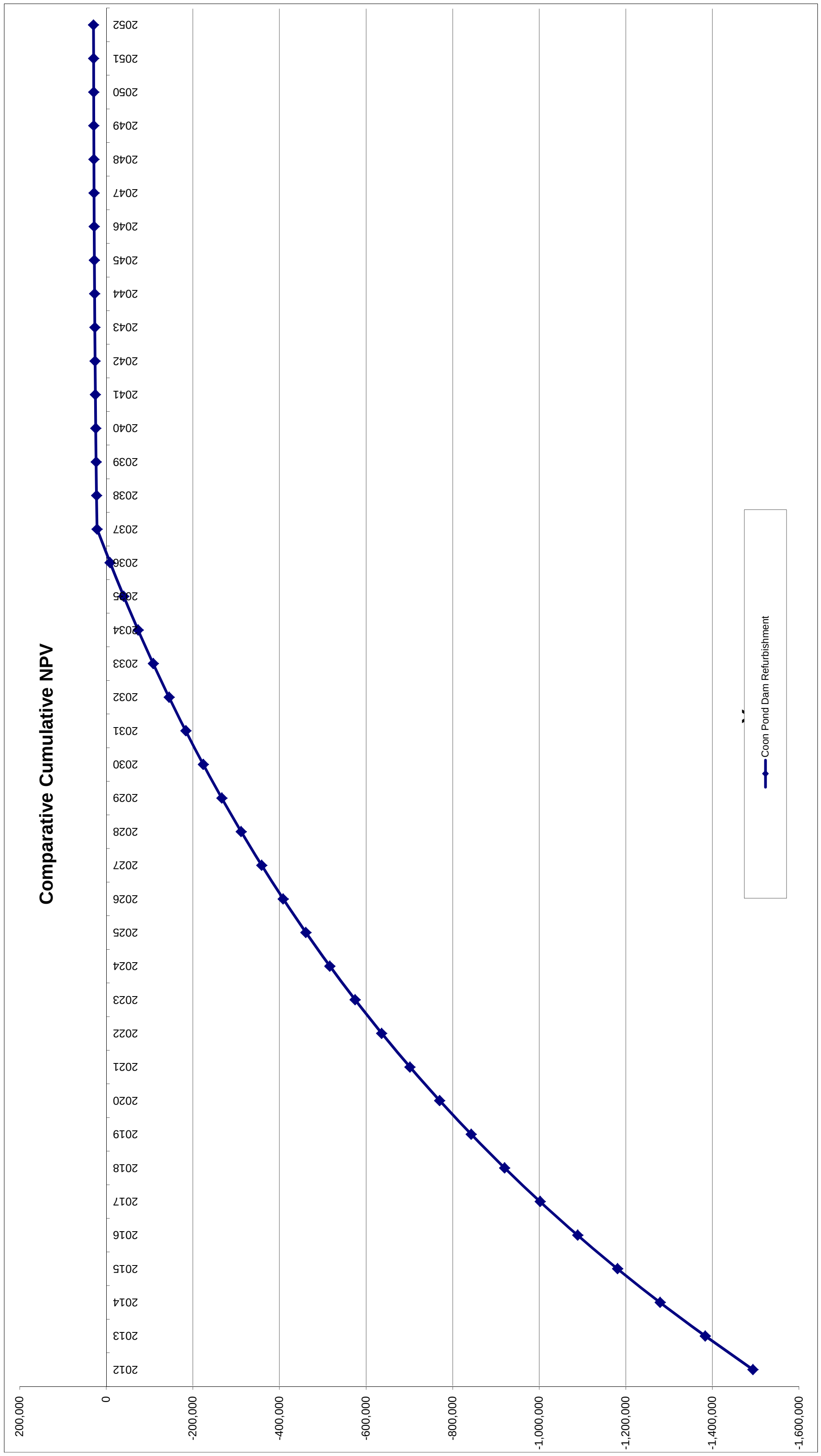
Avoided replacement energy cost = [Incremental replacement energy cost] x [Quantity of predicted annual unit outages / de-ratings] x [Estimated annual lost generation]

Avoided replacement energy cost (2012) = [redacted] x [1 outage] x [redacted] = $166,250
Total avoided cost (2012) = [$166,250] - [$35,000] = $131,250

Avoided replacement energy cost (2013) = [redacted] x [1 outage] x [redacted] = $166,250
Total avoided cost (2013)= [$166,250] - [$35,700] = $ 130,550

Coon Pond Dam Refurbishment
Coon Pond Dam Refurbishment

Year	Total Revenue	Operating Costs	Capital	CCA	UCC	CFBT	Applicable Taxes	CFAT	Discount Factor	PV of CF	CNPV
2012	-	131,250.0	(1,595,362.0)	47,860.9	1,547,501.1	(1,464,112.0)	(29,629.0)	(1,493,741.0)	1.000	(1,493,741.0)	(1,493,741.0)
2013	-	130,550.0	-	92,850.1	1,454,651.1	130,550.0	(12,988.9)	117,561.1	0.937	110,210.1	(1,383,530.9)
2014	-	133,161.0	-	87,279.1	1,367,372.0	133,161.0	(14,459.3)	118,701.7	0.879	104,321.2	(1,279,209.7)
2015	-	135,824.2	-	82,042.3	1,285,329.7	135,824.2	(16,672.4)	119,151.8	0.824	98,168.9	(1,181,040.9)
2016	-	138,540.7	-	77,119.8	1,208,209.9	138,540.7	(19,248.9)	119,291.8	0.772	92,138.6	(1,088,902.3)
2017	-	141,311.5	-	72,492.6	1,135,717.3	141,311.5	(21,333.9)	119,977.7	0.724	86,873.8	(1,002,028.5)
2018	-	144,137.7	-	68,143.0	1,067,574.3	144,137.7	(23,558.4)	120,579.4	0.679	81,850.1	(920,178.4)
2019	-	147,020.5	-	64,054.5	1,003,519.8	147,020.5	(25,719.5)	121,301.0	0.636	77,191.3	(842,987.1)
2020	-	149,960.9	-	60,211.2	943,308.6	149,960.9	(27,822.4)	122,138.5	0.597	72,864.2	(770,122.8)
2021	-	152,960.1	-	56,598.5	886,710.1	152,960.1	(29,872.1)	123,088.0	0.559	68,839.1	(701,283.8)
2022	-	156,019.3	-	53,202.6	833,507.5	156,019.3	(31,873.2)	124,146.1	0.524	65,089.4	(636,194.3)
2023	-	159,139.7	-	50,010.5	783,497.1	159,139.7	(33,830.1)	125,309.6	0.492	61,591.3	(574,603.1)
2024	-	162,322.5	-	47,009.8	736,487.2	162,322.5	(35,746.9)	126,575.6	0.461	58,323.3	(516,279.7)
2025	-	165,569.0	-	44,189.2	692,298.0	165,569.0	(37,627.7)	127,941.2	0.432	55,266.3	(461,013.4)
2026	-	168,880.3	-	41,537.9	650,760.1	168,880.3	(39,476.2)	129,404.2	0.405	52,403.0	(408,610.4)
2027	-	172,258.0	-	39,045.6	611,714.5	172,258.0	(41,295.8)	130,962.1	0.380	49,717.7	(358,892.6)
2028	-	175,703.1	-	36,702.9	575,011.6	175,703.1	(43,090.1)	132,613.0	0.356	47,196.5	(311,696.2)
2029	-	179,217.2	-	34,500.7	540,510.9	179,217.2	(44,862.1)	134,355.1	0.334	44,826.5	(266,869.7)
2030	-	182,801.5	-	32,430.7	508,080.3	182,801.5	(46,615.0)	136,186.6	0.313	42,596.4	(224,273.3)
2031	-	186,457.5	-	30,484.8	477,595.5	186,457.5	(48,351.5)	138,106.0	0.293	40,495.7	(183,777.5)
2032	-	190,186.7	-	28,655.7	448,939.7	190,186.7	(50,074.6)	140,112.1	0.275	38,515.0	(145,262.6)
2033	-	193,990.4	-	26,936.4	422,003.4	193,990.4	(51,786.8)	142,203.7	0.258	36,645.7	(108,616.9)
2034	-	197,870.2	-	25,320.2	396,683.2	197,870.2	(53,490.5)	144,379.7	0.242	34,879.9	(73,737.0)
2035	-	201,827.6	-	23,801.0	372,882.2	201,827.6	(55,188.3)	146,639.4	0.226	33,210.7	(40,526.3)
2036	-	205,864.2	-	22,372.9	350,509.2	205,864.2	(56,882.3)	148,981.9	0.212	31,631.4	(8,894.9)
2037	-	209,981.5	-	21,030.6	329,478.7	209,981.5	(58,574.8)	151,406.7	0.199	30,136.1	21,241.3
2038	-	-	-	19,768.7	309,710.0	-	6,128.3	6,128.3	0.187	1,143.5	22,384.8
2039	-	-	-	18,582.6	291,127.4	-	5,760.6	5,760.6	0.175	1,007.7	23,392.5
2040	-	-	-	17,467.6	273,659.7	-	5,415.0	5,415.0	0.164	888.0	24,280.5
2041	-	-	-	16,419.6	257,240.1	-	5,090.1	5,090.1	0.154	782.5	25,063.0
2042	-	-	-	15,434.4	241,805.7	-	4,784.7	4,784.7	0.144	689.6	25,752.6
2043	-	-	-	14,508.3	227,297.4	-	4,497.6	4,497.6	0.135	607.7	26,360.2
2044	-	-	-	13,637.8	213,659.5	-	4,227.7	4,227.7	0.127	535.5	26,895.7
2045	-	-	-	12,819.6	200,840.0	-	3,974.1	3,974.1	0.119	471.9	27,367.6
2046	-	-	-	12,050.4	188,789.6	-	3,735.6	3,735.6	0.111	415.8	27,783.5
2047	-	-	-	11,327.4	177,462.2	-	3,511.5	3,511.5	0.104	366.4	28,149.9
2048	-	-	-	10,647.7	166,814.5	-	3,300.8	3,300.8	0.098	322.9	28,472.8
2049	-	-	-	10,008.9	156,805.6	-	3,102.7	3,102.7	0.092	284.6	28,757.4
2050	-	-	-	9,408.3	147,397.3	-	2,916.6	2,916.6	0.086	250.8	29,008.2
2051	-	-	-	8,843.8	138,553.4	-	2,741.6	2,741.6	0.081	221.0	29,229.1
2052	-	-	-	8,313.2	130,240.2	-	3,169.0	3,169.0	0.076	239.5	29,468.6
Total	-	4,312,805.6	(1,595,362.0)	1,465,121.8	23,751,255.6	2,717,443.6	(887,714.7)	1,829,729.0	14.9	29,468.6	(14,558,665.3)


Comparative Cumulative NPV
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Coon Pond Dam Refurbishment

CI Number: 31204

Title: **HYD – Dickie Brook - Donahoe Lake Dam Refurbishment**

Start Date: 2012/04
Final Cost Date: 2012/10
Function: Generation
Forecast Amount: $1,597,494

DESCRIPTION:

This project consists of refurbishing the Donahoe Lake dam and spillway to meet the Canadian Dam Safety Guidelines. The project scope includes increasing the length and stability of the spillway and refurbishment of the dam. The Dam Safety report pertaining to this work was filed with the Board in 2007.

Summary of Related CI's +/- 2 years:
No projects for 2010,2011,2012, 2013 & 2014

JUSTIFICATION:

Justification Criteria: Hydro

Sub Criteria: Maintenance

Why do this project?

In 2009, Nova Scotia Power completed a Flood Study in accordance with the Canadian Dam Association's (CDA) Dam Safety Guidelines that evaluated the required spillway capacity for the structures on the Dickie Brook Hydro System. In 2006, Nova Scotia Power completed a Dam Safety Review of the structures in the Dickie Brook Hydro System in accordance with the Canadian Dam Association's (CDA) Dam Safety Guidelines.

The Flood Study and Dam Safety Review of Donahoe Lake concluded that there is presently insufficient freeboard to meet the minimum freeboard requirements and the spillway and dam structures do not meet the criteria for stability. At Donahoe Lake, the Inflow Design Flood (IDF) is the Probable Maximum Flood (PMF).

Why do this project now?

Since 1986, NSPI has carried out dam safety related work on a priority basis based on risk. The work at Donahoe Lake is scheduled for 2012 based on the downstream risk associated with the dam breaching or overtopping.

Why do this project this way?

Refurbishing the dam and spillway is the only practical means of addressing the freeboard and stability deficiencies.

CI Number : 31204-H564	- HYD - Dickie Brook - Donahoe Lake Dam Refurbishment	**Project Number**	H564
Parent CI Number :	-		
Cost Centre : 407	- 407-Dickie Brook Hydro	**Budget Version**	2012 ACE Plan

Capital Item Accounts

Acct	Actv	Account	Activity	Forecast Amount	Amount	Variance
094		094 - Interest Capitalized		18,925	0	18,925
095		095-Hydro Overtime Labour AO		2,771	0	2,771
095		095-Hydro Regular Labour AO		3,026	0	3,026
095		095-Thermal & Hydro Contracts AO		[redacted]	0	[redacted]
095		095-Hydro Term Labour AO		[redacted]	0	[redacted]
011	007	011 - Travel Expense	007 - HGP - Environmental	749	0	749
028	007	028 - Consulting	007 - HGP - Environmental	[redacted]	0	[redacted]
001	028	001 - HYDRO Regular Labour	028 - HGP - Dams & Spillways	16,386	0	16,386
013	028	013 - POWER PRODUCTION Contracts	028 - HGP - Dams & Spillways	[redacted]	0	[redacted]
011	085	011 - Travel Expense	085 Design	1,200	0	1,200
002	087	002 - HYDRO Overtime Labour	087 Field Super.& Ops.	30,000	0	30,000
004	087	004 - HYDRO Term Labour	087 Field Super.& Ops.	[redacted]	0	[redacted]
011	087	011 - Travel Expense	087 Field Super.& Ops.	24,000	0	24,000
041	087	041 - Meals & Entertainment	087 Field Super.& Ops.	6,000	0	6,000
066	087	066 - Other Goods & Services	087 Field Super.& Ops.	600	0	600
			Total Cost:	1,597,494	0	1,597,494
			Original Cost:	153,656		

Capital Project Detailed Estimate

Location: Hydro
FP#: 31204
Title: HYD - Dickie Brook - Donahoe Lake Dam Refurbishment

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Item	Description	Unit	Quantity	Unit Estimate	Total Estimate	Cost Support Reference	Completed Similar Projects (FP#'s) Note 1
1	**001 Regular Labour**						
1.1	Hydro Reg Labour	lot	1	13,000	13,000		
1.2	Environmental Services	lot	1	3,386	3,386		
1.3							
				Sub-Total	16,386		
2	**012 Materials**						
2.1							
2.2							
2.3							
2.4							
				Sub-Total			
3	**013 Power Production Contracts**						
3.1	Construction	lot	1	[redacted]	[redacted]	Cost Support Item #1	
3.2	Contingency	%	[redacted]	[redacted]	[redacted]		
3.3							
				Sub-Total	[redacted]		
4	**002 Overtime Labour**						
4.1	Site Supervision	lot	1	30,000	30,000		17830
4.2							
4.3							
				Sub-Total	30,000		
5	**004 Term Labour**						
5.1	Site Supervision	lot	1	[redacted]	[redacted]		17830
5.2							
5.3							
				Sub-Total	[redacted]		
6	**011 Travel Expenses**						
6.1		lot	1	25,949	25,949		
6.2							
6.3					-		
				Sub-Total	25,949		
7	**028 Consulting**						
7.1	Detailed Design	lot	1	[redacted]	[redacted]	Cost Support Item #2	
7.2	Contingency	%	[redacted]	[redacted]	[redacted]		
7.3	Wetland Assessment	lot	1	[redacted]	[redacted]	Cost Support Item #3	
				Sub-Total	[redacted]		
8	**041 Meals and Entertainment**						
8.1		lot	1	6,000	6,000		
8.2							
8.3							
				Sub-Total	6,000		
9	**066- Other Goods and Services**						
9.1					600		
9.2							
9.3							
				Sub-Total	600		
9	**094 Interest Capitalized**						
9.1					18,925		
9.2					-		
9.3					-		
				Sub-Total	18,925		
10	**095 Administrative Overhead**						
10.1	Hydro Regular Labour AO				3,026		
10.2	Hydro OT Labour AO				2,771		
10.3	Hydro Term Labour AO				[redacted]		
10.4	Thermal & Hydro Contracts AO				[redacted]		
	Thermal Reg. Labour AO				-		
				Sub-Total	72,812		
Project Cost Estimate				**Total**	$1,597,493		
11	**Original Cost**						
11.1					$153,656		

Note 1: Reference to "Completed similar projects (FP#'s)" is to be provided when the item estimate is based on work of similar scope for a recently completed project

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Donahoe Lake Dam Refurbishment
Summary of Alternatives

Budget Year :	2012	**Date :**	28-Oct-11
Division :	Power Production	**CI Number:**	31204
Department :	Hydro Production	**Project No. :**	
Originator :			

	Alternative	After Tax WACC	PV of EVA / NPV	Rank	IRR	Disc Pay
A	Donahoe Lake Dam Refurbishment	6.67%	2,169,765	1	19.98%	7.5 years
	0	6.67%	NA	NA	#NUM!	0.0 years
	0	6.67%	NA	NA	#NUM!	0.0 years
	0	6.67%	NA	NA	#NUM!	0.0 years

Recommendation :

Based on a positive NPV, it is recommended that the Donahoe Lake Dam and Spillway be Refurbished

Notes/Comments :

Donahoe Lake Dam Refurbishment

Assumptions and Inputs:

Capital cost for dam refurbishment = $1,597,493

2012 Operating costs = $100,000
2013 Operating costs = $102,000

Incremental replacement energy costs and annual operating costs in the years following 2013 are escalated at 2% annually.
Calculations:
Total annual avoided cost = [Replacement energy costs] - [Annual operating costs]

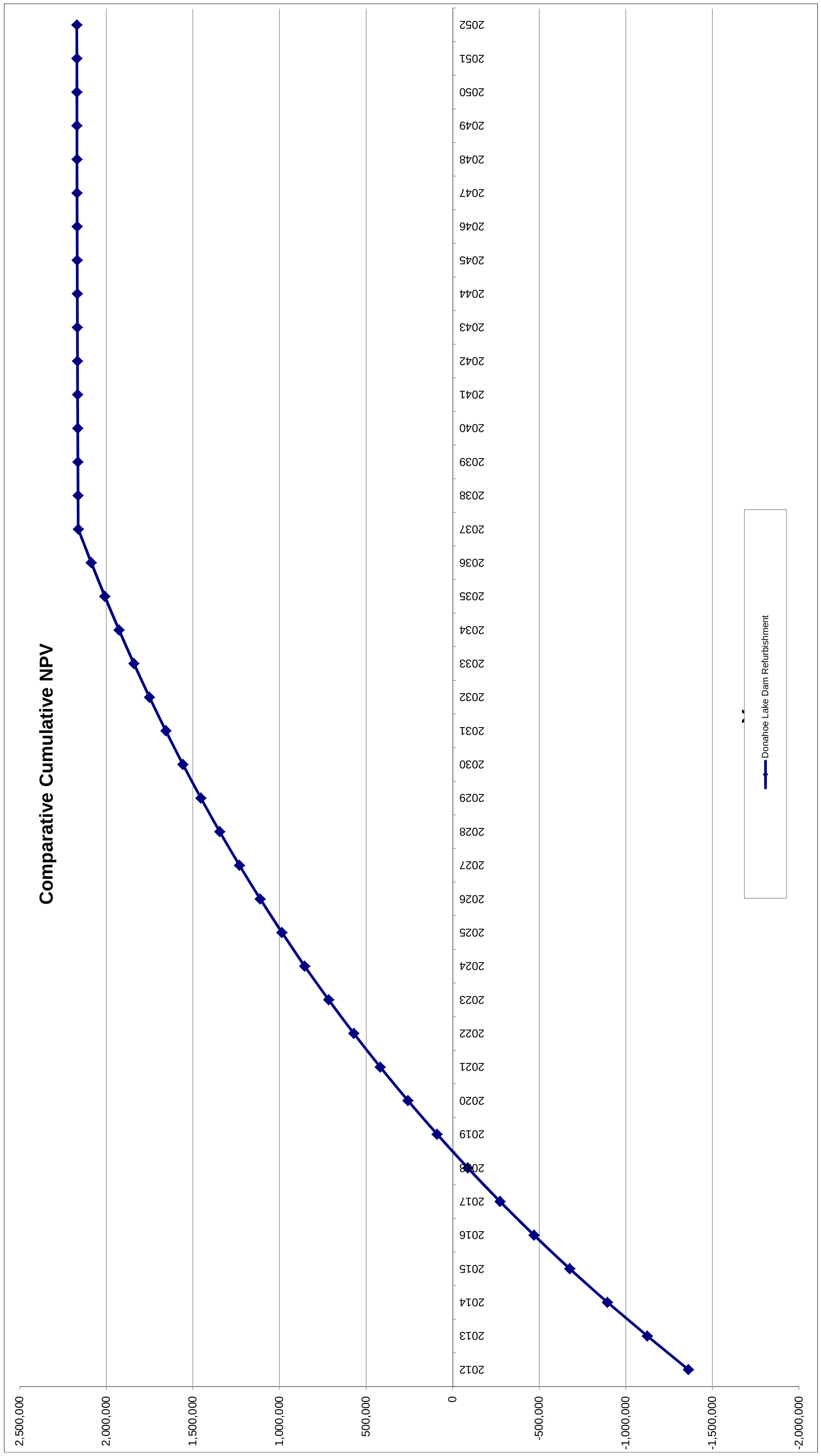
Avoided replacement energy cost = [Incremental replacement energy cost] x [Quantity of predicted annual unit outages / de-ratings] x [Estimated annual lost generation]

Avoided replacement energy cost (2012) = [redacted]/MWh] x [1 outage] x [redacted] MWh] = $434,625
Total avoided cost (2012) = [$434,625] - [$100,000] = $ 334,625

Avoided replacement energy cost (2013) = [redacted]/MWh] x [1 outage] x [redacted] MWh] = $434,625
Total avoided cost (2013)= [$434,625]- [$102,000] = $332,625

Donahoe Lake Dam Refurbishment
Donahoe Lake Dam Refurbishment

Year	Total Revenue	Operating Costs	Capital	CCA	UCC	CFBT	Applicable Taxes	CFAT	Discount Factor	PV of CF	CNPV
2012	-	334,625	(1,597,493)	47,925	1,549,568	(1,262,868)	(98,756)	(1,361,624)	1	(1,361,624)	(1,361,624)
2013	-	332,625	-	92,974	1,456,594	332,625	(78,624)	254,001	1	238,119	(1,123,506)
2014	-	339,278	-	87,396	1,369,198	339,278	(78,320)	260,958	1	229,343	(894,163)
2015	-	346,063	-	82,152	1,287,047	346,063	(81,812)	264,251	1	217,715	(676,447)
2016	-	352,984	-	77,223	1,209,824	352,984	(85,695)	267,290	1	206,449	(469,998)
2017	-	360,044	-	72,589	1,137,234	360,044	(89,111)	270,933	1	196,178	(273,820)
2018	-	367,245	-	68,234	1,069,000	367,245	(92,693)	274,552	1	186,367	(87,453)
2019	-	374,590	-	64,140	1,004,860	374,590	(96,239)	278,350	1	177,131	89,679
2020	-	382,082	-	60,292	944,569	382,082	(99,755)	282,327	1	168,428	258,106
2021	-	389,723	-	56,674	887,895	389,723	(103,245)	286,478	1	160,218	418,324
2022	-	397,518	-	53,274	834,621	397,518	(106,716)	290,802	1	152,467	570,791
2023	-	405,468	-	50,077	784,544	405,468	(110,171)	295,297	0	145,142	715,933
2024	-	413,577	-	47,073	737,471	413,577	(113,616)	299,961	0	138,216	854,148
2025	-	421,849	-	44,248	693,223	421,849	(117,056)	304,793	0	131,660	985,809
2026	-	430,286	-	41,593	651,629	430,286	(120,495)	309,791	0	125,452	1,111,261
2027	-	438,892	-	39,098	612,532	438,892	(123,936)	314,956	0	119,568	1,230,829
2028	-	447,669	-	36,752	575,780	447,669	(127,384)	320,285	0	113,988	1,344,817
2029	-	456,623	-	34,547	541,233	456,623	(130,844)	325,779	0	108,694	1,453,510
2030	-	465,755	-	32,474	508,759	465,755	(134,317)	331,438	0	103,667	1,557,178
2031	-	475,070	-	30,526	478,233	475,070	(137,809)	337,261	0	98,892	1,656,070
2032	-	484,572	-	28,694	449,539	484,572	(141,322)	343,250	0	94,355	1,750,425
2033	-	494,263	-	26,972	422,567	494,263	(144,860)	349,403	0	90,041	1,840,466
2034	-	504,149	-	25,354	397,213	504,149	(148,426)	355,722	0	85,937	1,926,403
2035	-	514,231	-	23,833	373,380	514,231	(152,024)	362,208	0	82,032	2,008,435
2036	-	524,516	-	22,403	350,977	524,516	(155,655)	368,861	0	78,315	2,086,750
2037	-	535,006	-	21,059	329,919	535,006	(159,324)	375,683	0	74,776	2,161,527
2038	-	-	-	19,795	310,124	-	6,136	6,136	0	1,145	2,162,672
2039	-	-	-	18,607	291,516	-	5,768	5,768	0	1,009	2,163,681
2040	-	-	-	17,491	274,025	-	5,422	5,422	0	889	2,164,570
2041	-	-	-	16,442	257,584	-	5,097	5,097	0	784	2,165,354
2042	-	-	-	15,455	242,129	-	4,791	4,791	0	690	2,166,044
2043	-	-	-	14,528	227,601	-	4,504	4,504	0	608	2,166,652
2044	-	-	-	13,656	213,945	-	4,233	4,233	0	536	2,167,189
2045	-	-	-	12,837	201,108	-	3,979	3,979	0	473	2,167,661
2046	-	-	-	12,066	189,042	-	3,741	3,741	0	416	2,168,078
2047	-	-	-	11,343	177,699	-	3,516	3,516	0	367	2,168,445
2048	-	-	-	10,662	167,037	-	3,305	3,305	0	323	2,168,768
2049	-	-	-	10,022	157,015	-	3,107	3,107	0	285	2,169,053
2050	-	-	-	9,421	147,594	-	2,920	2,920	0	251	2,169,304
2051	-	-	-	8,856	138,738	-	2,745	2,745	0	221	2,169,525
2052	-	-	-	8,324	130,414	-	3,173	3,173	0	240	2,169,765
Total	-	10,988,703	(1,597,493)	1,467,079	23,782,981	9,391,210	(2,965,767)	6,425,443	15	2,169,765	51,640,207


Comparative Cumulative NPV
Donahoe Lake Dam Refurbishment
2,500,000
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1,500,000
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-500,000
-1,000,000
-1,500,000
-2,000,000
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CI Number: 41143

Title: **HYD – St. Margaret's Bay - Tidewater Surge Tank Refurbishment**

Start Date: 2012/05
Final Cost Date: 2012/09
Function: Generation
Forecast Amount: $1,211,641

DESCRIPTION:

The refurbishment of the Tidewater Surge Tank consists of concrete foundation repairs, sand-blasting and painting the interior and exterior of the surge tank, replacing the ladders and vertical lifeline systems, miscellaneous steel repairs, and installation of a new fiberglass bubbler building designed to prevent freezing in the vertical piping connected to the surge tank.

Summary of Related CI's +/- 2 years:
No projects for 2010,2011,2012, 2013 & 2014

JUSTIFICATION:

Justification Criteria: Hydro

Sub Criteria: Maintenance

Why do this project?

These refurbishments are required in order to maintain the structural integrity of the tank and its foundations and ensure the strength and stability of the tank is not compromised. The existing foundations have started to show signs of degradation and must be refurbished to mitigate the risk of stability issues with the tank. The ladder and vertical lifeline system do not meet current Occupational Health and Safety Code requirements and must be replaced.

Why do this project now?

Completing this project now will ensure the structural integrity and stability of the tank is not compromised and provide climbing devices designed to current Codes and standards. Completing the refurbishment now will avoid more costly future repairs or replacement.

Why do this project now?

Recent inspections have identified significant areas of corrosion. Foundation and steel refurbishment are required to preserve the structural integrity of the structure.

Why do this project this way?

Refurbishment is a feasible and cost effective solution compared to replacing the surge tank and its foundations.

CI Number : 41143 - HYD - St. Maragets Bay - Tidewater Surge Tank Refurbishment **Project Number**

Parent CI Number : -

Cost Centre : 440 - 440-St.Margaret's Hydro System **Budget Version** 2012 ACE Plan

Capital Item Accounts

Acct	Actv	Account	Activity	Forecast Amount	Amount	Variance
094		094 - Interest Capitalized		12,001	0	12,001
095		095-Thermal & Hydro Contracts AO		[redacted]	0	[redacted]
095		095-Hydro Term Labour AO		[redacted]	0	[redacted]
004	027	004 - HYDRO Term Labour	027 - HGP - Waterways	[redacted]	0	[redacted]
011	027	011 - Travel Expense	027 - HGP - Waterways	4,140	0	4,140
012	027	012 - Materials	027 - HGP - Waterways	0	0	0
013	027	013 - POWER PRODUCTION Contracts	027 - HGP - Waterways	[redacted]	0	[redacted]
028	027	028 - Consulting	027 - HGP - Waterways	1,000	0	1,000
041	027	041 - Meals & Entertainment	027 - HGP - Waterways	5,180	0	5,180
			Total Cost:	1,211,641	0	1,211,641
			Original Cost:	100,648		

Capital Project Detailed Estimate

Location: Hydro
FP#: 41143
Title: HYD - St. Margaret's Bay - Tidewater Surge Tank Refurbishment

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Item	Description	Unit	Quantity	Unit Estimate	Total Estimate	Cost Support Reference	Completed Similar Projects (FP#'s) Note 1
1	**001 Regular Labour**						
1.1		hr					
1.2		hr					
1.3		hr					
				Sub-Total			
2	**012 Materials**						
2.1							
2.2							
2.3							
2.4							
				Sub-Total			
3	**013 Power Production Contracts**						
3.1	Painting of the Surge Tank	lot	[redacted]			Cost Support Item #1 - 2011 Pricing for Item 1-4 and 5	
3.2	Pricing escalation and contingency	%					
3.3							
				Sub-Total	[redacted]		
4	**002 Overtime Labour**						
4.1							
4.2							
4.3							
				Sub-Total			
5	**004 Term Labour**						
5.1	On-site construction supervisor	lot	1	[redacted]			
5.2							
5.3							
				Sub-Total	[redacted]		
6	**011 Travel Expenses**						
6.1		lot	1	4,140	4,140		
6.2							
6.3							
				Sub-Total	4,140		
7	**028 Consulting**						
7.1	Dept. of Environment site investigation for blasting/painting	lot	1	1,000	1,000		
7.2							
7.3							
				Sub-Total	1,000		
8	**041 Meals and Entertainment**						
8.1	Meals and Entertainment		1	5,180	5,180		
8.2							
8.3							
				Sub-Total	5,180		
9	**094 Interest Capitalized**						
9.1	Interest				12,001		
9.2					-		
9.3					-		
				Sub-Total	12,001		
10	**095 Administrative Overhead**						
10.1	Hydro Regular Labour AO				-		
10.2	Hydro OT Labour AO				-		
10.3	Hydro Term Labour AO				[redacted]		
10.4	Thermal & Hydro Contracts AO						
				Sub-Total	59,408		
Project Cost Estimate				**Total**	$1,211,641		
11	**Original Cost**						
11.1					$100,468		

Note 1: Reference to "Completed similar projects (FP#'s)" is to be provided when the item estimate is based on work of similar scope for a recently completed project

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Tidewater Surge Tank Refurbishment
Summary of Alternatives

Budget Year :	**2012**	**Date :**	**18-Oct-11**
Division :	Power Production	**CI Number:**	41143
Department :	Hydro Production	**Project No. :**	
Originator :			

	Alternative	After Tax WACC	PV of EVA / NPV	Rank	IRR	Disc Pay
A	Tidewater Surge Tank Refurbishment	6.67%	414,113	1	7.31%	23.4 years
	0	6.67%	NA	NA	#NUM!	0.0 years
	0	6.67%	NA	NA	#NUM!	0.0 years
	0	6.67%	NA	NA	#NUM!	0.0 years

Recommendation :

Based on a positive NPV, it is recommended that the surge tank be refurbished

Notes/Comments :

Tidewater Surge Tank Refurbishment

Assumptions and Inputs:

Capital cost for surge tank refurbishment = $1,211,641
Additional 2012 system capital costs: 7,500,000 for Pipeline replacement (CI 12419)

Estimated avoided capital decommissioning costs = $2,000,000

2012 Operating costs = $60,000
2013 Operating costs = $61,200

Incremental replacement energy costs and annual operating costs in the years following 2013 are escalated at 2% annually.
Calculations:
Total annual avoided cost = [Replacement energy costs] - [Annual operating costs]

Avoided replacement energy cost = [Incremental replacement energy cost] x [Quantity of predicted annual unit outages / de-ratings] x [Estimated annual lost generation]

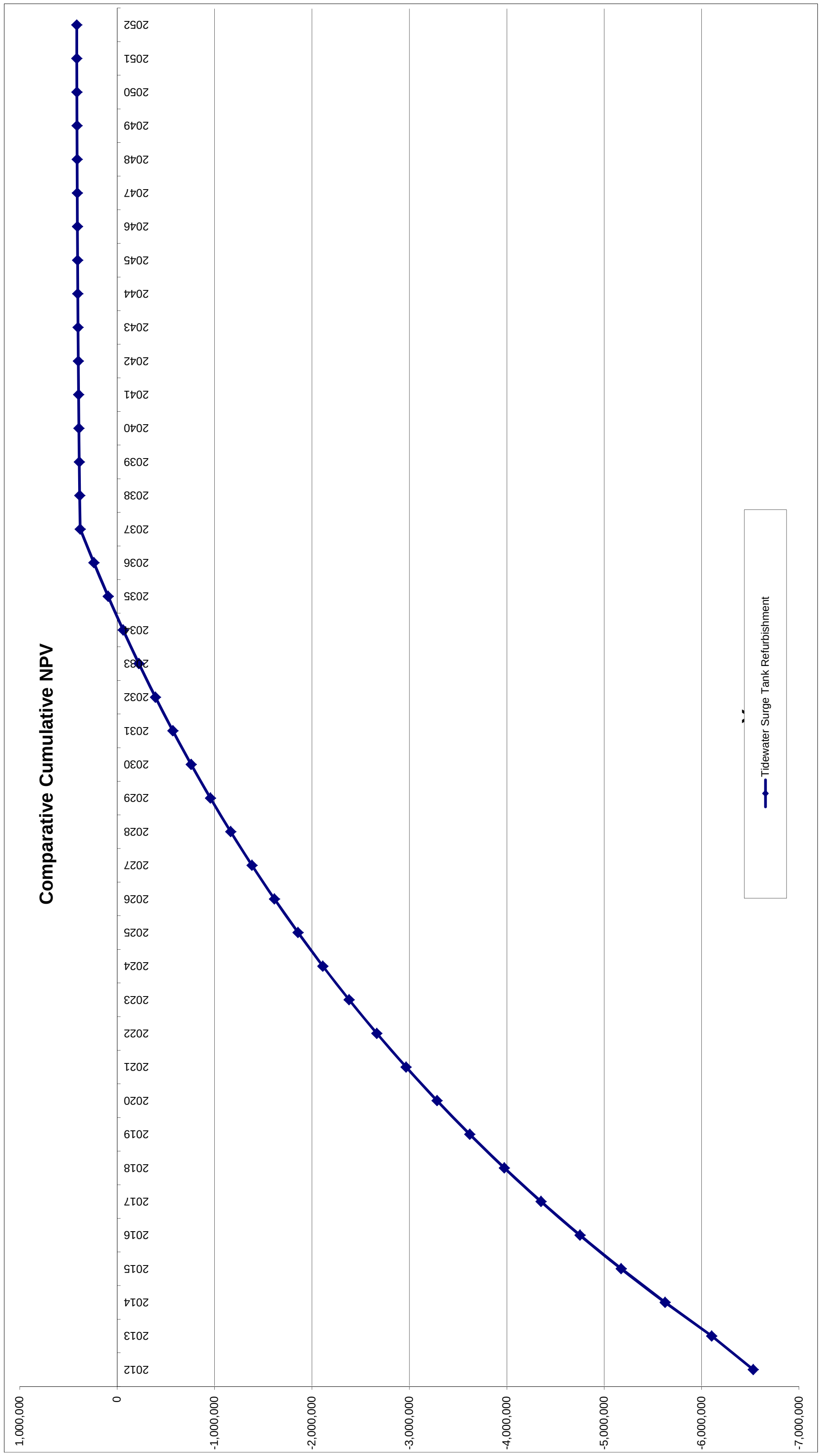
Avoided replacement energy cost (2012) = [redacted] x [1 outage] x [redacted] = $546,250
Total avoided cost (2012) = [546,250] - [$60,000] = $486,250

Avoided replacement energy cost (2013) = [redacted] x [1 outage] x [redacted] = $546,250
Total avoided cost (2013)= [$546,250] - [$61,200] = $485,050

Tidewater Surge Tank Refurbishment

Tidewater Surge Tank Refurbishment

Year	Total Revenue	Operating Costs	Capital	CCA	UCC	CFBT	Applicable Taxes	CFAT	Discount Factor	PV of CF	CNPV
2012	-	486,250	(6,916,065)	207,482	6,708,583	(6,429,815)	(100,316)	(6,530,131)	1	(6,530,131)	(6,530,131)
2013	-	485,050	-	402,515	6,306,068	485,050	(30,016)	455,034	1	426,581	(6,103,550)
2014	-	620,262	-	378,364	5,927,704	620,262	(76,011)	544,251	1	478,316	(5,625,234)
2015	-	632,667	-	355,662	5,572,042	632,667	(85,872)	546,796	1	450,504	(5,174,731)
2016	-	645,321	-	334,323	5,237,719	645,321	(97,313)	548,008	1	423,270	(4,751,461)
2017	-	658,227	-	314,263	4,923,456	658,227	(106,629)	551,598	1	399,403	(4,352,058)
2018	-	671,392	-	295,407	4,628,049	671,392	(116,555)	554,836	1	376,627	(3,975,431)
2019	-	684,819	-	277,683	4,350,366	684,819	(126,212)	558,607	1	355,476	(3,619,955)
2020	-	698,516	-	261,022	4,089,344	698,516	(135,623)	562,893	1	335,805	(3,284,150)
2021	-	712,486	-	245,361	3,843,983	712,486	(144,809)	567,677	1	317,483	(2,966,666)
2022	-	726,736	-	230,639	3,613,344	726,736	(153,790)	572,946	1	300,394	(2,666,273)
2023	-	741,271	-	216,801	3,396,544	741,271	(162,586)	578,685	0	284,431	(2,381,842)
2024	-	756,096	-	203,793	3,192,751	756,096	(171,214)	584,882	0	269,501	(2,112,341)
2025	-	771,218	-	191,565	3,001,186	771,218	(179,692)	591,525	0	255,519	(1,856,822)
2026	-	786,642	-	180,071	2,821,115	786,642	(188,037)	598,605	0	242,409	(1,614,413)
2027	-	802,375	-	169,267	2,651,848	802,375	(196,264)	606,112	0	230,101	(1,384,312)
2028	-	818,423	-	159,111	2,492,737	818,423	(204,387)	614,036	0	218,533	(1,165,779)
2029	-	834,791	-	149,564	2,343,173	834,791	(212,420)	622,371	0	207,649	(958,130)
2030	-	851,487	-	140,590	2,202,582	851,487	(220,378)	631,109	0	197,398	(760,732)
2031	-	868,517	-	132,155	2,070,427	868,517	(228,272)	640,244	0	187,734	(572,998)
2032	-	885,887	-	124,226	1,946,202	885,887	(236,115)	649,772	0	178,614	(394,384)
2033	-	903,605	-	116,772	1,829,430	903,605	(243,918)	659,687	0	170,000	(224,384)
2034	-	921,677	-	109,766	1,719,664	921,677	(251,692)	669,984	0	161,858	(62,526)
2035	-	940,110	-	103,180	1,616,484	940,110	(259,448)	680,662	0	154,155	91,629
2036	-	958,912	-	96,989	1,519,495	958,912	(267,196)	691,716	0	146,863	238,492
2037	-	978,091	-	91,170	1,428,325	978,091	(274,946)	703,145	0	139,955	378,447
2038	-	-	-	85,700	1,342,626	-	26,567	26,567	0	4,957	383,404
2039	-	-	-	80,558	1,262,068	-	24,973	24,973	0	4,368	387,773
2040	-	-	-	75,724	1,186,344	-	23,474	23,474	0	3,850	391,622
2041	-	-	-	71,181	1,115,164	-	22,066	22,066	0	3,392	395,015
2042	-	-	-	66,910	1,048,254	-	20,742	20,742	0	2,989	398,004
2043	-	-	-	62,895	985,358	-	19,498	19,498	0	2,634	400,638
2044	-	-	-	59,122	926,237	-	18,328	18,328	0	2,321	402,960
2045	-	-	-	55,574	870,663	-	17,228	17,228	0	2,046	405,006
2046	-	-	-	52,240	818,423	-	16,194	16,194	0	1,803	406,808
2047	-	-	-	49,105	769,318	-	15,223	15,223	0	1,589	408,397
2048	-	-	-	46,159	723,159	-	14,309	14,309	0	1,400	409,797
2049	-	-	-	43,390	679,769	-	13,451	13,451	0	1,234	411,030
2050	-	-	-	40,786	638,983	-	12,644	12,644	0	1,087	412,117
2051	-	-	-	38,339	600,644	-	11,885	11,885	0	958	413,075
2052	-	-	-	36,039	564,605	-	13,738	13,738	0	1,038	414,113
Total	-	19,840,825	(6,916,065)	6,351,460	102,964,235	12,924,760	(4,199,392)	8,725,369	15	414,113	(55,789,971)


Comparative Cumulative NPV
Tidewater Surge Tank Refurbishment
1,000,000
0
-1,000,000
-2,000,000
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CI Number: 39042

Title: **HYD – Sheet Harbour - Ten Mile Lake Dam Decommissioning**

Start Date: 2012/04
Final Cost Date: 2012/10
Function: Generation
Forecast Amount: $1,018,923

DESCRIPTION:

This project includes removing the dams and spillway at Ten Mile Lake. The existing dams no longer meet the Canadian Dam Association Safety guidelines and it is more economical to decommission the dams than to refurbish them.

Summary of Related CI's +/- 2 years:
No projects for 2010,2011,2012, 2013 & 2014

JUSTIFICATION:

Justification Criteria: Hydro

Why do this project?

The dams and spillways no longer meet the Canadian Dam Safety guidelines for freeboard and stability. The completed economic analysis supports removal of the structures over refurbishing them based on minimal energy production loss while maintaining installed generation capacity.

Why do this project now?

The options for these structures in 2012 include refurbishment and removal. Completing the decommissioning and removal in 2012 will mitigate the risk of these structures becoming a future liability.

Why do this project this way?

Decommissioning and removal of these structures is the most practical and cost effective option.

CI Number : 39042-H579 - HYD - Sheet harbour - Ten Mile Lake Dam Decommissioning **Project Number** H579

Parent CI Number : -

Cost Centre : 450 - 450-Sheet Harbour Hydro System **Budget Version** 2012 ACE Plan

Capital Item Accounts

Acct	Actv	Account	Activity	Forecast Amount	Amount	Variance
095		095-Thermal & Hydro Contracts AO		[redacted]	0	[redacted]
095		095-Hydro Regular Labour AO		[redacted]	0	[redacted]
011	007	011 - Travel Expense	007 - HGP - Environmental	[redacted]	0	[redacted]
041	007	041 - Meals & Entertainment	007 - HGP - Environmental	3,220	0	3,220
066	007	066 - Other Goods & Services	007 - HGP - Environmental	612	0	612
001	028	001 - HYDRO Regular Labour	028 - HGP - Dams & Spillways	10,785	0	10,785
012	028	012 - Materials	028 - HGP - Dams & Spillways	0	0	0
013	028	013 - POWER PRODUCTION Contracts	028 - HGP - Dams & Spillways	[redacted]	0	[redacted]
028	028	028 - Consulting	028 - HGP - Dams & Spillways	[redacted]	0	[redacted]
066	028	066 - Other Goods & Services	028 - HGP - Dams & Spillways	0	0	0
			Total Cost:	1,018,923	0	1,018,923
			Original Cost:	152,570		

Capital Project Detailed Estimate

Location: Hydro
FP#: 39042
Title: HYD - Sheet Harbour - Ten Mile Lake Dam Decommissioning

Item	Description	Unit	Quantity	Unit Estimate	Total Estimate	Cost Support Reference	Completed Similar Projects (FP#'s) Note 1
1	**001 Regular Labour**						
1.1	Hydro Regular Labour	lot	1	10,785	10,785		
				Sub-Total	10,785		
2	**012 Materials**						
2.1							
2.2							
2.3							
2.4							
				Sub-Total			
3	**013 Power Production Contracts**						
3.1	Decommissioning	lot	1	[redacted]	[redacted]	Cost Support Item #1	
3.2							
3.3							
				Sub-Total	[redacted]		
4	**002 Overtime Labour**						
4.1					-		
4.2					-		
4.3					-		
				Sub-Total	-		
5	**004 Term Labour**						
5.1					-		
5.2					-		
5.3					-		
				Sub-Total	-		
6	**011 Travel Expenses**						
6.1	Consultant Travel	lot	1	[redacted]	[redacted]		
6.2							
6.3							
				Sub-Total	[redacted]		
7	**028 Consulting**						
7.1	Detailed Design		1	[redacted]	[redacted]	Cost Support Item #2	
7.2	Contingency	%	20%	[redacted]	[redacted]		
7.3	Environmental Consulting		1	[redacted]	[redacted]	Cost Support Item #3	
				Sub-Total	[redacted]		
8	**041 Meals and Entertainment**						
8.1	meals and entertainment	lot	1	3,220	3,220		
8.3							
				Sub-Total	3,220		
9	**066- Other Goods and Services**						
9.1					612		
9.2					-		
9.3					-		
				Sub-Total	612		
9	**094 Interest Capitalized**						
9.1					-		
9.2					-		
9.3					-		
				Sub-Total	-		
10	**095 Administrative Overhead**						
10.1	Hydro Regular Labour AO				1,992		
10.2	Thermal Reg. Labour AO						
10.3	Thermal & Hydro Contracts AO				[redacted]		
				Sub-Total	[redacted]		
Project Cost Estimate				**Total**	$1,018,924		
11	**Original Cost**						
11.1					$152,570		

Note 1: Reference to "Completed similar projects (FP#'s)" is to be provided when the item estimate is based on work of similar scope for a recently completed project

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Ten Mile Lake Dam Decommissioning
Summary of Alternatives

Budget Year :	2011	**Date :**	21-Oct-11
Division :	Power Production	**CI Number:**	39042
Department :	Hydro Production	**Project No. :**	
Originator :			

	Alternative	After Tax WACC	PV of EVA / NPV	Rank	IRR	Disc Pay
A	Ten Mile Lake Dam Refurbishment	6.67%	-1,740,136	1	-5.26%	0.0 years
		6.67%	NA	NA	#NUM!	0.0 years
		6.67%	NA	NA	#NUM!	0.0 years
		6.67%	NA	NA	#NUM!	0.0 years

Recommendation :

Decommission the Ten Mile Lake Dam, as refurbishment has a negative NPV.

Notes/Comments :

Ten Mile Lake Dam Decommissioning

Assumptions and Inputs:

Capital cost for dam refurbishment = $3,200,000

Estimated avoided decommissioning costs = $1,018,924
Operating Costs per year = $10,000
Incremental replacement energy costs and annual operating costs in the years following 2013 are escalated at 2% annually.
Calculations:
Total annual avoided cost = [Replacement energy costs] - [Operating Costs]

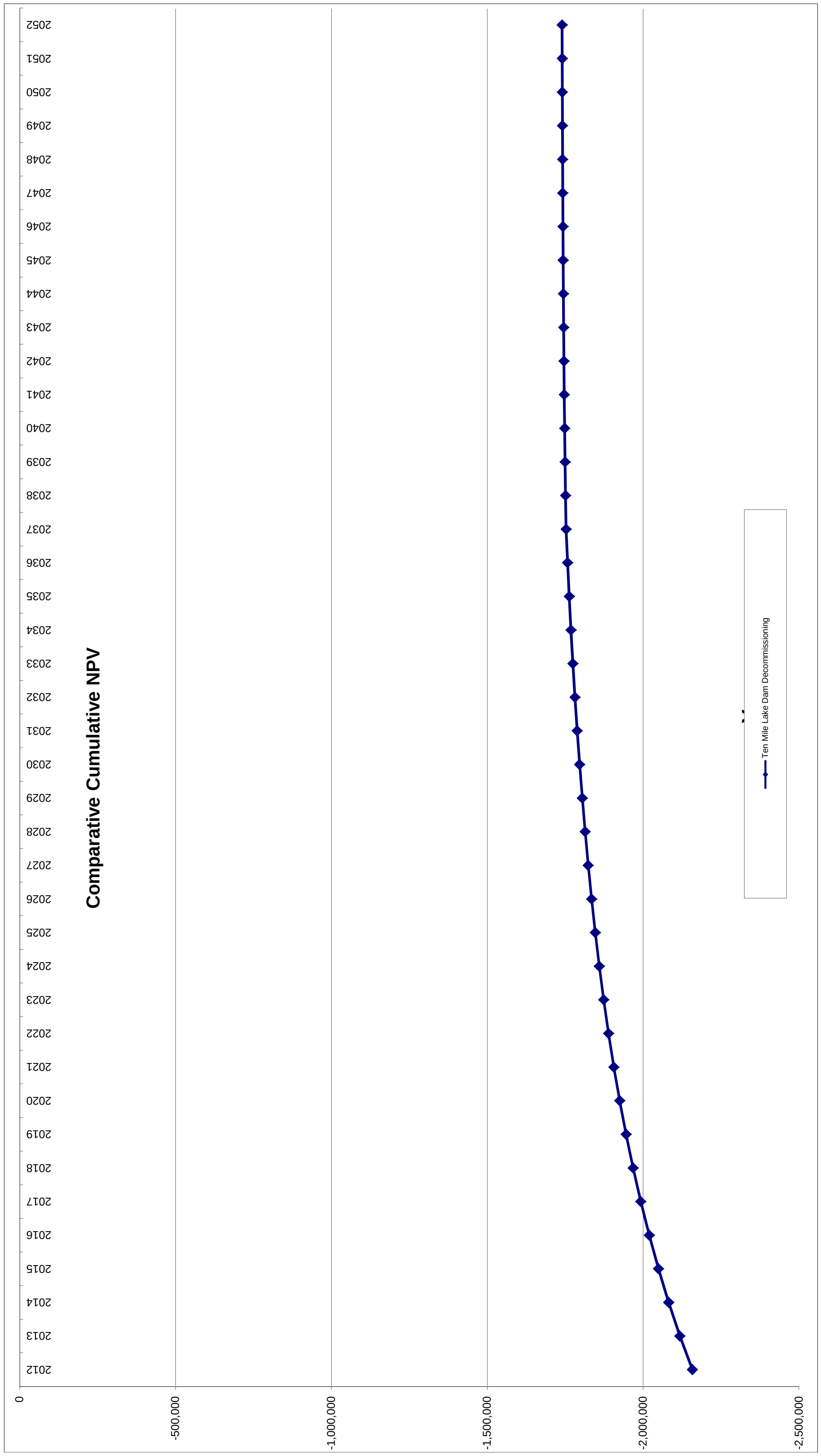
Avoided replacement energy cost = [Incremental replacement energy cost] x [Quantity of predicted annual unit outages / de-ratings] x [Estimated annual lost generation]

Avoided replacement energy cost (2012) =[[redacted]] x [1 outage] x [redacted]]-10000 = $9,000
Total avoided cost (2012) = $9,000

Avoided replacement energy cost (2013) = [[redacted]] x [1 outage] x [redacted]] - 10,000 = $9,000
Total avoided cost (2013)= $9,000

Ten Mile Lake Dam Decommissioning
Ten Mile Lake Dam Decommissioning

Year	Total Revenue	Operating Costs	Capital	CCA	UCC	CFBT	Applicable Taxes	CFAT	Discount Factor	PV of CF	CNPV
2012	-	9,040	(2,181,076)	55,243	2,125,833	(2,172,036)	13,955	(2,158,081)	1	(2,158,081)	(2,158,081)
2013	-	13,080	-	107,987	2,017,846	13,080	29,823	42,903	1	40,220	(2,117,860)
2014	-	13,342	-	103,073	1,914,774	13,342	27,486	40,828	1	35,882	(2,081,979)
2015	-	13,608	-	98,328	1,816,446	13,608	26,263	39,872	1	32,850	(2,049,129)
2016	-	13,881	-	93,753	1,722,693	13,881	24,463	38,344	1	29,616	(2,019,513)
2017	-	14,158	-	89,347	1,633,346	14,158	23,308	37,467	1	27,129	(1,992,384)
2018	-	14,441	-	85,107	1,548,239	14,441	21,906	36,348	1	24,673	(1,967,711)
2019	-	14,730	-	81,032	1,467,207	14,730	20,554	35,284	1	22,453	(1,945,257)
2020	-	15,025	-	77,119	1,390,088	15,025	19,249	34,274	1	20,447	(1,924,811)
2021	-	15,325	-	73,365	1,316,723	15,325	17,992	33,318	1	18,633	(1,906,177)
2022	-	15,632	-	69,766	1,246,957	15,632	16,782	32,414	1	16,994	(1,889,183)
2023	-	15,944	-	66,319	1,180,638	15,944	15,616	31,561	0	15,512	(1,873,670)
2024	-	16,263	-	63,020	1,117,618	16,263	14,495	30,758	0	14,173	(1,859,498)
2025	-	16,589	-	59,864	1,057,753	16,589	13,415	30,004	0	12,961	(1,846,537)
2026	-	16,920	-	56,848	1,000,905	16,920	12,378	29,298	0	11,864	(1,834,673)
2027	-	17,259	-	53,966	946,939	17,259	11,379	28,638	0	10,872	(1,823,801)
2028	-	17,604	-	51,215	895,724	17,604	10,420	28,024	0	9,973	(1,813,827)
2029	-	17,956	-	48,591	847,133	17,956	9,497	27,453	0	9,159	(1,804,668)
2030	-	18,315	-	46,087	801,046	18,315	8,609	26,925	0	8,421	(1,796,246)
2031	-	18,681	-	43,701	757,344	18,681	7,756	26,438	0	7,752	(1,788,494)
2032	-	19,055	-	41,428	715,916	19,055	6,936	25,991	0	7,145	(1,781,350)
2033	-	19,436	-	39,263	676,653	19,436	6,146	25,583	0	6,593	(1,774,757)
2034	-	19,825	-	37,203	639,450	19,825	5,387	25,212	0	6,091	(1,768,666)
2035	-	20,221	-	35,243	604,207	20,221	4,657	24,878	0	5,634	(1,763,032)
2036	-	20,626	-	33,378	570,829	20,626	3,953	24,579	0	5,219	(1,757,813)
2037	-	21,038	-	31,605	539,224	21,038	3,276	24,314	0	4,840	(1,752,974)
2038	-	-	-	29,920	509,304	-	9,275	9,275	0	1,731	(1,751,243)
2039	-	-	-	28,320	480,984	-	8,779	8,779	0	1,536	(1,749,707)
2040	-	-	-	26,800	454,184	-	8,308	8,308	0	1,362	(1,748,345)
2041	-	-	-	25,357	428,827	-	7,861	7,861	0	1,208	(1,747,137)
2042	-	-	-	23,987	404,841	-	7,436	7,436	0	1,072	(1,746,065)
2043	-	-	-	22,687	382,154	-	7,033	7,033	0	950	(1,745,115)
2044	-	-	-	21,454	360,700	-	6,651	6,651	0	842	(1,744,272)
2045	-	-	-	20,285	340,415	-	6,288	6,288	0	747	(1,743,526)
2046	-	-	-	19,176	321,239	-	5,945	5,945	0	662	(1,742,864)
2047	-	-	-	18,126	303,113	-	5,619	5,619	0	586	(1,742,277)
2048	-	-	-	17,130	285,983	-	5,310	5,310	0	520	(1,741,758)
2049	-	-	-	16,187	269,797	-	5,018	5,018	0	460	(1,741,298)
2050	-	-	-	15,293	254,503	-	4,741	4,741	0	408	(1,740,890)
2051	-	-	-	14,447	240,056	-	4,479	4,479	0	361	(1,740,529)
Total	-	427,996	(2,181,076)	1,941,020	35,587,631	(1,753,080)	468,444	(1,284,636)	15	(1,740,529)	(73,517,115)


Comparative Cumulative NPV
Ten Mile Lake Dam Decommissioning
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-1,500,000
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-2,500,000
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CI Number: 41138

Title: **HYD - Black River - Hollow Bridge Surge Tank Refurbishment**

Start Date: 2012/07
Final Cost Date: 2012/11
Function: Generation
Forecast Amount: $930,048

DESCRIPTION:

The refurbishment of the Hollow Bridge Surge Tank consists of concrete foundation repairs, sand-blasting and painting the interior and exterior of the surge tank, replacing the ladders and vertical lifeline systems, miscellaneous steel repairs, and installation of a new fiberglass bubbler system building designed to prevent freezing in the vertical piping connected to the surge tank.

Summary of Related CI's +/- 2 years:
No projects for 2010,2011,2012, 2013 & 2014

JUSTIFICATION:

Justification Criteria: Hydro

Sub Criteria: Maintenance

Why do this project?

These refurbishments are required in order to maintain the structural integrity of the tank and its foundations to ensure the strength and stability of the tank is not compromised. The existing foundations have started to show signs of degradation and must be refurbished to mitigate the risk of stability issues with the tank. The ladder and vertical lifeline system do not meet current Occupational Health and Safety Code requirements and must be replaced.

Why do this project now?

It has been approximately 20 years since this surge tank has been previously refurbished. Completing this project now will ensure the structural integrity and stability of the tank is not compromised and provides climbing devices designed to current Codes and standards. Completing the refurbishment now will avoid increased future repairs or replacement costs.

Why do this project this way?

Refurbishment is the most feasible option and is more cost effective than replacing the surge tank and its foundations.

CI Number : 41138 - HYD - Black River - Hollow Bridge Surge Tank Refurbishment **Project Number**

Parent CI Number : -

Cost Centre : 460 - 460-Black River Hydro System **Budget Version** 2012 ACE Plan

Capital Item Accounts

Acct	Actv	Account	Activity	Forecast Amount	Amount	Variance
094		094 - Interest Capitalized		9,241	0	9,241
095		095-Hydro Term Labour AO		[redacted]	0	[redacted]
095		095-Thermal & Hydro Contracts AO		[redacted]	0	[redacted]
004	027	004 - HYDRO Term Labour	027 - HGP - Waterways	[redacted]	0	[redacted]
011	027	011 - Travel Expense	027 - HGP - Waterways	8,380	0	8,380
012	027	012 - Materials	027 - HGP - Waterways	6,257	0	6,257
013	027	013 - POWER PRODUCTION Contracts	027 - HGP - Waterways	[redacted]	0	[redacted]
041	027	041 - Meals & Entertainment	027 - HGP - Waterways	7,140	0	7,140
			Total Cost:	930,048	0	930,048
			Original Cost:	70,178		

Capital Project Detailed Estimate

Location: Hydro
CI#: 41138
Title: HYD - Black River - Hollow Bridge Suge Tank Refurbishment

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Item	Description	Unit	Quantity	Unit Estimate	Total Estimate	Cost Support Reference	Completed Similar Projects (CI#'s) Note 1
1	**012 Materials**						
1.1	Fibreglass Building				$6,257		
1.2					-		
1.3					-		
1.4					-		
				Sub-Total	6,257		
2	**013 Power Production Contracts**						
2.1	Surge Tank Foundation Repairs	lot	1	[redacted]	[redacted]	Cost Support Item #1	
2.2	Application of protective coating for tank	lot	1	[redacted]	[redacted]	Cost Support Item #2	
2.3	Miscellaneous Steel Repairs	lot	1	[redacted]	[redacted]	Cost Support Item #2	
2.4	Removal and reinstatement of fence and bubbler system	lot	1	[redacted]	[redacted]	Cost Support Item #2	
2.5	Replace existing Ladder and VLL	lot	1	[redacted]	[redacted]	Cost Support Item #2	
2.6	Engineering	lot	1	[redacted]	[redacted]	Cost Support Item #2	
2.7	Site Cleanup and restoration	lot	1	[redacted]	[redacted]	Cost Support Item #2	
				Sub-Total	[redacted]		
3	**004 Term Labour**						
3.1	On-site construction supervisor	lot	1	[redacted]	[redacted]		
3.2							
3.3							
				Sub-Total	[redacted]		
4	**011 Travel Expenses**						
4.1	Travel Expenses	lot	1	8,380	8,380		
4.2							
4.3							
				Sub-Total	8,380		
5	**041 Meals and Entertainment**						
5.1	Meals and Entertainment	lot	1	7,140	7,140		
5.2							
5.3							
				Sub-Total	7,140		
6	**094 Interest Capitalized**						
6.1	Interest Capitalized				9,241		
6.2							
6.3							
				Sub-Total	9,241		
7	**095 Administrative Overhead**						
7.1	Hydro Regular Labour AO				-		
7.2	Hydro OT Labour AO				-		
7.3	Hydro Term Labour AO				[redacted]		
7.4	Thermal & Hydro Contracts AO						
				Sub-Total	47,093		
Project Cost Estimate				**Total**	**$930,049**		
8	**Original Cost**						
8.1					$70,178		

Note 1: Reference to "Completed similar projects (CI#'s)" is to be provided when the item estimate is based on work of similar scope for a recently completed project

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Hollow Bridge Surge Tank Refurbishment
Summary of Alternatives

Budget Year :	**2012**	**Date :**	**18-Oct-11**
Division :	Power Production	**CI Number:**	41138
Department :	Hydro Production	**Project No. :**	
Originator :			

	Alternative	After Tax WACC	PV of EVA / NPV	Rank	IRR	Disc Pay
A	Hollow Bridge Surge Tank Refurbishment	6.67%	11,217,389	1	457.66%	1.2 years
		6.67%	NA	NA	#NUM!	0.0 years
		6.67%	NA	NA	#NUM!	0.0 years
		6.67%	NA	NA	#NUM!	0.0 years

Recommendation :

Based on a positive NPV, it is recommended that the surge tank be refurbished at Hallow Bridge

Notes/Comments :

Hollow Bridge Surge Tank Refurbishment

Assumptions and Inputs:

Capital cost for surge tank refurbishment = $930,048

2012 Operating costs = $100,000
2013 Operating costs = $102,000

Incremental replacement energy costs and annual operating costs in the years following 2013 are escalated at 2% annually.
Calculations:
Total annual avoided cost = [Replacement energy costs] - [Annual operating costs]

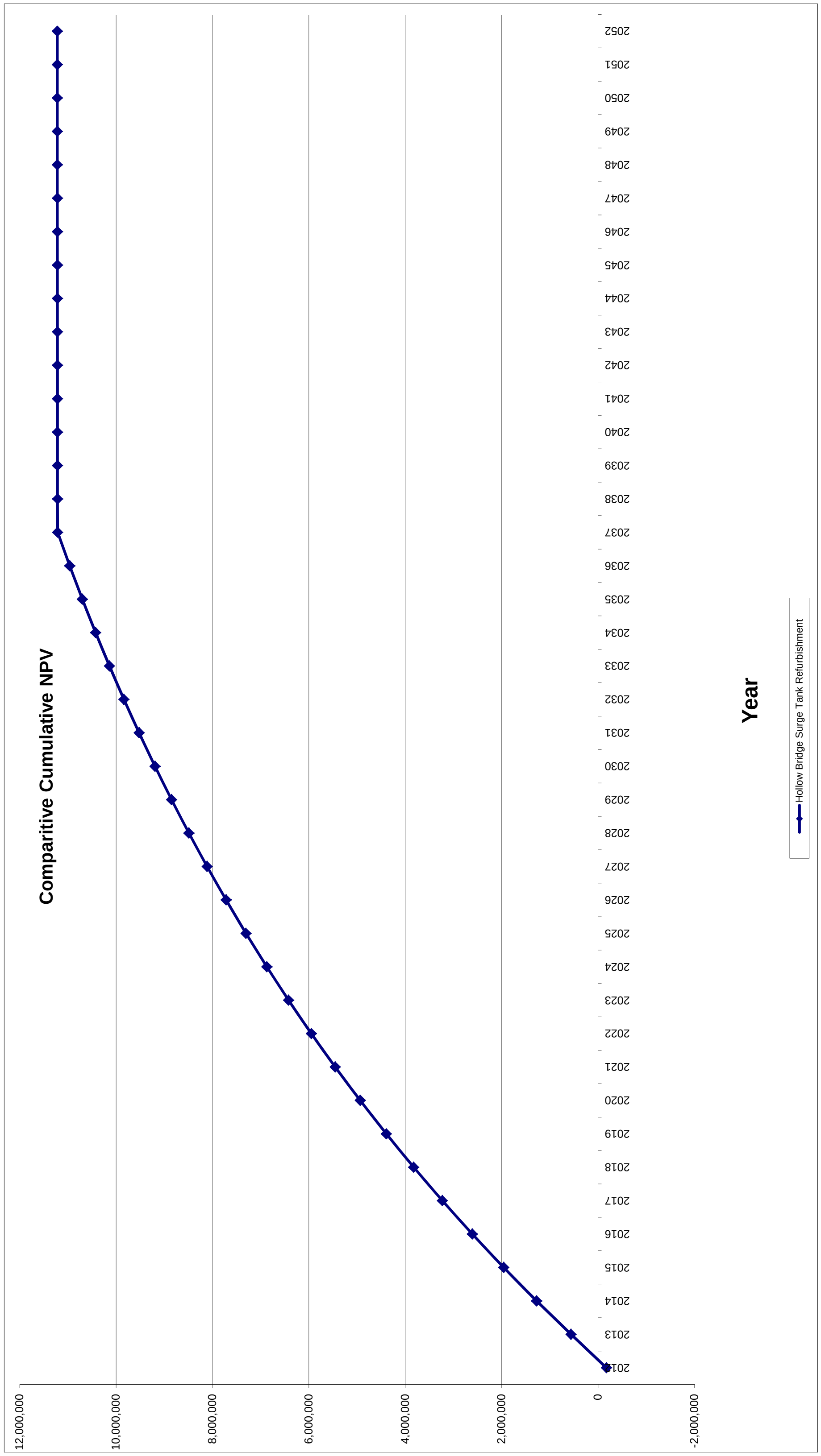
Avoided replacement energy cost = [Incremental replacement energy cost] x [Quantity of predicted annual unit outages / de-ratings] x [Estimated annual lost generation]

Avoided replacement energy cost (2012) = [redacted] x [1 outage] x [redacted] = $1,235,000
Total avoided cost (2012) = [$1,235,000] - [$100,000] = $ 1,135,000

Avoided replacement energy cost (2013) = [redacted] x [1 outage] x [redacted] = $1,235,000
Total avoided cost (2013)= [$1,235,000]- [$102,000] = $1,133,000

Hollow Bridge Surge Tank Refurbishment
Hollow Bridge Surge Tank Refurbishment

Year	Total Revenue	Operating Costs	Capital	CCA	UCC	CFBT	Applicable Taxes	CFAT	Discount Factor	PV of CF	CNPV
2012	-	1,135,000	(930,048)	27,901	902,147	204,952	(377,158)	(172,206)	1	(172,206)	(172,206)
2013	-	1,133,000	-	54,129	848,018	1,133,000	(351,062)	781,938	1	733,044	560,838
2014	-	1,155,660	-	50,881	797,137	1,155,660	(342,619)	813,041	1	714,542	1,275,380
2015	-	1,178,773	-	47,828	749,308	1,178,773	(350,593)	828,180	1	682,336	1,957,715
2016	-	1,202,349	-	44,959	704,350	1,202,349	(358,912)	843,436	1	651,453	2,609,168
2017	-	1,226,396	-	42,261	662,089	1,226,396	(367,082)	859,314	1	622,215	3,231,383
2018	-	1,250,924	-	39,725	622,364	1,250,924	(375,471)	875,452	1	594,263	3,825,646
2019	-	1,275,942	-	37,342	585,022	1,275,942	(383,966)	891,976	1	567,619	4,393,265
2020	-	1,301,461	-	35,101	549,921	1,301,461	(392,571)	908,889	1	542,216	4,935,482
2021	-	1,327,490	-	32,995	516,925	1,327,490	(401,293)	926,197	1	517,991	5,453,473
2022	-	1,354,040	-	31,016	485,910	1,354,040	(410,138)	943,902	1	494,885	5,948,358
2023	-	1,381,121	-	29,155	456,755	1,381,121	(419,109)	962,011	0	472,841	6,421,199
2024	-	1,408,743	-	27,405	429,350	1,408,743	(428,215)	980,528	0	451,807	6,873,005
2025	-	1,436,918	-	25,761	403,589	1,436,918	(437,459)	999,459	0	431,733	7,304,738
2026	-	1,465,656	-	24,215	379,374	1,465,656	(446,847)	1,018,810	0	412,573	7,717,312
2027	-	1,494,969	-	22,762	356,611	1,494,969	(456,384)	1,038,585	0	394,283	8,111,594
2028	-	1,524,869	-	21,397	335,214	1,524,869	(466,076)	1,058,792	0	376,820	8,488,414
2029	-	1,555,366	-	20,113	315,102	1,555,366	(475,929)	1,079,438	0	360,146	8,848,560
2030	-	1,586,474	-	18,906	296,196	1,586,474	(485,946)	1,100,528	0	344,223	9,192,783
2031	-	1,618,203	-	17,772	278,424	1,618,203	(496,134)	1,122,069	0	329,015	9,521,798
2032	-	1,650,567	-	16,705	261,718	1,650,567	(506,497)	1,144,070	0	314,490	9,836,288
2033	-	1,683,578	-	15,703	246,015	1,683,578	(517,041)	1,166,537	0	300,615	10,136,903
2034	-	1,717,250	-	14,761	231,254	1,717,250	(527,772)	1,189,478	0	287,360	10,424,263
2035	-	1,751,595	-	13,875	217,379	1,751,595	(538,693)	1,212,902	0	274,696	10,698,959
2036	-	1,786,627	-	13,043	204,336	1,786,627	(549,811)	1,236,816	0	262,597	10,961,556
2037	-	1,822,359	-	12,260	192,076	1,822,359	(561,131)	1,261,229	0	251,036	11,212,593
2038	-	-	-	11,525	180,552	-	3,573	3,573	0	667	11,213,259
2039	-	-	-	10,833	169,718	-	3,358	3,358	0	587	11,213,847
2040	-	-	-	10,183	159,535	-	3,157	3,157	0	518	11,214,364
2041	-	-	-	9,572	149,963	-	2,967	2,967	0	456	11,214,821
2042	-	-	-	8,998	140,965	-	2,789	2,789	0	402	11,215,223
2043	-	-	-	8,458	132,508	-	2,622	2,622	0	354	11,215,577
2044	-	-	-	7,950	124,557	-	2,465	2,465	0	312	11,215,889
2045	-	-	-	7,473	117,084	-	2,317	2,317	0	275	11,216,164
2046	-	-	-	7,025	110,059	-	2,178	2,178	0	242	11,216,407
2047	-	-	-	6,604	103,455	-	2,047	2,047	0	214	11,216,620
2048	-	-	-	6,207	97,248	-	1,924	1,924	0	188	11,216,808
2049	-	-	-	5,835	91,413	-	1,809	1,809	0	166	11,216,974
2050	-	-	-	5,485	85,928	-	1,700	1,700	0	146	11,217,121
2051	-	-	-	5,156	80,772	-	1,598	1,598	0	129	11,217,249
2052	-	-	-	4,846	75,926	-	1,847	1,847	0	140	11,217,389
Total	-	37,425,330	(930,048)	854,122	13,846,267	36,495,282	(11,387,558)	25,107,724	15	11,217,389	338,006,183


Comparitive Cumulative NPV
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Year
Hollow Bridge Surge Tank Refurbishment

CI Number: 23125

Title: **HYD – Sissiboo - Powerhouse Electrical Refurbishment**

Start Date: 2012/02
Final Cost Date: 2012/12
Function: Generation
Forecast Amount: $845,755

DESCRIPTION:

This project consists of replacing the existing medium voltage switchgear, electrical cables and control equipment at the Sissiboo powerhouse.

Summary of Related CI's +/- 2 years:
No projects for 2010,2011,2012, 2013 & 2014

JUSTIFICATION:

Justification Criteria: HYDRO

Sub Criteria: Equipment Replacement

Why do this project?

The electrical equipment to be replaced was commissioned with the Hydro Station when it entered service. The existing circuit breakers, power cables, control relays, protective relays, and voltage regulators have reached the end of their useful lives and replacement parts are no longer available.

Why do this project now?

This equipment has reached the end of its reliable operational life. Completing this project now will mitigate the risk of equipment failure. Failure of the switchgear or protective relays could expose the turbine generator to the potential for damage, extended forced outage and costly repairs.

Why do this project this way?

Upgrading obsolete equipment of this vintage is not a practical option due to the unavailability of spare parts and replacement is the only available option.

CI Number : 23125 - HYD - Sissiboo Falls - Electrical Equipment Replacement **Project Number**

Parent CI Number : -

Cost Centre : 411 - 411-Sissiboo/Weymouth System **Budget Version** 2012 ACE Plan

Capital Item Accounts

Acct	Actv	Account	Activity	Forecast Amount	Amount	Variance
092		092-Vehicle T&D OT Labour AO		1,267	0	1,267
092		092-Vehicle T&D Reg. Labour AO		5,320	0	5,320
094		094 - Interest Capitalized		12,165	0	12,165
095		095-Hydro Regular Labour AO		5,726	0	5,726
095		095-COPS Regular Labour AO		8,105	0	8,105
095		095-Thermal & Hydro Contracts AO		[redacted]	0	[redacted]
095		095-Hydro Overtime Labour AO		1,154	0	1,154
095		095-Thermal Regular Labour AO		10,324	0	10,324
095		095-COPS Overtime Labour AO		1,930	0	1,930
001	022	001 - THERMAL Regular Labour	022 - HGP - Elec Contr.Equip.	43,000	0	43,000
001	022	001 - HYDRO Regular Labour	022 - HGP - Elec Contr.Equip.	31,000	0	31,000
001	022	001 - T&D Regular Labour	022 - HGP - Elec Contr.Equip.	10,500	0	10,500
002	022	002 - T&D Overtime Labour	022 - HGP - Elec Contr.Equip.	5,000	0	5,000
002	022	002 - HYDRO Overtime Labour	022 - HGP - Elec Contr.Equip.	12,500	0	12,500
011	022	011 - Travel Expense	022 - HGP - Elec Contr.Equip.	11,000	0	11,000
012	022	012 - Materials	022 - HGP - Elec Contr.Equip.	[redacted]	0	[redacted]
013	022	013 - POWER PRODUCTION Contracts	022 - HGP - Elec Contr.Equip.	[redacted]	0	[redacted]
028	022	028 - Consulting	022 - HGP - Elec Contr.Equip.	[redacted]	0	[redacted]
041	022	041 - Meals & Entertainment	022 - HGP - Elec Contr.Equip.	7,500	0	7,500
066	022	066 - Other Goods & Services	022 - HGP - Elec Contr.Equip.	2,500	0	2,500
			Total Cost:	845,755	0	845,755
			Original Cost:	108,700		

Capital Project Detailed Estimate

Location: Hydro
FP#: 23125
Title: HYD - Sissiboo Falls - Electrical Equipment Replacement

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Item	Description	Unit	Quantity	Unit Estimate	Total Estimate	Cost Support Reference	Completed Similar Projects (FP#'s) Note 1
1	**001 Regular Labour**						
1.1	Hydro Reg Labour - Design / Proj Mngt	lot	1	4,500	$4,500		
1.2	Hydro Reg Labour - Commissioning	lot	1	26,500	26,500		
1.3	Thermal Regular Labour	lot	1	43,000	43,000		
1.4	T&D Regular Labour	lot	1	10,500	10,500		
				Sub-Total	84,500		16495, 16497
2	**012 Materials**						
2.1	Switchgear Supply	lot	1	[redacted]			
2.2	Generator Neutral Grounding Equipment	lot	1				
2.3	AC & DC Panelboards and Transfer Switch	lot	1				
2.4	Control Panel	lot	1				
2.5	Field Breaker Panel	lot	1				
2.6	Miscellaneous Material	lot	1				
				Sub-Total	[redacted]		16495, 16497
3	**013 Power Production Contracts**						
3.1	Installation	lot	1	[redacted]			
3.2					-		
3.3					-		
				Sub-Total	[redacted]		16495, 16497
4	**002 Overtime Labour**						
4.1	Hydro OT Labour - Design / Proj Mngt	lot	1	1,000	1,000		
4.2	Hydro OT Labour - Commissioning	lot	1	11,500	11,500		
4.3	T&D OT Labour	lot	1	5,000	5,000		
				Sub-Total	17,500		
6	**011 Travel Expenses**						
6.1	Travel Expenses	lot	1	11,000	11,000		
6.2							
6.3							
				Sub-Total	11,000		
7	**028 Consulting**						
7.1	Site Supervision	lot	1	[redacted]			
7.2	Commissioning	lot	1				
7.3	Design	lot	1				
				Sub-Total			16495, 16497
8	**041 Meals and Entertainment**						
8.1	Meals and Entertainment	lot	1	7,500.00	7,500.00		
8.2					-		
8.3							
				Sub-Total	7,500		
9	**066- Other Goods and Services**						
9.1	Other Goods and Services				2,500		
9.2					-		
9.3					-		
				Sub-Total	2,500		
9	**094 Interest Capitalized**						
9.1	Interest				12,165		
9.2					-		
9.3					-		
				Sub-Total	12,165		
10	**095 Administrative Overhead**						
10.1	Hydro Regular Labour AO				5,726		
10.2	Hydro OT Labour AO				1,154		
10.3	Hydro Term Labour AO				-		
10.4	Thermal & Hydro Contracts AO				[redacted]		
10.5	Thermal Regular Labour AO				10,324		
10.6	COPS Regular Labour				8,105		
10.7	COPS OT Labour				1,930		
10.8	Veh T&D Reg. Labour AO				5,320		
10.9	Veh T&D OT. Labour AO				1,267		
				Sub-Total	[redacted]		
Project Cost Estimate				**Total**	$845,755		
11	**Original Cost**						
11.1					$108,700		

Note 1: Reference to "Completed similar projects (FP#'s)" is to be provided when the item estimate is based on work of similar scope for a recently completed project

Sissiboo Falls Electrical Equipment Replacement
Summary of Alternatives

energy everywhere.

Budget Year :	**2012**	**Date :**	**31-Oct-11**
Division :	Power Production	**CI Number:**	23125
Department :	Hydro Production	**Project No. :**	
Originator :			

	Alternatives	After Tax WACC	PV of EVA / NPV	Rank	IRR	Disc Pay
A	Sissiboo Falls Electrical Refurbishment	6.67%	9,888,095	1	117.44%	1.9 years
		6.67%	NA	NA	#NUM!	0.0 years
		6.67%	NA	NA	#NUM!	0.0 years
		6.67%	NA	NA	#NUM!	0.0 years

Recommendation :

Based on a positive NPV,it is recommended that the Sissiboo falls electrical refurbishment be compeleted

Notes/Comments :

Sissiboo Falls Spillway Refurbishment

Assumptions and Inputs:

Capital cost for electrical refurbishment = $845,755 with an additional $314,412 and $181,972 expected on the system for the tailrace refurbishment (CI41140) and spillway refurbishment (CI41141) respectively

2012 Operating costs = $100,000
2013 Operating costs = $102,000

Incremental replacement energy costs and annual operating costs in the years following 2013 are escalated at 2% annually.
Calculations:
Total annual avoided cost = [Replacement energy costs] - [Annual operating costs]

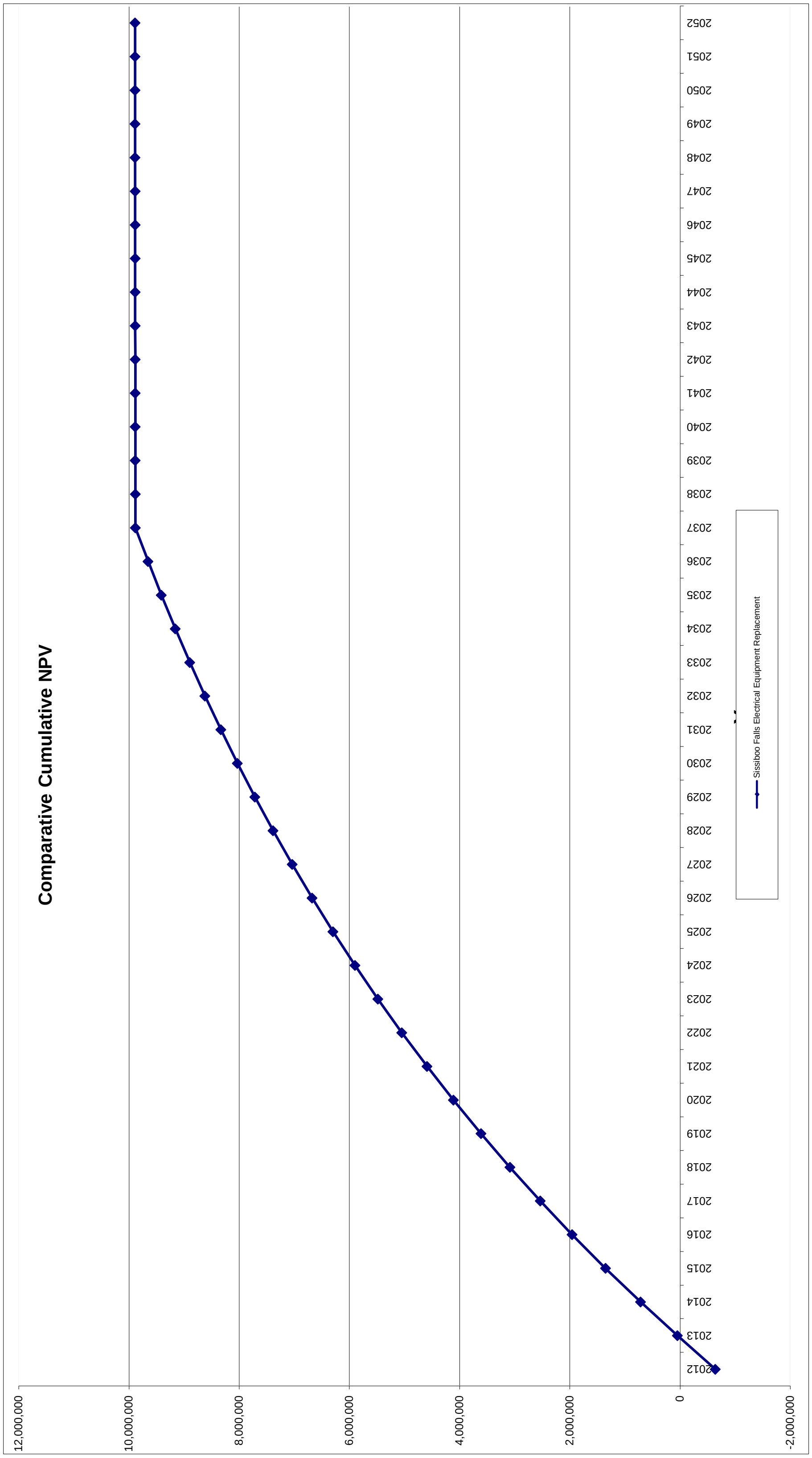
Avoided replacement energy cost = [Incremental replacement energy cost] x [Quantity of predicted annual unit outages / de-ratings] x [Estimated annual lost generation]

Avoided replacement energy cost (2012) = [[redacted]/MWh] x [1 outage] x [redacted] MWh] = $1,139,520
Total avoided cost (2012) = [$1,139,520] - [$100,000] = $ 1,039,520

Avoided replacement energy cost (2013) = [[redacted]/MWh] x [1 outage] x [redacted] MWh] = $1,139,520
Total avoided cost (2013)= [$1,139,520]- [$102,000] = $1,037,520

Sissiboo Falls Electrical Equipment Replacement
Sissiboo Falls Electrical Equipment Replacement

Year	Total Revenue	Operating Costs	Capital	CCA	UCC	CFBT	Applicable Taxes	CFAT	Discount Factor	PV of CF	CNPV
2012	-	1,039,520	(1,342,139)	53,686	1,288,453	(302,619)	(336,247)	(638,866)	1	(638,866)	(638,866)
2013	-	1,037,520	-	103,076	1,185,377	1,037,520	(304,294)	733,226	1	687,378	48,512
2014	-	1,058,270	-	94,830	1,090,547	1,058,270	(298,855)	759,416	1	667,414	715,926
2015	-	1,079,436	-	87,244	1,003,303	1,079,436	(307,580)	771,856	1	635,930	1,351,856
2016	-	1,101,025	-	80,264	923,039	1,101,025	(316,595)	784,430	1	605,877	1,957,733
2017	-	1,123,045	-	73,843	849,196	1,123,045	(325,253)	797,792	1	577,668	2,535,401
2018	-	1,145,506	-	67,936	781,260	1,145,506	(334,047)	811,459	1	550,824	3,086,226
2019	-	1,168,416	-	62,501	718,759	1,168,416	(342,834)	825,582	1	525,369	3,611,594
2020	-	1,191,784	-	57,501	661,259	1,191,784	(351,628)	840,156	1	501,212	4,112,807
2021	-	1,215,620	-	52,901	608,358	1,215,620	(360,443)	855,177	1	478,272	4,591,079
2022	-	1,239,932	-	48,669	559,689	1,239,932	(369,292)	870,641	1	456,474	5,047,553
2023	-	1,264,731	-	44,775	514,914	1,264,731	(378,186)	886,545	0	435,748	5,483,301
2024	-	1,290,026	-	41,193	473,721	1,290,026	(387,138)	902,888	0	416,031	5,899,333
2025	-	1,315,826	-	37,898	435,823	1,315,826	(396,158)	919,668	0	397,266	6,296,599
2026	-	1,342,143	-	34,866	400,957	1,342,143	(405,256)	936,887	0	379,398	6,675,997
2027	-	1,368,986	-	32,077	368,881	1,368,986	(414,442)	954,544	0	362,378	7,038,374
2028	-	1,396,365	-	29,510	339,370	1,396,365	(423,725)	972,640	0	346,159	7,384,533
2029	-	1,424,293	-	27,150	312,221	1,424,293	(433,114)	991,178	0	330,699	7,715,232
2030	-	1,452,778	-	24,978	287,243	1,452,778	(442,618)	1,010,160	0	315,958	8,031,190
2031	-	1,481,834	-	22,979	264,264	1,481,834	(452,245)	1,029,589	0	301,898	8,333,088
2032	-	1,511,471	-	21,141	243,123	1,511,471	(462,002)	1,049,469	0	288,485	8,621,573
2033	-	1,541,700	-	19,450	223,673	1,541,700	(471,898)	1,069,803	0	275,686	8,897,260
2034	-	1,572,534	-	17,894	205,779	1,572,534	(481,939)	1,090,596	0	263,471	9,160,731
2035	-	1,603,985	-	16,462	189,317	1,603,985	(492,132)	1,111,853	0	251,811	9,412,542
2036	-	1,636,065	-	15,145	174,171	1,636,065	(502,485)	1,133,580	0	240,678	9,653,220
2037	-	1,668,786	-	13,934	160,238	1,668,786	(513,004)	1,155,782	0	230,048	9,883,268
2038	-	-	-	12,819	147,419	-	3,974	3,974	0	742	9,884,010
2039	-	-	-	11,793	135,625	-	3,656	3,656	0	640	9,884,649
2040	-	-	-	10,850	124,775	-	3,364	3,364	0	552	9,885,201
2041	-	-	-	9,982	114,793	-	3,094	3,094	0	476	9,885,676
2042	-	-	-	9,183	105,610	-	2,847	2,847	0	410	9,886,087
2043	-	-	-	8,449	97,161	-	2,619	2,619	0	354	9,886,441
2044	-	-	-	7,773	89,388	-	2,410	2,410	0	305	9,886,746
2045	-	-	-	7,151	82,237	-	2,217	2,217	0	263	9,887,009
2046	-	-	-	6,579	75,658	-	2,039	2,039	0	227	9,887,236
2047	-	-	-	6,053	69,605	-	1,876	1,876	0	196	9,887,432
2048	-	-	-	5,568	64,037	-	1,726	1,726	0	169	9,887,601
2049	-	-	-	5,123	58,914	-	1,588	1,588	0	146	9,887,746
2050	-	-	-	4,713	54,201	-	1,461	1,461	0	126	9,887,872
2051	-	-	-	4,336	49,865	-	1,344	1,344	0	108	9,887,980
2052	-	-	-	3,989	45,876	-	1,521	1,521	0	115	9,888,095
Total	-	34,271,597	(1,342,139)	1,296,263	15,578,099	32,929,458	(10,267,671)	22,661,786	15	9,888,095	293,205,842


Comparative Cumulative NPV
Sissiboo Falls Electrical Equipment Replacement

CI Number: 41127

Title:	**HYD – Nictaux - Headcover Replacement**
Start Date:	2012/04
Final Cost Date:	2013/09
Function:	Generation
Forecast Amount:	$525,680

DESCRIPTION:

This project provides for the detailed engineering design, fabrication and installation of a new hydro turbine headcover for the Nictuax Unit.

Summary of Related CI's +/- 2 years:
2010 CI 39082 U&U Nictaux Headcover $429,815

JUSTIFICATION:

Justification Criteria: Hydro

Sub Criteria: Equipment Replacement

Why do this project?

During a planned outage in 2009, the headcover was removed, inspected, and cracks and erosion defects were repaired. As identified under CI 39082 – HYD U&U Nictaux Headcover, the repairs were short term in nature and only intended to provide lead time until the new replacement headcover could be installed in 2012. The new headcover must be installed to ensure the pressure boundry of the generating Unit is not compromised.

Why do this project now?

The turbine headcover must be replaced now to mitigate the risk of a headcover failure and compromising the pressure boundary.

Why do this project this way?

Replacing the headcover is the most viable and economically feasible option.

CI Number : 41127 - HYD - Nictaux - Headcover Replacement **Project Number**

Parent CI Number : -

Cost Centre : 431 - 431-Nictaux/Paradise System **Budget Version** 2012 ACE Plan

Capital Item Accounts

Acct	Actv	Account	Activity	Forecast Amount	Amount	Variance
094		094 - Interest Capitalized		13,491	0	13,491
095		095-Hydro Regular Labour AO		9,789	0	9,789
001	022	001 - THERMAL Regular Labour	022 - HGP - Elec Contr.Equip.	0	0	0
001	022	001 - HYDRO Regular Labour	022 - HGP - Elec Contr.Equip.	53,000	0	53,000
002	022	002 - HYDRO Overtime Labour	022 - HGP - Elec Contr.Equip.	11,000	0	11,000
011	022	011 - Travel Expense	022 - HGP - Elec Contr.Equip.	3,000	0	3,000
012	022	012 - Materials	022 - HGP - Elec Contr.Equip.	[redacted]	0	[redacted]
013	022	013 - POWER PRODUCTION Contracts	022 - HGP - Elec Contr.Equip.	0	0	0
028	022	028 - Consulting	022 - HGP - Elec Contr.Equip.	[redacted]	0	[redacted]
041	022	041 - Meals & Entertainment	022 - HGP - Elec Contr.Equip.	1,000	0	1,000
066	022	066 - Other Goods & Services	022 - HGP - Elec Contr.Equip.	0	0	0
			Total Cost:	525,680	0	525,680
			Original Cost:	59,153		

Capital Project Detailed Estimate

Location: Hydro
FP#: 41127
Title: HYD - Nictaux Headcover Replacement

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Item	Description	Unit	Quantity	Unit Estimate	Total Estimate	Cost Support Reference	Completed Similar Projects (FP#'s) Note 1
1	**001 Regular Labour**						
1.1	Unit Disassembly	lot	1	8,000	$8,000		
1.2	Unit Reassembly	lot	1	20,000	20,000		
1.3	Misc. Shop Work	lot	1	15,000	15,000		
1.4	Project Management	lot	1	5,000	5,000		
1.5	Spec. & Procurement	lot	1	5,000	5,000		
				Sub-Total	53,000		28857 - Ruth Falls #1 Headcover
2	**012 Materials**						
2.1	Headcover	lot	1	[redacted]	[redacted]	Cost Support Item #1	
2.2	Contingency	%	[redacted]	[redacted]	[redacted]		
2.3	Water lubricated bearing	lot	1	[redacted]	[redacted]	Cost Support Item #2	
2.4	Contingency	%	[redacted]	[redacted]	[redacted]		
2.5	Miscellaneous (Bolts, distributor ring, etc.)	lot	1	30,000	[redacted]		
2.6							
				Sub-Total	[redacted]		
3	**002 Overtime Labour**						
3.1	Unit Disasembly	lot	1	4,000	4,000		
3.2	Unit Reassembly	lot	1	7,000	7,000		
3.3							
				Sub-Total	11,000		
4	**011 Travel Expenses**						
4.1	Travel expenses	lot	1	3,000	3,000		
4.2							
4.2							
				Sub-Total	3,000		
5	**028 Consulting**						
5.1	Site Supervision	lot	1	[redacted]	[redacted]		
5.2							
5.3							
				Sub-Total	[redacted]		
6	**041 Meals and Entertainment**						
6.1	Meals and entertainment	lot	1	1,000	1,000		
6.2							
6.3							
				Sub-Total	1,000		
7	**094 Interest Capitalized**						
7.1					13,491		
				Sub-Total	13,491		
8	**095 Administrative Overhead**						
8.1	Hydro Regular Labour AO				9,789		
	Hydro OT Labour AO				-		
	Hydro Term Labour AO				-		
	Thermal & Hydro Contracts AO				-		
				Sub-Total	9,789		
Project Cost Estimate				**Total**	**$525,680**		
9	**Original Cost**						
9.1					$59,153		

Note 1: Reference to "Completed similar projects (FP#'s)" is to be provided when the item estimate is based on work of similar scope for a recently completed project

Nictaux Headcover Replacement
Summary of Alternatives

Budget Year :	**2012**	**Date :**	**18-Oct-11**
Division :	Power Production	**CI Number:**	41127
Department :	Hydro Production	**Project No. :**	
Originator :			

	Alternative	After Tax WACC	PV of EVA / NPV	Rank	IRR	Disc Pay
A	Nictaux Headcover Replacement	6.67%	15,147,409	1	#NUM!	2.2 years
		6.67%	NA	NA	#NUM!	0.0 years
		6.67%	NA	NA	#NUM!	0.0 years
		6.67%	NA	NA	#NUM!	0.0 years

Recommendation :

Based on positive NPV, it is recommended to replace the headcover at Nictaux

Notes/Comments :

Nictaux Headcover Replacement

Assumptions and Inputs:

Capital cost for headcover replacement = $513,235

2012 Operating costs = $100,000
2013 Operating costs = $102,000

Incremental replacement energy costs and annual operating costs in the years following 2013 are escalated at 2% annually.
Calculations:
Total annual avoided cost = [Replacement energy costs] - [Annual operating costs]

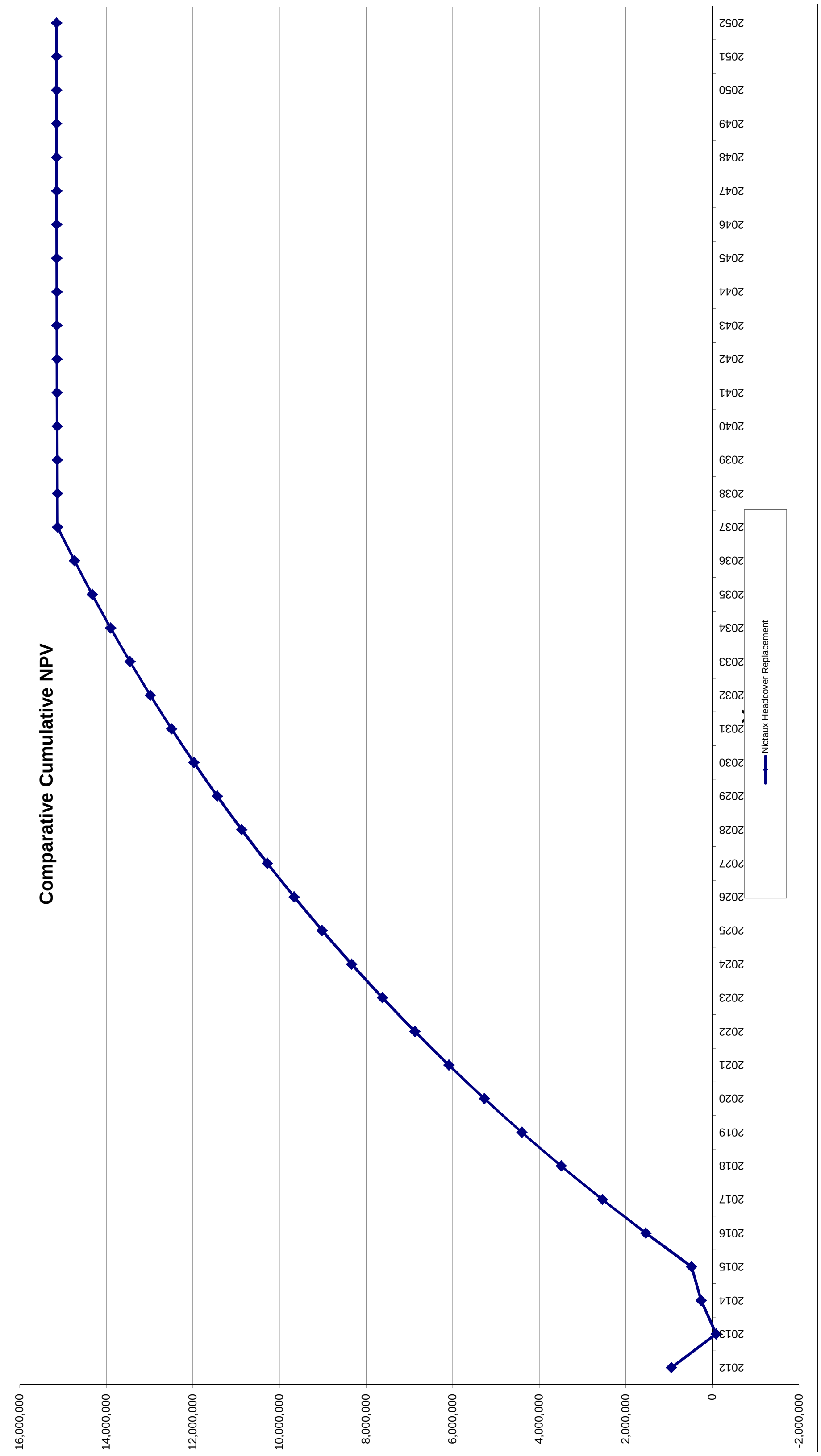
Avoided replacement energy cost = [Incremental replacement energy cost] x [Quantity of predicted annual unit outages / de-ratings] x [Estimated annual lost generation]

Avoided replacement energy cost (2012) = [redacted] x [1 outage] x [redacted] = $1,852,500
Total avoided cost (2012) = [$1,852,500] - [$100,000] = $ 1,752,500

Avoided replacement energy cost (2013) = [redacted] x [1 outage] x [redacted] = $1,852,500
Total avoided cost (2013)= [$1,852,500]- [$102,000] = $1,750,500

Nictaux Headcover Replacement
Nictaux Headcover Replacement

Year	Total Revenue	Operating Costs	Capital	CCA	UCC	CFBT	Applicable Taxes	CFAT	Discount Factor	PV of CF	CNPV
2012	-	1,752,500.0	(216,015.0)	17,281.2	198,733.8	1,536,485.0	(590,138.3)	946,346.7	1.000	946,346.7	946,346.7
2013	-	1,750,500.0	(2,316,819.7)	108,526.3	2,407,027.2	(566,319.7)	(534,860.0)	(1,101,179.7)	0.937	(1,032,323.7)	(85,977.1)
2014	-	1,785,510.0	(900,000.0)	207,547.2	3,099,480.0	885,510.0	(489,703.1)	395,806.9	0.879	347,855.4	261,878.3
2015	-	1,821,220.2	(1,061,208.0)	236,812.6	3,923,875.4	760,012.2	(491,166.3)	268,845.9	0.824	221,501.4	483,379.7
2016	-	1,857,644.6	-	263,531.6	3,660,343.8	1,857,644.6	(494,806.4)	1,362,838.2	0.772	1,052,628.5	1,536,008.2
2017	-	1,894,797.5	-	245,471.8	3,414,872.1	1,894,797.5	(511,291.0)	1,383,506.5	0.724	1,001,773.9	2,537,782.1
2018	-	1,932,693.4	-	228,675.4	3,186,196.7	1,932,693.4	(528,245.6)	1,404,447.8	0.679	953,348.8	3,491,130.9
2019	-	1,971,347.3	-	213,052.2	2,973,144.5	1,971,347.3	(545,071.5)	1,426,275.8	0.636	907,627.1	4,398,758.1
2020	-	2,010,774.3	-	198,518.6	2,774,625.9	2,010,774.3	(561,799.2)	1,448,975.0	0.597	864,415.5	5,263,173.5
2021	-	2,050,989.7	-	184,997.1	2,589,628.8	2,050,989.7	(578,457.7)	1,472,532.0	0.559	823,538.9	6,086,712.4
2022	-	2,092,009.5	-	172,415.7	2,417,213.0	2,092,009.5	(595,074.1)	1,496,935.5	0.524	784,838.2	6,871,550.6
2023	-	2,133,849.7	-	160,707.7	2,256,505.3	2,133,849.7	(611,674.0)	1,522,175.7	0.492	748,168.7	7,619,719.3
2024	-	2,176,526.7	-	149,811.3	2,106,694.0	2,176,526.7	(628,281.8)	1,548,244.9	0.461	713,398.4	8,333,117.7
2025	-	2,220,057.3	-	139,668.9	1,967,025.1	2,220,057.3	(644,920.4)	1,575,136.9	0.432	680,406.5	9,013,524.2
2026	-	2,264,458.4	-	130,227.4	1,836,797.7	2,264,458.4	(661,611.6)	1,602,846.8	0.405	649,082.5	9,662,606.7
2027	-	2,309,747.6	-	121,437.3	1,715,360.4	2,309,747.6	(678,376.2)	1,631,371.4	0.380	619,324.7	10,281,931.4
2028	-	2,355,942.5	-	113,252.7	1,602,107.7	2,355,942.5	(695,233.8)	1,660,708.7	0.356	591,039.8	10,872,971.2
2029	-	2,403,061.4	-	105,631.1	1,496,476.6	2,403,061.4	(712,203.4)	1,690,858.0	0.334	564,141.6	11,437,112.8
2030	-	2,451,122.6	-	98,532.8	1,397,943.8	2,451,122.6	(729,302.8)	1,721,819.8	0.313	538,550.4	11,975,663.2
2031	-	2,500,145.1	-	91,921.3	1,306,022.5	2,500,145.1	(746,549.4)	1,753,595.7	0.293	514,192.6	12,489,855.9
2032	-	2,550,148.0	-	85,762.5	1,220,260.0	2,550,148.0	(763,959.5)	1,786,188.5	0.275	490,999.9	12,980,855.7
2033	-	2,601,150.9	-	80,024.6	1,140,235.4	2,601,150.9	(781,549.2)	1,819,601.8	0.258	468,908.6	13,449,764.3
2034	-	2,653,173.9	-	74,678.4	1,065,557.0	2,653,173.9	(799,333.6)	1,853,840.3	0.242	447,859.5	13,897,623.8
2035	-	2,706,237.4	-	69,696.6	995,860.4	2,706,237.4	(817,327.7)	1,888,909.8	0.226	427,797.7	14,325,421.5
2036	-	2,760,362.2	-	65,053.7	930,806.7	2,760,362.2	(835,545.6)	1,924,816.5	0.212	408,671.4	14,734,092.9
2037	-	2,815,569.4	-	60,726.3	870,080.3	2,815,569.4	(854,001.4)	1,961,568.1	0.199	390,432.5	15,124,525.5
2038	-	-	-	56,692.5	813,387.8	-	17,574.7	17,574.7	0.187	3,279.4	15,127,804.8
2039	-	-	-	52,932.0	760,455.9	-	16,408.9	16,408.9	0.175	2,870.4	15,130,675.2
2040	-	-	-	49,425.7	711,030.1	-	15,322.0	15,322.0	0.164	2,512.6	15,133,187.8
2041	-	-	-	46,156.3	664,873.8	-	14,308.5	14,308.5	0.154	2,199.7	15,135,387.5
2042	-	-	-	43,107.4	621,766.4	-	13,363.3	13,363.3	0.144	1,925.9	15,137,313.5
2043	-	-	-	40,263.7	581,502.7	-	12,481.8	12,481.8	0.135	1,686.4	15,138,999.9
2044	-	-	-	37,611.3	543,891.4	-	11,659.5	11,659.5	0.127	1,476.8	15,140,476.7
2045	-	-	-	35,136.9	508,754.4	-	10,892.4	10,892.4	0.119	1,293.4	15,141,770.1
2046	-	-	-	32,828.4	475,926.0	-	10,176.8	10,176.8	0.111	1,132.9	15,142,903.0
2047	-	-	-	30,674.5	445,251.5	-	9,509.1	9,509.1	0.104	992.3	15,143,895.3
2048	-	-	-	28,664.5	416,587.0	-	8,886.0	8,886.0	0.098	869.3	15,144,764.6
2049	-	-	-	26,788.7	389,798.3	-	8,304.5	8,304.5	0.092	761.6	15,145,526.3
2050	-	-	-	25,037.9	364,760.5	-	7,761.7	7,761.7	0.086	667.3	15,146,193.6
2051	-	-	-	23,403.6	341,356.9	-	7,255.1	7,255.1	0.081	584.8	15,146,778.4
2052	-	-	-	21,878.0	319,478.9	-	8,339.9	8,339.9	0.076	630.2	15,147,408.6
Total	-	57,821,539.7	(4,494,042.7)	4,174,563.8	60,511,695.7	53,327,497.0	(16,708,239.6)	36,619,257.4	14.9	15,147,408.6	435,092,614.7


Comparative Cumulative NPV
16,000,000
14,000,000
12,000,000
10,000,000
8,000,000
6,000,000
4,000,000
2,000,000
0
-2,000,000
2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023 2024 2025 2026 2027 2028 2029 2030 2031 2032 2033 2034 2035 2036 2037 2038 2039 2040 2041 2042 2043 2044 2045 2046 2047 2048 2049 2050 2051 2052
Nictaux Headcover Replacement

CI Number: 41145

Title: **HYD – Mersey - Upper Lake Falls Riprap Replacement**

Start Date: 2012/04
Final Cost Date: 2012/09
Function: Generation
Forecast Amount: $516,420

DESCRIPTION:

This project includes the replacement of the riprap (comprised of loose rocks and boulders) on the dam at Upper Lake Falls.

Summary of Related CI's +/- 2 years:
No projects for 2010,2011,2012, 2013 & 2014

JUSTIFICATION:

Justification Criteria: Hydro

Sub Criteria: Maintenance

Why do this project?

The riprap protects the dam from the ongoing eroding action of waves. Upper Lake Falls is located on Lake Rossignol along a shoreline that is exposed to prevailing winds which can produce significant-size waves. The existing riprap has eroded and must be replaced to prevent deterioration of the impermeable core of the dam.

Why do this project now?

Riprap replacement is required to avoid compromising the integrity of the dam structure.

Why do this project this way?

Replacing the riprap is an effective technical solution to protect against the wave induced erosion.

CI Number : 41145 - HYD - Mersey - Upper Lake Falls Rip Rap Replacement **Project Number**

Parent CI Number : -

Cost Centre : 405 - 405-Hydro Production Administration **Budget Version** 2012 ACE Plan

Capital Item Accounts

Acct	Actv	Account	Activity	Forecast Amount	Amount	Variance
094		094 - Interest Capitalized		2,254	0	2,254
095		095-Hydro Regular Labour AO		554	0	554
095		095-Thermal & Hydro Contracts AO		[redacted]	0	[redacted]
095		095-Hydro Term Labour AO		[redacted]	0	[redacted]
001	028	001 - HYDRO Regular Labour	028 - HGP - Dams & Spillways	3,000	0	3,000
004	028	004 - HYDRO Term Labour	028 - HGP - Dams & Spillways	[redacted]	0	[redacted]
011	028	011 - Travel Expense	028 - HGP - Dams & Spillways	8,900	0	8,900
013	028	013 - POWER PRODUCTION Contracts	028 - HGP - Dams & Spillways	[redacted]	0	[redacted]
028	028	028 - Consulting	028 - HGP - Dams & Spillways	[redacted]	0	[redacted]
041	028	041 - Meals & Entertainment	028 - HGP - Dams & Spillways	2,000	0	2,000
066	028	066 - Other Goods & Services	028 - HGP - Dams & Spillways	500	0	500
			Total Cost:	516,420	0	516,420
			Original Cost:	333,575		

Capital Project Detailed Estimate

Location: Hydro
FP#: 41145
Title: HYD - Mersey - Upper Lake Falls Rip Rap Replacement

Item	Description	Unit	Quantity	Unit Estimate	Total Estimate	Cost Support Reference	Completed Similar Projects (FP#'s) Note 1
1	**001 Regular Labour**						
1.1	Engineering	hr	1	3,000	$3,000		
1.2		hr					
1.3		hr					
				Sub-Total	3,000		
2	**013 Power Production Contracts**						
2.1	Supply & Installation	Cubic Yards	15,000	[redacted]	[redacted]		28726
2.2							
2.3							
				Sub-Total	[redacted]		
3	**004 Term Labour**						
3.1	Site Supervision	lot	1	[redacted]	[redacted]		
3.2							
3.3							
				Sub-Total	[redacted]		
4	**011 Travel Expenses**						
4.1	Travel Expenses	lot	1	8,900	8,900		
4.2							
4.3							
				Sub-Total	8,900		
5	**028 Consulting**						
5.1	Detailed Design	lot	1	[redacted]	[redacted]		
5.2							
5.3							
				Sub-Total	[redacted]		
6	**041 Meals and Entertainment**						
6.1		lot	1	2,000	2,000		
6.2							
6.3							
				Sub-Total	2,000		
7	**066- Other Goods and Services**						
7.1					500		
7.2							
7.3							
				Sub-Total	500		
8	**094 Interest Capitalized**						
8.1					2,254		
8.2							
8.3							
				Sub-Total	2,254		
9	**095 Administrative Overhead**						
9.1	Hydro Regular Labour AO				554		
9.2	Hydro OT Labour AO				-		
9.3	Hydro Term Labour AO				[redacted]		
9.4	Thermal & Hydro Contracts AO				[redacted]		
				Sub-Total	24,766		
Project Cost Estimate				**Total**	$516,420		
10	**Original Cost**						
10.1					$333,575		

Note 1: Reference to "Completed similar projects (FP#'s)" is to be provided when the item estimate is based on work of similar scope for a recently completed project

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Upper Lake Falls Riprap Replacement
Summary of Alternatives

Budget Year :	**2012**	**Date :**	**18-Oct-11**
Division :	Power Production	**CI Number:**	41145
Department :	Hydro Production	**Project No. :**	
Originator :			

	Alternative	After Tax WACC	PV of EVA / NPV	Rank	IRR	Disc Pay
A	Upper Lake Falls Riprap Replacement	6.67%	11,065,203	1	#NUM!	0.0 years
		6.67%	NA	NA	#NUM!	0.0 years
		6.67%	NA	NA	#NUM!	0.0 years
		6.67%	NA	NA	#NUM!	0.0 years

Recommendation :

Based on a positive NPV, it is recommended that the Upper Lake Falls riprap be replaced

Notes/Comments :

Upper Lake Falls Riprap Replacement

Assumptions and Inputs:

Capital cost for riprap replacement = $516,420

2012 Operating costs = $100,000
2013 Operating costs = $102,000

Incremental replacement energy costs and annual operating costs in the years following 2013 are escalated at 2% annually.
Calculations:
Total annual avoided cost = [Replacement energy costs] - [Annual operating costs]

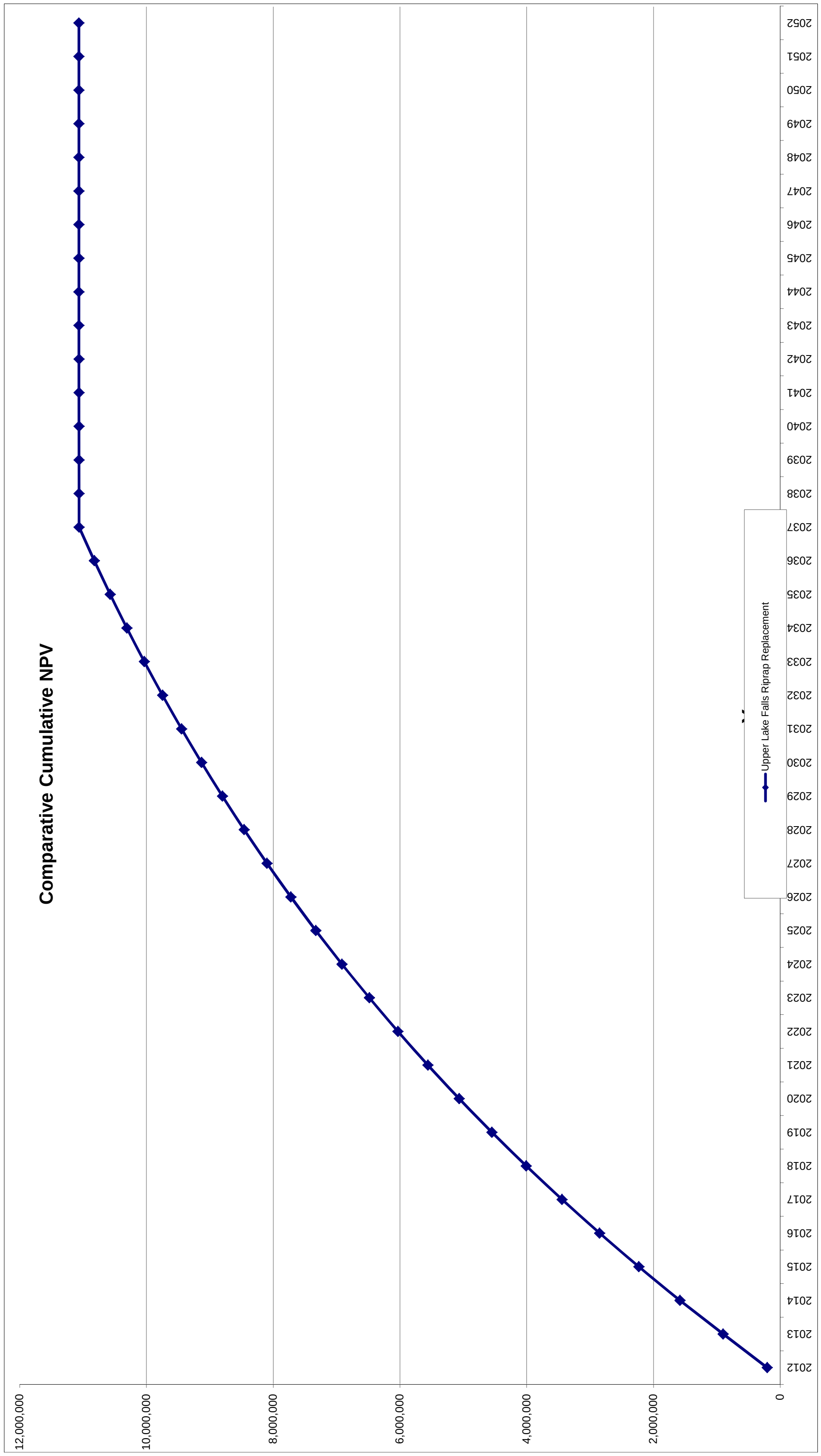
Avoided replacement energy cost = [Incremental replacement energy cost] x [Quantity of predicted annual unit outages / de-ratings] x [Estimated annual lost generation]

Avoided replacement energy cost (2012) =[redacted]] x [1 outage] x [redacted] = $1,187,500
Total avoided cost (2012) = [$1,187,500] - [$100,000] = $ 1,087,500

Avoided replacement energy cost (2013) =[redacted] x [1 outage] x[redacted] = $1,187,500
Total avoided cost (2013)= [$1,187,500]- [$102,000] = $1,085,500

Upper Lake Falls Riprap Replacement
Upper Lake Falls Riprap Replacement

Year	Total Revenue	Operating Costs	Capital	CCA	UCC	CFBT	Applicable Taxes	CFAT	Discount Factor	PV of CF	CNPV
2012	-	1,087,500	(516,420)	15,493	500,927	571,080	(364,896)	206,184	1	206,184	206,184
2013	-	1,085,500	-	30,056	470,872	1,085,500	(343,258)	742,242	1	695,830	902,015
2014	-	1,107,210	-	28,252	442,619	1,107,210	(334,553)	772,657	1	679,050	1,581,065
2015	-	1,129,354	-	26,557	416,062	1,129,354	(341,867)	787,487	1	648,809	2,229,874
2016	-	1,151,941	-	24,964	391,099	1,151,941	(349,431)	802,511	1	619,843	2,849,717
2017	-	1,174,980	-	23,466	367,633	1,174,980	(356,969)	818,011	1	592,308	3,442,024
2018	-	1,198,480	-	22,058	345,575	1,198,480	(364,691)	833,789	1	565,982	4,008,006
2019	-	1,222,449	-	20,734	324,840	1,222,449	(372,532)	849,918	1	540,855	4,548,861
2020	-	1,246,898	-	19,490	305,350	1,246,898	(380,496)	866,402	1	516,870	5,065,731
2021	-	1,271,836	-	18,321	287,029	1,271,836	(388,590)	883,247	1	493,971	5,559,701
2022	-	1,297,273	-	17,222	269,807	1,297,273	(396,816)	900,457	1	472,107	6,031,808
2023	-	1,323,218	-	16,188	253,619	1,323,218	(405,179)	918,039	0	451,228	6,483,036
2024	-	1,349,683	-	15,217	238,402	1,349,683	(413,684)	935,998	0	431,288	6,914,324
2025	-	1,376,676	-	14,304	224,097	1,376,676	(422,335)	954,341	0	412,243	7,326,568
2026	-	1,404,210	-	13,446	210,652	1,404,210	(431,137)	973,073	0	394,052	7,720,619
2027	-	1,432,294	-	12,639	198,012	1,432,294	(440,093)	992,201	0	376,674	8,097,293
2028	-	1,460,940	-	11,881	186,132	1,460,940	(449,208)	1,011,732	0	360,071	8,457,365
2029	-	1,490,159	-	11,168	174,964	1,490,159	(458,487)	1,031,672	0	344,209	8,801,574
2030	-	1,519,962	-	10,498	164,466	1,519,962	(467,934)	1,052,028	0	329,053	9,130,627
2031	-	1,550,361	-	9,868	154,598	1,550,361	(477,553)	1,072,808	0	314,571	9,445,198
2032	-	1,581,369	-	9,276	145,322	1,581,369	(487,349)	1,094,020	0	300,732	9,745,930
2033	-	1,612,996	-	8,719	136,603	1,612,996	(497,326)	1,115,670	0	287,506	10,033,436
2034	-	1,645,256	-	8,196	128,407	1,645,256	(507,488)	1,137,767	0	274,867	10,308,303
2035	-	1,678,161	-	7,704	120,702	1,678,161	(517,842)	1,160,319	0	262,788	10,571,091
2036	-	1,711,724	-	7,242	113,460	1,711,724	(528,389)	1,183,335	0	251,242	10,822,333
2037	-	1,745,959	-	6,808	106,653	1,745,959	(539,137)	1,206,822	0	240,207	11,062,540
2038	-	-	-	6,399	100,253	-	1,984	1,984	0	370	11,062,910
2039	-	-	-	6,015	94,238	-	1,865	1,865	0	326	11,063,236
2040	-	-	-	5,654	88,584	-	1,753	1,753	0	287	11,063,524
2041	-	-	-	5,315	83,269	-	1,648	1,648	0	253	11,063,777
2042	-	-	-	4,996	78,273	-	1,549	1,549	0	223	11,064,000
2043	-	-	-	4,696	73,576	-	1,456	1,456	0	197	11,064,197
2044	-	-	-	4,415	69,162	-	1,369	1,369	0	173	11,064,370
2045	-	-	-	4,150	65,012	-	1,286	1,286	0	153	11,064,523
2046	-	-	-	3,901	61,111	-	1,209	1,209	0	135	11,064,658
2047	-	-	-	3,667	57,445	-	1,137	1,137	0	119	11,064,776
2048	-	-	-	3,447	53,998	-	1,068	1,068	0	105	11,064,881
2049	-	-	-	3,240	50,758	-	1,004	1,004	0	92	11,064,973
2050	-	-	-	3,045	47,713	-	944	944	0	81	11,065,054
2051	-	-	-	2,863	44,850	-	887	887	0	72	11,065,126
2052	-	-	-	2,691	42,159	-	1,026	1,026	0	78	11,065,203
Total	-	35,856,390	(516,420)	474,261	7,688,301	35,339,970	(11,017,056)	24,322,915	15	11,065,203	337,310,431


Comparative Cumulative NPV
Upper Lake Falls Riprap Replacement
12,000,000
10,000,000
8,000,000
6,000,000
4,000,000
2,000,000
0
2012
2052

CI Number: 41140

Title: **HYD – Sissiboo - Sissiboo Falls Tailrace Concrete Refurbishment**

Start Date: 2012/04
Final Cost Date: 2012/12
Function: Generation
Forecast Amount: $314,412

DESCRIPTION:

This project includes the reconstruction of the concrete tailrace deck (including stair access and supporting sub-structure) and refurbishment of the associated steel tailrace gate and its structural steel support system.

Summary of Related CI's +/- 2 years:
No projects for 2010,2011,2012, 2013 & 2014

JUSTIFICATION:

Justification Criteria: Hydro

Sub Criteria: Equipment Replacement

Why do this project?

The existing tailrace concrete deck and sub-structure has experienced normal degradation over time and must now be refurbished. Completing this project will mitigate the risk of further degradation and potential for issues related to structural integrity. The concrete supporting sub-structure is also showing signs of degradation and requires refurbishment.

The protective coatings previously applied to the tailrace gate and support structure have started to degrade and require refurbishment to preserve the tailrace gate.

Why do this project now?

Refurbishing the tailrace concrete now will maintain the structural integrity of the tailrace and continue to provide safe working conditions. Refurbishing the tailrace gate and structural steel support system now will prevent further degradation and more costly repairs in the future.

Why do this project this way?

Refurbishing the tailrace concrete, gate and structural steel support system is the most feasible and effective option and will avoid the need for complete replacement of these components.

CI Number : 41140 - HYD Sissiboo Falls - Tailrace Concrete Refurbishment **Project Number**

Parent CI Number : -

Cost Centre : 411 - 411-Sissiboo/Weymouth System **Budget Version** 2012 ACE Plan

Capital Item Accounts

Acct	Actv	Account	Activity	Forecast Amount	Amount	Variance
094		094 - Interest Capitalized		3,449	0	3,449
095		095-Hydro Term Labour AO		[redacted]	0	[redacted]
095		095-Thermal & Hydro Contracts AO		[redacted]	0	[redacted]
095		095-Hydro Overtime Labour AO		92	0	92
002	027	002 - HYDRO Overtime Labour	027 - HGP - Waterways	1,000	0	1,000
004	027	004 - HYDRO Term Labour	027 - HGP - Waterways	[redacted]	0	[redacted]
011	027	011 - Travel Expense	027 - HGP - Waterways	1,000	0	1,000
012	027	012 - Materials	027 - HGP - Waterways	[redacted]	0	[redacted]
013	027	013 - POWER PRODUCTION Contracts	027 - HGP - Waterways	[redacted]	0	[redacted]
028	027	028 - Consulting	027 - HGP - Waterways	[redacted]	0	[redacted]
041	027	041 - Meals & Entertainment	027 - HGP - Waterways	1,000	0	1,000
066	027	066 - Other Goods & Services	027 - HGP - Waterways	1,000	0	1,000
			Total Cost:	314,412	0	314,412
			Original Cost:	40,410		

Capital Project Detailed Estimate

Location: Hydro
FP#: 41140
Title: HYD - Siissiboo Falls - Tailrace Concrete Refurbishment

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Item	Description	Unit	Quantity	Unit Estimate	Total Estimate	Cost Support Reference	Completed Similar Projects (FP#'s) Note 1
1	**012 Materials**						
1.1	Seals and Miscellaneous materials	lot	[redacted]				17618 - HYD -Bear River Tailrace Deck
1.2					-		
1.3					-		
1.4					-		
				Sub-Total	[redacted]		
2	**013 Power Production Contracts**						
2.1	Concrete Rerfurbishment	lot	[redacted]				17618 - HYD -Bear River Tailrace Deck
2.2	Steel Refurbishment and Recoating	lot	[redacted]				17618 - HYD -Bear River Tailrace Deck
2.3	Scaffolding and Miscellaneous Safety Items	lot	[redacted]				17618 - HYD -Bear River Tailrace Deck
				Sub-Total	[redacted]		
3	**002 Overtime Labour**						
3.1		lot	1	1,000	1,000		
3.2							
3.3							
				Sub-Total	1,000		
4	**004 Term Labour**						
4.1		lot	1	[redacted]			
4.2							
4.3							
				Sub-Total	[redacted]		
5	**011 Travel Expenses**						
5.1			1	1,000	1,000		
5.2							
5.3							
				Sub-Total	1,000		
6	**028 Consulting**						
6.1	Project Management	lot	1	[redacted]			
6.2	Inspections	lot	1				
6.3							
				Sub-Total	[redacted]		
7	**041 Meals and Entertainment**						
7.1				1,000	1,000		
7.2					-		
7.3					-		
				Sub-Total	1,000		
8	**066- Other Goods and Services**						
8.1				1000	1,000		
8.2							
8.3							
				Sub-Total	1,000		
9	**094 Interest Capitalized**						
9.1				3449	3,449		
9.2							
9.3							
				Sub-Total	3,449		
10	**095 Administrative Overhead**						
10.1	Hydro Regular Labour AO				-		
10.2	Hydro OT Labour AO				92		
10.3	Hydro Term Labour AO				[redacted]		
10.4	Thermal & Hydro Contracts AO						
				Sub-Total	10,963		
Project Cost Estimate				**Total**	$314,412		
11	**Original Cost**						
11.1					$40,410		

Note 1: Reference to "Completed similar projects (FP#'s)" is to be provided when the item estimate is based on work of similar scope for a recently completed project

Nova Scotia POWER An Emera Company energy everywhere.

Sissiboo Falls Tailrace Concrete Refurbishment
Summary of Alternatives

Budget Year :	2012	**Date :**	18-Oct-11
Division :	Power Production	**CI Number:**	41140
Department :	Hydro Production	**Project No. :**	
Originator :			

	Alternatives	After Tax WACC	PV of EVA / NPV	Rank	IRR	Disc Pay
A	Sissiboo Falls Spillway Refurbishments	6.67%	9,893,181	1	117.54%	1.9 years
		6.67%	NA	NA	#NUM!	0.0 years
		6.67%	NA	NA	#NUM!	0.0 years
		6.67%	NA	NA	#NUM!	0.0 years

Recommendation :

Based on a positive NPV, it is recommended that the Sissiboo tailrace refurbishment be compeleted

Notes/Comments :

Sissiboo Falls Spillway Refurbishment

Assumptions and Inputs:

Capital cost for tailrace refurbishment = $314,412 with an additional $181,972 and $845,755 expected on the system for spillway refurbishment (CI41141) and electrical refurbishment (CI23125) respectively.

2012 Operating costs = $100,000
2013 Operating costs = $102,000

Incremental replacement energy costs and annual operating costs in the years following 2013 are escalated at 2% annually.
Calculations:
Total annual avoided cost = [Replacement energy costs] - [Annual operating costs]

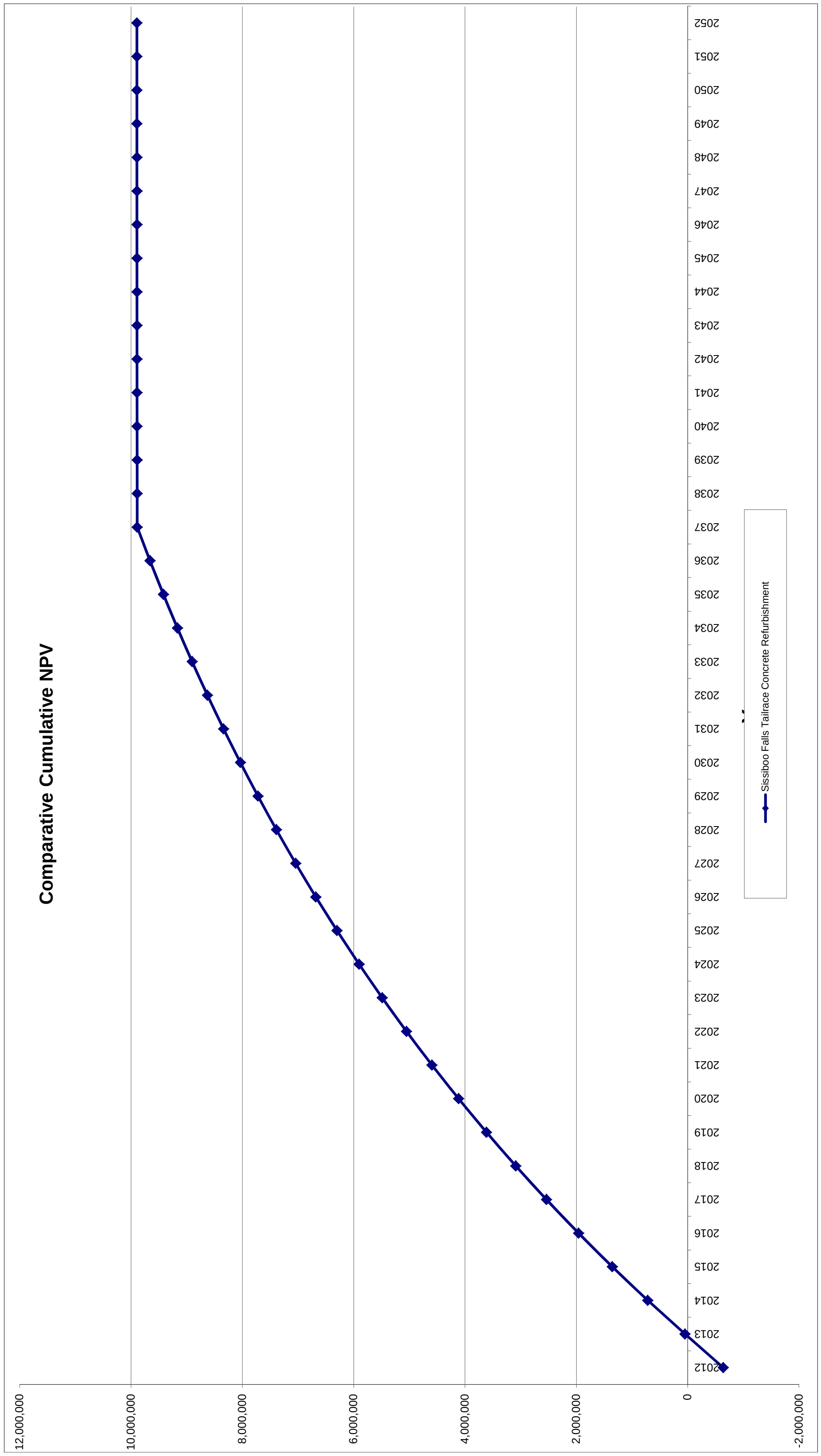
Avoided replacement energy cost = [Incremental replacement energy cost] x [Quantity of predicted annual unit outages / de-ratings] x [Estimated annual lost generation]

Avoided replacement energy cost (2012) = [redacted] x [1 outage] x [redacted] = $1,140,000
Total avoided cost (2012) = [$1,140,000] - [$100,000] = $ 1,040,000

Avoided replacement energy cost (2013) = [redacted] x [1 outage] x [redacted] = $1,140,000
Total avoided cost (2013)= [$1,140,000]- [$102,000] = $1,038,000

Sissiboo Falls Tailrace Concrete Refurbishment
Sissiboo Falls Tailrace Concrete Refurbishment

Year	Total Revenue	Operating Costs	Capital	CCA	UCC	CFBT	Applicable Taxes	CFAT	Discount Factor	PV of CF	CNPV
2012	-	1,040,000	(1,342,139)	53,686	1,288,453	(302,139)	(336,410)	(638,549)	1	(638,549)	(638,549)
2013	-	1,038,000	-	103,076	1,185,377	1,038,000	(304,450)	733,550	1	687,681	49,132
2014	-	1,058,760	-	94,830	1,090,547	1,058,760	(299,006)	759,754	1	667,710	716,843
2015	-	1,079,935	-	87,244	1,003,303	1,079,935	(307,734)	772,201	1	636,214	1,353,057
2016	-	1,101,534	-	80,264	923,039	1,101,534	(316,753)	784,781	1	606,149	1,959,206
2017	-	1,123,565	-	73,843	849,196	1,123,565	(325,414)	798,151	1	577,928	2,537,134
2018	-	1,146,036	-	67,936	781,260	1,146,036	(334,211)	811,825	1	551,072	3,088,206
2019	-	1,168,957	-	62,501	718,759	1,168,957	(343,001)	825,955	1	525,606	3,613,812
2020	-	1,192,336	-	57,501	661,259	1,192,336	(351,799)	840,537	1	501,439	4,115,252
2021	-	1,216,182	-	52,901	608,358	1,216,182	(360,617)	855,565	1	478,489	4,593,741
2022	-	1,240,506	-	48,669	559,689	1,240,506	(369,470)	871,036	1	456,681	5,050,423
2023	-	1,265,316	-	44,775	514,914	1,265,316	(378,368)	886,948	0	435,946	5,486,369
2024	-	1,290,623	-	41,193	473,721	1,290,623	(387,323)	903,299	0	416,221	5,902,590
2025	-	1,316,435	-	37,898	435,823	1,316,435	(396,347)	920,088	0	397,447	6,300,038
2026	-	1,342,764	-	34,866	400,957	1,342,764	(405,448)	937,315	0	379,572	6,679,609
2027	-	1,369,619	-	32,077	368,881	1,369,619	(414,638)	954,981	0	362,544	7,042,153
2028	-	1,397,011	-	29,510	339,370	1,397,011	(423,925)	973,086	0	346,318	7,388,470
2029	-	1,424,952	-	27,150	312,221	1,424,952	(433,319)	991,633	0	330,851	7,719,321
2030	-	1,453,451	-	24,978	287,243	1,453,451	(442,827)	1,010,624	0	316,103	8,035,424
2031	-	1,482,520	-	22,979	264,264	1,482,520	(452,457)	1,030,062	0	302,037	8,337,461
2032	-	1,512,170	-	21,141	243,123	1,512,170	(462,219)	1,049,951	0	288,618	8,626,078
2033	-	1,542,413	-	19,450	223,673	1,542,413	(472,119)	1,070,295	0	275,813	8,901,892
2034	-	1,573,262	-	17,894	205,779	1,573,262	(482,164)	1,091,098	0	263,593	9,165,484
2035	-	1,604,727	-	16,462	189,317	1,604,727	(492,362)	1,112,365	0	251,927	9,417,411
2036	-	1,636,821	-	15,145	174,171	1,636,821	(502,720)	1,134,102	0	240,789	9,658,200
2037	-	1,669,558	-	13,934	160,238	1,669,558	(513,243)	1,156,314	0	230,154	9,888,354
2038	-	-	-	12,819	147,419	-	3,974	3,974	0	742	9,889,096
2039	-	-	-	11,793	135,625	-	3,656	3,656	0	640	9,889,735
2040	-	-	-	10,850	124,775	-	3,364	3,364	0	552	9,890,287
2041	-	-	-	9,982	114,793	-	3,094	3,094	0	476	9,890,763
2042	-	-	-	9,183	105,610	-	2,847	2,847	0	410	9,891,173
2043	-	-	-	8,449	97,161	-	2,619	2,619	0	354	9,891,527
2044	-	-	-	7,773	89,388	-	2,410	2,410	0	305	9,891,832
2045	-	-	-	7,151	82,237	-	2,217	2,217	0	263	9,892,095
2046	-	-	-	6,579	75,658	-	2,039	2,039	0	227	9,892,322
2047	-	-	-	6,053	69,605	-	1,876	1,876	0	196	9,892,518
2048	-	-	-	5,568	64,037	-	1,726	1,726	0	169	9,892,687
2049	-	-	-	5,123	58,914	-	1,588	1,588	0	146	9,892,833
2050	-	-	-	4,713	54,201	-	1,461	1,461	0	126	9,892,958
2051	-	-	-	4,336	49,865	-	1,344	1,344	0	108	9,893,067
2052	-	-	-	3,989	45,876	-	1,521	1,521	0	115	9,893,181
Total	-	34,287,451	(1,342,139)	1,296,263	15,578,099	32,945,312	(10,272,608)	22,672,704	15	9,893,181	293,363,186


Comparative Cumulative NPV
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8,000,000
6,000,000
4,000,000
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0
-2,000,000
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Sissiboo Falls Tailrace Concrete Refurbishment

Generation

Steam Cls 10 -31

CI Number: 41229

Title:	**LIN Fire Suppression - Cable Spreading Rooms**
Start Date:	2012/06
Final Cost Date:	2012/10
Function:	Generation
Forecast Amount:	$918,292

DESCRIPTION:

This project includes the addition of a fixed fire protection system for the four cable spreading rooms at the Lingan Generating Station. At the time of construction, the fire protection infrastructure was adequate, but a recent risk analysis identified that existing fire protection in the cable spreading rooms no longer meets current industry standards.

The cable spreading rooms contain a high concentration of critical power and communication cables and fire protection systems that meet current industry standards are required to protect these cables.

This project completes the planned fire protection upgrades as identified in the most recent assessment of fire protection systems for all NSPI thermal plants.

Summary of Related CI's +/- 2 years:
2010 CI 38846 LIN1 Fire Protection/ Turbine $293,207
2011 CI 40184 LIN2 Fire Protection Turbine Hall $343,611
2011 CI 40212 LIN3,4 Burner Fronts Fire Protection $51,889

JUSTIFICATION:

Justification Criteria: Health and Safety

Why do this project?

In a recent assessment of fire protection systems at all NSPI thermal plants, the cable spreading rooms were identified as a risk and requiring upgrades to the fire protection system. This risk is best mitigated by applying a fixed fire protection system around the equipment in these rooms.

Why do this project now?

As a result of recent inspections, NSPI's insurance providers have recommended the need to introduce additional fire protection system modifications. Completing this project now will ensure the fire protection system is returned to current industry standards providing adequate loss control.

Why do this project this way?

The benchmark study used for assessing loss control practices was NFPA 850 and FM DS7-1 01. Although they are recommended practices, they have become industry guidelines, widely used by insurers in risk assessments for power generation facilities. The new fire protection system will be integrated into the current system that exists at the plant. A clean gaseous system is proposed in order to limit the risk of water damaging the equipment in the cable.

CI Number : 41229 - LIN - Cable Spreading Rooms Fire Protection **Project Number**

Parent CI Number : -

Cost Centre : 304 - 304-Lingan 1&2 Prod. Unit **Budget Version** 2012 ACE Plan

Capital Item Accounts

Acct	Actv	Account	Activity	Forecast Amount	Amount	Variance
094		094 - Interest Capitalized		16,512	0	16,512
095		095-Thermal Regular Labour AO		22,979	0	22,979
095		095-Thermal & Hydro Contracts AO		[redacted]	0	[redacted]
001	004	001 - THERMAL Regular Labour	004 - SGP - Misc.Equipment	95,708	0	95,708
002	004	002 - THERMAL Overtime Labour	004 - SGP - Misc.Equipment	0	0	0
004	004	004 - THERMAL Term Labour	004 - HGP - Misc.Equipment	0	0	0
011	004	011 - Travel Expense	004 - SGP - Misc.Equipment	2,000	0	2,000
012	004	012 - Materials	004 - SGP - Misc.Equipment	[redacted]	0	[redacted]
013	004	013 - POWER PRODUCTION Contracts	004 - SGP - Misc.Equipment	[redacted]	0	[redacted]
028	004	028 - Consulting	004 - DP - Misc.Equipment	0	0	0
041	004	041 - Meals & Entertainment	004 - SGP - Misc.Equipment	0	0	0
			Total Cost:	918,292	0	918,292
			Original Cost:			

Capital Project Detailed Estimate

Location: Lingan
CI#: 41229
Title: LIN - Cable Spreading Rooms Fire Protection

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Item	Description	Unit	Quantity	Unit Estimate	Total Estimate	Cost Support Reference	Completed Similar Projects (CI#'s) Note 1
1	**001 Regular Labour**						
1.1	Plant / Generation Services Engineering - Technical and Project Support	hr	[redacted]		$7,000		
1.2	Mech Trades Supervision -	hr	80	45.00	3,600		
1.3	Mech Trades - Install Supports	hr	160	39.50	6,320		
1.4	Elect Trades - EI Panel and Connections	hr	1259	42.50	53,508		
1.5	Mech Trades - Room Seal	hr	640	39.50	25,280		
				Sub-Total	95,708		
2	**012 Materials**						
2.1	Misc Materials - welding, brackets , seal flanges , etc	ea	1	[redacted]			
2.2	Fire Supression materials	ea	4			Aug 2, 2011 Budget Pricing - Note 2	
2.3					-		
				Sub-Total	[redacted]		
3	**013 Power Production Contracts**						
3.1	Fire Protection System Fixed Price Contract incl Matls	ea	4	[redacted]		Aug 2, 2011 Budget Pricing - Note 2	
3.3							
				Sub-Total	[redacted]		
4	**011 Travel and 041 Meals**						
4.1	Gen Services Engineering Travel, Meals - 3 trips	ea	1	2000	2,000		
4.2							
4.3							
				Sub-Total	2,000		
5	**094 Interest Capitalized**						
5.1					16,512		
5.2					-		
5.3					-		
				Sub-Total	16,512		
6	**095 Administrative Overhead**						
6.1	Therm & Hydro Contracts AO				[redacted]		
6.2	Thermal Regular labour AO				22,979		
6.3							
				Sub-Total	[redacted]		
Project Cost Estimate				**Total**	$918,292		
7	**Original Cost**						
7.1							

Note 1: Reference to "Completed similar projects (CI#'s)" is to be provided when the item estimate is based on work of similar scope for a recently completed project.

Note 2: Budget estimate of $375K is for two rooms. Therefore, budget estimate for supply of materials and installation for all four rooms is $750K. Based on previous experience, NSPI Engineering Staff estimate 30% of the total cost for materials and 70% for contracts. For each of the four rooms - $56,250 materials, and $131,250 for contracts.

FIRE PROTECTION 5-YEAR PLAN

Generating Station	Area	Protection	Investment Timeframe 2010	2011	2012	2013	2014
Lingan	Unit 1 Turbine - Generator Sprinkler System	Pre-Action Water Sprinkler	X				
	Fire System Electrical Panel Upgrades		X				
	Fire System Valve Replacement		X				
	Unit 1 Burner Front	Wet Automatic Sprinkler	X				
	Unit 2 Burner Front	Wet Automatic Sprinkler	X				
	Unit 2 Turbine - Generator Sprinkler System	Pre-Action Water Sprinkler		X			
	Unit 3 Turbine - Generator Sprinkler System	Pre-Action Water Sprinkler		X			
	Unit 3 Burner Front	Wet Automatic Sprinkler		X			
	Unit 4 Burner Front	Wet Automatic Sprinkler		X			
	Unit 1/2 Cable Spreading Room Elev. 112.5 m (4 m X 12 m X 36 m) 1728 cubic metres, 61,000 cubic feet	Clean Gaseous (Novec 1230, Inergen), Victaulic Vortex or VEWFD with Pre-Action			X		
	Unit 1/2 Cable Spreading Room Elev. 120.2 m (3 m X 12 m X 42.3 m) 1522 cubic metres, 54,000 cubic feet	Clean Gaseous (Novec 1230, Inergen), Victaulic Vortex or VEWFD with Pre-Action			X		
	Unit 3/4 Cable Spreading Room Elev. 112.5 m (4 m X 12 m X 36 m) 1728 cubic metres, 61,000 cubic feet	Clean Gaseous (Novec 1230, Inergen), Victaulic Vortex or VEWFD with Pre-Action			X		
	Unit 3/4 Cable Spreading Room Elev. 120.2 m (3 m X 12 m X 42.3 m) 1522 cubic metres, 54,000 cubic feet	Clean Gaseous (Novec 1230, Inergen), Victaulic Vortex or VEWFD with Pre-Action			X		
Point Aconi	Unit 1 Burner Fronts	Wet Automatic Sprinkler		X			
	Unit 1 Switch Gear Room Elevation 107.2 m (25 m X 14.5 m X 6 m) 2175 cubic metres, 77,000 cubic feet	Clean Gaseous (Novec 1230, Inergen), Victaulic Vortex or VEWFD with Pre-Action		X			
	Unit 1 Relay Room Elevation 113.2 m (25 m X 14.5 m X 6 m) 2175 cubic metres, 77,000 cubic feet	Clean Gaseous (Novec 1230, Inergen), Victaulic Vortex or VEWFD with Pre-Action		X			
	Unit 1 Turbine - Generator Sprinkler System	Pre-Action Water Sprinkler					X
Point Tupper	Unit 1/2 Cable Spreading Room Elevation (100 m X 5 m X 2.5 m) 1250 cubic metres, 45,000 cubic feet	Clean Gaseous (Novec 1230, Inergen), Victaulic Vortex or VEWFD with Pre-Action				X	
	Fire System Electrical Panel Upgrade					X	
	Unit 1 Turbine - Generator Sprinkler System	Pre-Action Water Sprinkler					X
	Replace Fire Pumps - More Capacity						X
Trenton	Fire System Upgrades		X				
	Unit 5 Burner Front	Wet Automatic Sprinkler	X				
	Unit 6 Burner Front	Wet Automatic Sprinkler		X			
	Unit 5 Turbine - Generator Sprinkler System	Pre-Action Water Sprinkler			X		
	Unit 6 Turbine - Generator Sprinkler System	Pre-Action Water Sprinkler			X		
	Unit 6 4160 Switchgear Cable Spreading Room Elevation 29.8 m (7.6 m X 37.8 m X 3 m) 860 cubic metres, 30,000 cubic feet	Clean Gaseous (Novec 1230, Inergen), Victaulic Vortex or VEWFD with Pre-Action			X		
	Unit 6 MCC Cable Spreading Room Elevation 22.7 m (7.6 m X 37.8 m X 3 m) 860 cubic metres, 30,000 cubic feet	Clean Gaseous (Novec 1230, Inergen), Victaulic Vortex or VEWFD with Pre-Action			X		
	Unit 5 Relay Room Elev 42 ft (50 ft X 30 ft X 12 ft) 18,000 cubic feet	Clean Gaseous (Novec 1230, Inergen), Victaulic Vortex or VEWFD with Pre-Action				X	
	Unit 5 4160 v Switch Gear Room Elev. 73' 0" (100' X 20' X 15') 30,000 cubic feet	Clean Gaseous (Novec 1230, Inergen), Victaulic Vortex or VEWFD with Pre-Action				X	
	Unit 5 4160 v Switch Gear Cable Area Elev. 57' 6" (100' X 20' X 15') 30,000 cubic feet	Clean Gaseous (Novec 1230, Inergen), Victaulic Vortex or VEWFD with Pre-Action				X	
Tufts Cove	Unit 1 Burner Front	Wet Automatic Sprinkler	X				
	Unit 2 Burner Front	Wet Automatic Sprinkler	X				
	Unit 3 Burner Front	Wet Automatic Sprinkler	X				
	TUC 6 Turbine-Generator and Lube Oil Sprinkler, Transformer Deluge.	Pre Action Water Sprinkler and Deluge	X				
	Unit 2 Turbine - Generator Sprinkler System	Pre-Action Water Sprinkler				X	
	Unit 3 Turbine - Generator Sprinkler System	Pre-Action Water Sprinkler				X	
	Fire System Electrical Panel Upgrade					X	
	Unit 1 Turbine - Generator Sprinkler System	Pre-Action Water Sprinkler					X
	Cable Spreading/Relay Room	Clean Gaseous (Novec 1230, Inergen), Victaulic Vortex or VEWFD with Pre-Action					X

CI Number: 41228

Title: **TUC3 – Turbine High Pressure (HP) Impulse Blades Replacement**

Start Date: 2012/07
Final Cost Date: 2012/12
Function: Generation
Forecast Amount: $882,152

DESCRIPTION:

The Tufts Cove Unit #3 turbine contains a high-pressure (HP), intermediate-pressure (IP) and low-pressure (LP) cylinder which work together to rotate the Unit #3 generator and result in the production of electrical energy. The HP turbine section is subjected to continuous high-temperature and high-pressure service conditions which results in blade material degradation over time which require replacement to ensure the continued reliable operation of the turbine.

Summary of Related CI's +/- 2 years:
2012 CI 41251 TUC3 Turbine High Pressure Cylinder Fastener Replacement $275,729

JUSTIFICATION:

Justification Criteria: Thermal

Sub Criteria: Equipment Replacement

Why do this project?

Recent engineering analysis of the HP turbine impulse blade root material determined that the accumulated creep strain in the root fixings are projected to be higher than recommended by the Original Equipment Manufacturer (OEM) and there is potential for cracks to form in the impulse blades in the near term. The OEM recommends the replacement of the HP turbine impulse blades to mitigate the risk of blade failure, which would potentially result in further damage to the turbine and an un-planned outage.

Why do this project now?

Replacing the HP blades now will address the blade integrity concerns due to creep and mitigate the risk of an unplanned failure. Delaying the project beyond the scheduled 2012 outage would increase the risk of a blade root failure; which could result in an unplanned unit outage of significant duration.

Why do this project this way?

Replacement of the HP blades to address the blade integrity concerns is the only option.

CI Number : 41228-S868 - TUC - Unit 3 Turbine HP Impulse Blades Replacement **Project Number** S868

Parent CI Number : -

Cost Centre : 319 - 319-TC Unit 3 Capital **Budget Version** 2012 ACE Plan

Capital Item Accounts

Acct	Actv	Account	Activity	Forecast Amount	Amount	Variance
094		094 - Interest Capitalized		15,240	0	15,240
095		095-Thermal Regular Labour AO		[redacted]	0	[redacted]
095		095-Thermal & Hydro Contracts AO		[redacted]	0	[redacted]
001	010	001 - THERMAL Regular Labour	010 - SGP - Turbo Gen.Instal.	43,400	0	43,400
012	010	012 - Materials	010 - SGP - Turbo Gen.Instal.	[redacted]	0	[redacted]
013	010	013 - POWER PRODUCTION Contracts	010 - SGP - Turbo Gen.Instal.	[redacted]	0	[redacted]
			Total Cost:	882,152	0	882,152
			Original Cost:	226,000		

Capital Project Detailed Estimate

Location: Tufts Cove
FP#: 41228
Title: TUC3 - Turbine High Pressure (HP) Impulse

Item	Description	Unit	Quantity	Unit Estimate	Total Estimate	Cost Support Reference	Completed Similar Projects (FP#'s) Note 1
1	**001 Regular Labour**						
1.1	Generation Services Engineering	hr	160	80.00	12,800		
1.2	Electrical / Mechancial Tradesperson	hr	680	45.00	30,600		
1.3							
				Sub-Total	43,400		39529
2	**013 Power Production Contracts**						
2.1	Labour and Services [redacted]	lot	1	[redacted]			
2.2	Project manager	lot	1				
2.3	Site inspector	lot	1				
				Sub-Total	[redacted]		39529
3	**012 Materials**						
3.1	HP Spindle Impulse Blading	lot	[redacted]			quote EH3881	
3.2	Contingency				[redacted]		
3.3							
				Sub-Total	[redacted]		
4	**094 Interest Capitalized**						
4.1	Interest				15,240		
4.2							
4.3							
				Sub-Total	15,240		
5	**095 Administrative Overhead**						
5.1	AO				36,513		
5.2							
5.3							
				Sub-Total	36,513		
Project Cost Estimate				**Total**	$882,153		
6	Original Cost						
6.1					$226,000		

Note 1: Reference to "Completed similar projects (FP#'s)" is to be provided when the item estimate is based on work of similar scope for a recently completed project

TUC3 - Turbine High Pressure (HP) Impluse Blades
Summary of Alternatives & Assumptions

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Budget Year :	**2012**	**Date :**	**31-Oct-11**
Division :	Power Production	**CI Number:**	41228
Department :	Tufts Cove	**Project No. :**	
Originator :			

	Alternative	After Tax WACC	PV of EVA / NPV	Rank	IRR	Disc Pay
A	Replace Blades	6.67%	1,540,601	1	385.99%	1.3 years
B	Test 2	6.67%	0	2	#NUM!	0.0 years
C	Test 3	6.67%	0	2	#NUM!	0.0 years
D	Test 4	6.67%	0	2	#NUM!	0.0 years

Recommendation :

Based on a positive NPV, it is recommended that the HP impulse blades be replaced

Assumptions

Incremental replacement energy costs and annual operating costs in the years following 2013 are escalated at 2% annually.

Calculations:
Total annual avoided cost = [Replacement energy costs] + [Avoided unplanned repair costs]

Avoided replacement energy cost = [Incremental replacement energy cost] x [Quantity of predicted annual unit outages / de-ratings] x [capacity factor] x [Probability of failure] x [Derating/outage] x [Duration of Derating]

Avoided unplanned repair costs = [cost of Labour and materials in event of failure] x [Probability of failure] x [quantity of predicted annual unit outages / de-ratings]

Calculation of probability of failure in Year 2

The probability of the unit failing in year 2 is: (Probability of unit not failing in year 1) x (probability the unit will fail in year 2 if no failure accured in year 1)

Example: Replace Blades

1	
-30%	Minus the Probability of failure in year 1
70%	Probability that unit does not fail in year 1
x	
35%	Probability of unit failing in year 2 if no failure occurs in year 1
25%	**Actual probability of the unit failing in year 2**

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Avoided Cost Calculations

Budget Year :	2012	Date :	31-Oct-11
Division :	Power Production	CI Number:	41228
Department :	Tufts Cove	Project No.	
Originator :			

Replace Blades	
Capital Cost	$ -
Avoided Replacement Energy costs (2012) =	[redacted] MWh x 1 outages x 70% x 30% x [redacted] MW x 1680 h = $186,278
Avoided Unplanned Repair Costs (2012)	$ 3,000,000 x 30% x 1 = $ 900,000
Total Annual Avoided costs	$1,086,278.40
Avoided Replacement Energy costs (2013) =	[redacted] MWh x 1 outages x 70% x 24.5% x [redacted] MW x 1680 h = $152,127
Avoided Unplanned Repair Costs (2013)	$ 3,060,000 x 24.5% x 1 = $ 749,700
Total Annual Avoided costs	$ 901,827.36

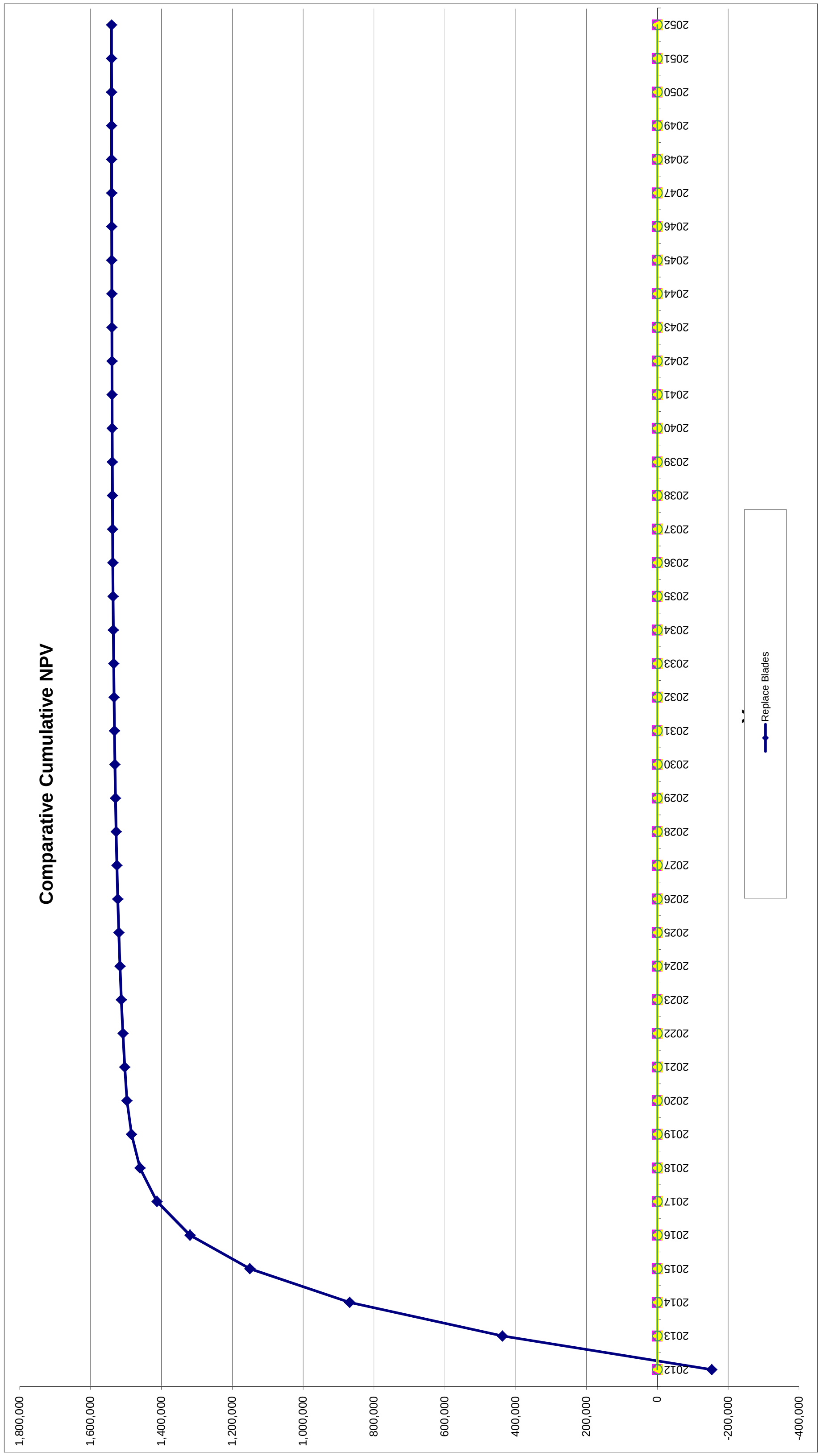
Test 2	
Capital Cost	
Avoided Replacement Energy costs (2012) =	
Avoided Unplanned Repair Costs (2012)	
Total Annual Avoided costs	
Avoided Replacement Energy costs (2013) =	
Avoided Unplanned Repair Costs (2013)	
Total Annual Avoided costs	

Test 3	
Capital Cost	
Avoided Replacement Energy costs (2012) =	
Avoided Unplanned Repair Costs (2012)	
Total Annual Avoided costs	
Avoided Replacement Energy costs (2013) =	
Avoided Unplanned Repair Costs (2013)	
Total Annual Avoided costs	

Test 4	
Capital Cost	
Avoided Replacement Energy costs (2012) =	
Avoided Unplanned Repair Costs (2012)	
Total Annual Avoided costs	
Avoided Replacement Energy costs (2013) =	
Avoided Unplanned Repair Costs (2013)	
Total Annual Avoided costs	

TUC3 - Turbine High Pressure (HP) Impluse Blades
Replace Blades

Year	Total Revenue	Operating Costs	Capital	CCA	UCC	CFBT	Applicable Taxes	CFAT	Discount Factor	PV of CF	CNPV
2012	-	1,086,278	(882,153)	35,286	846,867	204,125	(358,036)	(153,911)	1	(153,911)	(153,911)
2013	-	901,827	-	67,749	779,118	901,827	(271,470)	630,358	1	590,942	437,031
2014	-	683,327	-	62,329	716,788	683,327	(192,633)	490,694	1	431,247	868,279
2015	-	470,471	-	57,343	659,445	470,471	(128,070)	342,401	1	282,104	1,150,382
2016	-	293,260	-	52,756	606,689	293,260	(74,661)	218,599	1	168,842	1,319,224
2017	-	164,519	-	48,535	558,154	164,519	(35,955)	128,564	1	93,091	1,412,315
2018	-	82,379	-	44,652	513,502	82,379	(11,695)	70,684	1	47,981	1,460,295
2019	-	36,412	-	41,080	472,422	36,412	1,447	37,859	1	24,092	1,484,387
2020	-	13,999	-	37,794	434,628	13,999	7,376	21,375	1	12,752	1,497,139
2021	-	-	-	34,770	399,858	-	10,779	10,779	1	6,028	1,503,167
2022	-	-	-	31,989	367,869	-	9,916	9,916	1	5,199	1,508,367
2023	-	-	-	29,430	338,440	-	9,123	9,123	0	4,484	1,512,851
2024	-	-	-	27,075	311,364	-	8,393	8,393	0	3,867	1,516,718
2025	-	-	-	24,909	286,455	-	7,722	7,722	0	3,336	1,520,054
2026	-	-	-	22,916	263,539	-	7,104	7,104	0	2,877	1,522,931
2027	-	-	-	21,083	242,456	-	6,536	6,536	0	2,481	1,525,412
2028	-	-	-	19,396	223,059	-	6,013	6,013	0	2,140	1,527,552
2029	-	-	-	17,845	205,215	-	5,532	5,532	0	1,846	1,529,397
2030	-	-	-	16,417	188,797	-	5,089	5,089	0	1,592	1,530,989
2031	-	-	-	15,104	173,694	-	4,682	4,682	0	1,373	1,532,362
2032	-	-	-	13,895	159,798	-	4,308	4,308	0	1,184	1,533,546
2033	-	-	-	12,784	147,014	-	3,963	3,963	0	1,021	1,534,567
2034	-	-	-	11,761	135,253	-	3,646	3,646	0	881	1,535,448
2035	-	-	-	10,820	124,433	-	3,354	3,354	0	760	1,536,208
2036	-	-	-	9,955	114,478	-	3,086	3,086	0	655	1,536,863
2037	-	-	-	9,158	105,320	-	2,839	2,839	0	565	1,537,428
2038	-	-	-	8,426	96,894	-	2,612	2,612	0	487	1,537,916
2039	-	-	-	7,752	89,143	-	2,403	2,403	0	420	1,538,336
2040	-	-	-	7,131	82,011	-	2,211	2,211	0	363	1,538,699
2041	-	-	-	6,561	75,451	-	2,034	2,034	0	313	1,539,011
2042	-	-	-	6,036	69,414	-	1,871	1,871	0	270	1,539,281
2043	-	-	-	5,553	63,861	-	1,721	1,721	0	233	1,539,513
2044	-	-	-	5,109	58,752	-	1,584	1,584	0	201	1,539,714
2045	-	-	-	4,700	54,052	-	1,457	1,457	0	173	1,539,887
2046	-	-	-	4,324	49,728	-	1,340	1,340	0	149	1,540,036
2047	-	-	-	3,978	45,750	-	1,233	1,233	0	129	1,540,165
2048	-	-	-	3,660	42,090	-	1,135	1,135	0	111	1,540,276
2049	-	-	-	3,367	38,723	-	1,044	1,044	0	96	1,540,372
2050	-	-	-	3,098	35,625	-	960	960	0	83	1,540,454
2051	-	-	-	2,850	32,775	-	883	883	0	71	1,540,526
2052	-	-	-	2,622	30,153	-	1,000	1,000	0	76	1,540,601
Total	-	3,732,473	(882,153)	852,000	10,239,078	2,850,320	(938,122)	1,912,198	15	1,540,601	58,513,788


Comparative Cumulative NPV
Replace Blades
1,800,000
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CI Number: 28674

Title: **TRE6 – Human / Machine Interface (HMI) Upgrades**

Start Date: 2012/04
Final Cost Date: 2012/12
Function: Generation
Forecast Amount: $867,805

DESCRIPTION:

This project includes the replacement of the plant's existing Human Machine Interface (HMI) for Trenton Unit #6. The HMI is one of the five functional areas of the Distributed Control and Management System (DCMS). The functional areas of the DCMS include:

(1) Input / Output (I/O) systems. These systems communicate input signals from operating equipment in the plant and communicate signals from the Control Room to the operating equipment.

(2) Controllers - Interpret the input signals from field instruments and operator requests and determine the output signals.

(3) Communication networks – Communicate information between the I/O systems, controllers and HMI.

(4) Power Systems- Provide power for all components and signals.

(5) HMI – The Operator's interface with the DCMS, which includes operator computers, controls software and communications hardware for monitoring, troubleshooting, and programming the DCMS.

The scope of this project includes replacement of the existing HMI with new equipment designed to current standards. This includes new operator computers, implementation of new controls software, upgrading the existing graphics and installation and commissioning of the new operator stations.

Summary of Related CI's +/- 2 years:
No projects for 2010,2011,2012, 2013 & 2014

JUSTIFICATION:

Justification Criteria: Thermal

Sub Criteria: Equipment Replacement

Why do this project?

The HMI is used to interface the plant's operating equipment to the control room and allow the Operator to view the process information, select operating set points and enact control. The existing equipment is obsolete and spare parts can no longer be obtained . Completing this project will mitigate the risk of HMI component failure and the loss of control over the plant's equipment.

Why do this project now?

The existing HMI components were procured in the late 1980's and are no longer supported by the Original Equipment Manufacturer (OEM). Spare parts for the HMI have been depleted and completing this project now will mitigate the risk of DCMS failure, potential unplanned outages and associated replacement energy costs

Why do this project this way?

The existing equipment is obsolete and no longer supported by the OEM. Replacement with equipment designed to current standards is the only option.

CI Number : 28674 - TRE6 - Human Machine Interface (HMI) Upgrade **Project Number**

Parent CI Number : -

Cost Centre : 345 - 345-Trenton unit 6 Capital **Budget Version** 2012 ACE Plan

Capital Item Accounts

Acct	Actv	Account	Activity	Forecast Amount	Amount	Variance
001		001 - THERMAL Regular Labour		124,560	0	124,560
002		002 - THERMAL Overtime Labour		91,530	0	91,530
011		011 - Travel Expense		5,000	0	5,000
012		012 - Materials		[redacted]	0	[redacted]
013		013 - POWER PRODUCTION Contracts		[redacted]	0	[redacted]
041		041 - Meals & Entertainment		1,650	0	1,650
094		094 - Interest Capitalized		8,518	0	8,518
095		095-Thermal Overtime Labour AO		10,988	0	10,988
095		095-Thermal Regular Labour AO		29,907	0	29,907
095		095-Thermal & Hydro Contracts AO		[redacted]	0	[redacted]
			Total Cost:	867,805	0	867,805
			Original Cost:	595,013		

Capital Project Detailed Estimate

Location: Trenton
FP#: 28674
Title: TRE6 Human Machine Interface (HMI) Upgrade

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Item	Description	Unit	Quantity	Unit Estimate	Total Estimate	Cost Support Reference	Completed Similar Projects (CI#'s) Note 1
1	**001 Regular Labour**						
1.1	Technical Support Supervisor	hr	[redacted]		$12,600		
1.2	Contract Supervisor	hr	[redacted]		21,000		
1.3	Electrical & Instrumentation Labour	hr	1200	45.00	54,000		
1.4	Operator Labour	hr	360	45.00	16,200		
1.5	Contingency	%	20%		20,760		
				Sub-Total	**124,560**		38826
2	**002 Overtime Labour**						
2.1	Contract Supervisor	hr	[redacted]		12,375		
2.2	Electrical & Instrumentation Labour	hr	560	90.00	50,400		
2.3	Operator Labour	hr	150	90.00	13,500		
2.4	Contingency	%	20%		15,255		
				Sub-Total	**91,530**		38826
3	**012 Materials**						
3.1	Misc. Materials including cable and desks	unit	1	[redacted]			38826
3.2	Supply of hardware and software	ea	1			LBC-110719-1 Pg 11	
3.3	Contingency	%	10		[redacted]		
				Sub-Total			
4	**013 Power Production Contracts**						
4.1	Engineering services for HMI	unit	1	[redacted]		LBC-110719-1 Pg 11	
4.2	On-site supervision and commissioning services	hr	80			LBC-110719-1 Pg 11	
4.3	Contractor travel and living expenses	day	25				
4.4							
4.5	Freight	lot	1				
4.6	Capital Spares	unit	1				
4.7	Contingency	%	[redacted]		[redacted]		
				Sub-Total			
5	**011 Travel Expenses**						
5.1	Expenses	day	25	200.00	5,000		
				Sub-Total	**5,000**		
6	**041 Meals and Entertainment**						
6.1	Expenses	day	25	66.00	1,650		
					-		
					-		
				Sub-Total	**1,650**		
7	**094 Interest Capitalized**						
7.1					8,518		
				Sub-Total	**8,518**		
8	**095 Administrative Overhead**						
8.1	Regular Labour AO				29,907		
8.2	Contracts AO				[redacted]		
8.3	Overtime Labour AO				10,988		
				Sub-Total	[redacted]		
				Total	**$867,806**		
9	Original Cost				$595,000		
9.1							

Note 1: Reference to "Completed similar projects (CI#'s)" is to be provided when the item estimate is based on work of similar scope for a recently completed project

TRE6 HMI Upgrade
Summary of Alternatives & Assumptions

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Budget Year :	**2012**	**Date :**	**29-Oct-11**
Division :	Power Production	**CI Number:**	28674
Department :	Trenton	**Project No. :**	
Originator :			

	Alternative	After Tax WACC	PV of EVA / NPV	Rank	IRR	Disc Pay
A	HMI Upgrade	6.67%	3,484,105	1	70.60%	2.7 years
B	Test 2	6.67%	0	2	#NUM!	0.0 years
C	Test 3	6.67%	0	2	#NUM!	0.0 years
D	Test 4	6.67%	0	2	#NUM!	0.0 years

Recommendation :

Based on a Positive NPV, it is recommended that the HMI Upgrade proceed as planned

Assumptions

Incremental replacement energy costs and annual operating costs in the years following 2013 are escalated at 2% annually.

Calculations:
Total annual avoided cost = [Replacement energy costs] + [Avoided unplanned repair costs]

Avoided replacement energy cost = [Incremental replacement energy cost] x [Quantity of predicted annual unit outages / de-ratings] x [capacity factor] x [Probability of failure] x [Derating/outage] x [Duration of Derating]

Avoided unplanned repair costs = [cost of Labour and materials in event of failure] x [Probability of failure] x [quantity of predicted annual unit outages / de-ratings]

Calculation of probability of failure in Year 2

The probability of the unit failing in year 2 is: (Probability of unit not failing in year 1) x (probability the unit will fail in year 2 if no failure accured in year 1)

Example: HMI Upgrade

1	
-5%	Minus the Probability of failure in year 1
95%	Probability that the HMI / DMCS does not fail in year 1
x	
6%	Probability of HMI / DCMS failing in year 2 if no failure occurs in year 1
6%	**Actual probability of the HMI / DCMS failing in year 2**

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Avoided Cost Calculations

Budget Year :	2012	Date :	29-Oct-11
Division :	Power Production	CI Number:	28674
Department :	Trenton	Project No.	
Originator :			

HMI Upgrade	
Capital Cost	$ 867,805
Avoided Replacement Energy costs (2012) =	[redacted] MWh x 1 outages x 90% x 5% x [redacted] MW x 2880 h = $396,175.03
Avoided Unplanned Repair Costs (2012)	$ 800,000.00 x 5% x 1 = $40,000.00
Total Annual Avoided costs	$436,175.03
Avoided Replacement Energy costs (2013) =	[redacted] MWh x 1 outages x 90% x 5.7% x [redacted] MW x 2880 h = $451,742.05
Avoided Unplanned Repair Costs (2013)	$ 832,160.00 x 6% x 1 = $47,433.12
Total Annual Avoided costs	$ 499,175.17

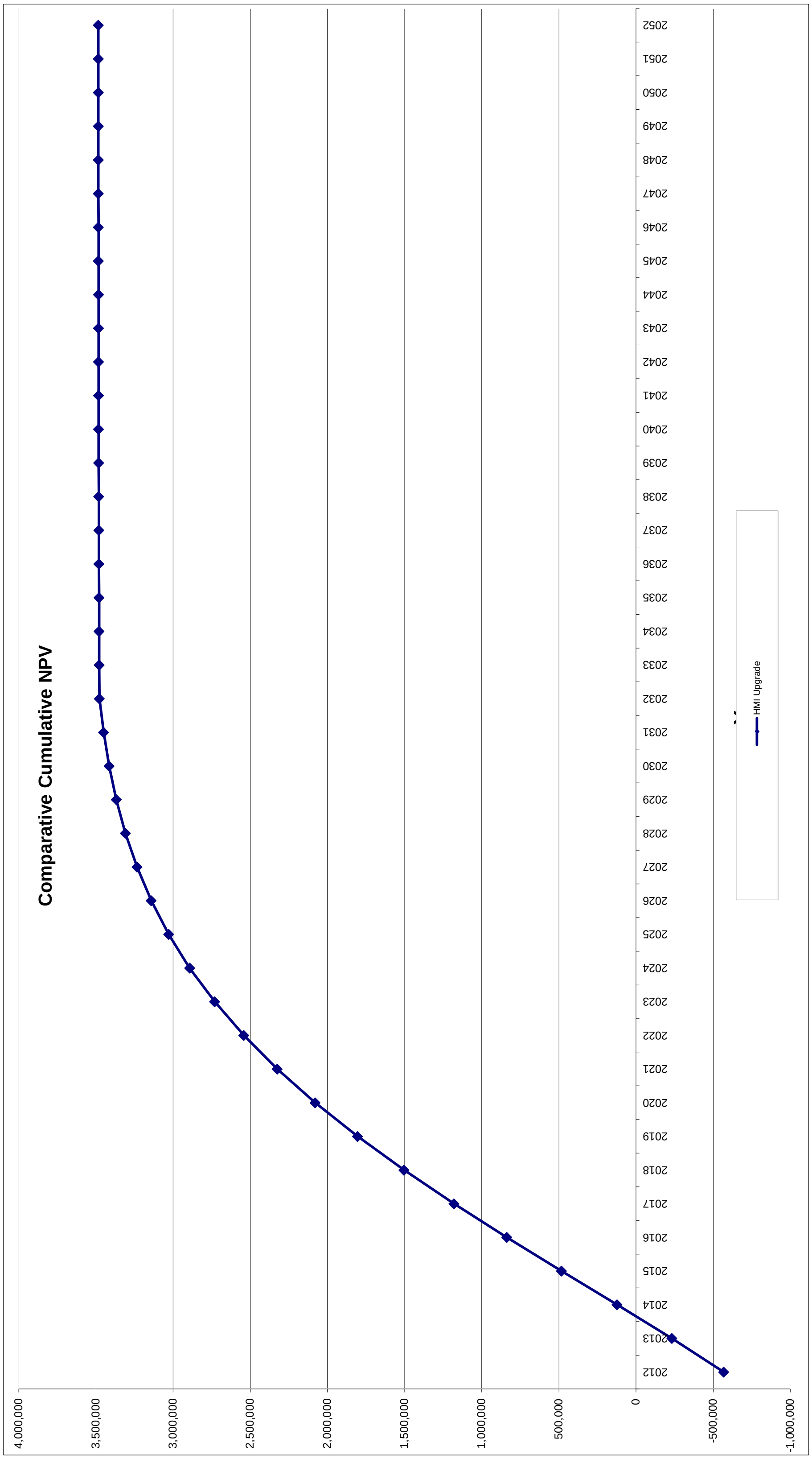
Test 2	
Capital Cost	
Avoided Replacement Energy costs (2012) =	
Avoided Unplanned Repair Costs (2012)	
Total Annual Avoided costs	
Avoided Replacement Energy costs (2013) =	
Avoided Unplanned Repair Costs (2013)	
Total Annual Avoided costs	

Test 3	
Capital Cost	
Avoided Replacement Energy costs (2012) =	
Avoided Unplanned Repair Costs (2012)	
Total Annual Avoided costs	
Avoided Replacement Energy costs (2013) =	
Avoided Unplanned Repair Costs (2013)	
Total Annual Avoided costs	

Test 4	
Capital Cost	
Avoided Replacement Energy costs (2012) =	
Avoided Unplanned Repair Costs (2012)	
Total Annual Avoided costs	
Avoided Replacement Energy costs (2013) =	
Avoided Unplanned Repair Costs (2013)	
Total Annual Avoided costs	

TRE6 HMI Upgrade
HMI Upgrade

Year	Total Revenue	Operating Costs	Capital	CCA	UCC	CFBT	Applicable Taxes	CFAT	Discount Factor	PV of CF	CNPV
2012	-	436,175	(867,805)	34,712	833,093	(431,630)	(137,185)	(568,815)	1	(568,815)	(568,815)
2013	-	499,073	-	66,647	766,446	499,073	(140,926)	358,146	1	335,752	(233,063)
2014	-	559,313	-	61,316	705,130	559,313	(154,501)	404,812	1	355,770	122,707
2015	-	607,521	-	56,410	648,720	607,521	(170,844)	436,677	1	359,777	482,484
2016	-	642,611	-	51,898	596,822	642,611	(183,224)	459,387	1	354,821	837,305
2017	-	664,062	-	47,746	549,076	664,062	(191,058)	473,004	1	342,494	1,179,799
2018	-	671,924	-	43,926	505,150	671,924	(194,679)	477,245	1	323,957	1,503,756
2019	-	666,793	-	40,412	464,738	666,793	(194,178)	472,615	1	300,754	1,804,510
2020	-	649,746	-	37,179	427,559	649,746	(189,896)	459,850	1	274,333	2,078,843
2021	-	622,260	-	34,205	393,354	622,260	(182,297)	439,963	1	246,057	2,324,900
2022	-	586,102	-	31,468	361,886	586,102	(171,937)	414,166	1	217,146	2,542,046
2023	-	543,223	-	28,951	332,935	543,223	(159,424)	383,799	0	188,642	2,730,687
2024	-	495,633	-	26,635	306,300	495,633	(145,389)	350,243	0	161,385	2,892,072
2025	-	445,299	-	24,504	281,796	445,299	(130,447)	314,853	0	136,006	3,028,078
2026	-	394,053	-	22,544	259,253	394,053	(115,168)	278,885	0	112,936	3,141,014
2027	-	343,512	-	20,740	238,512	343,512	(100,059)	243,453	0	92,423	3,233,437
2028	-	295,029	-	19,081	219,431	295,029	(85,544)	209,485	0	74,555	3,307,992
2029	-	249,664	-	17,555	201,877	249,664	(71,954)	177,710	0	59,292	3,367,284
2030	-	208,178	-	16,150	185,727	208,178	(59,529)	148,650	0	46,495	3,413,778
2031	-	171,044	-	14,858	170,869	171,044	(48,418)	122,626	0	35,957	3,449,735
2032	-	138,474	-	13,669	157,199	138,474	(38,689)	99,785	0	27,429	3,477,165
2033	-	-	-	12,576	144,623	-	3,899	3,899	0	1,005	3,478,169
2034	-	-	-	11,570	133,053	-	3,587	3,587	0	866	3,479,036
2035	-	-	-	10,644	122,409	-	3,300	3,300	0	747	3,479,783
2036	-	-	-	9,793	112,616	-	3,036	3,036	0	645	3,480,428
2037	-	-	-	9,009	103,607	-	2,793	2,793	0	556	3,480,983
2038	-	-	-	8,289	95,318	-	2,569	2,569	0	479	3,481,463
2039	-	-	-	7,625	87,693	-	2,364	2,364	0	414	3,481,876
2040	-	-	-	7,015	80,678	-	2,175	2,175	0	357	3,482,233
2041	-	-	-	6,454	74,223	-	2,001	2,001	0	308	3,482,541
2042	-	-	-	5,938	68,285	-	1,841	1,841	0	265	3,482,806
2043	-	-	-	5,463	62,823	-	1,693	1,693	0	229	3,483,035
2044	-	-	-	5,026	57,797	-	1,558	1,558	0	197	3,483,232
2045	-	-	-	4,624	53,173	-	1,433	1,433	0	170	3,483,402
2046	-	-	-	4,254	48,919	-	1,319	1,319	0	147	3,483,549
2047	-	-	-	3,914	45,006	-	1,213	1,213	0	127	3,483,676
2048	-	-	-	3,600	41,405	-	1,116	1,116	0	109	3,483,785
2049	-	-	-	3,312	38,093	-	1,027	1,027	0	94	3,483,879
2050	-	-	-	3,047	35,045	-	945	945	0	81	3,483,960
2051	-	-	-	2,804	32,242	-	869	869	0	70	3,484,030
2052	-	-	-	2,579	29,662	-	983	983	0	74	3,484,105
Total	-	9,889,690	(867,805)	838,143	10,072,546	9,021,885	(2,825,626)	6,196,259	15	3,484,105	113,761,686


Comparative Cumulative NPV
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HMI Upgrade

CI Number: 39923

Title: **TUC2 – Generator Excitation & AVR System Replacement**

Start Date: 2012/05
Final Cost Date: 2012/12
Function: Generation
Forecast Amount: $844,543

DESCRIPTION:

The excitation system for a synchronous generator provides the DC field current to the generator rotor. The DC field current is derived from rectifying an AC supply. The excitation system includes the thyristor rectifier bridges, Automatic Voltage Regulator (AVR), field circuit breaker, monitoring and control. The AVR automatically controls the generator voltage via field current regulation and is integral to the excitation system.

The existing excitation system will be completely replaced with modern digital static excitation system equipment, excluding the existing exciter transformer.

This project includes the specification and replacement of existing Auto Voltage Regulation devices on Unit #2 at the Tufts Cove Generating Station. The existing AVR devices are obsolete and are no longer supported by the Original Equipment Manufacturer (OEM).

Summary of Related CI's +/- 2 years:
No projects for 2010,2011,2012, 2013 & 2014

JUSTIFICATION:

Justification Criteria: Thermal

Sub Criteria: Equipment Replacement

Why do this project?

The excitation system for Tufts Cove #2 generator is now obsolete. The OEM no longer supports this equipment and it is no longer possible to source spare parts or receive technical support service. A dependable excitation system is required for reliable operation of Unit #2.

Why do this project now?

The spare parts originally supplied with the system have now been depleted and replacement parts are no longer available. Replacing the excitation system now will mitigate the risk of an unplanned outage and associated replacement energy costs

Why do this project this way?

Replacement of the obsolete excitation system and AVR is the only option. The existing AVR equipment removed from Unit #2 will be salvaged where possible and used for spares to support potential repairs that may be required for Unit #1. Completing this project will reduce the risks associated with obsolescence on Unit #1 until the generator excitation and AVR system is replaced on that Unit.

CI Number : 39923 - TUC - Generator Excitation and AVR System Replacement **Project Number**

Parent CI Number : -

Cost Centre : 311 - 311-Tufts Cove Admin./Common Capita **Budget Version** 2012 ACE Plan

Capital Item Accounts

Acct	Actv	Account	Activity	Forecast Amount	Amount	Variance
094		094 - Interest Capitalized		44,747	0	44,747
095		095-Thermal Regular Labour AO		[redacted]	0	[redacted]
095		095-Thermal & Hydro Contracts AO		[redacted]	0	[redacted]
095		095-Thermal Overtime Labour AO		1,561	0	1,561
001	010	001 - THERMAL Regular Labour	010 - SGP - Turbo Gen.Instal.	220,575	0	220,575
002	010	002 - THERMAL Overtime Labour	010 - SGP - Turbo Gen.Instal.	13,000	0	13,000
011	010	011 - Travel Expense	010 - SGP - Turbo Gen.Instal.	35,000	0	35,000
012	010	012 - Materials	010 - SGP - Turbo Gen.Instal.	[redacted]	0	[redacted]
013	010	013 - POWER PRODUCTION Contracts	010 - SGP - Turbo Gen.Instal.	[redacted]	0	[redacted]
041	010	041 - Meals & Entertainment	010 - SGP - Turbo Gen.Instal.	2,000	0	2,000
			Total Cost:	844,543	0	844,543
			Original Cost:	225,947		

Capital Project Detailed Estimate

Location: Tufts Cove
FP#: 39923
Title: TUC2 - Generator Excitation and AVR System Replacement

Nova Scotia POWER An Emera Company energy everywhere.

Item	Description	Unit	Quantity	Unit Estimate	Total Estimate	Cost support Reference	Completed Similar Projects (FP#'s) Note 1
1	**001 Regular Labour**						
1.1	Regular Labour (electrical, Mechanical)	hr	1745	65	$113,425		
1.2	Legal Services	hr	[redacted]	[redacted]	10,500		
1.3	Project supervisor	hr	[redacted]	[redacted]	30,000		
1.4	Procurement Services	hr	[redacted]	[redacted]	4,550		
1.5	Engineering Services	hr	[redacted]	[redacted]	29,750		
1.6	CADD Specialist	hr	[redacted]	[redacted]	12,350		
1.7	Contingency	lot	1	20,000	20,000		
1.8							
				Sub-Total	220,575		39926
2	**012 Materials**						
2.1	Excitation / AVR System	lot	1	[redacted]	[redacted]	April 6, 2011 Quote and supplemental email attached	
2.2	Control Room HMII	lot	1	[redacted]	[redacted]		39926
2.3	Control Cables	lot	1	[redacted]	[redacted]		39926
2.4	DC Cables	lot	1	[redacted]	[redacted]		39926
2.5	Cable Tray	lot	1	[redacted]	[redacted]		39926
2.6	AVR Spare Parts	lot	1	[redacted]	[redacted]	April 6, 2011 Quote	
2.7	Misc Materials	lot	1	[redacted]	[redacted]		39926
2.8	Power Builder Software	lot	1	[redacted]	[redacted]		39926
2.9							
				Sub-Total	[redacted]		
3	**013 Power Production Contracts**						
3.1	Engineering	hr	160	[redacted]	[redacted]		39926
3.2	Technical Field Service	hr	200	[redacted]	[redacted]	April 6, 2011 Quote	
3.3	Commissioning	lot	1	[redacted]	[redacted]	April 6, 2011 Quote	
3.4	PSS Study	lot	1	[redacted]	[redacted]	April 6, 2011 Quote	
3.3	Training	lot	1	[redacted]	[redacted]	April 6, 2011 Quote	
				Sub-Total	[redacted]		
4	**002 Overtime Labour**						
4.1	Overtime Labour	hr	200	65	13,000		
4.2							
4.3							
				Sub-Total	13,000		
5	**041 Meals and Entertainment**						
5.1	Meals and Entertainment	lot	1	2,000	2,000		
5.2							
5.3							
				Sub-Total	2,000		
6	**011 - Travel and Expenses**						
6.1	Travel and Expenses	lot	1	35,000	35,000		
6.2							
6.3							
				Sub-Total	35,000		
8	**094 Interest Capitalized**						
8.1	Interest				44,747		
8.2							
8.3							
				Sub-Total	44,747		
8	**095 Administrative Overhead**						
8.1	AO				61,121		
8.2							
8.3							
				Sub-Total	61,121		
Project Cost Estimate				**Total**	**$844,543**		
9	Original Cost						
9.1					**$225,947**		

Note 1: Reference to "Completed similar projects (FP#'s)" is to be provided when the item estimate is based on work of similar scope for a recently completed project

TUC2 Replace Excitation and AVR system
Summary of Alternatives & Assumptions

Nova Scotia POWER An Emera Company energy everywhere.

Budget Year :	**2012**	**Date :**	**28-Oct-11**
Division :	Power Production	**CI Number:**	39923
Department :	Tufts Cove	**Project No. :**	
Originator :			

	Alternative	After Tax WACC	PV of EVA / NPV	Rank	IRR	Disc Pay
A	Replace AVR system	6.67%	204,466	1	26.58%	3.2 years
B	Test 2	6.67%	0	2	#NUM!	0.0 years
C	Test 3	6.67%	0	2	#NUM!	0.0 years
D	Test 4	6.67%	0	2	#NUM!	0.0 years

Recommendation :

Based on positive NPV, it is recommended that the AVR system be replaced

Assumptions

Incremental replacement energy costs and annual operating costs in the years following 2013 are escalated at 2% annually.

Calculations:
Total annual avoided cost = [Replacement energy costs] + [Avoided unplanned repair costs]

Avoided replacement energy cost = [Incremental replacement energy cost] x [Quantity of predicted annual unit outages / de-ratings] x [capacity factor] x [Probability of failure] x [Derating/outage] x [Duration of Derating]

Avoided unplanned repair costs = [cost of Labour and materials in event of failure] x [Probability of failure] x [quantity of predicted annual unit outages / de-ratings]

Calculation of probability of failure in Year 2

The probability of the unit failing in year 2 is: (Probability of unit not failing in year 1) x (probability the unit will fail in year 2 if no failure accured in year 1)

Example: **Replace AVR system**

1	
-50%	Minus the Probability of failure in year 1
50%	Probability that unit does not fail in year 1
x	
50%	Probability of unit failing in year 2 if no failure occurs in year 1
25%	**Actual probability of the unit failing in year 2**

Nova Scotia POWER An Emera Company energy everywhere.

Avoided Cost Calculations

Budget Year :	2012	Date :	28-Oct-11
Division :	Power Production	CI Number:	39923
Department :	Tufts Cove	Project No.	
Originator :			

Replace AVR system	
Capital Cost	$ 844,543.00
Avoided Replacement Energy costs (2012) =	[redacted] MWh x 2 outages x 70% x 50% x [redacted] MW x 672 h = $165,532
Avoided Unplanned Repair Costs (2012)	$ 506,725.80 x 50% x 2 = $ 506,726
Total Annual Avoided costs	$672,258.01
Avoided Replacement Energy costs (2013) =	[redacted] MWh x 2 outages x 70% x 25% x [redacted] MW x 672 h = $82,766
Avoided Unplanned Repair Costs (2013)	$ 515,171.23 x 25% x 2 = $ 257,586
Total Annual Avoided costs	$ 340,351.72

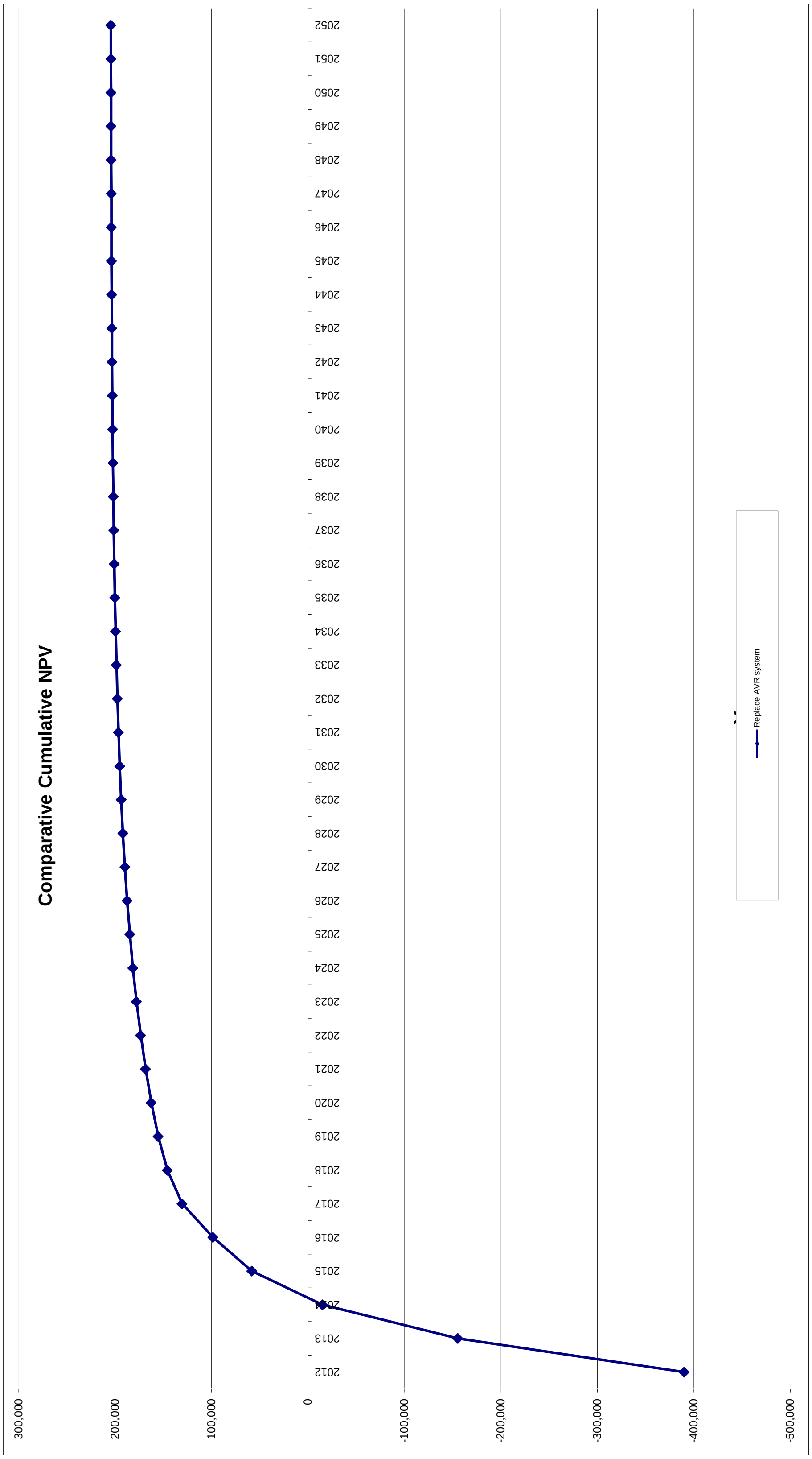
Test 2	
Capital Cost	
Avoided Replacement Energy costs (2012) =	
Avoided Unplanned Repair Costs (2012)	
Total Annual Avoided costs	
Avoided Replacement Energy costs (2013) =	
Avoided Unplanned Repair Costs (2013)	
Total Annual Avoided costs	

Test 3	
Capital Cost	
Avoided Replacement Energy costs (2012) =	
Avoided Unplanned Repair Costs (2012)	
Total Annual Avoided costs	
Avoided Replacement Energy costs (2013) =	
Avoided Unplanned Repair Costs (2013)	
Total Annual Avoided costs	

Test 4	
Capital Cost	
Avoided Replacement Energy costs (2012) =	
Avoided Unplanned Repair Costs (2012)	
Total Annual Avoided costs	
Avoided Replacement Energy costs (2013) =	
Avoided Unplanned Repair Costs (2013)	
Total Annual Avoided costs	

TUC2 Replace Excitation and AVR system
Replace AVR system

Year	Total Revenue	Operating Costs	Capital	CCA	UCC	CFBT	Applicable Taxes	CFAT	Discount Factor	PV of CF	CNPV
2012	-	672,258	(844,543)	33,782	810,761	(172,285)	(217,751)	(390,036)	1	(390,036)	(390,036)
2013	-	340,352	-	64,861	745,900	340,352	(89,912)	250,440	1	234,780	(155,256)
2014	-	204,819	-	59,672	686,228	204,819	(45,114)	159,705	1	140,357	(14,899)
2015	-	104,141	-	54,898	631,330	104,141	(15,265)	88,876	1	73,225	58,326
2016	-	52,954	-	50,506	580,824	52,954	(859)	52,095	1	40,237	98,563
2017	-	43,465	-	46,466	534,358	43,465	930	44,395	1	32,146	130,709
2018	-	13,256	-	42,749	491,609	13,256	9,143	22,399	1	15,204	145,913
2019	-	4,043	-	39,329	452,280	4,043	10,939	14,982	1	9,534	155,447
2020	-	1,233	-	36,182	416,098	1,233	10,834	12,067	1	7,199	162,646
2021	-	376	-	33,288	382,810	376	10,203	10,579	1	5,916	168,562
2022	-	130	-	30,625	352,185	130	9,453	9,583	1	5,024	173,586
2023	-	40	-	28,175	324,011	40	8,722	8,761	0	4,306	177,893
2024	-	12	-	25,921	298,090	12	8,032	8,044	0	3,706	181,599
2025	-	4	-	23,847	274,242	4	7,391	7,395	0	3,194	184,794
2026	-	1	-	21,939	252,303	1	6,801	6,802	0	2,755	187,548
2027	-	0	-	20,184	232,119	0	6,257	6,257	0	2,376	189,924
2028	-	0	-	18,570	213,549	0	5,757	5,757	0	2,049	191,973
2029	-	0	-	17,084	196,465	0	5,296	5,296	0	1,767	193,740
2030	-	0	-	15,717	180,748	0	4,872	4,872	0	1,524	195,263
2031	-	0	-	14,460	166,288	0	4,483	4,483	0	1,314	196,578
2032	-	-	-	13,303	152,985	-	4,124	4,124	0	1,134	197,711
2033	-	-	-	12,239	140,746	-	3,794	3,794	0	978	198,689
2034	-	-	-	11,260	129,487	-	3,491	3,491	0	843	199,532
2035	-	-	-	10,359	119,128	-	3,211	3,211	0	727	200,260
2036	-	-	-	9,530	109,598	-	2,954	2,954	0	627	200,887
2037	-	-	-	8,768	100,830	-	2,718	2,718	0	541	201,428
2038	-	-	-	8,066	92,763	-	2,501	2,501	0	467	201,895
2039	-	-	-	7,421	85,342	-	2,301	2,301	0	402	202,297
2040	-	-	-	6,827	78,515	-	2,116	2,116	0	347	202,644
2041	-	-	-	6,281	72,234	-	1,947	1,947	0	299	202,943
2042	-	-	-	5,779	66,455	-	1,791	1,791	0	258	203,202
2043	-	-	-	5,316	61,139	-	1,648	1,648	0	223	203,424
2044	-	-	-	4,891	56,248	-	1,516	1,516	0	192	203,616
2045	-	-	-	4,500	51,748	-	1,395	1,395	0	166	203,782
2046	-	-	-	4,140	47,608	-	1,283	1,283	0	143	203,925
2047	-	-	-	3,809	43,799	-	1,181	1,181	0	123	204,048
2048	-	-	-	3,504	40,295	-	1,086	1,086	0	106	204,154
2049	-	-	-	3,224	37,072	-	999	999	0	92	204,246
2050	-	-	-	2,966	34,106	-	919	919	0	79	204,325
2051	-	-	-	2,728	31,377	-	846	846	0	68	204,393
2052	-	-	-	2,510	28,867	-	957	957	0	72	204,466
Total	-	1,437,084	(844,543)	815,676	9,802,542	592,541	(217,009)	375,531	15	204,466	6,484,739


Comparative Cumulative NPV
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200,000
100,000
0
-100,000
-200,000
-300,000
-400,000
-500,000
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Replace AVR system

CI Number: 37611

Title: **LIN3 – Generator Excitation & AVR System Replacement**

Start Date: 2012/03
Final Cost Date: 2012/08
Function: Generation
Forecast Amount: $819,469

DESCRIPTION:

The excitation system for a synchronous generator provides the DC field current to the generator rotor. The DC field current is derived from rectifying an AC supply. The excitation system includes the thyristor rectifier bridges, Automatic Voltage Regulator (AVR), field circuit breaker, monitoring and control. The AVR automatically controls the generator voltage via field current regulation and is integral to the excitation system.

The existing excitation system will be completely replaced with modern digital static excitation system equipment, excluding the existing exciter transformer.

This project includes the specification and replacement of existing Auto Voltage Regulation (AVR) devices on Unit 3 at the Lingan Generating Station. The existing AVR devices are obsolete and are no longer supported by the Original Equipment Manufacturer (OEM).

Summary of Related CI's +/- 2 years:
No projects for 2010,2011,2012, 2013 & 2014

JUSTIFICATION:

Justification Criteria: Thermal

Sub Criteria: Equipment Replacement

Why do this project?

The excitation system for Lingan Unit #3 generator is now obsolete. The OEM no longer supports this equipment and it is no longer possible to source spare parts, or receive technical support service. A dependable excitation system is required for reliable operation of Unit #3.

Why do this project now?

The spare parts originally supplied with the system have now been depleted and replacement parts are no longer available. Replacing the excitation system will mitigate the risk of an unplanned outage and associated replacement energy costs

Why do this project this way?

Replacement of the obsolete excitation system and AVR is the only option. The existing AVR equipment removed from Unit #3 will be salvaged where possible and used for spares to support potential repairs that may be required for Units 1,2 and 4. Completing one of the four Units will reduce the risks associated with obsolescence on the other three Units.

CI Number : 37611 - LIN3 - Generator Excitation & AVR System Replacement **Project Number**

Parent CI Number : -

Cost Centre : 305 - 305-Lingan 3&4 Prod.Unit **Budget Version** 2012 ACE Plan

Capital Item Accounts

Acct	Actv	Account	Activity	Forecast Amount	Amount	Variance
094		094 - Interest Capitalized		8,895	0	8,895
095		095-Thermal Regular Labour AO		30,985	0	30,985
095		095-Thermal & Hydro Contracts AO		[redacted]	0	[redacted]
001	010	001 - THERMAL Regular Labour	010 - SGP - Turbo Gen.Instal.	129,050	0	129,050
002	010	002 - THERMAL Overtime Labour	010 - SGP - Turbo Gen.Instal.	0	0	0
004	010	004 - THERMAL Term Labour	010 - SGP - Turbo Gen.Instal.	0	0	0
011	010	011 - Travel Expense	010 - SGP - Turbo Gen.Instal.	19,955	0	19,955
012	010	012 - Materials	010 - SGP - Turbo Gen.Instal.	[redacted]	0	[redacted]
013	010	013 - POWER PRODUCTION Contracts	010 - SGP - Turbo Gen.Instal.	[redacted]	0	[redacted]
028	010	028 - Consulting	010 - SGP - Turbo Gen.Instal.	[redacted]	0	[redacted]
			Total Cost:	819,469	0	819,469
			Original Cost:	263,000		

Capital Project Detailed Estimate

Location: Lingan
FP#:37611
Title: LIN3 - Generator Excitation & AVR System Replacement

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Item	Description	Unit	Quantity	Unit Estimate	Total Estimate	Cost Support Reference	Completed Similar Projects (CI#'s) Note 1
1	**001 Regular Labour**						
1.1	Plant & Generation Services Engineering - Technical and Project Support	hr	[redacted]		8,000		
1.2	Electrical & Instrumentation Trades Supervision	hr	80	45.00	3,600		
1.3	Electrical and Instrumentation Trades	hr	2400	42.50	102,000		
1.4	Mechanical Trades	hr	300	39.50	11,850		
1.5	Utility Trades	hr	120	30.00	3,600		
				Sub-Total	129,050		
2	**012 Materials**						
2.1	Excitation System Replacement	ea	1	[redacted]		Proposal 1116-1048	
2.2	Power Builder SW - E circuit Design software	ea	1				
2.3	Tools and Rigging - Misc	ea	1				
2.4	Cable Tray - new wire runs	ea	1				
2.5	DC Cables	ea	1				
2.6	AC Cable and misc materials	ea	1				
		$					
				Sub-Total	[redacted]		
3	**013 Power Production Contracts**						
3.1	[redacted] services - (PSS study, training , site commission)	ea	1	[redacted]		Proposal 1116-1048	
3.2	Contingency for [redacted] Scope of work	%					
3.3	NSPI Project Coordinator - Site work (five weeks)	hr					
3.4	Electrical install detail design	hr				Reference Sept 8, 2011 Rates	
3.5	Technical Assitance install support	hr				Reference Dec 20, 2010 Rates	
				Sub-Total	[redacted]		
4	**028 Consulting**						
4.1	As builts Records and document control general	hr	[redacted]				
4.2							
4.3							
				Sub-Total	[redacted]		
5	**011 Travel and 041 Meals**						
5.1	Technical Assitance travel expenses and meals - five 5 weeks	ea	1	10,255	10,255		
5.2	NSPI Engineering - travel expenses and meals - three trips	ea	1	1,650	1,650		
5.3	Site Manager travel expenses and meals - five weeks	ea	1	8,050	8,050		
				Sub-Total	19,955		
6	**094 Interest Capitalized**						
6.1			1	8,895	8,895		
6.2							
6.3							
				Sub-Total	8,895		
7	**095 Administrative Overhead**						
7.1	Therm & Hydro Contracts AO		1	[redacted]			
7.2	Thermal Regualr labour AO		1				
7.3							
				Sub-Total	39,869		
Project Cost Estimate				**Total**	**$819,469**		
8	**Original Cost**						
8.1					$263,000		

Note 1: Reference to "Completed similar projects (CI#'s)" is to be provided when the item estimate is based on work of similar scope for a recently completed project

LIN3 Generator Excitation and AVR Replacement
Summary of Alternatives & Assumptions

Nova Scotia POWER An Emera Company energy everywhere.

Budget Year :	**2012**	**Date :**	**31-Oct-11**
Division :	Power Production	**CI Number:**	37611
Department :	Lingan	**Project No. :**	
Originator :			

	Alternative	After Tax WACC	PV of EVA / NPV	Rank	IRR	Disc Pay
A	Replace Excitation & AVR System	6.67%	733,382	1	25.96%	4.9 years
B	Test 2	6.67%	0	2	#NUM!	0.0 years
C	Test 3	6.67%	0	2	#NUM!	0.0 years
D	Test 4	6.67%	0	2	#NUM!	0.0 years

Recommendation :

Replacement of the obsolete excitation system and AVR is the only option. Based on a positive NPV, it is recommended that the excitation system and AVR be Replaced

Assumptions

Incremental replacement energy costs and annual operating costs in the years following 2013 are escalated at 2% annually.

Calculations:
Total annual avoided cost = [Replacement energy costs] + [Avoided unplanned repair costs]

Avoided replacement energy cost = [Incremental replacement energy cost] x [Quantity of predicted annual unit outages / de-ratings] x [capacity factor] x [Probability of failure] x [Derating/outage] x [Duration of Derating]

Avoided unplanned repair costs = [cost of Labour and materials in event of failure] x [Probability of failure] x [quantity of predicted annual unit outages / de-ratings]

Calculation of probability of failure in Year 2

The probability of the unit failing in year 2 is: (Probability of unit not failing in year 1) x (probability the unit will fail in year 2 if no failure accured in year 1)

Example: Replace Excitation & AVR System

1	
-5%	Minus the Probability of failure in year 1
95%	Probability that equipment does not fail in year 1
x	
6%	Probability of equipment failing in year 2 if no failure occurs in year 1
6%	**Probability of the equipment failing in year 2**

Nova Scotia POWER An Emera Company energy everywhere.

Avoided Cost Calculations

Budget Year :	2012	Date :	31-Oct-11
Division :	Power Production	CI Number:	37611
Department :	Lingan	Project No.	
Originator :			

Replace Excitation & AVR System	
Severe failure requiring replacement Capital Cost	$ 819,469.00
Avoided Replacement Energy costs (2012) =	[redacted] MWh x 1 outages x 80% x 5.0% x [redacted] MW x 2016 h = $78,236.93
Avoided Unplanned Repair Costs (2012)	$ 819,469.00 x 5% x 1 = $40,973.45
Avoided Replacement Energy costs (2013) =	[redacted] MWh x 1 outages x 80% x 5.7% x [redacted] MW x 2016 h = $89,190.10
Avoided Unplanned Repair Costs (2013)	$ 835,858.38 x 5.7% x 1 = $47,643.93

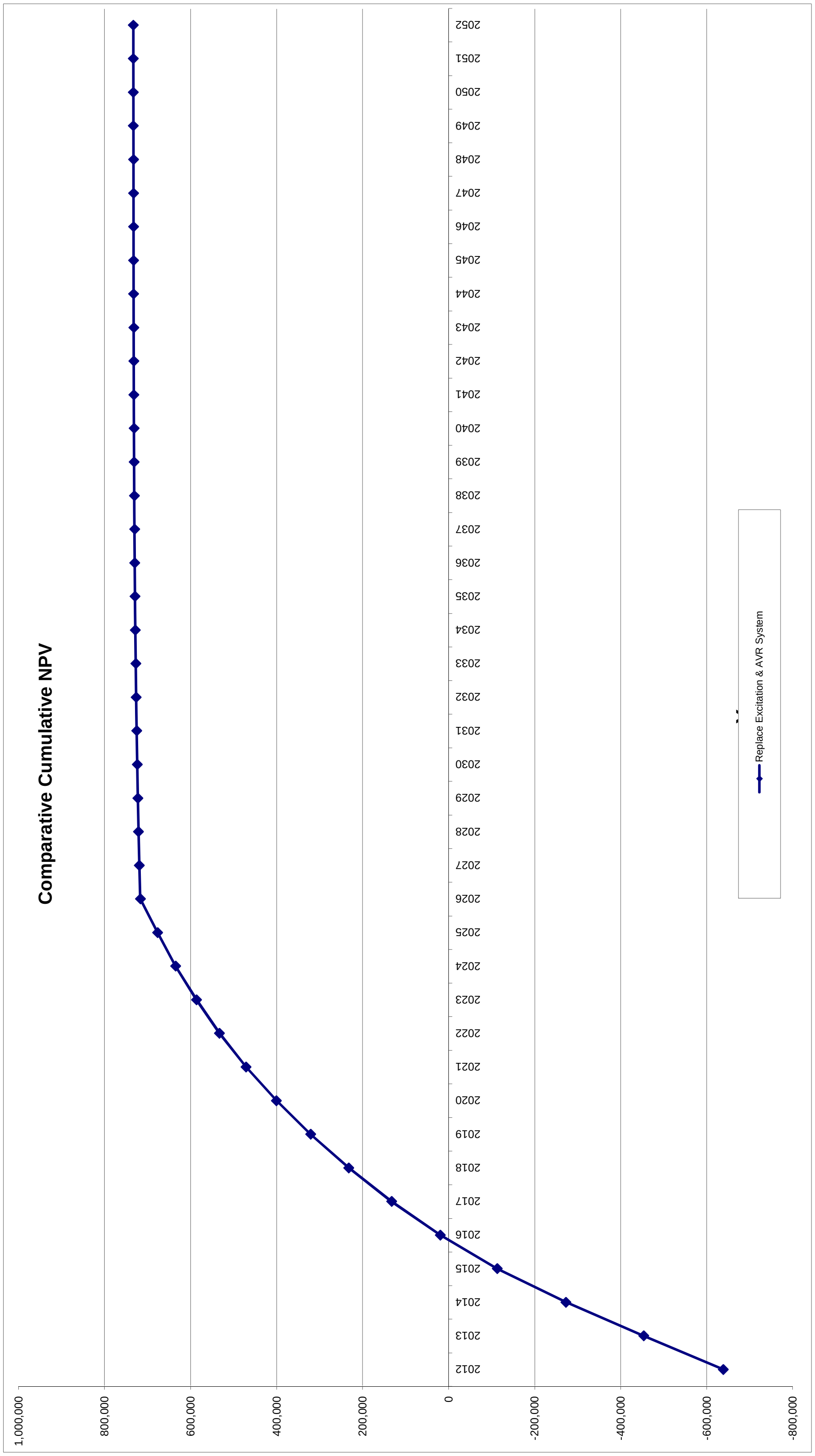
Replace AVR continued	
Failure requiring Repair	
Avoided Replacement Energy costs (2012) =	[redacted] MWh x 1 outages x 80% x 25% x [redacted] MW x 672 h = $ 130,394.88
Avoided Unplanned Repair Costs (2012)	$ 36,000.00 x 25% x 1 = $ 9,000.00
Total Annual Avoided costs (2012)	$258,605.26
Avoided Replacement Energy costs (2013) =	[redacted] MWh x 1 outages x 80% x 22.5% x [redacted] MW x 672 h = $ 117,355.39
Avoided Unplanned Repair Costs (2013)	$ 36,400.00 x 22.5% x 1 = $ 8,190.00
Total Annual Avoided costs (2013)	$262,379.42

Test 3	
Capital Cost	
Avoided Replacement Energy costs (2012) =	
Avoided Unplanned Repair Costs (2012)	
Total Annual Avoided costs	
Avoided Replacement Energy costs (2013) =	
Avoided Unplanned Repair Costs (2013)	
Total Annual Avoided costs	

Test 4	
Capital Cost	
Avoided Replacement Energy costs (2012) =	
Avoided Unplanned Repair Costs (2012)	
Total Annual Avoided costs	
Avoided Replacement Energy costs (2013) =	
Avoided Unplanned Repair Costs (2013)	
Total Annual Avoided costs	

LIN3 Generator Excitation and AVR Replacement
Replace Excitation & AVR System

Year	Total Revenue	Operating Costs	Capital	CCA	UCC	CFBT	Applicable Taxes	CFAT	Discount Factor	PV of CF	CNPV
2012	-	258,605	(819,469)	32,779	786,690	(560,864)	(77,430)	(638,294)	1	(638,294)	(638,294)
2013	-	262,379	-	62,935	723,755	262,379	(65,186)	197,194	1	184,863	(453,430)
2014	-	272,515	-	57,900	665,855	272,515	(66,645)	205,869	1	180,929	(272,502)
2015	-	257,268	-	53,268	612,586	257,268	(63,240)	194,028	1	159,859	(112,643)
2016	-	226,389	-	49,007	563,579	226,389	(55,086)	171,303	1	132,311	19,668
2017	-	206,297	-	45,086	518,493	206,297	(49,975)	156,322	1	113,190	132,858
2018	-	193,761	-	41,479	477,014	193,761	(47,207)	146,554	1	99,482	232,340
2019	-	185,025	-	38,161	438,852	185,025	(45,528)	139,497	1	88,771	321,111
2020	-	177,114	-	35,108	403,744	177,114	(44,022)	133,092	1	79,399	400,509
2021	-	168,262	-	32,300	371,445	168,262	(42,148)	126,114	1	70,531	471,040
2022	-	157,893	-	29,716	341,729	157,893	(39,735)	118,158	1	61,950	532,990
2023	-	145,958	-	27,338	314,391	145,958	(36,772)	109,186	0	53,666	586,656
2024	-	140,672	-	25,151	289,240	140,672	(35,811)	104,860	0	48,317	634,974
2025	-	130,727	-	23,139	266,100	130,727	(33,352)	97,375	0	42,063	677,037
2026	-	133,340	-	21,288	244,812	133,340	(34,736)	98,604	0	39,930	716,967
2027	-	-	-	19,585	225,227	-	6,071	6,071	0	2,305	719,272
2028	-	-	-	18,018	207,209	-	5,586	5,586	0	1,988	721,260
2029	-	-	-	16,577	190,632	-	5,139	5,139	0	1,715	722,974
2030	-	-	-	15,251	175,382	-	4,728	4,728	0	1,479	724,453
2031	-	-	-	14,031	161,351	-	4,349	4,349	0	1,275	725,728
2032	-	-	-	12,908	148,443	-	4,002	4,002	0	1,100	726,828
2033	-	-	-	11,875	136,568	-	3,681	3,681	0	949	727,777
2034	-	-	-	10,925	125,642	-	3,387	3,387	0	818	728,595
2035	-	-	-	10,051	115,591	-	3,116	3,116	0	706	729,301
2036	-	-	-	9,247	106,344	-	2,867	2,867	0	609	729,909
2037	-	-	-	8,507	97,836	-	2,637	2,637	0	525	730,434
2038	-	-	-	7,827	90,009	-	2,426	2,426	0	453	730,887
2039	-	-	-	7,201	82,809	-	2,232	2,232	0	390	731,278
2040	-	-	-	6,625	76,184	-	2,054	2,054	0	337	731,614
2041	-	-	-	6,095	70,089	-	1,889	1,889	0	290	731,905
2042	-	-	-	5,607	64,482	-	1,738	1,738	0	251	732,155
2043	-	-	-	5,159	59,323	-	1,599	1,599	0	216	732,371
2044	-	-	-	4,746	54,578	-	1,471	1,471	0	186	732,558
2045	-	-	-	4,366	50,211	-	1,354	1,354	0	161	732,719
2046	-	-	-	4,017	46,194	-	1,245	1,245	0	139	732,857
2047	-	-	-	3,696	42,499	-	1,146	1,146	0	120	732,977
2048	-	-	-	3,400	39,099	-	1,054	1,054	0	103	733,080
2049	-	-	-	3,128	35,971	-	970	970	0	89	733,169
2050	-	-	-	2,878	33,093	-	892	892	0	77	733,245
2051	-	-	-	2,647	30,446	-	821	821	0	66	733,312
2052	-	-	-	2,436	28,010	-	928	928	0	70	733,382
Total	-	2,916,204	(819,469)	791,459	9,511,510	2,096,735	(669,492)	1,427,244	15	733,382	22,223,322


Comparative Cumulative NPV
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600,000
400,000
200,000
0
-200,000
-400,000
-600,000
-800,000
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Replace Excitation & AVR System

CI Number: 41441

Title: **TRE Siding Replacement (Phase 2)**

Start Date: 2012/05
Final Cost Date: 2012/10
Function: Generation
Forecast Amount: $608,915

DESCRIPTION:

The exterior siding on the building housing the boilers and turbines for Units 1 through 5 at the Trenton Generating Station ranges in age from 40 to 60 years. The siding needs to be replaced due to normal age-related deterioration. This is a continuation of the work completed in 2011 under CI 39933 – TRE Siding Replacement.

The scope of this project includes replacement of siding in the following areas:

(1) South wall of Units 3-4 boiler house

(2) North wall of Units 3-4 turbine hall

(3) North wall of Unit 5 turbine hall - This will include siding replacement and repair of damaged louvers in the area of the unit 5 transformer compound.

The current plan is to bring a project forward for approval in 2013 to complete the remaining areas.

Summary of Related CI's +/- 2 years:
2011 CI 39933 TRE Siding Replacement $297,536
2013 CI TBD TRE Siding Replacement (Phase 3) $350,000

JUSTIFICATION:

Justification Criteria: Thermal

Sub Criteria: Buildings

Why do this project?

Replacing the siding will address deterioration issues with the existing siding that has resulted in ingress of water into the building structure. An added benefit of completing this project will be the replacement of the existing asbestos-containing siding.

Why do this project now?

Replacing the siding now and addressing issues with water leakage into the building structure will mitigate the risk of more extensive water damage and costly repairs.

Why do this project this way?

Due to the age and condition of the existing siding, replacement is the most practical option. The replacement will be completed in the most economically feasible manner, which includes replacing the existing siding with sheet metal siding and completing wall sections in their entirety.

CI Number	: 41441	- TRE - Siding Replacement (Phase 2)	**Project Number**	
Parent CI Number	:	-		
Cost Centre	: 341	- 341-Trenton Admin./Common Capital	**Budget Version**	2012 ACE Plan

Capital Item Accounts

Acct	Actv	Account	Activity	Forecast Amount	Amount	Variance
094		094 - Interest Capitalized		7,288	0	7,288
095		095-Thermal & Hydro Contracts AO		[redacted]	0	[redacted]
095		095-Thermal Regular Labour AO		3,794	0	3,794
001	003	001 - THERMAL Regular Labour	003 - SGP - Bldg.,Struct.Grnd.	12,000	0	12,000
013	003	013 - POWER PRODUCTION Contracts	003 - SGP - Bldg.,Struct.Grnd.	[redacted]	0	[redacted]
001	085	001 - THERMAL Regular Labour	085 Design	2,000	0	2,000
001	087	001 - THERMAL Regular Labour	087 Field Super.& Ops.	1,800	0	1,800
011	087	011 - Travel Expense	087 Field Super.& Ops.	200	0	200
013	087	013 - POWER PRODUCTION Contracts	087 Field Super.& Ops.	[redacted]	0	[redacted]
021	087	021 - Telephones	087 Field Super.& Ops.	150	0	150
041	087	041 - Meals & Entertainment	087 Field Super.& Ops.	150	0	150
			Total Cost:	608,916	0	608,916
			Original Cost:	99,000		

Capital Project Detailed Estimate

Location: Trenton
FP#: 41441
Title: TRE - Siding Replacement (Phase 2)

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Item	Description	Unit	Quantity	Unit Estimate	Total Estimate	Cost Support Reference	Completed Similar Projects (FP#'s) Note 1
1	**001 Regular Labour**						
1.1	Regular Labour - Utility	hr	480	25.00	12,000		
1.2	Project Engineering	lot	1	2,000.00	2,000		
1.3	Project Supervision	lot	1	1,800.00	1,800		
1.4					-		
1.5					-		
1.6							
				Sub-Total	15,800		39933
2	**013 Power Production Contracts**						
2.1	External Supervisor	lot	1	[redacted]	[redacted]		
2.2	Siding Replacement - Section 16	lot	1	[redacted]	[redacted]	April 30, 2009 quote pg2	
2.3	Siding Replacement - Section 17	lot	1	[redacted]	[redacted]	April 30, 2009 quote pg2	
2.4	Siding Replacement - Section 19	lot	1	[redacted]	[redacted]	April 30, 2009 quote pg2	
2.5	Contingency	%	[redacted]		[redacted]		39933
				Sub-Total	[redacted]		
3	**011 Travel Expenses**						
3.1	Trevel	day	1	200	200		
3.2							
3.3							
				Sub-Total	200		
4	**Misc**						
4.1	Telephones	Lot	1	150	150		
4.2	Meals and Entertainment	lot	1	150	150		
4.3					-		
4.4					-		
				Sub-Total	300		
5	**094 Interest Capitalized**						
5.1	Interested Capitalized				7,288		
					-		
					-		
				Sub-Total	7,288		
6	**095 Administrative Overhead**						
6.1	Thermal Regular Labour AO				3,794		
6.2	Thermal and hydro Contracts AO				[redacted]		
				Sub-Total	[redacted]		
Project Cost Estimate				**Total**	**$608,917**		
7	Original Cost						
7.1					$99,000		

Note 1: Reference to "Completed similar projects (FP#'s)" is to be provided when the item estimate is based on work of similar scope for a recently completed project

CI Number: 41507

Title: **TRE6 - Air Heater Refurbishment**

Start Date: 2012/06
Final Cost Date: 2012/11
Function: Generation
Forecast Amount: $553,438

DESCRIPTION:

The air heaters on Unit #6 are tri-sector units which transfer heat from the flue gas exiting the boiler to both the primary air (that transports pulverized fuel from the mills to the boiler) and secondary combustion air to the boiler.

The Original Equipment Manufacturer (OEM) completed an inspection of the Unit #6 air heaters during the 2010 shutdown and made a number of recommendations to improve the efficiency of the air heaters and mitigate the risk of unplanned failures.

Of the ten recommendations made, the following are planned for completion during the 2012 schedule outage:

- Replace the hot end and cold end bypass seals, T-bars, rotor angles, and bypass seal holding angles on air heaters 6A & 6B.

- Replace the pin rack assemblies along with the pinion gear/taper lock bushing and carbon seal/spring on air heaters 6A & 6B.

Replacing the deteriorated bypass seals will improve air heater efficiency. Replacing the pin rack assemblies will mitigate the risk of failure and an unplanned Unit outage.

The following OEM recommendations will be completed during the 2014 planned outage for Unit #6:

- Replace complete set of hot end, intermediate and cold end baskets to APH's 6-A & 6-B.

- Replace the cold end support grating and support blocks when the cold end baskets are being replaced to APH's 6-A & 6-B.

Summary of Related CI's +/- 2 years:
2010 CI 38582 TRE6 Air Heater Refurbishment $501,532
2014 CI TBD TRE6 Air Heater Refurbishment $TBD

JUSTIFICATION:

Justification Criteria: Thermal

Sub Criteria: Equipment Replacement

Why do this project?

This refurbishment will re-establish the hot & cold end bypass seals of 6A & 6B air heaters to Original Equipment Manufacturer (OEM) specifications. Short- circuiting of air will be reduced to acceptable levels, resulting in improved air heater efficiency. Also, the pin racks will be re-established to OEM specifications, resulting in improved Unit reliability.

Why do this project now?

Deferring the work planned for 2012 until 2014 would increase the risk of pin rack failure, which could

CI Number : 41507 - TRE6 - Air Heater Refurbishment **Project Number**

Parent CI Number : -

Cost Centre : 345 - 345-Trenton unit 6 Capital **Budget Version** 2012 ACE Plan

Capital Item Accounts

Acct	Actv	Account	Activity	Forecast Amount	Amount	Variance
094		094 - Interest Capitalized		6,545	0	6,545
095		095-Thermal Regular Labour AO		[redacted]	0	[redacted]
095		095-Thermal & Hydro Contracts AO		[redacted]	0	[redacted]
095		095-Thermal Overtime Labour AO		7,995	0	7,995
001	013	001 - THERMAL Regular Labour	013 - SGP - Boiler	171,600	0	171,600
002	013	002 - THERMAL Overtime Labour	013 - SGP - Boiler	66,600	0	66,600
012	013	012 - Materials	013 - SGP - Boiler	[redacted]	0	[redacted]
013	013	013 - POWER PRODUCTION Contracts	013 - SGP - Boiler	[redacted]	0	[redacted]
001	085	001 - THERMAL Regular Labour	085 Design	4,400	0	4,400
028	085	028 - Consulting	085 Design	[redacted]	0	[redacted]
001	087	001 - THERMAL Regular Labour	087 Field Super.& Ops.	2,000	0	2,000
011	087	011 - Travel Expense	087 Field Super.& Ops.	900	0	900
013	087	013 - POWER PRODUCTION Contracts	087 Field Super.& Ops.	[redacted]	0	[redacted]
021	087	021 - Telephones	087 Field Super.& Ops.	300	0	300
041	087	041 - Meals & Entertainment	087 Field Super.& Ops.	300	0	300
			Total Cost:	553,438	0	553,438
			Original Cost:	452,000		

Capital Project Detailed Estimate

Location: Trenton
FP#:41507
Title: TRE6 - Air Heater Refurbishment

Nova Scotia POWER An Emera Company energy everywhere.

Item	Description	Unit	Quantity	Unit Estimate	Total Estimate	Cost Support Reference	Completed Similar Projects (CI#'s) Note 1
1	**001 Regular Labour**						
1.1	Detailed Engineering (Generation Services)	hr	[redacted]		4,400		
1.2	Engineering Support and Supervision	hr	[redacted]		2,000		
1.3	Mechanical trades	hr	2240	45.00	100,800		
1.4	Confined Space Watch	hr	480	30.00	14,400		
1.5	Emergency Response Team (ERT) coverage	hr	720	45.00	32,400		
1.6	Utility - Staging and site cleanup	hr	800	30.00	24,000		
				Sub-Total	178,000		38582
2	**002 Overtime Labour**						
2.1	Mechanical trades	hr	960	45.00	43,200		
2.2	Confined Space Watch	hr	240	30.00	7,200		
2.3	Emergency Response Team (ERT) coverage	hr	360	45.00	16,200		
				Sub-Total	66,600		38582
3	**012 Materials**						
3.1	Bypass seals	ea	1	[redacted]		August 2, 2011 quote	
3.2	Pink rack assemblies	Lot	1			August 2, 2011 quote	
3.3	Contingency	Lot	1				
3.4	Misc. materials (casing repairs, seal work)	Lot	1				
				Sub-Total			38582
4	**013 Power Production Contracts**						
4.1	High Pressure Water Wash	Lot	[redacted]				
4.2	Installation Supervision	hr					
				Sub-Total	[redacted]		38582
5	**028 Consulting**						
5.1	Technical Service Representative	Lot	1	[redacted]			
5.2							
5.3							
				Sub-Total	[redacted]		
6	**011 Travel / 021 Telephones and 041 Meals**						
6.1	Travel	Lot	1	900	900		
6.2	Telephones	Lot	1	300	300		
6.3	Meals	Lot	1	300	300		
				Sub-Total	1,500		
7	**094 Interest Capitalized**						
7.1					6,545		
7.2							
7.3							
				Sub-Total	6,545		
8	**095 Administrative Overhead**						
8.1	Thermal & Hydro Contracts AO		1	[redacted]			
8.2	Thermal Regular labour AO		1	42,738	42,738		
8.3	Thermal Overtime Labour AO		1	7995	7,995		
				Sub-Total	[redacted]		
Project Cost Estimate				**Total**	**$553,438**		
9	**Original Cost**				$452,000		
9.1							

Note 1: Reference to "Completed similar projects (CI#'s)" is to be provided when the item estimate is based on work of similar scope for a recently completed project.

ALSTOM AIR PREHEATER, INC.

Technical Service Report for
Nova Scotia Power
Trenton Unit #6
Trenton, Nova Scotia
HOW-1124 (2) size 25 VI Howden Air Preheaters
Visit Date: April 7–30, 2010
Technical Representative: [redacted]

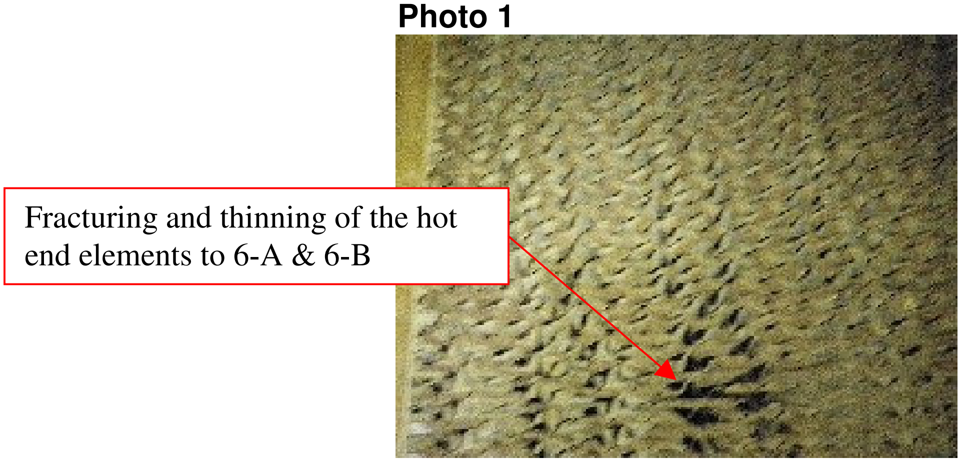
The purpose of this visit was to provide technical assistance with the inspection and repairs to Air Preheaters 6-A & 6-B on Boiler #6. Both Air Preheaters 6-A & 6-B were high pressured water washed before the start of the job. I had my safety and lock out tag out procedures orientation before I met with [redacted] and [redacted] with Nova Scotia Power to discuss the scope of this work. After my inspection I provided the plant with a prioritized punch list of work that should be done this outage. I worked with [redacted], Project Manager with Matheson Pressure Vessels that fabricated all the seals and plating materials that were needed for the repairs to APH's 6-A & 6-B.

Inspection Results & Work Performed This Outage:

Heat Transfer Element:

APH's 6-A & 6-B have the DN7™ heat transfer surface in the hot end and intermediate. The hot end on 6-A & 6-B APH's has fracturing and thinning of the elements with some pluggage in the outer "D" baskets. See **Photo 1.** The intermediate baskets were not inspected this outage. **Recommend replacing the hot end and intermediate baskets within the next 4 years.**

Photo 1



APH's 6-A & 6-B have the NF6 heat transfer surface in the cold end. There are signs in both APH's 6-A & 6-B of fracturing and thinning of the elements with pockets of spiking of up to 1" deep. See **Photo 2 & 3. Recommend replacing the cold end baskets in the next 4 years.**

Photo 2

Photo 3

Fracturing and thinning with some pockets of spiking of up to 1" deep in the cold end baskets to 6-A & 6-B

Some of the erosion and spiking displayed in the cold end heat transfer surfaces is a product of excessive moisture in the soot blowing medium in conjunction with an erratic travel on the soot blower swing arm. **Recommend that the moisture in the soot blower medium be minimized.**

Rotor Structure:

APH's 6-A & 6-B; the hot end rotor structure is in serviceable condition with no hot end rotor diaphragm-to-rotor post, diaphragm-to-stay plate, or diaphragm-to-rotor shell cracks observed at this time. The stiffeners all seem to be in good serviceable condition.

APH's 6-A & 6-B; the cold end rotor structure is in good serviceable condition with no cold end rotor diaphragm-to-rotor post, diaphragm-to-stay plate, or diaphragm-to-rotor shell cracks observed at this time. There is some erosion observed at this time.

APH's 6-A & 6-B; the cold end basket support grating and blocks has seen a good amount of erosion and repairs, especially outboard. **Recommend when the cold end baskets are replaced that the support grating and blocks be replaced.**

The hot end gas inlet duct corner; gas-to-primary air had severe erosion holes that were repaired with plating material and seal welded in place to APH's 6-A & 6-B. See **Photo 4 & 5.**

Photo 4

Photo 5

Severe erosion holes in the hot end corner ducts to 6-A & 6-B

Rotor Seals:

The hot end sector plate sealing surfaces, there was severe erosion on the outboard edge of the flue gas-to-primary sector plate to APH's 6-A & 6-B. The hot end sector plate sealing surfaces to the primary air-to-secondary air and secondary air-to-flue gas were in serviceable condition. See **Photo 6 & 7**. **Repairs were made by gouging/cutting out the damage area and installing plating material across the outboard end of the sector plates and seal welded it in place.** The majority of the erosion displayed on the outboard edge of the hot end sector plate sealing surface is due to the hot end axial seal plate-to-sector plate bypass seal being in unsatisfactory condition.

The hot end radial seals were in serviceable condition to APH's 6-A & 6-B. Replacement of the broken/eroded outer radial sealing tabs were made. The hot end radial seals were found to be at the correct seal setting specifications to APH's 6-A & 6-B.

Photo 6

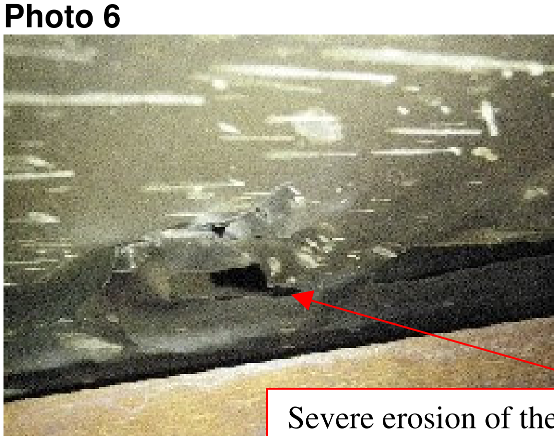


Photo 7

Severe erosion of the hot end flue gas-to-primary air sector plate outboard ends to 6-A & 6-B

The cold end sector plate sealing surfaces, there was severe erosion on the outboard edge of the gas to primary sector plate to APH's 6-A & 6-B. The cold end sector plate sealing surfaces to the primary air-to-secondary air and secondary air-to- flue gas were in serviceable condition. See **Photo 8 & 9**. **Repairs were made by gouging/cutting out the damage area and installing plating material across the outboard end of the sector plates and seal welded it in place.** The majority of the erosion displayed on the outboard edge of the cold end sector plate sealing surface is due to the cold end axial seal plate-to-sector plate bypass seal being in unsatisfactory condition. I was able to perform a run out on the cold end sector plate of APH's 6-A & 6-B. See **Page 8 & 9.**

The cold end radial seals were in serviceable condition, but needed to be reset to the seal setting specification for better performance and reliability of the air preheaters.

Photo 8

Photo 9

Severe erosion of the cold end flue gas-to-primary air sector plate outboard ends to 6-A & 6-B

The axial seal plates to APH's 6-A & 6-B are in serviceable condition. The axial seals were replaced this outage and were set to the seal setting specifications. I was able to perform a run out on the axial seal plate of APH's 6-A & 6-B. See **Page 10 & 11.** The axial seal plate static seals were replaced due to erosion gas-to-primary air on APH's 6-A & 6-B.

The hot end and cold end post seals are in serviceable condition to APH's 6-A & 6-B.

The hot end and cold end static spool are in serviceable condition to APH's 6-A & 6-B. Erosion holes were repaired to the hot end static spools to APH's 6-A & 6-B.

The hot end and cold end sector plate static seals are in good serviceable condition to APH's 6-A & 6-B, except for the sector plate static seals and studs in the hot end primary air outlet duct; gas-to-primary air and primary air-to-secondary air duct to APH's 6-A & 6-B. The static seals and studs were replaced this outage.

The hot end bypass seals were replaced to APH's 6-A & 6-B.
Recommend replacing the T-bar, rotor angle, and bypass seal holding angle due to a good amount of erosion and repairs to APH's 6-A & 6-B.

The cold end bypass seals were replaced to APH's 6-A & 6-B.
Recommend replacing the T-bar, rotor angle, and bypass seal holding angle due to a good amount of erosion and repairs to APH's 6-A & 6-B.

Soot Blower:

I could not check the operation of the swing arm cleaning device in the cold end gas outlet duct to APH's 6-A & 6-B during my inspection. The sequence of operation should be checked when the unit is back online. The lance and nozzle seem to be in serviceable condition. The linkage arm busing is worn. The random spiking observed indicates some "lost motion", dwelling, or erratic travel of the swing arm cleaning device. This may be caused by wear to the linkage arm bushing. **Recommend replacing the linkage arm bushing and adjusting the swing arm cleaning device for optimum coverage of the heat transfer surface.**

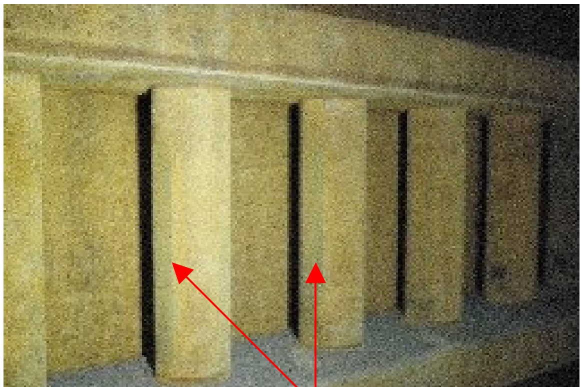
Moisture in the steam may have adverse affects on the air preheater performance and will reduce heat transfer surface life.

Rotor Drive:

An external inspection was made to the rotor drive gearbox to APH's 6-A & 6-B. The oil was clean and seems to be at the correct level. The rotor started easily using the auxiliary air drive and coasted smoothly to a stop. We did not operate the rotor using the main electric drive motor. **Recommend performing regular oil sampling/analysis on the rotor gearbox to APH's 6-A & 6-B.**

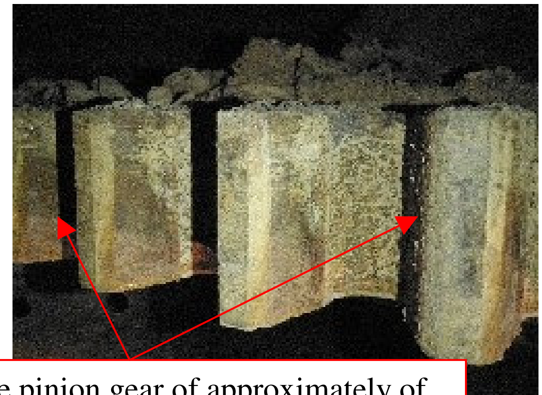
The pin rack assemblies on APH's 6-A & 6-B are in fair to poor condition. Wear to the pins are moderate to severe 3/32" wear from contact and about double that from erosion on the four (4) adjacent pins to the axial seals. The pinion gear has approximately 1/16" wear to the teeth. The pinion gear root clearances and the clearances from the pin rack rails remain within specifications. There were no hot end and cold end pin rack assembly support blocks cracks found at this time. See **Photo 10, 11 & 12**. **Recommend replacing the pin rack assemblies along with the pinion gear/taper lock bushing and carbon seal/spring next outage to 6-A & 6-B.**

Photo10



Wear to the pin rack pins of 3/32" or more to 6-A & 6-B

Photo 11



Wear to the pinion gear of approximately of 1/16" to 6-A & 6-B

Photo 12

Carbon seal & spring needs to be replaced to 6-A & 6-B

Rotor Bearings:

An internal inspection of APH's 6-A & 6-B rotor guide bearing was performed. All the internal components seem to be in serviceable condition. The oil level was low on APH 6-B by 6" inches and APH 6-A by 2" inches. I had the plant perform an oil analysis and the results did not indicate a problem. Ensure that the guide bearing oil circulating system is working properly and the coolers and the cooling water lines are clear and repair any leakage. The oil and oil filters were being replaced this outage. **Recommend replacing the cuno oil filters with a spin on type oil filter conversion if possible to APH's 6-A & 6-B.**

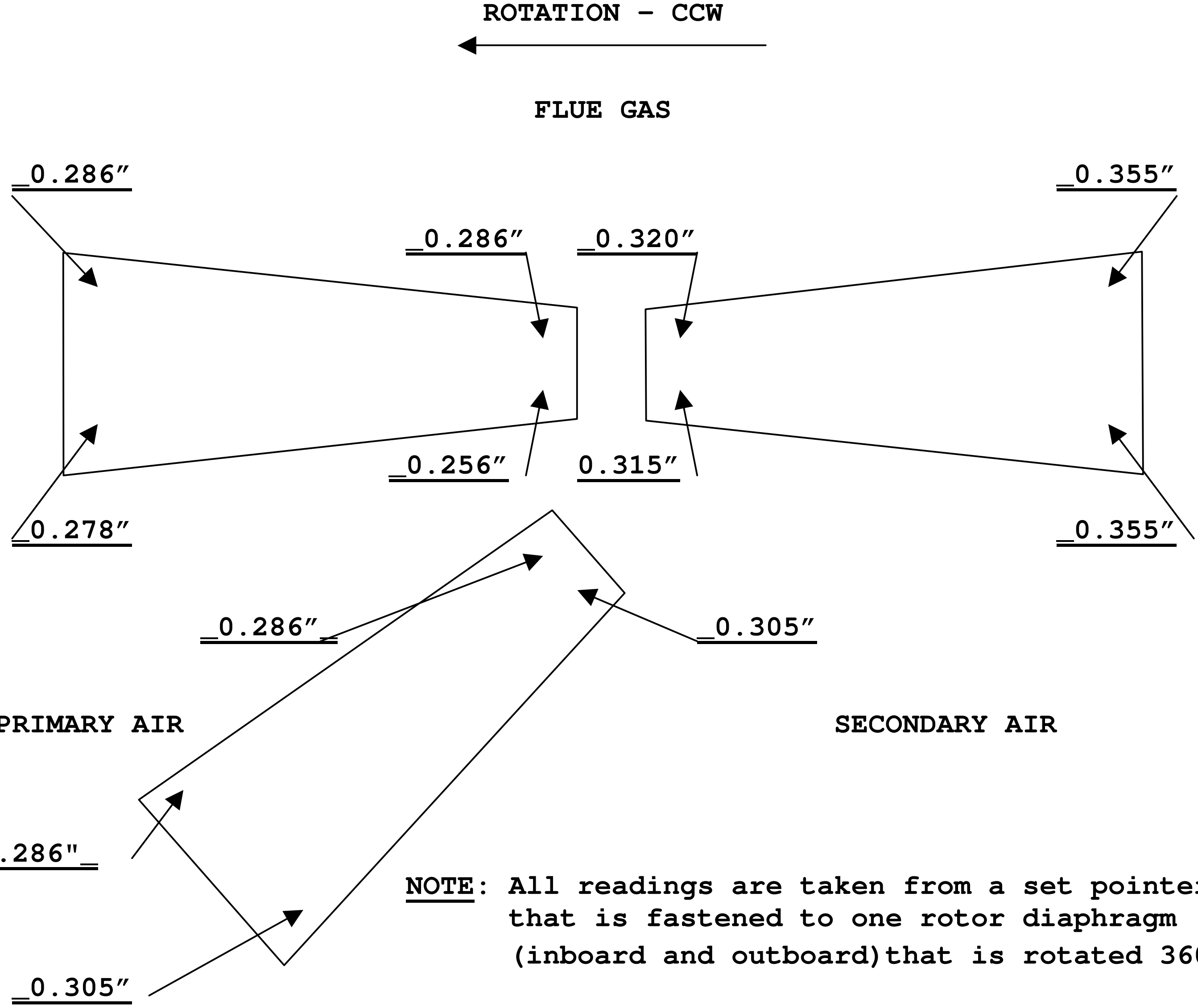
An external inspection of APH's 6-A & 6-B rotor support bearing was performed. The oil levels seem to be at the correct level to both. The oil was replaced this outage. I had the plant perform an oil analysis and the results did not indicate a problem. Internal inspection of this bearing is not practical without complete disassembly. **Recommend performing regular oil sampling/analysis on the rotor guide bearing and support bearing to APH's 6-A 6-B.**

INSPECTION RECORD
SECTOR PLATE PLANE - COLD END

HOW-_1124 **SERIAL NO.:______** **APH:_6-A__**

DATE: 4-30-2010 **By:** [redacted]

ROTATION - CCW



NOTE: All readings are taken from a set pointer that is fastened to one rotor diaphragm (inboard and outboard)that is rotated 360°.

SEAL SETTING SPECS.: Inboard = _0.000"_; Outboard = _0.460"_

Sector plate plane total variation = _0.049"_ Inboard
Sector plate plane total variation = _0.077"_ Outboard

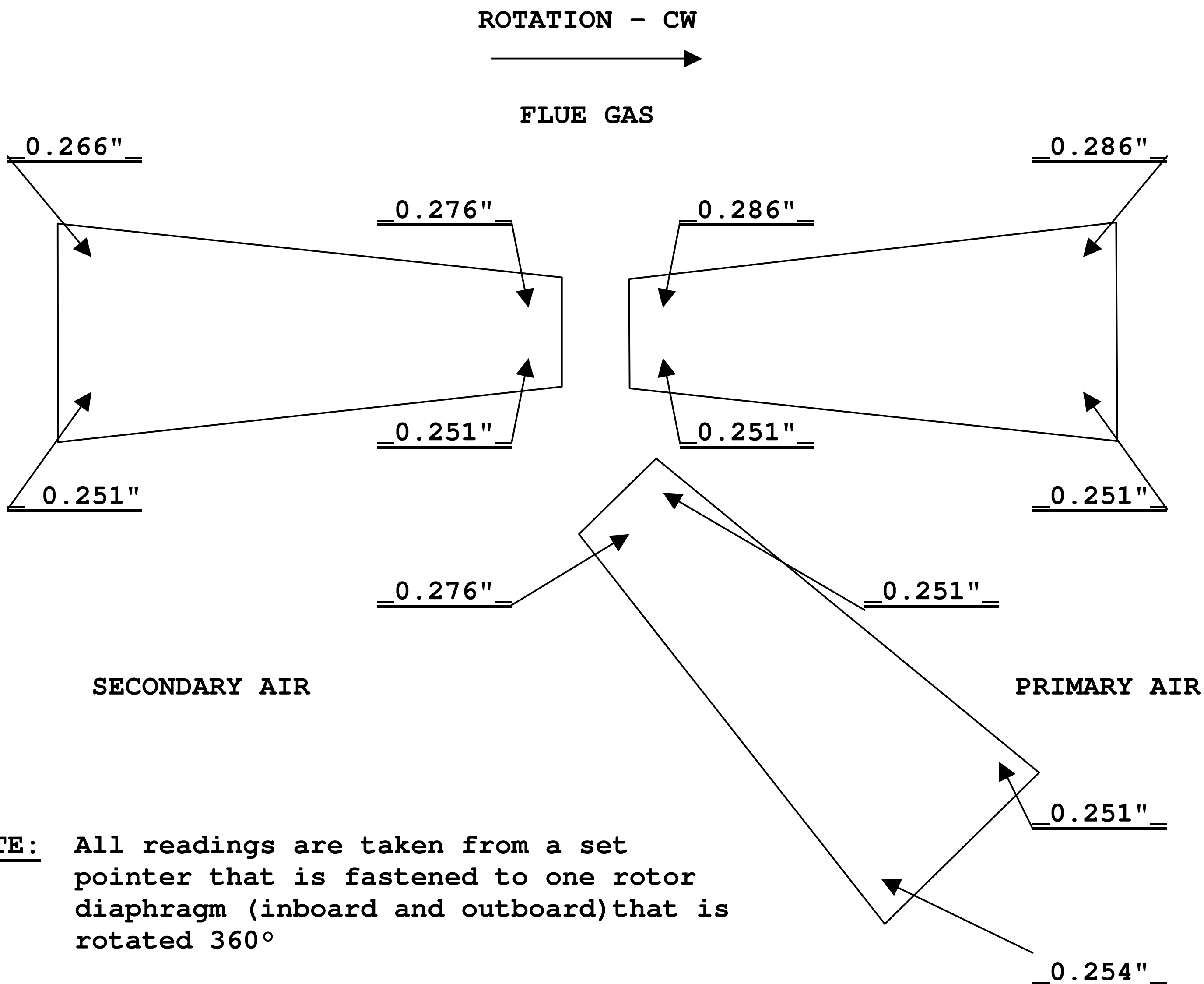
Maximum allowable variation = _0.060"_ Inboard and Outboard

Nova Scotia Power, Trenton Station
HOW 1124
April 30, 2010
Page 9 of 12

INSPECTION RECORD
SECTOR PLATE PLANE - COLD END

HOW-_1124_ SERIAL NO.:______ APH:_6-B___

DATE:_4-30-2010 BY: [redacted]



NOTE: All readings are taken from a set pointer that is fastened to one rotor diaphragm (inboard and outboard)that is rotated 360°

SEAL SETTING SPECS.: Inboard = _0.000"_; Outboard = _0.460"_

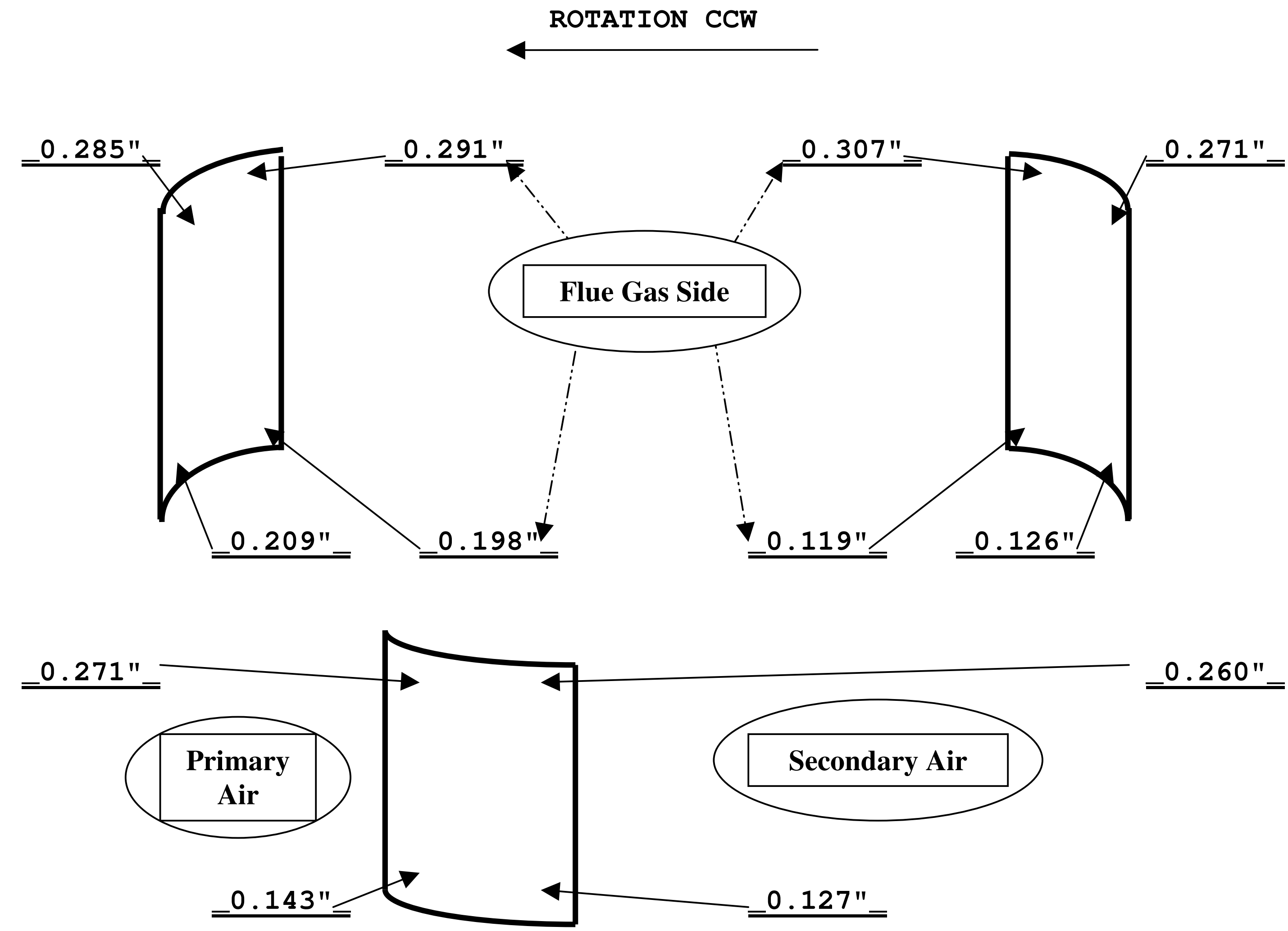
Sector plate plane total variation = _0.035"_ Inboard
Sector plate plane total variation = _0.035"_ Outboard

Maximum allowable variation = _0.060"_ Inboard and Outboard

INSPECTION RECORD
Axial Seal Plate Alignment
VI, Tri-Sector

HOW-_1124_   SERIAL NO.:______   APH:_6-A___

DATE:_4-30-2010_   BY:_[redacted]



NOTE:
All readings are taken from a set pointer that is fastened to one axial seal (top and bottom) that is rotated 360°
SEAL CLEARANCE SPECS.: Hot End = _0.271"_; Cold End = _0.143"_

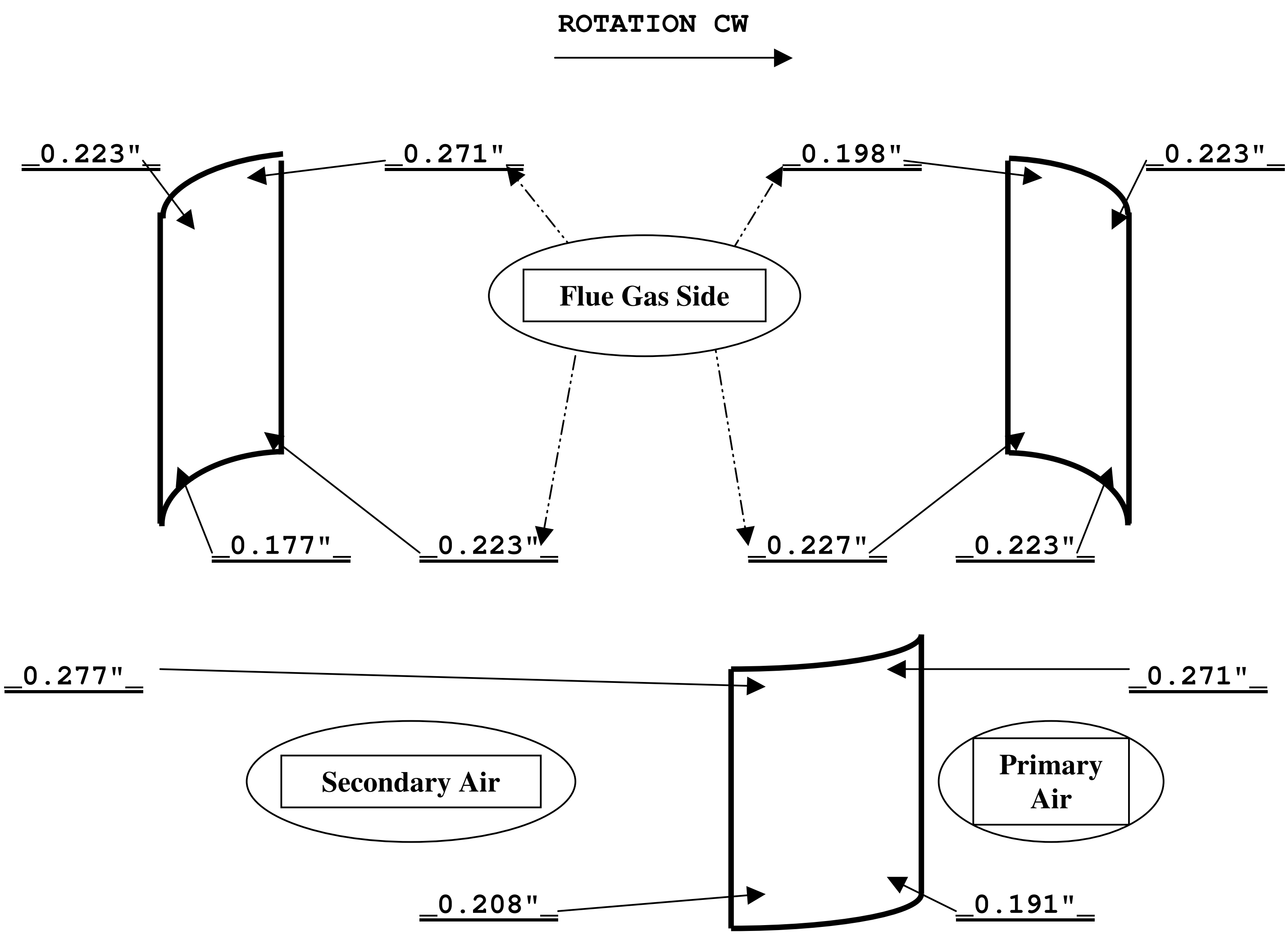
Axial seal plate total variation = _0.047"_ Hot End
Axial seal plate total variation = _0.090"_ Cold End

Maximum allowable variation = _0.060"_ Hot end and Cold End

INSPECTION RECORD
Axial Seal Plate Alignment
VI, Tri-Sector

HOW-_1124_ SERIAL NO.:______ APH:_6-B___

DATE:_4-30-2010 BY:_[redacted]



NOTE:

All readings are taken from a set pointer that is fastened to one axial seal (top and bottom) that is rotated 360°

SEAL CLEARANCE SPECS.: Hot End = _0.271"_; Cold End = _0.143"_

Axial seal plate total variation = _0.079"_ Hot End
Axial seal plate total variation = _0.050"_ Cold End

Maximum allowable variation = _0.060"_ Hot end and Cold End

Future Recommendations:

1) Replace complete set of hot end, intermediate and cold end baskets to APH's 6-A & 6-B in the next 4 years.
2) Replace the cold end support grating and support blocks when the cold end baskets are being replaced to APH's 6-A & 6-B in the next 4 years.
3) Replace the hot end and cold end bypass seals, T-bars, rotor angles, and bypass seal holding angles to APH's 6-A & 6-B in the next 4 years.
4) Replace the linkage arm bushing and adjust the swing arm soot blower to provide optimum coverage to APH's 6-A & 6-B next outage.
5) Moisture in the soot blower medium needs to be minimized to APH's 6-A & 6-B.
6) Replace the pin rack assemblies along with the pinion gear/taper lock bushing and carbon seal/spring to APH's 6-A & 6-B next outage.
7) Replace the guide bearing cuno oil filters and replace with a spin on type oil filter conversion if possible to APH's 6-A & 6-B.
8) Ensure that the guide bearing oil circulating system is working properly and the coolers and the cooling water lines are clear and repair any leakage.
9) Recommend performing regular oil sampling/analysis on the rotor guide bearing, support bearing and main rotor drive gearbox to APH's 6-A & 6-B.
10) Continue to maintain the air preheaters as per the O&M Manual.

Thank you again for this opportunity and if you need any further assistance please do not hesitate to contact me.

Respectfully,
Frank R. Parise
Technical Advisor
Alstom, Air Preheater Company

TRE Air Heater Refurbishment
Summary of Alternatives & Assumptions

Nova Scotia POWER An Emera Company energy everywhere.

Budget Year :	**2012**	**Date :**	**31-Oct-11**
Division :	Power Production	**CI Number:**	41507
Department :	Trenton	**Project No. :**	
Originator :			

	Alternative	After Tax WACC	PV of EVA / NPV	Rank	IRR	Disc Pay
A	Air Heater Refurbishment	6.67%	3,247,900	1	533.93%	1.2 years
B	Test 2	6.67%	0	2	#NUM!	0.0 years
C	Test 3	6.67%	0	2	#NUM!	0.0 years
D	Test 4	6.67%	0	2	#NUM!	0.0 years

Recommendation :

Based on a positive NPV, it is recommended that the air heater be refurbished.

Assumptions

Incremental replacement energy costs and annual operating costs in the years following 2013 are escalated at 2% annually.

Calculations:
Total annual avoided cost = [Replacement energy costs] + [Avoided unplanned repair costs]

Avoided replacement energy cost = [Incremental replacement energy cost] x [Quantity of predicted annual unit outages / de-ratings] x [capacity factor] x [Probability of failure] x [Derating/outage] x [Duration of Derating]

Avoided unplanned repair costs = [cost of Labour and materials in event of failure] x [Probability of failure] x [quantity of predicted annual unit outages / de-ratings]

Calculation of probability of failure in Year 2

The probability of the unit failing in year 2 is: (Probability of unit not failing in year 1) x (probability the unit will fail in year 2 if no failure occured in year 1)

Example: Air Heater Refurbishment

1	
-10%	Minus the Probability of failure in year 1
90%	Probability that the air heater does not fail in year 1
x	
12%	Probability of air heater failing in year 2 if no failure occurs in year 1
11%	**Probability of the air heater failing in year 2**

Nova Scotia POWER An Emera Company energy everywhere.

Avoided Cost Calculations

Budget Year :	2012	Date :	31-Oct-11
Division :	Power Production	CI Number:	41507
Department :	Trenton	Project No. :	
Originator :			

Air Heater Refurbishment	
Capital Cost	$ 553,438.00
Avoided Replacement Energy costs (2012) =	[redacted] MWh x 1 outages x 90% x 10% x [redacted] MW x 2184 h = $601,001.86
Avoided Unplanned Repair Costs (2012)	$ 803,438.00 x 10% x 1 = $ 80,343.80
Total Annual Avoided costs	$681,345.66
Avoided Replacement Energy costs (2013) =	[redacted] MWh x 1 outages x 90% x 10.8% x [redacted] MW x 2184 h = $649,082.00
Avoided Unplanned Repair Costs (2013)	$ 813,438.00 x 10.8% x 1 = $ 87,851.30
Total Annual Avoided costs	$ 736,933.31

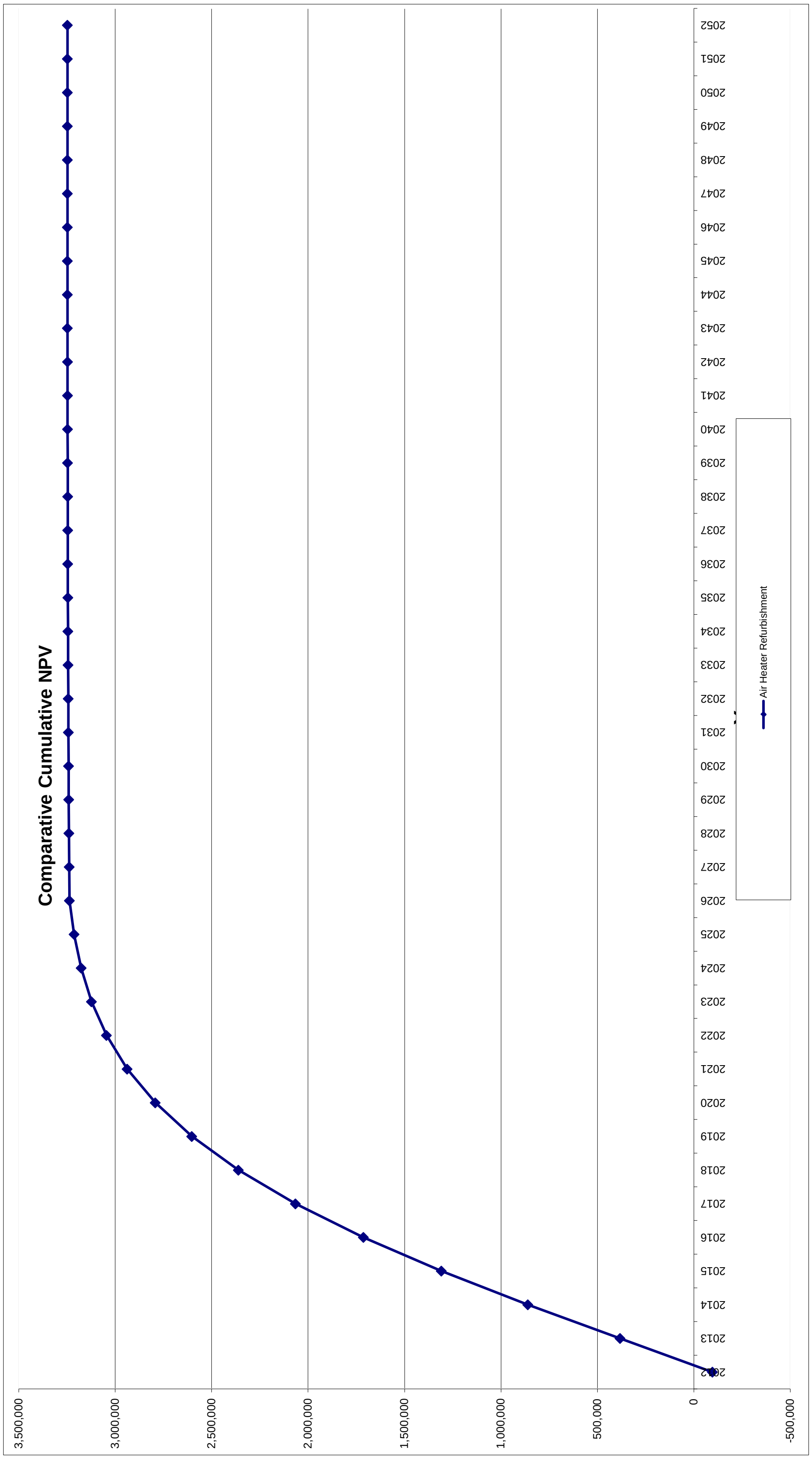
Test 2	
Capital Cost	
Avoided Replacement Energy costs (2012) =	
Avoided Unplanned Repair Costs (2012)	
Total Annual Avoided costs	
Avoided Replacement Energy costs (2013) =	
Avoided Unplanned Repair Costs (2013)	
Total Annual Avoided costs	

Test 3	
Capital Cost	
Avoided Replacement Energy costs (2012) =	
Avoided Unplanned Repair Costs (2012)	
Total Annual Avoided costs	
Avoided Replacement Energy costs (2013) =	
Avoided Unplanned Repair Costs (2013)	
Total Annual Avoided costs	

Test 4	
Capital Cost	
Avoided Replacement Energy costs (2012) =	
Avoided Unplanned Repair Costs (2012)	
Total Annual Avoided costs	
Avoided Replacement Energy costs (2013) =	
Avoided Unplanned Repair Costs (2013)	
Total Annual Avoided costs	

TRE Air Heater Refurbishment
Air Heater Refurbishment

Year	Total Revenue	Operating Costs	Capital	CCA	UCC	CFBT	Applicable Taxes	CFAT	Discount Factor	PV of CF	CNPV
2012	-	681,346	(553,438)	22,138	531,300	127,908	(224,569)	(96,661)	1	(96,661)	(96,661)
2013	-	736,933	-	42,504	488,796	736,933	(225,937)	510,996	1	479,044	382,383
2014	-	771,066	-	39,104	449,693	771,066	(226,986)	544,080	1	478,165	860,548
2015	-	772,388	-	35,975	413,717	772,388	(228,288)	544,100	1	448,282	1,308,831
2016	-	743,944	-	33,097	380,620	743,944	(220,428)	523,516	1	404,353	1,713,183
2017	-	690,882	-	30,450	350,170	690,882	(204,734)	486,148	1	352,012	2,065,195
2018	-	619,724	-	28,014	322,157	619,724	(183,430)	436,294	1	296,159	2,361,354
2019	-	537,542	-	25,773	296,384	537,542	(158,649)	378,894	1	241,113	2,602,467
2020	-	451,168	-	23,711	272,673	451,168	(132,512)	318,656	1	190,101	2,792,568
2021	-	366,542	-	21,814	250,860	366,542	(106,866)	259,677	1	145,229	2,937,797
2022	-	288,276	-	20,069	230,791	288,276	(83,144)	205,132	1	107,550	3,045,347
2023	-	219,454	-	18,463	212,328	219,454	(62,307)	157,147	0	77,240	3,122,586
2024	-	161,662	-	16,986	195,341	161,662	(44,849)	116,812	0	53,825	3,176,411
2025	-	115,191	-	15,627	179,714	115,191	(30,865)	84,327	0	36,426	3,212,837
2026	-	79,350	-	14,377	165,337	79,350	(20,141)	59,208	0	23,977	3,236,814
2027	-	-	-	13,227	152,110	-	4,100	4,100	0	1,557	3,238,371
2028	-	-	-	12,169	139,941	-	3,772	3,772	0	1,343	3,239,713
2029	-	-	-	11,195	128,746	-	3,471	3,471	0	1,158	3,240,871
2030	-	-	-	10,300	118,446	-	3,193	3,193	0	999	3,241,870
2031	-	-	-	9,476	108,970	-	2,937	2,937	0	861	3,242,731
2032	-	-	-	8,718	100,253	-	2,702	2,702	0	743	3,243,474
2033	-	-	-	8,020	92,233	-	2,486	2,486	0	641	3,244,115
2034	-	-	-	7,379	84,854	-	2,287	2,287	0	553	3,244,667
2035	-	-	-	6,788	78,066	-	2,104	2,104	0	477	3,245,144
2036	-	-	-	6,245	71,820	-	1,936	1,936	0	411	3,245,555
2037	-	-	-	5,746	66,075	-	1,781	1,781	0	355	3,245,909
2038	-	-	-	5,286	60,789	-	1,639	1,639	0	306	3,246,215
2039	-	-	-	4,863	55,926	-	1,508	1,508	0	264	3,246,479
2040	-	-	-	4,474	51,452	-	1,387	1,387	0	227	3,246,706
2041	-	-	-	4,116	47,336	-	1,276	1,276	0	196	3,246,903
2042	-	-	-	3,787	43,549	-	1,174	1,174	0	169	3,247,072
2043	-	-	-	3,484	40,065	-	1,080	1,080	0	146	3,247,218
2044	-	-	-	3,205	36,860	-	994	994	0	126	3,247,344
2045	-	-	-	2,949	33,911	-	914	914	0	109	3,247,452
2046	-	-	-	2,713	31,198	-	841	841	0	94	3,247,546
2047	-	-	-	2,496	28,702	-	774	774	0	81	3,247,626
2048	-	-	-	2,296	26,406	-	712	712	0	70	3,247,696
2049	-	-	-	2,112	24,293	-	655	655	0	60	3,247,756
2050	-	-	-	1,943	22,350	-	602	602	0	52	3,247,808
2051	-	-	-	1,788	20,562	-	554	554	0	45	3,247,853
2052	-	-	-	1,645	18,917	-	627	627	0	47	3,247,900
Total	-	7,235,467	(553,438)	534,521	6,423,710	6,682,029	(2,108,198)	4,573,831	15	3,247,900	117,200,316


Comparative Cumulative NPV
Air Heater Refurbishment
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2,500,000
2,000,000
1,500,000
1,000,000
500,000
0
-500,000
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CI Number: 41303

Title: **TRE6 - Waterwall Panel Replacements**

Start Date: 2012/06
Final Cost Date: 2012/11
Function: Generation
Forecast Amount: $548,225

DESCRIPTION:

This project is the continuation of the waterwall panel replacement program for Trenton Unit #6 based on tube survey and wear measurements in the boiler.

Timely replacement of waterwall panels avoids unplanned repair and replacement energy costs. The replacement of waterwall panels is an integral component of the boiler tube failure reduction program. It serves to maintain target heat rates and support reliable boiler operation.

This project includes replacement of three sections of wall panels on the west side of the Unit #6 boiler at the Trenton Generating Station. Non-destructive examination (NDE) completed during the 2010 planned shutdown revealed that areas of the boiler on the west waterwalls in the vicinity of the sootblowers were approaching minimum wall thickness. Replacement of these panels will minimize forced outages due to boiler tube failures in these areas of the waterwalls.

Summary of Related CI's +/- 2 years:
2010 CI 34504 TRE6 Waterwall Panel Replacements $425,086
2012 CI 41544 TRE6 O2 Sensor Replacement $72,171

JUSTIFICATION:

Justification Criteria: Thermal

Sub Criteria: Equipment Replacement

Why do this project?

Non Destructive Examination (NDE) performed on the waterwall panels indicated the areas of the boiler on the west waterwalls are approaching a minimal wall thickness and must be replaced. The extent of the thinning precludes padding as an effective method of repair. Replacing tubes that have experienced normal wear from erosion/corrosion will ensure reliable operation of the Unit is maintained.

Why do this project now?

Boiler tube failures have historically been a major contributor to the unavailability of thermal units. Replacement of selected waterwall panels now will maintain target heat rates and mitigate the risk of unplanned Unit outages due to waterwall tube leaks.

Why do this project this way?

The waterwall panel replacement program is required to support reliable Unit performance. Replacement is the only viable option.

CI Number : 41303 - TRE6 - Waterwall Panel Replacements **Project Number**

Parent CI Number : -

Cost Centre : 345 - 345-Trenton unit 6 Capital **Budget Version** 2012 ACE Plan

Capital Item Accounts

Acct	Actv	Account	Activity	Forecast Amount	Amount	Variance
094		094 - Interest Capitalized		11,150	0	11,150
095		095-Thermal Overtime Labour AO		720	0	720
095		095-Thermal Term Labour AO		[redacted]	0	[redacted]
095		095-Thermal & Hydro Contracts AO		[redacted]	0	[redacted]
095		095-Thermal Regular Labour AO		3,433	0	3,433
001	013	001 - THERMAL Regular Labour	013 - SGP - Boiler	7,500	0	7,500
002	013	002 - THERMAL Overtime Labour	013 - SGP - Boiler	6,000	0	6,000
004	013	004 - THERMAL Term Labour	013 - SGP - Boiler	[redacted]	0	[redacted]
012	013	012 - Materials	013 - SGP - Boiler	[redacted]	0	[redacted]
013	013	013 - POWER PRODUCTION Contracts	013 - SGP - Boiler	[redacted]	0	[redacted]
001	085	001 - THERMAL Regular Labour	085 Design	2,800	0	2,800
001	087	001 - THERMAL Regular Labour	087 Field Super.& Ops.	4,000	0	4,000
011	087	011 - Travel Expense	087 Field Super.& Ops.	500	0	500
021	087	021 - Telephones	087 Field Super.& Ops.	200	0	200
041	087	041 - Meals & Entertainment	087 Field Super.& Ops.	200	0	200
			Total Cost:	548,225	0	548,225
			Original Cost:	411,000		

Capital Project Detailed Estimate

Location: Trenton
CI#: 41303
Title: TRE6 - Waterwall Panel Replacements

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Item	Description	Unit	Quantity	Unit Estimate	Total Estimate	Cost support Reference	Completed Similar Projects (CI#'s) Note 1
1	**001 Regular Labour**						
1.1	Utility Regular	hr	300	25.00	$7,500		CI34504
1.2	Utility - Term prep work	hr	[redacted]	[redacted]	[redacted]		CI34504
1.3	Project engineering	hr	[redacted]	[redacted]	[redacted]		
1.4	Project Supervision	hr	[redacted]	[redacted]	[redacted]		
1.5					-		
1.6					-		
				Sub-Total	21,800		
2	**012 Materials**						
2.1	Tube Material	lot	1	[redacted]	[redacted]		CI34504
2.2	Miscellaneous Materials	lot	1	[redacted]	[redacted]		CI34504
2.3					-		
2.4					-		
2.5					-		
2.6					-		
2.7				Sub-Total	[redacted]		
3	**013 Contracts**						
3.1	Tube Removal	lot	1	[redacted]	[redacted]		CI34504
3.2	Tube Installation	lot	1	[redacted]	[redacted]		CI34504
3.3	Mobilization/ Demobilization	lot	1	[redacted]	[redacted]		CI34504
3.4	QA Radiography and inspection	lot	1	[redacted]	[redacted]		CI34504
3.5	Remove/install insulation	lot	1	[redacted]	[redacted]		CI34504
3.6	Equipment rental	lot	1	[redacted]	[redacted]		CI34505
				Sub-Total	[redacted]		
4	**002 Overtime Labour**						
4.1	Utility - Regular OT	hr	120	50.00	6,000		CI34504
4.2							
4.3							
4.4							
				Sub-Total	6,000		
5	**011 Travel Expenses**						
5.1	Travel	lot	1	500	500		
5.2							
5.3							
				Sub-Total	500		
6	**041 Meals and Entertainment**						
6.1	Meals and entertainment	lot	1	200	200		
6.2					-		
6.3					-		
				Sub-Total	200		
7	**021 Telephones**						
7.1	Telephones	lot	1	200	200		
7.2					-		
7.3					-		
				Sub-Total	200		
8	**094 Interest Capitalized**						
8.1	Interested Capitalized				11,150		
8.2							
8.3							
				Sub-Total	11,150		
9	**095 Administrative Overhead**						
9.1	Thermal Regular Labour AO				3,433		
9.2	Thermal and hydro Contracts AO				[redacted]		
9.3	Thermal Term Labour				[redacted]		
9.4	Thermal Overtime Labour				720		
				Sub-Total	[redacted]		
Cost Estimate				**Total**	$548,225		
10	Original Cost						
10.1					$411,000		

Note 1: Reference to "Completed similar projects (CI#'s)" is to be provided when the item estimate is based on work of similar scope for a recently completed project

TRE6 Waterwall Panel Replacement
Summary of Alternatives & Assumptions

Nova Scotia POWER An Emera Company energy everywhere.

Budget Year :	**2012**	**Date :**	**29-Oct-11**
Division :	Power Production	**CI Number:**	41303
Department :	Trenton	**Project No. :**	
Originator :			

	Alternative	After Tax WACC	PV of EVA / NPV	Rank	IRR	Disc Pay
A	Waterwall Panel Replacement	6.67%	101,671	1	41.11%	2.1 years
B	Test 2	6.67%	0	2	#NUM!	0.0 years
C	Test 3	6.67%	0	2	#NUM!	0.0 years
D	Test 4	6.67%	0	2	#NUM!	0.0 years

Recommendation :

Based on a positive NPV, it is recommended that the waterwalls be replaced

Assumptions

Incremental replacement energy costs and annual operating costs in the years following 2013 are escalated at 2% annually.

Calculations:
Total annual avoided cost = [Replacement energy costs] + [Avoided unplanned repair costs]

Avoided replacement energy cost = [Incremental replacement energy cost] x [Quantity of predicted annual unit outages / de-ratings] x [capacity factor] x [Probability of failure] x [Derating/outage] x [Duration of Derating]

Avoided unplanned repair costs = [cost of Labour and materials in event of failure] x [Probability of failure] x [quantity of predicted annual unit outages / de-ratings]

Calculation of probability of failure in Year 2

The probability of the unit failing in year 2 is: (Probability of unit not failing in year 1) x (probability the unit will fail in year 2 if no failure accured in year 1)

Example: Waterwall Panel Replacement

1
-75% Minus the Probability of failure in year 1
25% Probability that boiler tubes / Unit does not fail in year 1
x
79% Probability of unit failing in year 2 if no failure occurs in year 1
20% Probability of the unit failing in year 2

Nova Scotia POWER An Emera Company energy everywhere.

Avoided Cost Calculations

Budget Year :	2012	Date :	29-Oct-11
Division :	Power Production	CI #:	41303
Department :	Trenton		
Originator :			

Waterwall Panel Replacement	
Capital Cost	$ 548,225
Avoided Replacement Energy costs (2012) =	[redacted] MWh x 1 outages x 90% x 75% x [redacted] MW x 72 h = $148,566
Avoided Unplanned Repair Costs (2012)	$ 644,225 x 75% x 1 = $ 483,169
Total Annual Avoided costs	$631,734
Avoided Replacement Energy costs (2013) =	[redacted] MWh x 1 outages x 90% x 19.7% x [redacted] MW x 72 h = $38,998
Avoided Unplanned Repair Costs (2013)	$ 670,032 x 20% x 1 = $ 131,913
Total Annual Avoided costs	$ 170,911

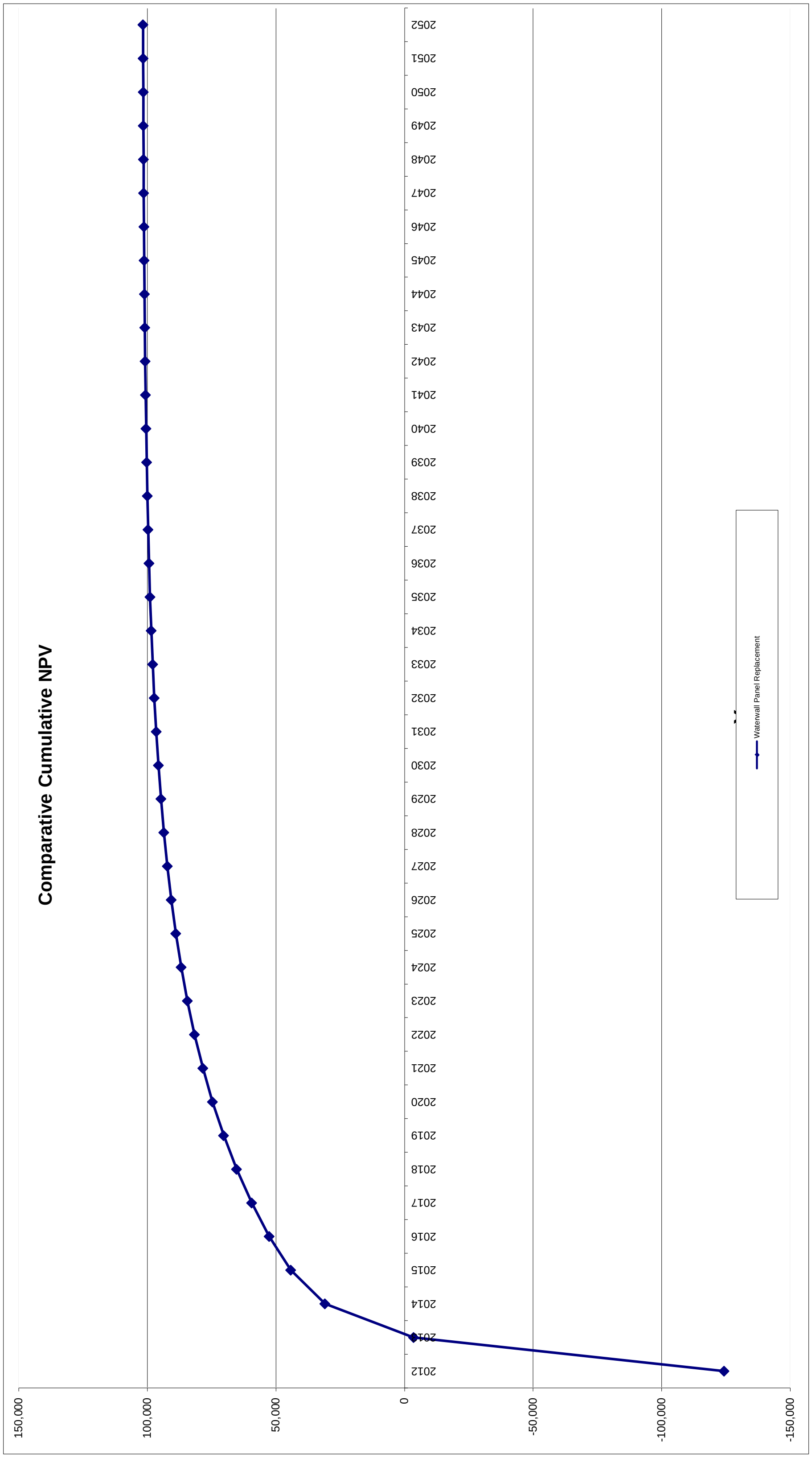
Test 2	
Capital Cost	
Avoided Replacement Energy costs (2012) =	
Avoided Unplanned Repair Costs (2012)	
Total Annual Avoided costs	
Avoided Replacement Energy costs (2013) =	
Avoided Unplanned Repair Costs (2013)	
Total Annual Avoided costs	

Test 3	
Capital Cost	
Avoided Replacement Energy costs (2012) =	
Avoided Unplanned Repair Costs (2012)	
Total Annual Avoided costs	
Avoided Replacement Energy costs (2013) =	
Avoided Unplanned Repair Costs (2013)	
Total Annual Avoided costs	

Test 4	
Capital Cost	
Avoided Replacement Energy costs (2012) =	
Avoided Unplanned Repair Costs (2012)	
Total Annual Avoided costs	
Avoided Replacement Energy costs (2013) =	
Avoided Unplanned Repair Costs (2013)	
Total Annual Avoided costs	

TRE6 Waterwall Panel Replacement
Waterwall Panel Replacement

Year	Total Revenue	Operating Costs	Capital	CCA	UCC	CFBT	Applicable Taxes	CFAT	Discount Factor	PV of CF	CNPV
2012	-	631,734	(548,225)	21,929	526,296	83,509	(207,768)	(124,259)	1	(124,259)	(124,259)
2013	-	170,911	-	42,104	484,192	170,911	(42,108)	128,804	1	120,750	(3,509)
2014	-	39,488	-	38,735	445,457	39,488	(310)	39,178	1	34,431	30,922
2015	-	7,433	-	35,637	409,820	7,433	8,743	16,176	1	13,328	44,250
2016	-	1,065	-	32,786	377,035	1,065	9,768	10,833	1	8,368	52,617
2017	-	102	-	30,163	346,872	102	9,319	9,421	1	6,822	59,439
2018	-	5	-	27,750	319,122	5	8,601	8,606	1	5,842	65,281
2019	-	-	-	25,530	293,592	-	7,914	7,914	1	5,036	70,317
2020	-	-	-	23,487	270,105	-	7,281	7,281	1	4,344	74,661
2021	-	-	-	21,608	248,497	-	6,699	6,699	1	3,746	78,407
2022	-	-	-	19,880	228,617	-	6,163	6,163	1	3,231	81,638
2023	-	-	-	18,289	210,328	-	5,670	5,670	0	2,787	84,425
2024	-	-	-	16,826	193,501	-	5,216	5,216	0	2,403	86,828
2025	-	-	-	15,480	178,021	-	4,799	4,799	0	2,073	88,901
2026	-	-	-	14,242	163,780	-	4,415	4,415	0	1,788	90,689
2027	-	-	-	13,102	150,677	-	4,062	4,062	0	1,542	92,231
2028	-	-	-	12,054	138,623	-	3,737	3,737	0	1,330	93,561
2029	-	-	-	11,090	127,533	-	3,438	3,438	0	1,147	94,708
2030	-	-	-	10,203	117,330	-	3,163	3,163	0	989	95,697
2031	-	-	-	9,386	107,944	-	2,910	2,910	0	853	96,550
2032	-	-	-	8,636	99,309	-	2,677	2,677	0	736	97,286
2033	-	-	-	7,945	91,364	-	2,463	2,463	0	635	97,921
2034	-	-	-	7,309	84,055	-	2,266	2,266	0	547	98,468
2035	-	-	-	6,724	77,330	-	2,085	2,085	0	472	98,940
2036	-	-	-	6,186	71,144	-	1,918	1,918	0	407	99,348
2037	-	-	-	5,692	65,452	-	1,764	1,764	0	351	99,699
2038	-	-	-	5,236	60,216	-	1,623	1,623	0	303	100,002
2039	-	-	-	4,817	55,399	-	1,493	1,493	0	261	100,263
2040	-	-	-	4,432	50,967	-	1,374	1,374	0	225	100,488
2041	-	-	-	4,077	46,890	-	1,264	1,264	0	194	100,683
2042	-	-	-	3,751	43,138	-	1,163	1,163	0	168	100,850
2043	-	-	-	3,451	39,687	-	1,070	1,070	0	145	100,995
2044	-	-	-	3,175	36,512	-	984	984	0	125	101,119
2045	-	-	-	2,921	33,591	-	906	906	0	108	101,227
2046	-	-	-	2,687	30,904	-	833	833	0	93	101,320
2047	-	-	-	2,472	28,432	-	766	766	0	80	101,400
2048	-	-	-	2,275	26,157	-	705	705	0	69	101,469
2049	-	-	-	2,093	24,065	-	649	649	0	59	101,528
2050	-	-	-	1,925	22,139	-	597	597	0	51	101,579
2051	-	-	-	1,771	20,368	-	549	549	0	44	101,624
2052	-	-	-	1,629	18,739	-	621	621	0	47	101,671
Total	-	850,739	(548,225)	529,486	6,363,202	302,514	(120,520)	181,994	15	101,671	3,361,235


Comparative Cumulative NPV
150,000
100,000
50,000
0
-50,000
-100,000
-150,000
2012
2013
2014
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2016
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Waterwall Panel Replacement

CI Number: 41544

Title:	**TRE6 – O2 Sensor Replacement**
Start Date:	2012/05
Final Cost Date:	2012/10
Function:	Generation
Forecast Amount:	$72,171

DESCRIPTION:
The boiler on Unit #6 has three O2 sensors that monitor and adjust oxygen levels in the boiler to ensure optimum combustion and minimal production of particulate and emitted gasses.

Summary of Related CI's +/- 2 years:
2012 CI 41303 – TRE6 Waterwall Panel Replacements

JUSTIFICATION:

Justification Criteria: Environment

Sub-Criteria: Equipment Replacement

Why do this project?

Replacing the O2 sensors will ensure optimum combustion continues to be achieved and mitigate the risk of an unplanned failure. The existing O2 sensors and associated hardware are now obsolete and must be replaced.

Why do this project now?

As the O2 sensors and associated hardware are now obsolete and no longer supported by the Original Equipment Manufacturer (OEM), they must be replaced to mitigate the risk of unplanned failure.

Why do this project this way?

Replacing all of the obsolete sensors on Unit #6 at one time is the most practical and cost effective option.

CI Number: 41549

Title: **TRE5 - Main Steam Attemperator Replacement**

Start Date: 2012/06
Final Cost Date: 2012/10
Function: Generation
Forecast Amount: $535,227
DESCRIPTION:

The Unit #5 boiler is equipped with two main steam attemperators which assist in controlling the temperature of the main steam passing from the boiler to the turbine. The attemperators spray water in the steam piping between the primary and secondary superheaters to control the main steam temperature. The existing design for these attemperators has been prone to failures resulting in reduced temperature control and blockage of downstream boiler tubes due to broken attemperator components. The blockage of downstream boiler tubes results in tube failures caused by overheating.

Summary of Related CI's +/- 2 years:
No projects for 2010,2011,2012, 2013 & 2014

JUSTIFICATION:

Justification Criteria: Thermal

Sub Criteria: Equipment Replacement

Why do this project?

The attemperators on Unit # 5 have been in service since the boiler went into operation in 1969 and have reached the end of their useful life. Replacing the steam attemperators will result in improved temperature control and Unit efficiency and reliability. Replacing the attemperators will also mitigate the risk of boiler tube failures that result from overheating due to being blocked with broken attemperator components.

Why do this project now?

Replacing the existing attemperators now reduces the risk of prolonged unplanned outages on Unit #5 due to blocked down-stream boiler tubes and improves main steam temperature control.

Why do this project this way?

The Original Equipment Manufacturer (OEM) has recommended that that the attemperators be completely disassembled and the nozzles, liners, and main body inspected for repairs and replaced as necessary. Replacement of the complete attemperator assemblies is the most practical option, as operating experience indicates that the existing vintage of attemperators has been prone to failure.

Limiting the scope to removal of the nozzle assemblies, inspections and replacement of the venturi and liner would expose the Unit to the risk of an extended outage if inspection results concluded that complete new attemperators were required and not readily available for installation. The delivery period for new steam attemperators is approximately four months.

CI Number : 41549 - TRE5- Main Steam Attemperator Replacement **Project Number**

Parent CI Number : -

Cost Centre : 340 - 340-Trenton Unit 5 Capital **Budget Version** 2012 ACE Plan

Capital Item Accounts

Acct	Actv	Account	Activity	Forecast Amount	Amount	Variance
094		094 - Interest Capitalized		11,036	0	11,036
095		095-Thermal Overtime Labour AO		1,891	0	1,891
095		095-Thermal & Hydro Contracts AO		[redacted]	0	[redacted]
095		095-Thermal Regular Labour AO		6,663	0	6,663
001	013	001 - THERMAL Regular Labour	013 - SGP - Boiler	21,750	0	21,750
002	013	002 - THERMAL Overtime Labour	013 - SGP - Boiler	15,750	0	15,750
012	013	012 - Materials	013 - SGP - Boiler	[redacted]	0	[redacted]
013	013	013 - POWER PRODUCTION Contracts	013 - SGP - Boiler	[redacted]	0	[redacted]
001	085	001 - THERMAL Regular Labour	085 Design	2,000	0	2,000
001	087	001 - THERMAL Regular Labour	087 Field Super.& Ops.	4,000	0	4,000
011	087	011 - Travel Expense	087 Field Super.& Ops.	500	0	500
013	087	013 - POWER PRODUCTION Contracts	087 Field Super.& Ops.	[redacted]	0	[redacted]
021	087	021 - Telephones	087 Field Super.& Ops.	150	0	150
041	087	041 - Meals & Entertainment	087 Field Super.& Ops.	250	0	250
			Total Cost:	535,227	0	535,227
			Original Cost:	367,000		

Capital Project Detailed Estimate

Location: Trenton
FP#: 41549
Title: TRE 5 - Main Steam Attemperator Replacement

Item	Description	Unit	Quantity	Unit Estimate	Total Estimate	Cost Support Reference	Completed Similar Projects (FP#'s) Note 1
1	**001 Regular Labour, 004 Overtime Labour**						
1.1	Utility - Manwatch	hr	500	30.00	$15,000		
1.2	Utility - material handling	hr	300	30.00	9,000		
1.3	Mechanic	hr	150	45.00	6,750		
1.4	Electrical & Instrumentation	hr	150	45.00	6,750		
1.5	NSPI Engineering	lot	[redacted]				
1.6	NSPI Supervisor	lot	1	4,000.00	4,000		
				Sub-Total	43,500		38742
2	**012 Materials**						
2.1	Attemperator assemblies	unit	2	[redacted]	[redacted]	July 29, 2011 Quote	
2.2	Insulation/cladding	lot	1	[redacted]	[redacted]		
2.3	Contingency (attemperator assembly)	[redacted]					
2.4					-		
2.5					-		
2.6					-		
2.7				Sub-Total	[redacted]		
3	**013 Power Production Contracts**						
3.1	Scaffolod -rental	lot	1	[redacted]	[redacted]		
3.2	Vac Truck - rental	[redacted]					
3.3	Contract Labour - Scaffold	[redacted]					38742
3.4	Attemperator installation	lot	1	[redacted]	[redacted]	July 29, 2011 Quote	
3.5	AIC	hr	[redacted]				
3.6	MacDoanlds - remove/replace insulation	hr	[redacted]				
3.7	Project Supervisor external	lot	1	[redacted]	[redacted]		
3.8	Contingency (attemperator install)	[redacted]					
				Sub-Total	[redacted]		
4	**028 Consulting**						
				Sub-Total			
5	**011 Travel Expenses**						
5.1	Travel	lot	1	500	500		
					-		
				Sub-Total	500		
6	**041 Meals and Entertainment**						
6.1	Meals and Entertainment	lot	1	400	400		
					-		
					-		
				Sub-Total	400		
7	**094 Interest Capitalized**						
7.1	Interested Capitalized		1	11,036	11,036		
				Sub-Total	11,036		
8	**095 Administrative Overhead**						
8.1	Thermal Regular Labour AO		1	6,663	6,663		
8.2	Thermal and hydro Contracts AO		1	[redacted]	[redacted]		
8.3	Thermal Overtime AO		1	1,891	1,891		
				Sub-Total	[redacted]		
Project Cost Estimate				**Total**	**$535,228**		
9	Original Cost						
9.1					$367,000		

Note 1: Reference to "Completed similar projects (FP#'s)" is to be provided when the item estimate is based on work of similar scope for a recently completed project

babcock & wilcox power generation group

Plant Service Bulletin

Spray Attemperators

Purpose

The purpose of this bulletin is to advise customers and field personnel about superheater attemperator problems and provide recommendations for corrective action.

Background

The first B&W spray attemperator went into service in the mid 1950s. Since that time, design improvements have been made to extend attemperator life. These include adding a thermal sleeve and a material change. Figure 1 shows an early design attemperator.

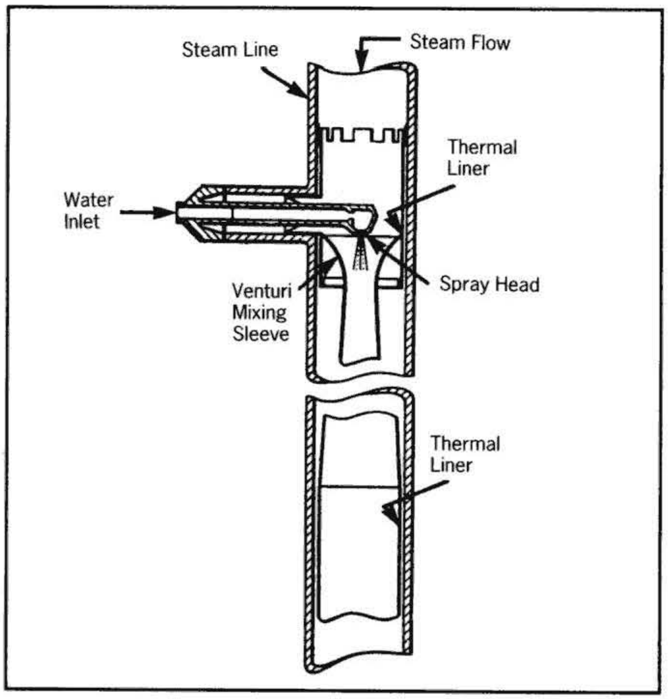

Figure 1 *Spray attemperator.*

Problem

A limited number of attemperator failures have occurred. These failures are mainly attributed to extensive temperature cycling and low spray water temperatures. Some of the problems reported are as follows:

1. Cracks have been found in the early design spray nozzles.
2. Cracks have been found in or near dissimilar material welds on early design attemperators.
3. Spray nozzles have broken off and become lodged either in the Venturi or further downstream.
4. Cracks have been found in the thermal liners, and pieces have broken off and been found in downstream piping.

Figure 2 and Figure 3 show different views of a cracked spray nozzle. Figure 4 shows a cracked weld between dissimilar materials.

Warning

Tube pluggage may occur and cause localized overheating of the tubes if small parts break off and are carried downstream. Larger parts of the spray head can break loose and become lodged in the Venturi. This blocks steam flow, resulting in increased pressure drop and uncontrolled steam temperatures.

Figure 2 *Nozzle crack.*

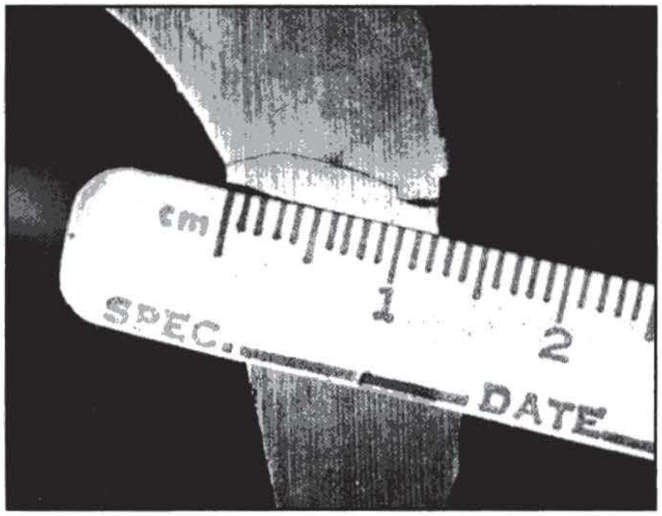

Figure 3 *Nozzle crack.*

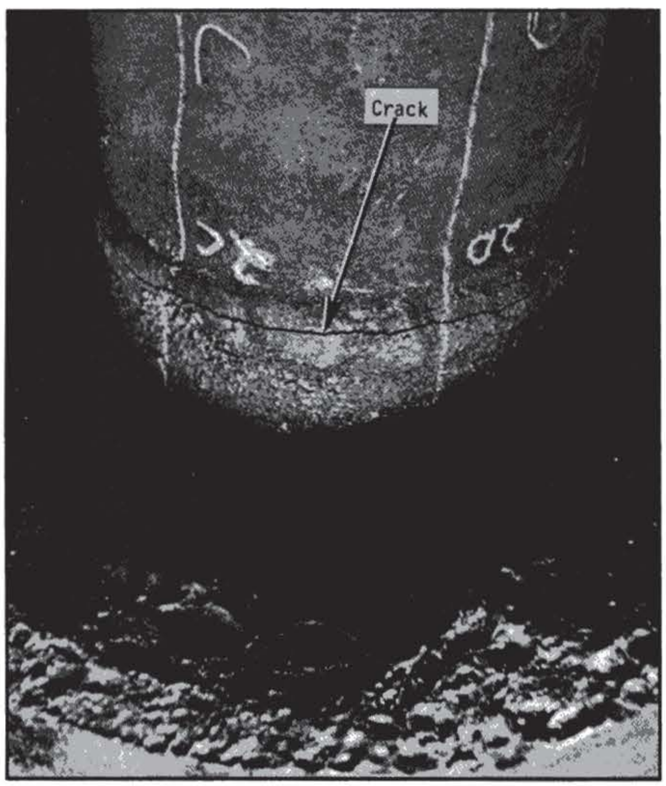

Figure 4 *Dissimilar weld cracks.*

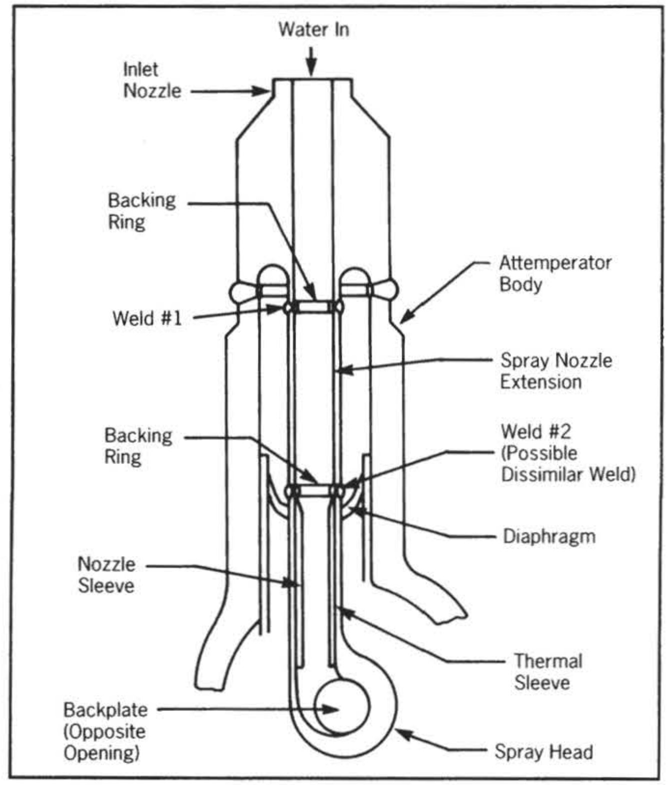

Figure 5 *Spray nozzle assembly.*

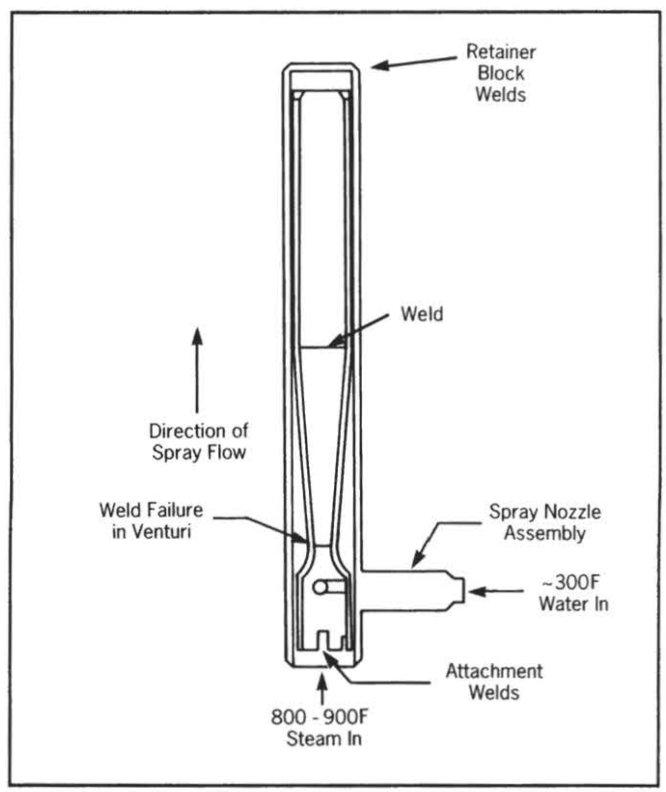

Figure 6 *Cross section of attemperator assembly.*

Recommendations

All attemperators should be inspected after 10 years of operation. The following areas should be included in the inspection:

1. Inspect spray nozzle assembly (Figure 5)
   a. The diaphragm
   b. Welds on nozzle extensions (welds #1 and #2)
   c. Backplate
   d. Inside and outside of spray header
2. Inspect the attemperator liner (Figure 6)
   a. Check liner welds – circumferential and longitudinal
   b. Liner retainer block welds

All areas should be inspected for cracks, cracked or broken welds, and cracked or broken nozzles, liners and piping. Depending on observations made during the initial inspection, a schedule for subsequent inspections can be determined at that time. These inspections can be performed with fiber optics, or by removal of the attemperator. The results of the inspection will determine the extent of the repairs required. Complete replacement of the attemperator, in lieu of the repairs, may be a more economical alternative. The replacement attemperator should incorporate B&W's latest design, which includes material change to low alloy steels, eliminating the need for dissimilar welds.

Support

If any questions arise or assistance is required, contact B&W Field Service Engineering.

For more information...

In the U.S., call 1-800-BABCOCK (222-2625) or fax (216) 860-1886 (Barberton, Ohio). Outside the U.S., call (519) 621-2130 or fax (519) 621-2142 (Cambridge, Ontario, Canada). In Mexico, call (5) 208-1906 or fax (5) 533-5550. Or contact your nearest B&W sales or service office worldwide.

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PSB-15 2M H 6/94

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Plant Service Bulletin

Spray Attemperators for Industrial Boilers

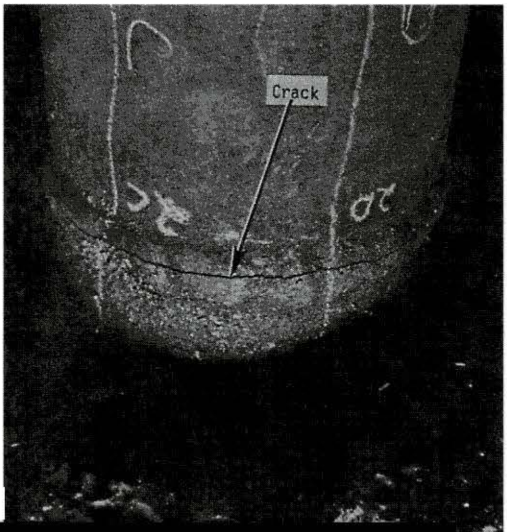

Figure 1 ***Dissimilar material welds can experience cracking in or near the weld.***

Purpose

This plant service bulletin (PSB) advises owners and operators of known superheater attemperator problems and provides recommendations for corrective action.

Background

The first direct-contact spray attemperator on B&W boilers went into service in the mid-1950s. Most of the attemperators were designed and built by B&W, although some were supplied by other manufacturers.

PSB-15 was issued in 1985 to notify customers of problems experienced with B&W spray attemperators. However, attemperators built by other manufacturers also have experienced problems on many industrial-sized boilers. This bulletin expands on the information supplied in PSB-15.

Problem

Depending on the operating characteristics of a particular boiler and the extent of load swings it is subjected to, the spray attemperator assembly can experience extensive thermal cycling. Factors contributing to thermal cycling include:

- Temperature differentials between steam and water
- Intermittent (on/off) attemperator operation
- Low-load boiler operation

Of the few attemperator failures reported, the cause was mainly attributed to thermal cycling between steam and spray water temperatures. Problems associated with these failures have included:

- Cracks in or near dissimilar material welds (Figure 1)
- Cracks in the older spray nozzle design (Figures 2 and 3)
- Cracks in the attemperator steam line when a liner is not used
- Cracks in the thermal liners which have caused pieces to break off and be carried into the downstream piping
- Spray nozzles that have broken off and become lodged in the venturi or further in the downstream piping

Figure 2 ***Crack in an older spray nozzle design.***

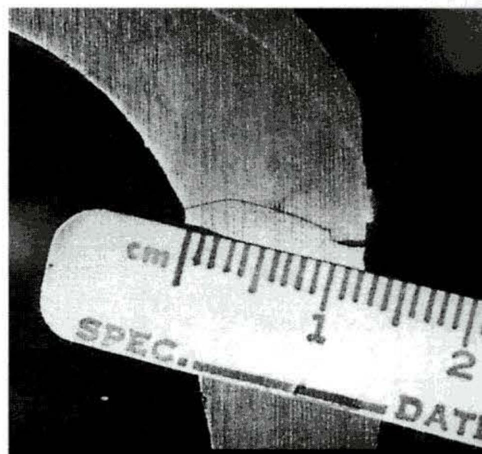

Figure 3 ***Nozzle cracks can occur from extensive thermal cycling between steam and spray water temperatures.***

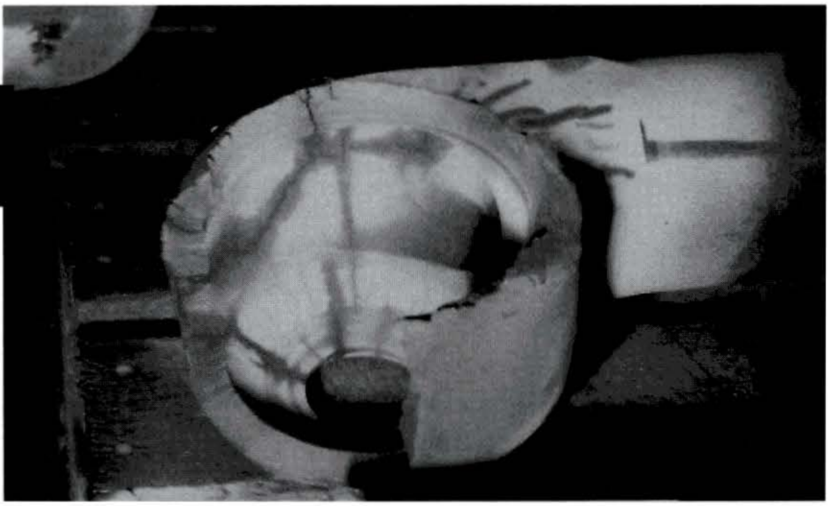

Figure 4 ***Failed attemperator spray head.***

Warning

If small parts of the attemperator system break off and are carried downstream, tube plugging may occur and cause localized tube overheating. Larger parts of the spray head also can break loose (Figure 4) and get lodged in the venturi. If this occurs, steam flow is blocked, causing increased pressure drop and uncontrolled steam temperatures. Steam leakage also can result from cracks that have developed in the attemperator body and propagated through the wall.

Design improvements for life extension

To extend attemperator life, B&W has made the following design improvements:

1. A thermal liner was added to the spray attemperator (Figure 5), which protects the high-temperature piping from thermal shock.

2. The spray attemperator material was changed to low-alloy steels, eliminating the need for dissimilar metal welds which can crack (reference Figure 1).

3. One-piece cast spray nozzle heads were designed to eliminate the need for a welded backplate.

4. Purchasing specifications and quality control procedures were made much more stringent.

Inspection recommendations

All attemperators with liners should be visually inspected after 10 years of operation. Those without a liner, however, should be inspected after five years of service (Figure 6). Future inspections for all attemperators should be on five-year intervals unless damage is found.

The visual inspection should thoroughly examine the following areas for damage:

- **Spray Nozzle Assembly** (Figure 7) – including the diaphragm, welds on the nozzle extensions (weld #1 and #2), backplate, and the inside and outside of the spray head
- **Attemperator Liner**, if one exists (Figure 8) – including the liner welds (circumferential

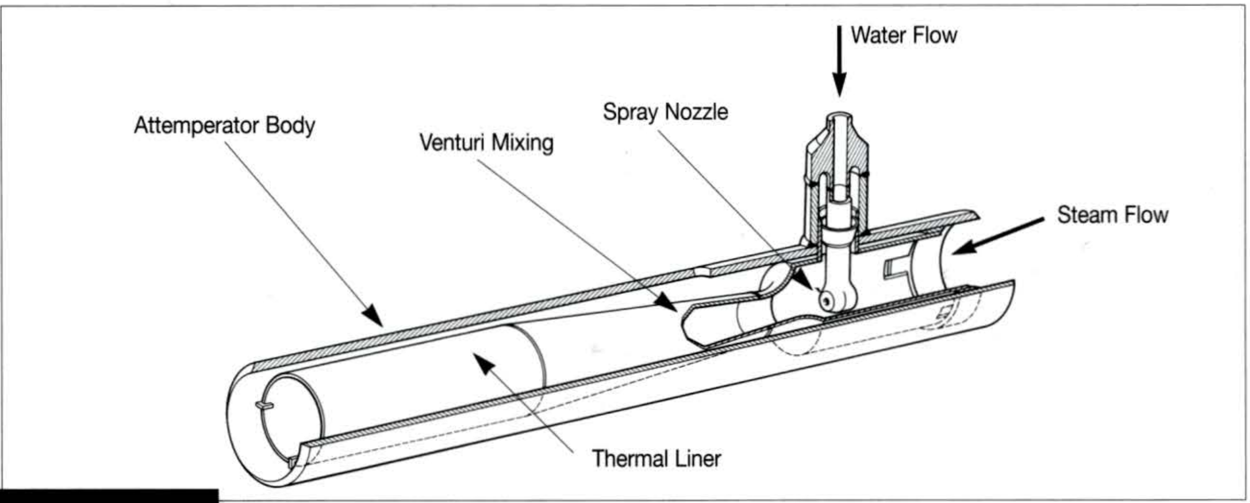

Figure 5 ***B&W spray attemperator design with a thermal liner.***

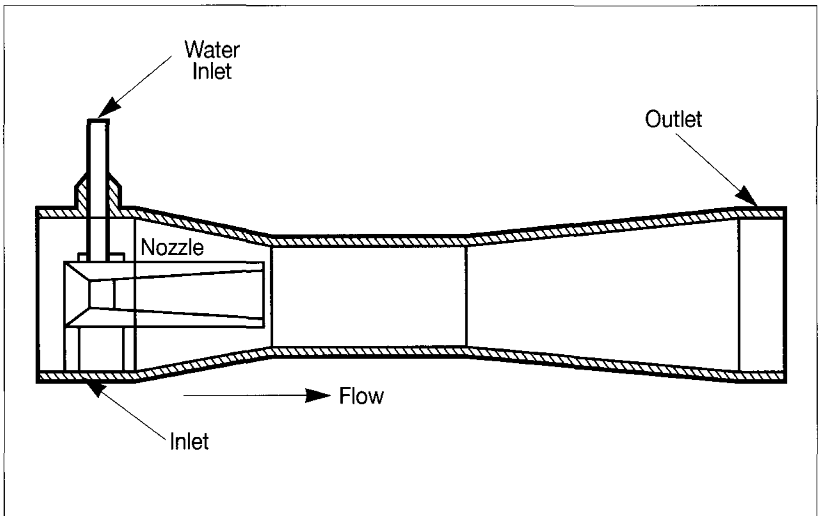

Figure 6 ***The Graham attemperator design does not have a liner.***

and longitudinal) and the liner retainer block welds

- **Attemperator Body** – including cracks and erosion, especially when there is not a liner (reference Figure 6)

All areas should be inspected for cracked or broken welds and cracked or broken nozzles, liners and piping. Depending on observations made during the initial inspection, a schedule for subsequent inspections can be determined. The preferred inspection method is to remove the spray nozzle and inspect the venturi and thermal liner using a fiber optic scope or microchip camera. These inspections also can be performed with a fiber optic scope through a radiograph plug or thermowell opening.

The results of the inspection will determine the extent of the repairs. However, if extensive repairs are required, a complete attemperator replacement may be more economical. If a replacement is needed, the attemperator should incorporate B&W's latest design enhancements, which include changing materials to low-alloy steels and adding a thermal liner.

Support

Contact Field Service Engineering through your local B&W district service office to coordinate your inspection and repair efforts, and to answer any questions.

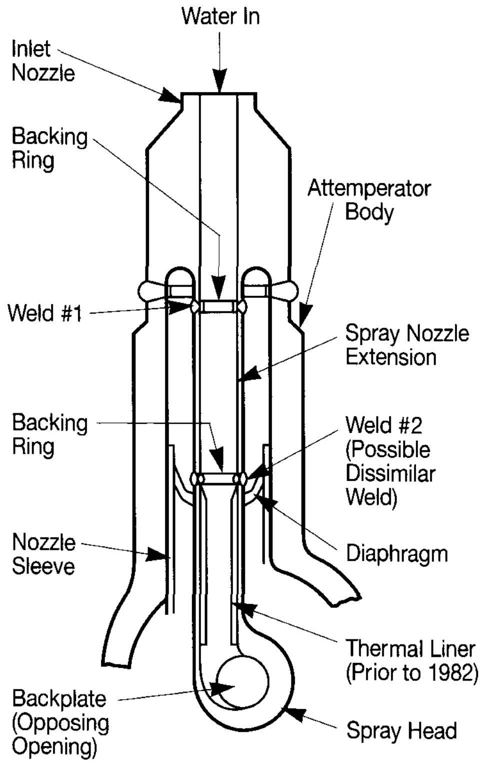

Figure 7 ***B&W spray nozzle assembly.***

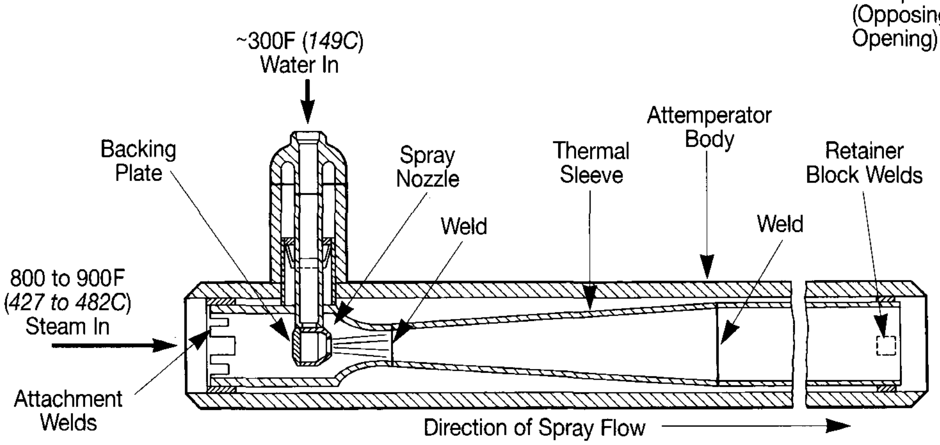

Figure 8 ***Cross section of a typical B&W attemperator assembly.***

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PSB-24A 4MD6H

TRE5 Main Steam Attemperator Replacement
Summary of Alternatives & Assumptions

Nova Scotia POWER An Emera Company energy everywhere.

Budget Year :	**2012**	**Date :**	**19-Oct-11**
Division :	Power Production	**CI Number:**	41549
Department :	Trenton	**Project No. :**	
Originator :			

	Alternative	After Tax WACC	PV of EVA / NPV	Rank	IRR	Disc Pay
A	Replace Attemperator	6.67%	211,727	1	25.50%	3.8 years
B	Test 2	6.67%	0	2	#NUM!	0.0 years
C	Test 3	6.67%	0	2	#NUM!	0.0 years
D	Test 4	6.67%	0	2	#NUM!	0.0 years

Recommendation :

Based on positive NPV, it is recommended that this project be completed in 2012

Assumptions

Incremental replacement energy costs and annual operating costs in the years following 2013 are escalated at 2% annually.

Calculations:
Total annual avoided cost = [Replacement energy costs] + [Avoided unplanned repair costs]

Avoided replacement energy cost = [Incremental replacement energy cost] x [Quantity of predicted annual unit outages / de-ratings] x [capacity factor] x [Probability of failure] x [Derating/outage] x [Duration of Derating]

Avoided unplanned repair costs = [cost of Labour and materials in event of failure] x [Probability of failure] x [quantity of predicted annual unit outages / de-ratings]

Calculation of probability of failure in Year 2

The probability of the unit failing in year 2 is: (Probability of unit not failing in year 1) x (probability the unit will fail in year 2 if no failure accured in year 1)

Example: Replace Attemperator

1
-25% Minus the Probability of failure in year 1
75% Probability that attemperators do not fail in year 1
x
28% Probability of attemperators failing in year 2 if no failure occurs in year 1
21% Actual probability of the attemperators failing in year 2

Avoided Cost Calculations

Budget Year :	2012	**Date :**	**19-Oct-11**
Division :	Power Production	**CI Number:**	41549
Department :	Trenton	**Project No.**	
Originator :			

Replace Attemperator	
Capital Cost	$ 535,227.00
Avoided Replacement Energy costs (2012) =	[redacted] MWh x 1 outages x 90% x 25% x [redacted] MW x 1344 h = $96,736.96
Avoided Unplanned Repair Costs (2012)	$ 685,227.00 x 25% x 1 = $ 171,307
Total Annual Avoided costs	$268,043.71
Avoided Replacement Energy costs (2013) =	[redacted] MWh x 1 outages x 90% x 21% x [redacted] MW x 1344 h = $81,259.05
Avoided Unplanned Repair Costs (2013)	$ 695,931.54 x 21% x 1 = $ 146,146
Total Annual Avoided costs	$ 227,404.67

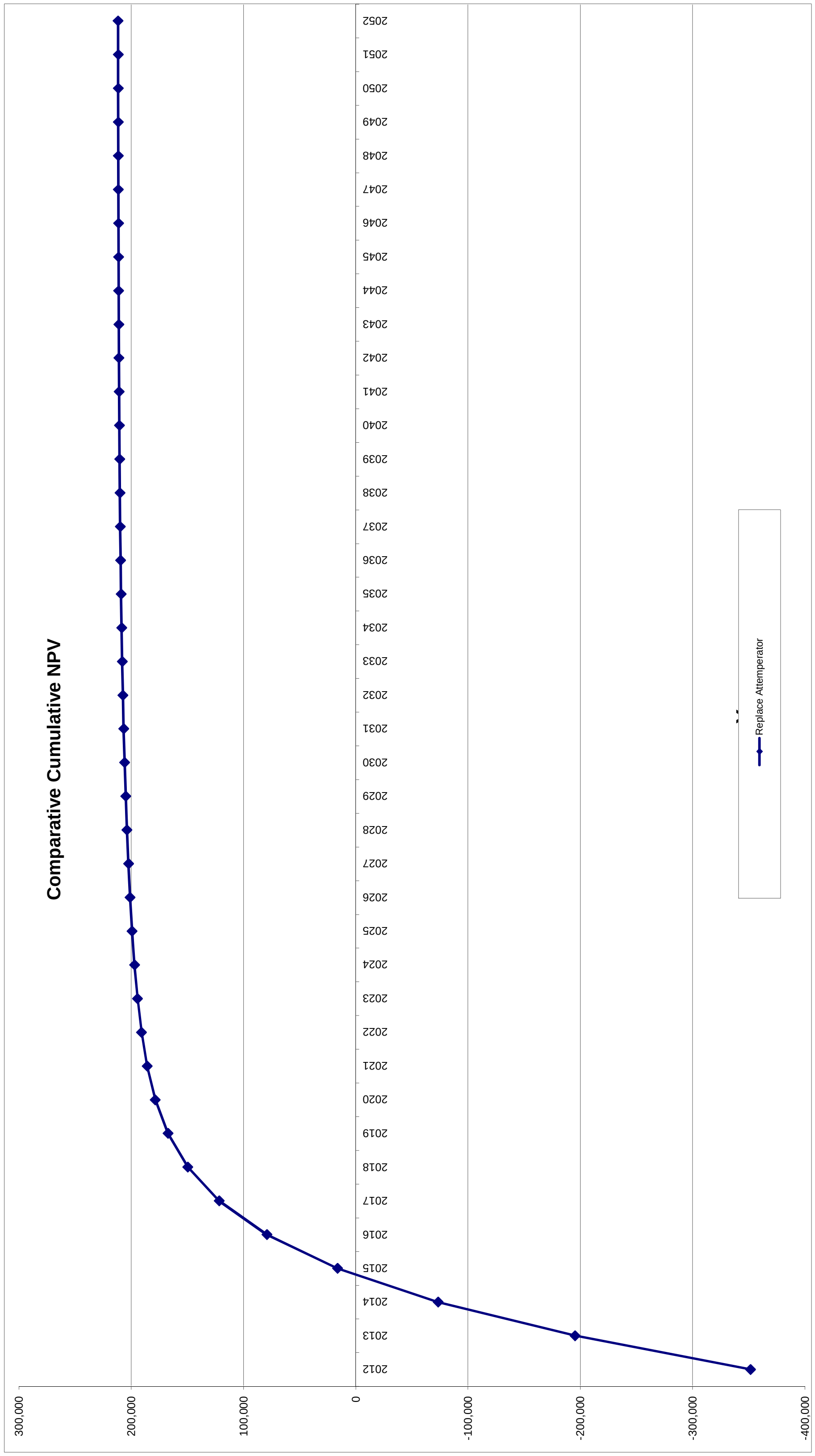
Test 2	
Capital Cost	
Avoided Replacement Energy costs (2012) =	
Avoided Unplanned Repair Costs (2012)	
Total Annual Avoided costs	
Avoided Replacement Energy costs (2013) =	
Avoided Unplanned Repair Costs (2013)	
Total Annual Avoided costs	

Test 3	
Capital Cost	
Avoided Replacement Energy costs (2012) =	
Avoided Unplanned Repair Costs (2012)	
Total Annual Avoided costs	
Avoided Replacement Energy costs (2013) =	
Avoided Unplanned Repair Costs (2013)	
Total Annual Avoided costs	

Test 4	
Capital Cost	
Avoided Replacement Energy costs (2012) =	
Avoided Unplanned Repair Costs (2012)	
Total Annual Avoided costs	
Avoided Replacement Energy costs (2013) =	
Avoided Unplanned Repair Costs (2013)	
Total Annual Avoided costs	

TRE5 Main Steam Attemperator Replacement
Replace Attemperator

Year	Total Revenue	Operating Costs	Capital	CCA	UCC	CFBT	Applicable Taxes	CFAT	Discount Factor	PV of CF	CNPV
2012	-	268,044	(535,227)	21,409	513,818	(267,183)	(84,280)	(351,463)	1	(351,463)	(351,463)
2013	-	227,405	-	41,105	472,712	227,405	(60,787)	166,618	1	156,200	(195,263)
2014	-	184,397	-	37,817	434,895	184,397	(45,515)	138,882	1	122,057	(73,206)
2015	-	141,958	-	34,792	400,104	141,958	(33,222)	108,736	1	89,588	16,381
2016	-	103,725	-	32,008	368,096	103,725	(22,296)	81,430	1	62,895	79,276
2017	-	71,872	-	29,448	338,648	71,872	(13,152)	58,721	1	42,519	121,795
2018	-	47,165	-	27,092	311,556	47,165	(6,223)	40,942	1	27,792	149,586
2019	-	29,262	-	24,924	286,632	29,262	(1,345)	27,917	1	17,765	167,352
2020	-	17,126	-	22,931	263,701	17,126	1,799	18,926	1	11,291	178,642
2021	-	9,432	-	21,096	242,605	9,432	3,616	13,048	1	7,297	185,940
2022	-	4,873	-	19,408	223,197	4,873	4,506	9,379	1	4,917	190,857
2023	-	2,353	-	17,856	205,341	2,353	4,806	7,159	0	3,519	194,376
2024	-	1,058	-	16,427	188,914	1,058	4,765	5,822	0	2,683	197,058
2025	-	440	-	15,113	173,800	440	4,549	4,989	0	2,155	199,213
2026	-	169	-	13,904	159,896	169	4,258	4,427	0	1,793	201,006
2027	-	-	-	12,792	147,105	-	3,965	3,965	0	1,505	202,512
2028	-	-	-	11,768	135,336	-	3,648	3,648	0	1,298	203,810
2029	-	-	-	10,827	124,509	-	3,356	3,356	0	1,120	204,930
2030	-	-	-	9,961	114,549	-	3,088	3,088	0	966	205,896
2031	-	-	-	9,164	105,385	-	2,841	2,841	0	833	206,729
2032	-	-	-	8,431	96,954	-	2,614	2,614	0	718	207,447
2033	-	-	-	7,756	89,198	-	2,404	2,404	0	620	208,067
2034	-	-	-	7,136	82,062	-	2,212	2,212	0	534	208,601
2035	-	-	-	6,565	75,497	-	2,035	2,035	0	461	209,062
2036	-	-	-	6,040	69,457	-	1,872	1,872	0	398	209,459
2037	-	-	-	5,557	63,901	-	1,723	1,723	0	343	209,802
2038	-	-	-	5,112	58,789	-	1,585	1,585	0	296	210,098
2039	-	-	-	4,703	54,085	-	1,458	1,458	0	255	210,353
2040	-	-	-	4,327	49,759	-	1,341	1,341	0	220	210,573
2041	-	-	-	3,981	45,778	-	1,234	1,234	0	190	210,763
2042	-	-	-	3,662	42,116	-	1,135	1,135	0	164	210,926
2043	-	-	-	3,369	38,746	-	1,044	1,044	0	141	211,067
2044	-	-	-	3,100	35,647	-	961	961	0	122	211,189
2045	-	-	-	2,852	32,795	-	884	884	0	105	211,294
2046	-	-	-	2,624	30,171	-	813	813	0	91	211,385
2047	-	-	-	2,414	27,758	-	748	748	0	78	211,463
2048	-	-	-	2,221	25,537	-	688	688	0	67	211,530
2049	-	-	-	2,043	23,494	-	633	633	0	58	211,588
2050	-	-	-	1,880	21,615	-	583	583	0	50	211,638
2051	-	-	-	1,729	19,885	-	536	536	0	43	211,681
2052	-	-	-	1,591	18,295	-	606	606	0	46	211,727
Total	-	1,109,280	(535,227)	516,932	6,212,336	574,053	(194,510)	379,543	15	211,727	6,705,140


Comparative Cumulative NPV
300,000
200,000
100,000
0
-100,000
-200,000
-300,000
-400,000
2012
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2014
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2052
Replace Attemperator

CI Number: 40655

Title:	**LIN – Pulverizer Refurbishment**
Start Date:	2012/02
Final Cost Date:	2012/12
Function:	Generation
Forecast Amount:	$461,279

DESCRIPTION:

The purpose of this project is to replace pulverizer components that have reached the end of their useful life. Based on experienced wear characteristics, there is risk that component failures will occur if a replacement plan is not performed. This capital item includes the replacement of welded steel rollers and tables with ceramic wear components, worn gear & shaft, vertical shaft and other non-repairable mill components. The scope of this project is to refurbish two pulverizers with new ceramic tables and rollers. Components to be replaced or refurbished will be determined based on the condition assessment when teardown is undertaken as part of the planned outage for each pulverizer. The two pulverizers that will be refurbished under this project are 1A and 1 D . This work will complete the ceramic retrofit program for the Lingan pulverizers. Going forward, regular refurbishments of the Lingan pulverizers will still be required to extend asset life and ensure the reliability of this equipment is maintained.

Summary of Related CI's +/- 2 years:
2011 CI 39903 LIN 2011 Mill Refurbishment $760,079

JUSTIFICATION:

Justification Criteria: Thermal

Sub Criteria: Maintenance

Why do this project?

A failed pulverizer could limit peak generation of a unit depending on the fuel blend in service. This makes it imperative that the pulverizers are available and able to operate for extended lengths between scheduled outages. The replacement of components and the upgrading of the ceramics help to achieve this initiative.

Why do this project now?

An evaluation of the pulverizers has identified several areas of concern that need to be addressed in order for the pulverizers to meet availability targets. Replacement parts are now needed due to age and wear on many of the components. Refurbishment of pulverizer components is no longer sustainable and some of the components are worn beyond Original Equipment Manufacturer (OEM) tolerances.

Why do this project this way?

A phased approach to upgrading the pulverizers allows for scheduled outages of selected pulverizers , reducing the risk of extended unplanned outages. An unplanned outage could require in excess of 16 weeks based on material lead time and labor.

CI Number	: 40655	- LIN - Pulverizer Refurbishment	**Project Number**	
Parent CI Number	:	-		
Cost Centre	: 301	- 301-Lingan Admin./Common Capital	**Budget Version**	2012 ACE Plan

Capital Item Accounts

Acct	Actv	Account	Activity	Forecast Amount	Amount	Variance
094		094 - Interest Capitalized		[redacted]	0	[redacted]
095		095-Thermal Regular Labour AO		27,957	0	27,957
001	018	001 - THERMAL Regular Labour	018 - SGP - Fuel Hndlg.Coal	116,440	0	116,440
012	018	012 - Materials	018 - SGP - Fuel Hndlg.Coal	[redacted]	0	[redacted]
			Total Cost:	461,279	0	461,279
			Original Cost:	131,200		

Capital Project Detailed Estimate

Location: Lingan
FP#:40655
Title: LIN - Pulverizer Refurbishment

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Item	Description	Unit	Quantity	Unit Estimate	Total Estimate	Cost Support Reference	Completed Similar Projects (CI#'s) Note 1
1	**001 Regular Labour**						
1.1	Plant Engineering - Technical and Project Support	hr	[redacted]		$1,000		
1.2	Mech Trades Supervision	hr	40	42.00	1,680		
1.4	Mechanical Trades	hr	2880	39.50	113,760		39903
1.4							
1.5							
				Sub-Total	**116,440**		
2	**012 Materials**						
2.1	Materials - OEM and re-engineered fabrication pieces	lot	1	[redacted]			39903
2.2							
2.3							
2.9							
				Sub-Total	[redacted]		
3	**094 Interest Capitalized**						
3.1		ea	1	[redacted]			
				Sub-Total	[redacted]		
4	**095 Administrative Overhead**						
4.1	Thermal Regualr labour AO	ea	1	27,957	27,957		
					-		
				Sub-Total	27,957		
Project Total Cost Estimate				**Total**	**$461,279**		
5	**Original Cost**						
5.1					$131,200		

Note 1: Reference to "Completed similar projects (CI#'s)" is to be provided when the item estimate is based on work of similar scope for a recently completed project

Materials Estimate Sheet

Station: LINGAN GENERATING STATION

CI Number: 40655

Project: LIN - Pulverizer Refurbishment

Item	Description	Unit Cost ($)	Qty	Total Cost ($)
	OEM materials for Refurbishment			
1	Worm gear PN 66-101-A	[redacted]		
2	Worm Gear Hub PN 66-308			
3	Shaft , Worm PN 66-289-A			
4	Grinding Roll , Ceramic Design 66-930-XW , XWIN 663			
5	Bull Ring Assembly for 663 RPS , 66-931-XW			
6	Keyless shaft and bowl hub 66-985 , assembly 663 RS			
7	Whizzer Disc and Clip Assembly EX-5731			
8	Fan Blade Clip for Exhauster EX-2352-CAN			
9	Whizzer Blade – Rev 03 on Drwg A-EX-3729-N-CER			
10	Exhauster Fan Blades SKC 65405-AA			
11	Ceramic Lined Hub protector EX 5840 per quote 49976 SQ			
12	Spider Arm Protector EX 5657			
14	Shaft End Cap PN 66-184-A			
15	Journal head Skirt PN 66-179			
16	Journal pressure Spring Cup PN 70-228			
17	Journal Head PN 66-178			
18	Trunnion Bushing Retainer PN 66-185			
	Non-OEM materials for Refurbishment			
19	Roof Liners 90-49-2120	[redacted]		
20	Inner Cone 09-25-1200			
21	Reject Scraper 09-08-4860			
22	Wall Liners 09-49-9060			
23	Bowl Ext Ring 09-76-6170			
24	Vane Wheel 09-80-2230			
29	Riffle boxes			
	Total Materials Estimate			[redacted]

LIN Pulverizer Refurbishment
Summary of Alternatives & Assumptions

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Budget Year :	**2012**	**Date :**	**24-Oct-11**
Division :	Power Production	**CI Number:**	40655
Department :	Lingan	**Project No. :**	
Originator :			

	Alternative	After Tax WACC	PV of EVA / NPV	Rank	IRR	Disc Pay
A	Pulverizer Refurbishment	6.67%	263,775	1	#NUM!	0.0 years
B	Test 2	6.67%	0	2	#NUM!	0.0 years
C	Test 3	6.67%	0	2	#NUM!	0.0 years
D	Test 4	6.67%	0	2	#NUM!	0.0 years

Recommendation :

Based on a positive NPV, it is recommended that the mills be refurbished

Assumptions

Incremental replacement energy costs and annual operating costs in the years following 2013 are escalated at 2% annually.

Calculations:
Total annual avoided cost = [Replacement energy costs] + [Avoided unplanned repair costs]

Avoided replacement energy cost = [Incremental replacement energy cost] x [Quantity of predicted annual unit outages / de-ratings] x [capacity factor] x [Probability of failure] x [Derating/outage] x [Duration of Derating]

Avoided unplanned repair costs = [cost of Labour and materials in event of failure] x [Probability of failure] x [quantity of predicted annual unit outages / de-ratings]

Calculation of probability of failure in Year 2

The probability of the unit failing in year 2 is: (Probability of unit not failing in year 1) x (probability the unit will fail in year 2 if no failure accured in year 1)

Example: Pulverizer Refurbishment

1	
-75%	Minus the Probability of failure in year 1
25%	Probability that pulverizer does not fail in year 1
x	
80%	Probability of pulverizer failing in year 2 if no failure occurs in year 1
20%	**Probability of the unit failing in year 2**

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Avoided Cost Calculations

Budget Year :	**2012**	**Date :**	**24-Oct-11**
Division :	Power Production	**CI Number:**	40655
Department :	Lingan	**Project No.**	
Originator :			

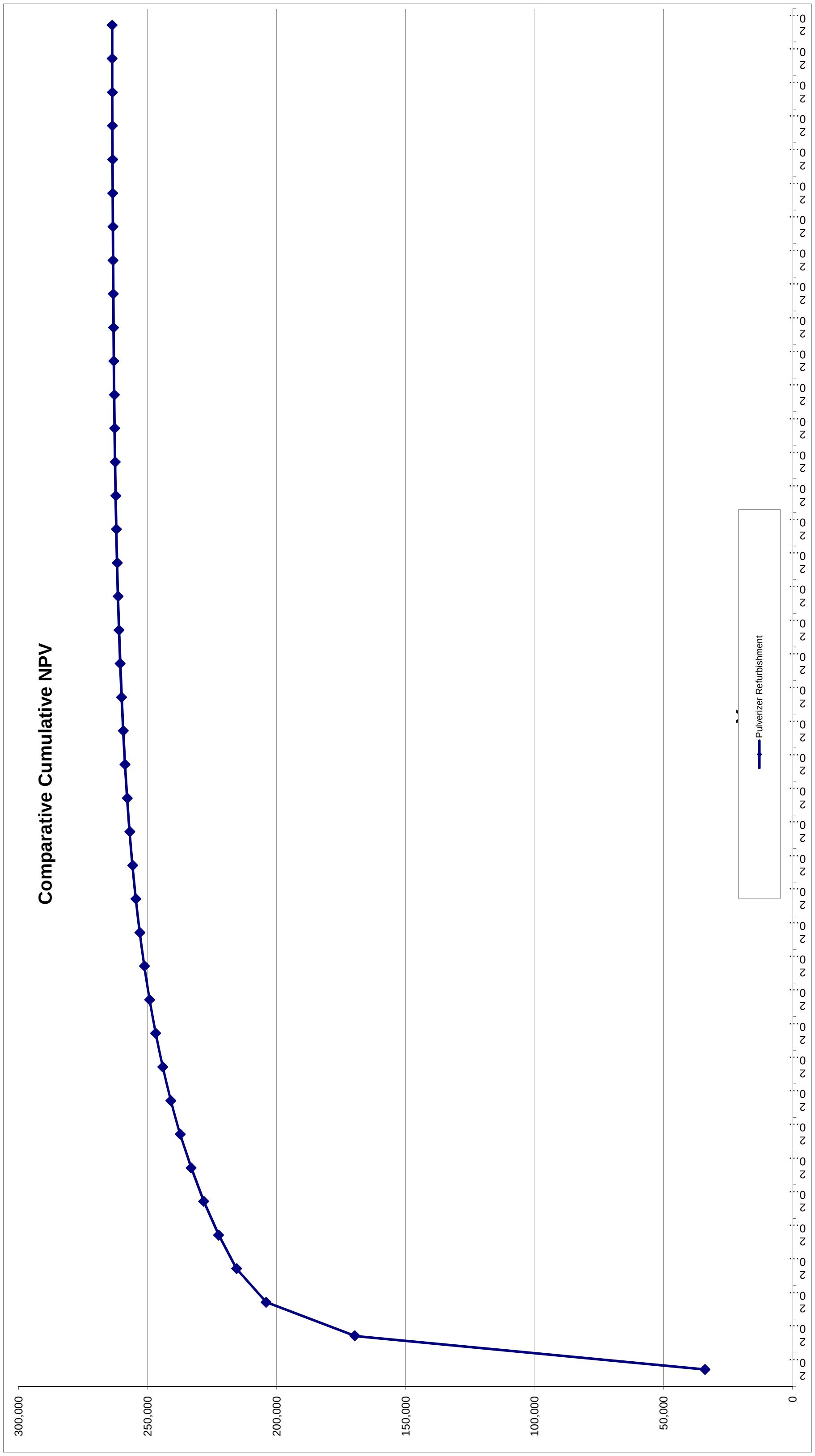
Pulverizer Refurbishment	
Capital Cost	**$ 461,279.00**
Avoided Replacement Energy costs (2012) =	**[redacted] MWh x 4 outages x 80% x 75% x [redacted] x 336 h = $101,542.26**
Avoided Unplanned Repair Costs (2012)	**$ 213,319.75 x 75% x 4 = $ 639,959**
Total Annual Avoided costs	**$741,501.51**
Avoided Replacement Energy costs (2013) =	**[redacted] MWh x 4 outages x 80% x 20% x [redacted] x 336 h = $27,077.94**
Avoided Unplanned Repair Costs (2013)	**$ 213,319.75 x 20% x 4 = $ 170,656**
Total Annual Avoided costs	**$ 197,733.74**

Test 2	
Capital Cost	
Avoided Replacement Energy costs (2012) =	
Avoided Unplanned Repair Costs (2012)	
Total Annual Avoided costs	
Avoided Replacement Energy costs (2013) =	
Avoided Unplanned Repair Costs (2013)	
Total Annual Avoided costs	

Test 3	
Capital Cost	
Avoided Replacement Energy costs (2012) =	
Avoided Unplanned Repair Costs (2012)	
Total Annual Avoided costs	
Avoided Replacement Energy costs (2013) =	
Avoided Unplanned Repair Costs (2013)	
Total Annual Avoided costs	

Test 4	
Capital Cost	
Avoided Replacement Energy costs (2012) =	
Avoided Unplanned Repair Costs (2012)	
Total Annual Avoided costs	
Avoided Replacement Energy costs (2013) =	
Avoided Unplanned Repair Costs (2013)	
Total Annual Avoided costs	

Year	Total Revenue	Operating Costs	Capital	CCA	UCC	CFBT	Applicable Taxes	CFAT	Discount Factor	PV of CF	CNPV
2012	-	741,502	(461,279)	18,451	442,828	280,223	(246,202)	34,020	1	34,020	34,020
2013	-	197,734	-	35,426	407,402	197,734	(52,956)	144,778	1	135,725	169,745
2014	-	42,133	-	32,592	374,809	42,133	(3,022)	39,111	1	34,373	204,118
2015	-	6,710	-	29,985	344,825	6,710	7,215	13,925	1	11,473	215,591
2016	-	673	-	27,586	317,239	673	8,288	8,961	1	6,921	222,512
2017	-	67	-	25,379	291,860	67	7,847	7,914	1	5,730	228,243
2018	-	-	-	23,349	268,511	-	7,238	7,238	1	4,913	233,156
2019	-	-	-	21,481	247,030	-	6,659	6,659	1	4,238	237,394
2020	-	-	-	19,762	227,268	-	6,126	6,126	1	3,655	241,048
2021	-	-	-	18,181	209,086	-	5,636	5,636	1	3,152	244,200
2022	-	-	-	16,727	192,359	-	5,185	5,185	1	2,719	246,919
2023	-	-	-	15,389	176,971	-	4,771	4,771	0	2,345	249,264
2024	-	-	-	14,158	162,813	-	4,389	4,389	0	2,022	251,286
2025	-	-	-	13,025	149,788	-	4,038	4,038	0	1,744	253,030
2026	-	-	-	11,983	137,805	-	3,715	3,715	0	1,504	254,535
2027	-	-	-	11,024	126,780	-	3,418	3,418	0	1,297	255,832
2028	-	-	-	10,142	116,638	-	3,144	3,144	0	1,119	256,951
2029	-	-	-	9,331	107,307	-	2,893	2,893	0	965	257,916
2030	-	-	-	8,585	98,722	-	2,661	2,661	0	832	258,749
2031	-	-	-	7,898	90,825	-	2,448	2,448	0	718	259,466
2032	-	-	-	7,266	83,559	-	2,252	2,252	0	619	260,086
2033	-	-	-	6,685	76,874	-	2,072	2,072	0	534	260,620
2034	-	-	-	6,150	70,724	-	1,906	1,906	0	461	261,080
2035	-	-	-	5,658	65,066	-	1,754	1,754	0	397	261,477
2036	-	-	-	5,205	59,861	-	1,614	1,614	0	343	261,820
2037	-	-	-	4,789	55,072	-	1,485	1,485	0	295	262,116
2038	-	-	-	4,406	50,666	-	1,366	1,366	0	255	262,370
2039	-	-	-	4,053	46,613	-	1,257	1,257	0	220	262,590
2040	-	-	-	3,729	42,884	-	1,156	1,156	0	190	262,780
2041	-	-	-	3,431	39,453	-	1,064	1,064	0	164	262,943
2042	-	-	-	3,156	36,297	-	978	978	0	141	263,084
2043	-	-	-	2,904	33,393	-	900	900	0	122	263,206
2044	-	-	-	2,671	30,722	-	828	828	0	105	263,311
2045	-	-	-	2,458	28,264	-	762	762	0	90	263,401
2046	-	-	-	2,261	26,003	-	701	701	0	78	263,479
2047	-	-	-	2,080	23,923	-	645	645	0	67	263,547
2048	-	-	-	1,914	22,009	-	593	593	0	58	263,605
2049	-	-	-	1,761	20,248	-	546	546	0	50	263,655
2050	-	-	-	1,620	18,628	-	502	502	0	43	263,698
2051	-	-	-	1,490	17,138	-	462	462	0	37	263,735
2052	-	-	-	1,371	15,767	-	523	523	0	39	263,775
Total	-	988,820	(461,279)	445,512	5,354,028	527,541	(193,145)	334,396	15	263,775	10,090,352


Comparative Cumulative NPV
300,000
250,000
200,000
150,000
100,000
50,000
0
Pulverizer Refurbishment

CI Number: 41121

Title: **LIN3 - Cooling Water (CW) Pump Refurbishment**

Start Date: 2012/07
Final Cost Date: 2012/11
Function: Generation
Forecast Amount: $447,687

DESCRIPTION:

The Lingan circulating water (CW) system supplies cooling water to the steam condenser. Cooling water is drawn from a shoreline intake through a pair of traveling screens by two vertical single stage pumps. The water is then pumped through the CW piping and into the steam condenser inlet. These pumps also supply cooling water to the turbine lube-oil coolers, general service cooling water coolers hydrogen coolers and vacuum pump heat exchangers.

This project is for refurbishment of the 3B Cooling Water (CW) pump at the Lingan Generating Station. This refurbishment includes re-surfacing and coating of worn, corroded and damaged surfaces and components, a new sleeveless, chromed stainless pump shaft, new marine bearings, and verification of all mating fits and alignments.

The refurbishment project includes the installation of an additional bearing on the pump shaft. This bearing will help to maintain alignment and will reduce the movement of the pump shaft if misalignment occurs, protecting related bearings and running surfaces. The pump refurbished in 2010 with the additional bearing modification has demonstrated successful operation since being returned to service.

Summary of Related CI's +/- 2 years:
No projects for 2010,2011,2012, 2013 & 2014

JUSTIFICATION:

Justification Criteria: Thermal

Sub Criteria: Maintenance

Why do this project?

Each operating unit is equipped with two 50% duty CW pumps, which supply cooling water to each Unit's condenser and various smaller heat exchangers serving the Unit. Adequate condenser cooling is necessary to ensure sufficient condenser vacuum, which is a major contributor to Unit efficiency. During the cooler months, one CW pump per operating unit is capable of providing adequate condenser cooling. During warmer months, both pumps must operate at the same time to maintain condenser vacuum. If one of a Unit's two CW pumps is unavailable during the warmer months, the Unit's heat rate and/or ability to generate full load will be restricted. The loss of both pumps would lead to an unplanned unit outage. The availability of these pumps is critical to ensure reliable unit operation. The CW pumps range in age from 18 to 23 years. Over the years, these pumps have developed normal operating wear and component erosion and corrosion due to solid particle and salt water exposure which has been managed through periodic maintenance overhauls.

Why do this project now?

The station's CW pumps are currently exhibiting wear profiles that indicate rebuilds must be completed. Routine maintenance has extended the life of the pumps but has not addressed the age-related refurbishment work to be completed under this project. Completing this project now will mitigate the risk of an unplanned pump failure unit de-rating or forced outage.

Why do this project this way?

Refurbishing CW pumps with new component and design features is more cost effective than procuring a replacement pump.

CI Number : 41121 - LIN - Cooling Water (CW) Pump Refurbishment **Project Number**

Parent CI Number : -

Cost Centre : 301 - 301-Lingan Admin./Common Capital **Budget Version** 2012 ACE Plan

Capital Item Accounts

Acct	Actv	Account	Activity	Forecast Amount	Amount	Variance
094		094 - Interest Capitalized		1,816	0	1,816
095		095-Thermal & Hydro Contracts AO		[redacted]	0	[redacted]
095		095-Thermal Regular Labour AO		18,871	0	18,871
001	014	001 - THERMAL Regular Labour	014 - SGP - Circ.Water Sys.	78,596	0	78,596
012	014	012 - Materials	014 - SGP - Circ.Water Sys.	12,500	0	12,500
013	014	013 - POWER PRODUCTION Contracts	014 - SGP - Circ.Water Sys.	[redacted]	0	[redacted]
			Total Cost:	447,687	0	447,687
			Original Cost:	391,000		

Capital Project Detailed Estimate

Location: Lingan
FP#:41121
Title: Cooling Water (CW) Pump Refurbishment

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Item	Description	Unit	Quantity	Unit Estimate	Total Estimate	Cost Support Reference	Completed Similar Projects (CI#'s) Note 1
1	**001 Regular Labour**						
1.1	Plant / GS Engineering - Technical and Project Support	hr	[redacted]	[redacted]	$2,000		
1.2	Mech Trades Supervision - 10hrs / week , 8 weeks	hr	80	45.00	3,600		
1.3	For disassembly & pump extraction - Mech Trades - 3 Mech. / shift - 2 shifts / day , 4 weeks + 10% contigency - extract	hr	924	39.50	36,498		
1.4	For reassembly - Mech Trades - 3 Mech. / shifts - 2 shifts / day , 4 weeks + 10% contigency - install	hr	924	39.50	36,498		
				Sub-Total	78,596	Note 2	39623
2	**012 Materials**						
2.1	Piping replacement	Lot	1	5,000	5,000		
2.2	Consumables , Misc	Lot	1	7,500	7,500		
					-		
				Sub-Total	12,500		
3	**013 Power Production Contracts**						
3.1	CW Pump rebuild subcontract	ea	1	[redacted]	[redacted]	Note 3	
3.2	Machine and Mech contracts - local	ea	1	[redacted]	[redacted]		
3.3	Transportation and Loading	ea	1	[redacted]	[redacted]		
3.4	Contingency for unforseen pump repair scope - 10% and price escalation	ea	1	[redacted]	[redacted]	Note 4	39623
				Sub-Total	[redacted]		
4	**094 Interest Capitalized**						
4.1					1,816		
				Sub-Total	1,816		
5	**095 Administrative Overhead**						
5.1	Therm & Hydro Contracts AO				[redacted]		
5.2	Thermal Regualr labour AO				18,871		
				Sub-Total	[redacted]		
ect Cost Estimate				**Total**	447,687		
6	**Original Cost**						
6.1					$391,000		

Note 1: Reference to "Completed similar projects (CI#'s)" is to be provided when the item estimate is based on work of similar scope for a recently completed project

Note 2: Under project 39623 actual labour cost was $66K. Given the scope of this project compared to 39623, estimated labour cost is higher.

Note 3: Reference quote Q10004914 for a recent project very similar in scope. A portion of the contingency under item 3.4 of this estimate is for price escalation from April 2010.

Note 4: Contintency is based similar past projects, particularly 39623.

LIN CW Pump Refurbishment
Summary of Alternatives & Assumptions

energy everywhere.

Budget Year :	**2012**		**Date :**	**29-Oct-11**
Division :	Power Production		**CI Number:**	41121
Department :	Lingan		**Project No. :**	
Originator :				

	Alternative	After Tax WACC	PV of EVA / NPV	Rank	IRR	Disc Pay
A	Refurbish Pump	6.67%	248,991	1	38.19%	3.0 years
B	Replace Pump	6.67%	70,246	2	11.46%	5.9 years
C	Test 3	6.67%	0	3	#NUM!	0.0 years
D	Test 4	6.67%	0	3	#NUM!	0.0 years

Recommendation :

Based on a positive NPV, it is recommended that the CW pump be refurbished

Assumptions

Incremental replacement energy costs and annual operating costs in the years following 2013 are escalated at 2% annually.

Calculations:
Total annual avoided cost = [Replacement energy costs] + [Avoided unplanned repair costs]

Avoided replacement energy cost = [Incremental replacement energy cost] x [Quantity of predicted annual unit outages / de-ratings] x [capacity factor] x [Probability of failure] x [Derating/outage] x [Duration of Derating]

Avoided unplanned repair costs = [cost of Labour and materials in event of failure] x [Probability of failure] x [quantity of predicted annual unit outages / de-ratings]

Calculation of probability of failure in Year 2

The probability of the unit failing in year 2 is: (Probability of unit not failing in year 1) x (probability the unit will fail in year 2 if no failure accured in year 1)

Example: Refurbish Pump

1
-25% Minus the Probability of failure in year 1
75% Probability that pump does not fail in year 1
x
30% Probability of pump failing in year 2 if no failure occurs in year 1
23% Probability of the pump failing in year 2

Avoided Cost Calculations

Budget Year :	2012	Date :	31-Oct-11
Division :	Power Production	CI Number:	41121
Department :	Lingan	Project No.	
Originator :			

Refurbish Pump	
Capital Cost	$ 447,687
Avoided Replacement Energy costs (2012) =	[redacted] MWh x 1 outages x 80% x 25% x [redacted] MW x 504 h = $97,734
Avoided Unplanned Repair Costs (2012)	$ 619,687.00 x 25% x 1 = $154,922
Total Annual Avoided costs	$252,656.17
Avoided Replacement Energy costs (2013) =	[redacted] MWh x 1 outages x 80% x 22.5% x [redacted] MW x 504 h = $87,961
Avoided Unplanned Repair Costs (2013)	$ 630,640.74 x 22.5% x 1 = $141,894
Total Annual Avoided costs	$ 229,855.15

Test 2	
Capital Cost	
Avoided Replacement Energy costs (2012) =	
Avoided Unplanned Repair Costs (2012)	
Total Annual Avoided costs	
Avoided Replacement Energy costs (2013) =	
Avoided Unplanned Repair Costs (2013)	
Total Annual Avoided costs	

Test 3	
Capital Cost	
Avoided Replacement Energy costs (2012) =	
Avoided Unplanned Repair Costs (2012)	
Total Annual Avoided costs	
Avoided Replacement Energy costs (2013) =	
Avoided Unplanned Repair Costs (2013)	
Total Annual Avoided costs	

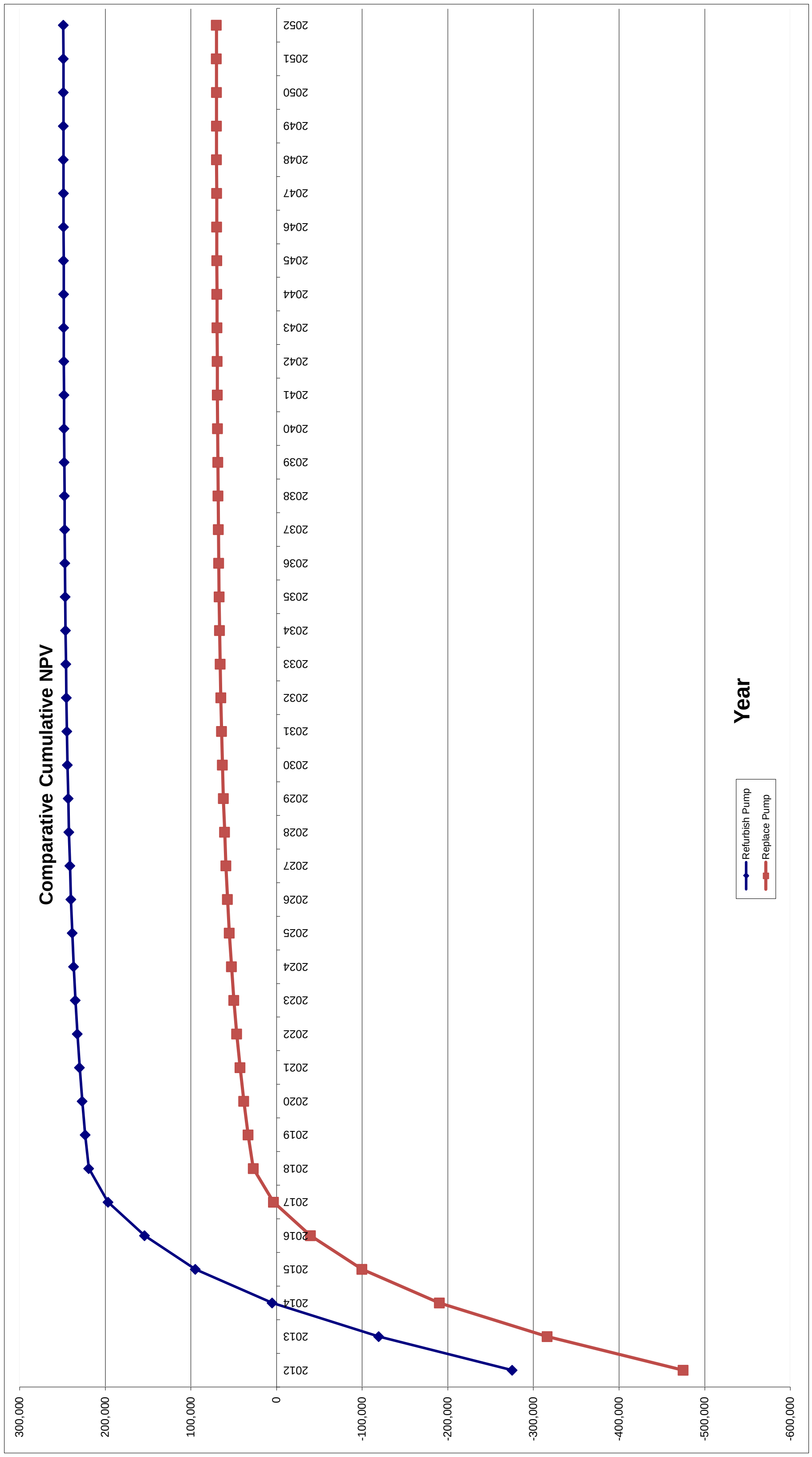
Test 4	
Capital Cost	
Avoided Replacement Energy costs (2012) =	
Avoided Unplanned Repair Costs (2012)	
Total Annual Avoided costs	
Avoided Replacement Energy costs (2013) =	
Avoided Unplanned Repair Costs (2013)	
Total Annual Avoided costs	

LIN CW Pump Refurbishment
Refurbish Pump

Year	Total Revenue	Operating Costs	Capital	CCA	UCC	CFBT	Applicable Taxes	CFAT	Discount Factor	PV of CF	CNPV
2012	-	252,656	(447,687)	17,907	429,780	(195,031)	(80,169)	(275,200)	1	(275,200)	(275,200)
2013	-	229,855	-	34,382	395,397	229,855	(63,729)	166,126	1	155,739	(119,461)
2014	-	191,205	-	31,632	363,765	191,205	(49,530)	141,674	1	124,511	5,049
2015	-	144,682	-	29,101	334,664	144,682	(35,830)	108,852	1	89,683	94,732
2016	-	99,481	-	26,773	307,891	99,481	(22,593)	76,888	1	59,387	154,119
2017	-	74,314	-	24,631	283,260	74,314	(15,402)	58,913	1	42,658	196,777
2018	-	37,852	-	22,661	260,599	37,852	(4,709)	33,143	1	22,497	219,274
2019	-	-	-	20,848	239,751	-	6,463	6,463	1	4,113	223,387
2020	-	-	-	19,180	220,571	-	5,946	5,946	1	3,547	226,934
2021	-	-	-	17,646	202,925	-	5,470	5,470	1	3,059	229,993
2022	-	-	-	16,234	186,691	-	5,033	5,033	1	2,639	232,632
2023	-	-	-	14,935	171,756	-	4,630	4,630	0	2,276	234,908
2024	-	-	-	13,740	158,015	-	4,260	4,260	0	1,963	236,870
2025	-	-	-	12,641	145,374	-	3,919	3,919	0	1,693	238,563
2026	-	-	-	11,630	133,744	-	3,605	3,605	0	1,460	240,023
2027	-	-	-	10,700	123,045	-	3,317	3,317	0	1,259	241,282
2028	-	-	-	9,844	113,201	-	3,052	3,052	0	1,086	242,368
2029	-	-	-	9,056	104,145	-	2,807	2,807	0	937	243,305
2030	-	-	-	8,332	95,813	-	2,583	2,583	0	808	244,113
2031	-	-	-	7,665	88,148	-	2,376	2,376	0	697	244,809
2032	-	-	-	7,052	81,097	-	2,186	2,186	0	601	245,410
2033	-	-	-	6,488	74,609	-	2,011	2,011	0	518	245,929
2034	-	-	-	5,969	68,640	-	1,850	1,850	0	447	246,376
2035	-	-	-	5,491	63,149	-	1,702	1,702	0	386	246,761
2036	-	-	-	5,052	58,097	-	1,566	1,566	0	333	247,094
2037	-	-	-	4,648	53,449	-	1,441	1,441	0	287	247,380
2038	-	-	-	4,276	49,173	-	1,326	1,326	0	247	247,628
2039	-	-	-	3,934	45,239	-	1,219	1,219	0	213	247,841
2040	-	-	-	3,619	41,620	-	1,122	1,122	0	184	248,025
2041	-	-	-	3,330	38,291	-	1,032	1,032	0	159	248,184
2042	-	-	-	3,063	35,227	-	950	950	0	137	248,321
2043	-	-	-	2,818	32,409	-	874	874	0	118	248,439
2044	-	-	-	2,593	29,816	-	804	804	0	102	248,541
2045	-	-	-	2,385	27,431	-	739	739	0	88	248,628
2046	-	-	-	2,194	25,237	-	680	680	0	76	248,704
2047	-	-	-	2,019	23,218	-	626	626	0	65	248,769
2048	-	-	-	1,857	21,360	-	576	576	0	56	248,826
2049	-	-	-	1,709	19,651	-	530	530	0	49	248,874
2050	-	-	-	1,572	18,079	-	487	487	0	42	248,916
2051	-	-	-	1,446	16,633	-	448	448	0	36	248,952
2052	-	-	-	1,331	15,302	-	507	507	0	38	248,991
Total	-	1,030,045	(447,687)	432,385	5,196,267	582,358	(195,825)	386,533	15	248,991	8,561,066

LIN CW Pump Refurbishment
Replace Pump

Year	Total Revenue	Operating Costs	Capital	CCA	UCC	CFBT	Applicable Taxes	CFAT	Discount Factor	PV of CF	CNPV
2012	-	252,656	(650,000)	26,000	624,000	(397,344)	(77,578)	(474,922)	1	(474,922)	(474,922)
2013	-	227,391	-	49,920	574,080	227,391	(57,969)	169,422	1	158,828	(316,094)
2014	-	187,139	-	45,926	528,154	187,139	(43,867)	143,272	1	125,915	(190,179)
2015	-	140,106	-	42,252	485,901	140,106	(30,335)	109,771	1	90,440	(99,738)
2016	-	95,321	-	38,872	447,029	95,321	(17,576)	77,745	1	60,049	(39,690)
2017	-	70,463	-	35,762	411,267	70,463	(10,757)	59,706	1	43,232	3,542
2018	-	35,517	-	32,901	378,366	35,517	(811)	34,706	1	23,559	27,101
2019	-	-	-	30,269	348,096	-	9,383	9,383	1	5,971	33,072
2020	-	-	-	27,848	320,249	-	8,633	8,633	1	5,150	38,222
2021	-	-	-	25,620	294,629	-	7,942	7,942	1	4,442	42,664
2022	-	-	-	23,570	271,058	-	7,307	7,307	1	3,831	46,495
2023	-	-	-	21,685	249,374	-	6,722	6,722	0	3,304	49,799
2024	-	-	-	19,950	229,424	-	6,184	6,184	0	2,850	52,649
2025	-	-	-	18,354	211,070	-	5,690	5,690	0	2,458	55,106
2026	-	-	-	16,886	194,184	-	5,235	5,235	0	2,120	57,226
2027	-	-	-	15,535	178,650	-	4,816	4,816	0	1,828	59,054
2028	-	-	-	14,292	164,358	-	4,431	4,431	0	1,577	60,631
2029	-	-	-	13,149	151,209	-	4,076	4,076	0	1,360	61,991
2030	-	-	-	12,097	139,112	-	3,750	3,750	0	1,173	63,164
2031	-	-	-	11,129	127,983	-	3,450	3,450	0	1,012	64,176
2032	-	-	-	10,239	117,745	-	3,174	3,174	0	872	65,048
2033	-	-	-	9,420	108,325	-	2,920	2,920	0	752	65,801
2034	-	-	-	8,666	99,659	-	2,686	2,686	0	649	66,450
2035	-	-	-	7,973	91,686	-	2,472	2,472	0	560	67,009
2036	-	-	-	7,335	84,351	-	2,274	2,274	0	483	67,492
2037	-	-	-	6,748	77,603	-	2,092	2,092	0	416	67,909
2038	-	-	-	6,208	71,395	-	1,925	1,925	0	359	68,268
2039	-	-	-	5,712	65,683	-	1,771	1,771	0	310	68,577
2040	-	-	-	5,255	60,429	-	1,629	1,629	0	267	68,845
2041	-	-	-	4,834	55,594	-	1,499	1,499	0	230	69,075
2042	-	-	-	4,448	51,147	-	1,379	1,379	0	199	69,274
2043	-	-	-	4,092	47,055	-	1,268	1,268	0	171	69,445
2044	-	-	-	3,764	43,291	-	1,167	1,167	0	148	69,593
2045	-	-	-	3,463	39,827	-	1,074	1,074	0	127	69,720
2046	-	-	-	3,186	36,641	-	988	988	0	110	69,830
2047	-	-	-	2,931	33,710	-	909	909	0	95	69,925
2048	-	-	-	2,697	31,013	-	836	836	0	82	70,007
2049	-	-	-	2,481	28,532	-	769	769	0	71	70,077
2050	-	-	-	2,283	26,250	-	708	708	0	61	70,138
2051	-	-	-	2,100	24,150	-	651	651	0	52	70,191
2052	-	-	-	1,932	22,218	-	736	736	0	56	70,246
Total	-	1,008,593	(650,000)	627,782	7,544,497	358,593	(128,349)	230,244	15	70,246	1,037,193


Comparative Cumulative NPV
Refurbish Pump
Replace Pump
Year
300,000
200,000
100,000
0
-100,000
-200,000
-300,000
-400,000
-500,000
-600,000
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CI Number: 40256

Title: **POT Plant Siding Replacement**

Start Date: 2012/04
Final Cost Date: 2012/11
Function: Generation
Forecast Amount: $392,601

DESCRIPTION:

As part of life cycle management at the Point Tupper Generating Station, the condition of buildings, pipe bridges, walkways, and other structural components is regularly assessed. Several areas of the plant siding have been identified as requiring replacement.

This project includes replacement of deteriorated exterior plant siding, fasteners, and structural components in various locations of the plant. The majority of the siding to be replaced is original to the plant (installed in 1973) and has reached the end of its useful life. The remaining siding to be replaced is approximately 10 to 20 years old.

Summary of Related CI's +/- 2 years:
2013, 2014 CI #TBD POT Siding Replacement $TBD

JUSTIFICATION:

Justification Criteria: Thermal

Sub Criteria: Buildings

Why do this project?

Replacing the siding will mitigate the risk of further deterioration of the siding and prevent separation from the building structure. Replacing the siding will also ensure the building envelope is adequately sealed, prevent premature damage to the building's interior structural components and ensure equipment inside the plant is protected.

Why do this project now?

The siding to be replaced under this project has reached the end of its useful life and must be replaced. Minor repairs have been completed in recent years, but the degree of deterioration of both the siding and some of the support structure no longer allows for repairs to be completed.

Why do this project this way?

Replacing the siding is economically feasible and the most practical solution to preserving the building structure.

CI Number : 40256 - POT - Plant Siding Replacement **Project Number**

Parent CI Number : -

Cost Centre : 351 - 351-Pt.Tupper Admin./Capital **Budget Version** 2012 ACE Plan

Capital Item Accounts

Acct	Actv	Account	Activity	Forecast Amount	Amount	Variance
094		094 - Interest Capitalized		5,158	0	5,158
095		095-Thermal Term Labour AO		[redacted]	0	[redacted]
095		095-Thermal & Hydro Contracts AO		[redacted]	0	[redacted]
095		095-Thermal Regular Labour AO		504	0	504
095		095-Thermal Overtime Labour AO		151	0	151
001	003	001 - THERMAL Regular Labour	003 - SGP - Bldg.,Struct.Grnd.	2,100	0	2,100
002	003	002 - THERMAL Overtime Labour	003 - SGP - Bldg.,Struct.Grnd.	1,260	0	1,260
004	003	004 - THERMAL Term Labour	003 - DP - Bldg.,Struct.Grnd.	1,200	0	1,200
011	003	011 - Travel Expense	003 - SGP - Bldg.,Struct.Grnd.	1,000	0	1,000
012	003	012 - Materials	003 - SGP - Bldg.,Struct.Grnd.	[redacted]	0	[redacted]
013	003	013 - POWER PRODUCTION Contracts	003 - SGP - Bldg.,Struct.Grnd.	[redacted]	0	[redacted]
041	003	041 - Meals & Entertainment	003 - SGP - Bldg.,Struct.Grnd.	1,000	0	1,000
			Total Cost:	392,601	0	392,601
			Original Cost:	81,176		

Capital Project Detailed Estimate

Location: Point Tupper
FP#: 40256
Title: POT - Plant Siding Replacement

Nova Scotia POWER An Emera Company energy everywhere.

Item	Description	Unit	Quantity	Unit Estimate	Total Estimate	Cost Support Reference	Completed Similar Projects (CI#'s) Note 1
1	**Labour**						
1.1	001 Regular Labour	hr	[redacted]		$2,100		
1.2	004 Term Labour	hr			1,200		
1.3	002 Overtime Labour	hr			1,260		
				Sub-Total	4,560		33242, 39933
2	**012 Materials**						
2.1	Siding and other materials	lot	1	[redacted]			
2.2							
				Sub-Total	[redacted]		33242, 39933
3	**013 Power Production Contracts**						
3.1	Installation contract	ea	1	[redacted]			
				Sub-Total	[redacted]		33242, 39933
4	**011 Travel Expenses**						
4.1	Travel	lot	1	1,000	1,000		
				Sub-Total	1,000		
5	**041 Meals and Entertainment**						
5.1	Meals / Expenses	lot	1	1000	1,000		
				Sub-Total	1,000		
6	**094 Interest Capitalized**						
6.1	Interest				5,158		
				Sub-Total	5,158		
7	**095 Administrative Overhead**						
7.1	Overhead				10,884		
				Sub-Total	10,884		
Project Cost Estimate				**Total**	$392,602		
8	Original Cost						
8.1					$81,176		

Note 1: Reference to "Completed similar projects (CI#'s)" is to be provided when the item estimate is based on work of similar scope for a recently completed project

POT Plant Siding Replacement
Summary of Alternatives & Assumptions

Nova Scotia POWER An Emera Company energy everywhere.

Budget Year :	**2012**	**Date :**	**29-Oct-11**
Division :	Power Production	**CI Number:**	40256
Department :	Point Tupper	**Project No. :**	
Originator :			

	Alternative	After Tax WACC	PV of EVA / NPV	Rank	IRR	Disc Pay
A	Replace Siding	6.67%	365,189	1	14.14%	12.3 years
B	Test 2	6.67%	0	2	#NUM!	0.0 years
C	Test 3	6.67%	0	2	#NUM!	0.0 years
D	Test 4	6.67%	0	2	#NUM!	0.0 years

Recommendation :

Based on a positive NPV, it is recommended that the plant siding be replaced

Assumptions

Incremental replacement energy costs and annual operating costs in the years following 2013 are escalated at 2% annually.

Calculations:
Total annual avoided cost = [Replacement energy costs] + [Avoided unplanned repair costs]

Avoided replacement energy cost = [Incremental replacement energy cost] x [Quantity of predicted annual unit outages / de-ratings] x [capacity factor] x [Probability of failure] x [Derating/outage] x [Duration of Derating]

Avoided unplanned repair costs = [cost of Labour and materials in event of failure] x [Probability of failure] x [quantity of predicted annual unit outages / de-ratings]

Calculation of probability of failure in Year 2

The probability of the unit failing in year 2 is: (Probability of unit not failing in year 1) x (probability the unit will fail in year 2 if no failure accured in year 1)

Example: Replace Siding

1	
-30%	Minus the Probability of failure in year 1
70%	Probability that the siding does not fail in year 1
x	
31%	Probability of siding failing in year 2 if no failure occurs in year 1
22%	**Probability of the siding failing in year 2**

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Avoided Cost Calculations

Budget Year :	2012	Date :	29-Oct-11
Division :	Power Production	CI Number:	40256
Department :	Point Tupper	Project No.	
Originator :			

Replace Siding	
Capital Cost	$ 392,601
Avoided Replacement Energy costs (2012) =	[redacted] MWh x 3 outages x 90% x 30% x [redacted] MW x 12 h = $3,886.75
Avoided Unplanned Repair Costs (2012)	$ 32,400.00 x 30% x 3 = $29,160.00
Total Annual Avoided costs	$33,046.75
Avoided Replacement Energy costs (2013) =	[redacted] MWh x 3 outages x 90% x 31% x [redacted] MW x 12 h = $4,016.31
Avoided Unplanned Repair Costs (2013)	$ 33,696.96 x 31% x 3 = $31,338.17
Total Annual Avoided costs	$ 35,354.48

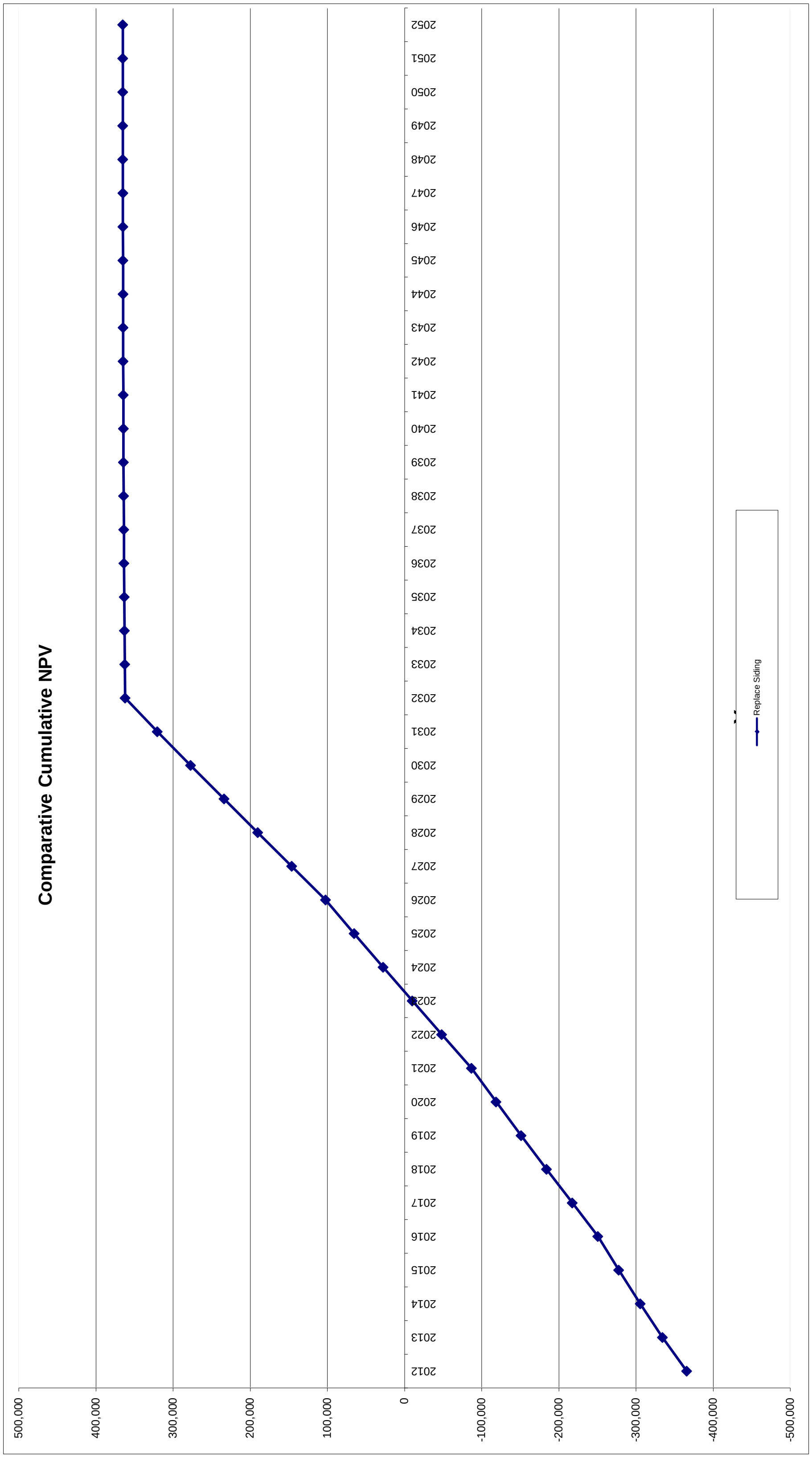
Test 2	
Capital Cost	
Avoided Replacement Energy costs (2012) =	
Avoided Unplanned Repair Costs (2012)	
Total Annual Avoided costs	
Avoided Replacement Energy costs (2013) =	
Avoided Unplanned Repair Costs (2013)	
Total Annual Avoided costs	

Test 3	
Capital Cost	
Avoided Replacement Energy costs (2012) =	
Avoided Unplanned Repair Costs (2012)	
Total Annual Avoided costs	
Avoided Replacement Energy costs (2013) =	
Avoided Unplanned Repair Costs (2013)	
Total Annual Avoided costs	

Test 4	
Capital Cost	
Avoided Replacement Energy costs (2012) =	
Avoided Unplanned Repair Costs (2012)	
Total Annual Avoided costs	
Avoided Replacement Energy costs (2013) =	
Avoided Unplanned Repair Costs (2013)	
Total Annual Avoided costs	

POT Plant Siding Replacement
Replace Siding

Year	Total Revenue	Operating Costs	Capital	CCA	UCC	CFBT	Applicable Taxes	CFAT	Discount Factor	PV of CF	CNPV
2012	-	33,047	(392,601)	15,704	376,897	(359,555)	(6,207)	(365,762)	1	(365,762)	(365,762)
2013	-	35,354	-	30,152	346,746	35,354	(1,866)	33,488	1	31,394	(334,368)
2014	-	35,054	-	27,740	319,006	35,054	(2,322)	32,731	1	28,766	(305,602)
2015	-	37,567	-	25,520	293,485	37,567	(3,734)	33,833	1	27,875	(277,728)
2016	-	40,224	-	23,479	270,007	40,224	(5,238)	34,986	1	27,023	(250,705)
2017	-	56,831	-	21,601	248,406	56,831	(10,922)	45,910	1	33,243	(217,462)
2018	-	62,478	-	19,872	228,534	62,478	(13,208)	49,270	1	33,445	(184,017)
2019	-	66,713	-	18,283	210,251	66,713	(15,013)	51,700	1	32,900	(151,118)
2020	-	71,185	-	16,820	193,431	71,185	(16,853)	54,332	1	32,413	(118,705)
2021	-	75,905	-	15,474	177,956	75,905	(18,733)	57,172	1	31,974	(86,731)
2022	-	100,076	-	14,237	163,720	100,076	(26,610)	73,466	1	38,518	(48,213)
2023	-	106,599	-	13,098	150,622	106,599	(28,986)	77,614	0	38,148	(10,065)
2024	-	113,482	-	12,050	138,573	113,482	(31,444)	82,038	0	37,801	27,737
2025	-	120,742	-	11,086	127,487	120,742	(33,994)	86,749	0	37,473	65,209
2026	-	128,399	-	10,199	117,288	128,399	(36,642)	91,757	0	37,158	102,367
2027	-	162,743	-	9,383	107,905	162,743	(47,541)	115,201	0	43,734	146,101
2028	-	175,587	-	8,632	99,272	175,587	(51,756)	123,831	0	44,071	190,172
2029	-	186,421	-	7,942	91,331	186,421	(55,329)	131,093	0	43,738	233,910
2030	-	197,838	-	7,306	84,024	197,838	(59,065)	138,773	0	43,405	277,316
2031	-	209,866	-	6,722	77,302	209,866	(62,975)	146,891	0	43,072	320,388
2032	-	216,874	-	6,184	71,118	216,874	(65,314)	151,560	0	41,662	362,050
2033	-	-	-	5,689	65,429	-	1,764	1,764	0	455	362,504
2034	-	-	-	5,234	60,194	-	1,623	1,623	0	392	362,896
2035	-	-	-	4,816	55,379	-	1,493	1,493	0	338	363,234
2036	-	-	-	4,430	50,948	-	1,373	1,373	0	292	363,526
2037	-	-	-	4,076	46,873	-	1,264	1,264	0	251	363,777
2038	-	-	-	3,750	43,123	-	1,162	1,162	0	217	363,994
2039	-	-	-	3,450	39,673	-	1,069	1,069	0	187	364,181
2040	-	-	-	3,174	36,499	-	984	984	0	161	364,343
2041	-	-	-	2,920	33,579	-	905	905	0	139	364,482
2042	-	-	-	2,686	30,893	-	833	833	0	120	364,602
2043	-	-	-	2,471	28,421	-	766	766	0	104	364,705
2044	-	-	-	2,274	26,148	-	705	705	0	89	364,795
2045	-	-	-	2,092	24,056	-	648	648	0	77	364,872
2046	-	-	-	1,924	22,131	-	597	597	0	66	364,938
2047	-	-	-	1,771	20,361	-	549	549	0	57	364,995
2048	-	-	-	1,629	18,732	-	505	505	0	49	365,045
2049	-	-	-	1,499	17,233	-	465	465	0	43	365,087
2050	-	-	-	1,379	15,855	-	427	427	0	37	365,124
2051	-	-	-	1,268	14,586	-	393	393	0	32	365,156
2052	-	-	-	1,167	13,419	-	445	445	0	34	365,189
Total	-	2,232,986	(392,601)	379,182	4,556,893	1,840,385	(575,783)	1,264,602	15	365,189	6,662,218


Comparative Cumulative NPV
500,000
400,000
300,000
200,000
100,000
0
-100,000
-200,000
-300,000
-400,000
-500,000
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Replace Siding

CI Number: 41511

Title: **TRE6 - Condenser Waterbox and CW Piping Refurbishment**

Start Date: 2012/06
Final Cost Date: 2012/11
Function: Generation
Forecast Amount: $392,172

DESCRIPTION:

The Unit #6 condenser and cooling water (CW) piping were installed in 1991 and are original equipment to the plant. The function of this condenser is to provide the greatest vacuum possible to the turbine exhaust in order to achieve the most generating capacity possible from the steam and increase efficiency of the Unit. Once the steam from the turbine enters the condenser, it flows around the outside of the condenser tubes and condenses when cooled by river water which flows through the inside of the condenser tubes. The cooling water enters the plant through two large CW pumps, and then flows through large-diameter pipes into the waterboxes of the condenser. After cooling water passes through the tubes in the waterbox of the condenser, it is piped back to the river.

This project includes re-lining of the four condenser waterboxes and the refurbishment of the CW discharge piping. Refurbishment of the CW piping will include replacement of some sections of pipe as well as extending the life of some existing sections through applying a protective coating to the inside of the piping.

Summary of Related CI's +/- 2 years:
No projects for 2010,2011,2012, 2013 & 2014

JUSTIFICATION:

Justification Criteria: Thermal

Sub Criteria: Equipment Replacement

Why do this project?

The CW piping and the waterboxes are made of carbon steel, and have experienced normal wear and corrosion over time due to coming in contact with brackish East River water. These components are lined with a coating in order to protect the steel from premature corrosion. The interior surfaces of the waterboxes are lined with neoprene and the CW piping is lined with an epoxy coating. Due to normal wear overt time, these linings have deteriorated, and evidence of degradation in the CW piping and waterboxes is now evident.

The condition of the pipes is such that multiple leaks have been recently experienced, resulting in short unplanned outages to completed temporary repairs. In the case of the condenser waterbox, the neoprene lining has started to separate from the interior surfaces of the waterbox, resulting in large pieces of lining covering the condenser tubesheets. This impedes the flow of cooling water through the condenser, which results in de-rating of the Unit and lower efficiency.

Completing this project will extend the life of the existing waterboxes and CW piping and mitigate the risk of un-planned outages and associated replacement energy costs.

Why do this project now?

The sections of CW piping to be replaced are at the end of their useful life and must be replaced. Re-lining of the CW piping and condenser waterbox now will prevent further deterioration and extend their useful life. The 2012 outage is of sufficient duration to complete this work, and the next scheduled outage of sufficient duration to complete this work is not until 2014. As the piping has recently experienced leaks and the neoprene coating has started to separate from the interior surfaces of the waterboxes, this work must be completed now to mitigate the risk of further deterioration and un-planned unit outages.

Why do this project this way?

Removal of the remaining neoprene lining and replacing it with an epoxy coating will protect the waterboxes from further degradation. Replacement and repair of the CW piping combined with upgrading the internal and external coatings will ensure the reliability of the system. Refurbishing the waterboxes and CW piping is the most cost-effective option.

CI Number : 41511	- TRE6 - Condenser Waterbox and Cooling Water (CW) Piping Refurbishment	**Project Number**	
Parent CI Number :	-		
Cost Centre : 345	- 345-Trenton unit 6 Capital	**Budget Version**	2012 ACE Plan

Capital Item Accounts

Acct	Actv	Account	Activity	Forecast Amount	Amount	Variance
094		094 - Interest Capitalized		7,622	0	7,622
095		095-Thermal Term Labour AO		[redacted]	0	[redacted]
095		095-Thermal & Hydro Contracts AO		[redacted]	0	[redacted]
095		095-Thermal Regular Labour AO		6,051	0	6,051
095		095-Thermal Overtime Labour AO		720	0	720
001	014	001 - THERMAL Regular Labour	014 - SGP - Circ.Water Sys.	25,200	0	25,200
002	014	002 - THERMAL Overtime Labour	014 - SGP - Circ.Water Sys.	6,000	0	6,000
004	014	004 - THERMAL Term Labour	014 - SGP - Circ.Water Sys.	7,200	0	7,200
012	014	012 - Materials	014 - SGP - Circ.Water Sys.	[redacted]	0	[redacted]
013	014	013 - POWER PRODUCTION Contracts	014 - SGP - Circ.Water Sys.	[redacted]	0	[redacted]
028	085	028 - Consulting	085 Design	3,000	0	3,000
011	087	011 - Travel Expense	087 Field Super.& Ops.	500	0	500
013	087	013 - POWER PRODUCTION Contracts	087 Field Super.& Ops.	8,400	0	8,400
021	087	021 - Telephones	087 Field Super.& Ops.	250	0	250
041	087	041 - Meals & Entertainment	087 Field Super.& Ops.	250	0	250
			Total Cost:	392,172	0	392,172
			Original Cost:	252,000		

Capital Project Detailed Estimate

Location: Trenton
FP#: 41511
Title: **TRE6 - Condenser Waterbox and Cooling Water (CW) Piping Refurbishment**

Item	Description	Unit	Quantity	Unit Estimate	Total Estimate	Cost Support Reference	Completed Similar Projects (FP#'s) Note 1
1	**001 Regular Labour**						
1.1	Regular Labour	hr	480	40.00	$19,200		34062
1.2	Regular labour - Manwatch	hr	240	25.00	6,000		34062
1.3	Term Labour	hr	[redacted]				34062
				Sub-Total	[redacted]		
2	**013 Power Production Contracts**						
2.1	Chillers/Fans	lot	1	[redacted]			
2.2	Removing Existing Coating and apply new coating	lot	1			Sept 21, 2011 quote	
2.4	Recoat Pipes	lot	1				34062
2.5	Pipe refurbishment	lot	1				34062
2.5	Contingency for re- and pipe refurbishment scope	%	10%				34062
2.6	Waste Removal	lot	1				
2.7	External Supervisor	hr	[redacted]		8,400		
2.8							
2.9							
				Sub-Total	[redacted]		
3	**012 Materials**						
3.2	Replacement Gaskets	lot	1	[redacted]			
3.3							
				Sub-Total	[redacted]		
4	**028 Consulting**						
4.1	Detailed Engineering	hr	[redacted]		3,000		
4.2							
4.3							
				Sub-Total	3,000		
5	**011 Travel Expenses**						
5.1	Travel	lot	1	500	500		
5.2							
5.3							
				Sub-Total	500		
6	**Miscellaneous**						
6.1	Telephones	lot	1	250	250		
6.2	Meals and entertainment	lot	1	250	250		
6.3							
				Sub-Total	500		
7	**002 Overtime Labour**						
7.1	Overtime labour - Manwatch	hr	120	50.00	6,000		
7.2							
7.3							
				Sub-Total	6,000		
8	**094 Interest Capitalized**						
8.1	Interest				7,622		
8.2							
8.3							
				Sub-Total	7,622		
8	**095 Administrative Overhead**						
8.1	AO				24,249		
8.2							
8.3							
				Sub-Total	24,249		
Project Cost Estimate				**Total**	**$392,171**		
9	Original Cost						
9.1					$252,000		

Note 1: Reference to "Completed similar projects (FP#'s)" is to be provided when the item estimate is based on work of similar scope for a recently completed project

TRE6 Condesner Waterbox & CW Piping Refurbishment
Summary of Alternatives & Assumptions

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Budget Year :	**2012**	**Date :**	**20-Oct-11**
Division :	Power Production	**CI Number:**	41511
Department :	Trenton	**Project No. :**	
Originator :			

	Alternative	After Tax WACC	PV of EVA / NPV	Rank	IRR	Disc Pay
A	Refurbish Waterboxes and CW Piping	6.67%	29,507	1	14.65%	6.2 years
B	Test 2	6.67%	0	2	#NUM!	0.0 years
C	Test 3	6.67%	0	2	#NUM!	0.0 years
D	Test 4	6.67%	0	2	#NUM!	0.0 years

Recommendation :

Based on a positive NPV, it is recommended that the Condenser Waterbox piping be relined and CW piping refurbished

Assumptions

Incremental replacement energy costs and annual operating costs in the years following 2013 are escalated at 2% annually.

Calculations:
Total annual avoided cost = [Replacement energy costs] + [Avoided unplanned repair costs]

Avoided replacement energy cost = [Incremental replacement energy cost] x [Quantity of predicted annual unit outages / de-ratings] x [capacity factor] x [Probability of failure] x [Derating/outage] x [Duration of Derating]

Avoided unplanned repair costs = [cost of Labour and materials in event of failure] x [Probability of failure] x [quantity of predicted annual unit outages / de-ratings]

Calculation of probability of failure in Year 2

The probability of the unit failing in year 2 is: (Probability of unit not failing in year 1) x (probability the unit will fail in year 2 if no failure accured in year 1)

Example: Refurbish Waterboxes and CW Piping

1	
-75%	Minus the Probability of failure in year 1
25%	Probability that the condenser or CW piping does not fail in year 1
x	
80%	Probability of condenser or CW piping failing in year 2 if no failure occurs in year 1
20%	**Actual probability of the condenser or CW piping failing in year 2**

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Avoided Cost Calculations

Budget Year :	2012	Date :	20-Oct-11
Division :	Power Production	CI Number:	41511
Department :	Trenton	Project No.	
Originator :			

Refurbish Waterboxes and CW Piping	
Capital Cost	$ 392,172.00
Avoided Replacement Energy costs (2012) =	[redacted] MWh x 1 outages x 90% x 75% x [redacted] MW x 48 h = $99,044
Avoided Unplanned Repair Costs (2012)	$ 407,172.00 x 75% x 1 = $ 305,379
Total Annual Avoided costs	$404,422.76
Avoided Replacement Energy costs (2013) =	[redacted] MWh x 1 outages x 90% x 20% x [redacted] MW x 48 h = $26,412
Avoided Unplanned Repair Costs (2013)	$ 415,315.44 x 20% x 1 = $ 83,063
Total Annual Avoided costs	$ 109,474.76

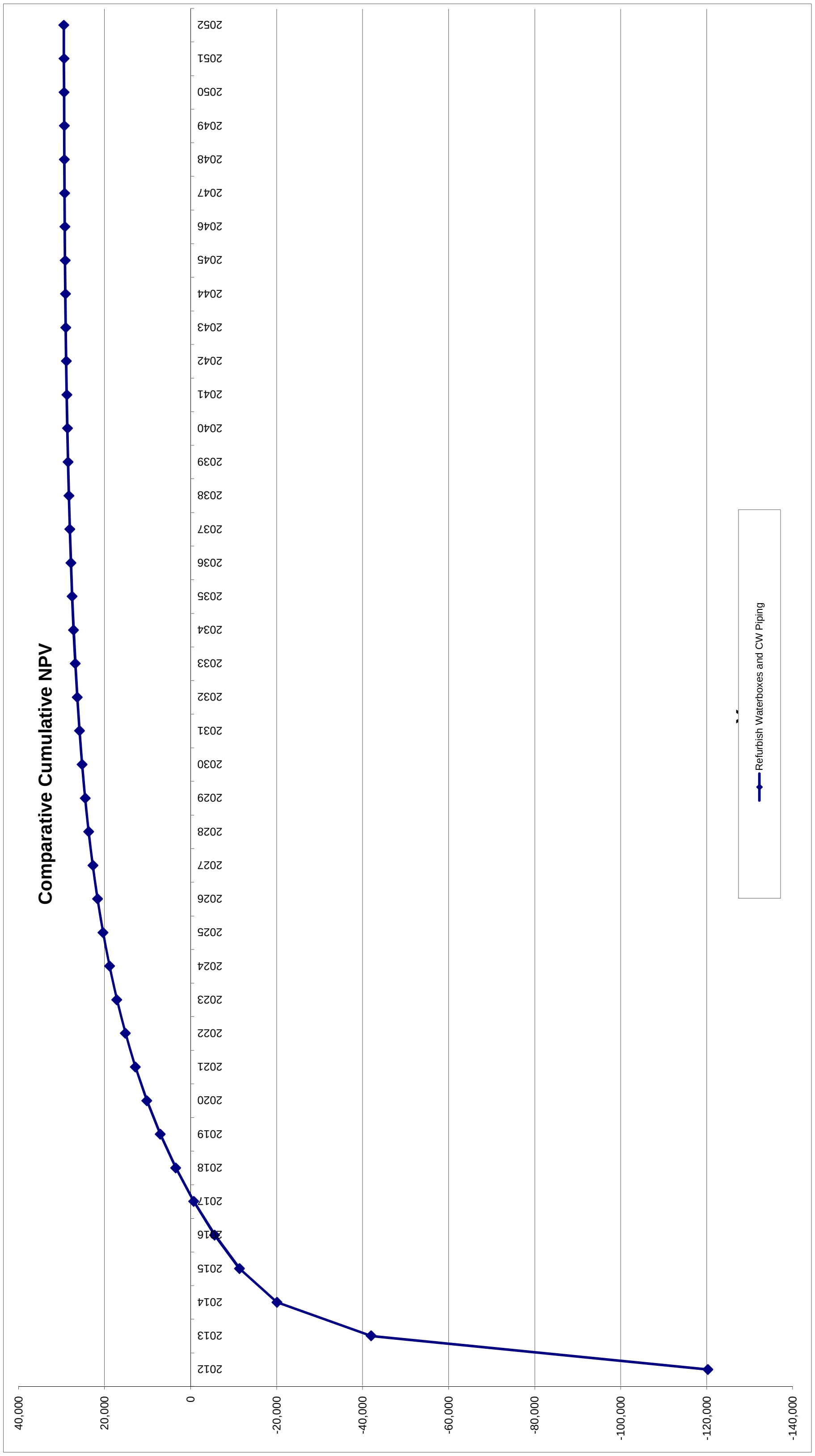
Test 2	
Capital Cost	
Avoided Replacement Energy costs (2012) =	
Avoided Unplanned Repair Costs (2012)	
Total Annual Avoided costs	
Avoided Replacement Energy costs (2013) =	
Avoided Unplanned Repair Costs (2013)	
Total Annual Avoided costs	

Test 3	
Capital Cost	
Avoided Replacement Energy costs (2012) =	
Avoided Unplanned Repair Costs (2012)	
Total Annual Avoided costs	
Avoided Replacement Energy costs (2013) =	
Avoided Unplanned Repair Costs (2013)	
Total Annual Avoided costs	

Test 4	
Capital Cost	
Avoided Replacement Energy costs (2012) =	
Avoided Unplanned Repair Costs (2012)	
Total Annual Avoided costs	
Avoided Replacement Energy costs (2013) =	
Avoided Unplanned Repair Costs (2013)	
Total Annual Avoided costs	

TRE6 Condesner Waterbox & CW Piping Refurbishment
Refurbish Waterboxes and CW Piping

Year	Total Revenue	Operating Costs	Capital	CCA	UCC	CFBT	Applicable Taxes	CFAT	Discount Factor	PV of CF	CNPV
2012	-	404,423	(392,172)	15,687	376,485	12,251	(132,481)	(120,230)	1	(120,230)	(120,230)
2013	-	109,475	-	30,119	346,366	109,475	(25,966)	83,509	1	78,287	(41,943)
2014	-	23,729	-	27,709	318,657	23,729	1,179	24,908	1	21,890	(20,053)
2015	-	3,844	-	25,493	293,164	3,844	6,711	10,555	1	8,696	(11,357)
2016	-	414	-	23,453	269,711	414	7,096	7,510	1	5,800	(5,556)
2017	-	22	-	21,577	248,134	22	6,682	6,704	1	4,854	(702)
2018	-	-	-	19,851	228,284	-	6,154	6,154	1	4,177	3,475
2019	-	-	-	18,263	210,021	-	5,661	5,661	1	3,603	7,078
2020	-	-	-	16,802	193,219	-	5,209	5,209	1	3,107	10,185
2021	-	-	-	15,458	177,762	-	4,792	4,792	1	2,680	12,865
2022	-	-	-	14,221	163,541	-	4,408	4,408	1	2,311	15,176
2023	-	-	-	13,083	150,458	-	4,056	4,056	0	1,993	17,170
2024	-	-	-	12,037	138,421	-	3,731	3,731	0	1,719	18,889
2025	-	-	-	11,074	127,347	-	3,433	3,433	0	1,483	20,372
2026	-	-	-	10,188	117,159	-	3,158	3,158	0	1,279	21,651
2027	-	-	-	9,373	107,787	-	2,906	2,906	0	1,103	22,754
2028	-	-	-	8,623	99,164	-	2,673	2,673	0	951	23,705
2029	-	-	-	7,933	91,231	-	2,459	2,459	0	821	24,526
2030	-	-	-	7,298	83,932	-	2,263	2,263	0	708	25,234
2031	-	-	-	6,715	77,218	-	2,082	2,082	0	610	25,844
2032	-	-	-	6,177	71,040	-	1,915	1,915	0	526	26,370
2033	-	-	-	5,683	65,357	-	1,762	1,762	0	454	26,824
2034	-	-	-	5,229	60,128	-	1,621	1,621	0	392	27,216
2035	-	-	-	4,810	55,318	-	1,491	1,491	0	338	27,554
2036	-	-	-	4,425	50,893	-	1,372	1,372	0	291	27,845
2037	-	-	-	4,071	46,821	-	1,262	1,262	0	251	28,096
2038	-	-	-	3,746	43,076	-	1,161	1,161	0	217	28,313
2039	-	-	-	3,446	39,630	-	1,068	1,068	0	187	28,500
2040	-	-	-	3,170	36,459	-	983	983	0	161	28,661
2041	-	-	-	2,917	33,542	-	904	904	0	139	28,800
2042	-	-	-	2,683	30,859	-	832	832	0	120	28,920
2043	-	-	-	2,469	28,390	-	765	765	0	103	29,023
2044	-	-	-	2,271	26,119	-	704	704	0	89	29,112
2045	-	-	-	2,090	24,030	-	648	648	0	77	29,189
2046	-	-	-	1,922	22,107	-	596	596	0	66	29,256
2047	-	-	-	1,769	20,339	-	548	548	0	57	29,313
2048	-	-	-	1,627	18,712	-	504	504	0	49	29,362
2049	-	-	-	1,497	17,215	-	464	464	0	43	29,405
2050	-	-	-	1,377	15,837	-	427	427	0	37	29,441
2051	-	-	-	1,267	14,570	-	393	393	0	32	29,473
2052	-	-	-	1,166	13,405	-	444	444	0	34	29,507
Total	-	541,906	(392,172)	378,767	4,551,909	149,734	(63,930)	85,804	15	29,507	649,264


Comparative Cumulative NPV
Refurbish Waterboxes and CW Piping
40,000
20,000
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-20,000
-40,000
-60,000
-80,000
-100,000
-120,000
-140,000
2012
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CI Number: 41503

Title:	**TRE6 - Steam Turbine Control Valve Refurbishment**
Start Date:	2012/06
Final Cost Date:	2012/10
Function:	Generation
Forecast Amount:	$359,507

DESCRIPTION:

During the 2010 outage, the steam turbine control valves on Trenton Unit #6 were disassembled and inspected. As a result, the Original Equipment Manufacturer (OEM) recommended that an overhaul of the control valves be completed in 2012; including replacement of three of the four valve stems and replacement of all sleeve bearings.

Summary of Related CI's +/- 2 years:
No projects for 2010,2011,2012, 2013 & 2014

JUSTIFICATION:

Justification Criteria: Thermal

Sub Criteria: Equipment Replacement

Why do this project?

Completing this project in accordance with OEM recommendations is necessary to ensure the control valves operate as designed and ensure the Unit is capable of operating under variable load requirements. Replacing the sleeve bearings will ensure that full valve stroke is maintained at full load and, therefore, ensure full Unit load is achieved when required.

Why do this project now?

Completing this work now will mitigate the risk of an unplanned outage to repair the control valves if they stick due to the condition of the stems.

Why do this project this way?

Replacing the valve stems that are out of or near OEM tolerances is the only option and will maintain reliable operation of the control valves.

CI Number : 41503 - TRE6 - Turbine Control Valve Refurbishment **Project Number**

Parent CI Number : -

Cost Centre : 345 - 345-Trenton unit 6 Capital **Budget Version** 2012 ACE Plan

Capital Item Accounts

Acct	Actv	Account	Activity	Forecast Amount	Amount	Variance
094		094 - Interest Capitalized		3,059	0	3,059
095		095-Thermal Regular Labour AO		14,819	0	14,819
095		095-Thermal & Hydro Contracts AO		[redacted]	0	[redacted]
001	010	001 - THERMAL Regular Labour	010 - SGP - Turbo Gen.Instal.	37,720	0	37,720
012	010	012 - Materials	010 - SGP - Turbo Gen.Instal.	60,200	0	60,200
013	010	013 - POWER PRODUCTION Contracts	010 - SGP - Turbo Gen.Instal.	[redacted]	0	[redacted]
001	085	001 - THERMAL Regular Labour	085 Design	20,000	0	20,000
028	085	028 - Consulting	085 Design	[redacted]	0	[redacted]
001	087	001 - THERMAL Regular Labour	087 Field Super.& Ops.	4,000	0	4,000
011	087	011 - Travel Expense	087 Field Super.& Ops.	500	0	500
013	087	013 - POWER PRODUCTION Contracts	087 Field Super.& Ops.	[redacted]	0	[redacted]
021	087	021 - Telephones	087 Field Super.& Ops.	150	0	150
041	087	041 - Meals & Entertainment	087 Field Super.& Ops.	250	0	250
			Total Cost:	359,507	0	359,507
			Original Cost:	269,000		

Capital Project Detailed Estimate

Location: Trenton
FP#: 41503
Title: Turbine Control Valve Refurbishment

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Item	Description	Unit	Quantity	Unit Estimate	Total Estimate	Cost Support Reference	Completed Similar Projects (FP#'s) Note 1
1	**001 Regular Labour**						
1.1	Mechanic	hr	448	60	$26,880		
1.2	Crane Driver	hr	224	35	7,840		
1.3	Utility	hr	100	30	3,000		
1.4	Generation Services Detailed Engineering	hr	[redacted]		20,000		
1.5	Project supervision	lot	1	4,000	4,000		
1.6							
				Sub-Total	61,720		
2	**012 Materials**						
2.1	Valve Stems	unit	[redacted]		13,500	NSPI Inventory Item	
2.2	Valve Bushings	unit			16,000	NSPI Inventory Item	
2.3	Sleeve Bearings	unit			2,400		
2.4	Needle Bearings	unit			1,300		
2.5	Internal Bypass valve	lot			7,000	NSPI Inventory Item	
2.6	Misc Spare parts and stores withdrawals	lot			20,000	NSPI Inventory Item	
2.7				Sub-Total	60,200		
3	**013 Power Production Contracts**						
3.1	Fundy Grinding	lot	1	[redacted]		April 30, 2010 Invoice	
3.2	Insulation removal and reinstallation	lot	1				
3.3	Non-Destructive Examination (NDE)	lot	1				
3.4	Project Supervision	lot	1				
3.5	Lunch Trailer	lot	1				
3.6							
				Sub-Total	[redacted]		
4	**028 Consulting**						
4.1	Technical Service Rep	lot	1	[redacted]			
4.2							
4.3							
4.4							
				Sub-Total	[redacted]		
5	**011 Travel Expenses**						
5.1	Travel	lot	1	500	500		
5.2							
5.3							
				Sub-Total	500		
6	**041 Meals and Entertainment**						
6.1	Meals and entertainment	lot	1	400	400		
6.2							
6.3							
				Sub-Total	400		
7	**Misc**						
7.1							
7.2							
7.3							
				Sub-Total			
8	**094 Interest Capitalized**						
8.1	Interested Capitalized				3,059		
8.2							
8.3							
				Sub-Total	3,059		
8	**095 Administrative Overhead**						
8.1	Thermal Regular Labour AO				14,819		
8.2	Thermal and hydro Contracts AO				[redacted]		
8.3					-		
				Sub-Total	[redacted]		
Project Cost Estimate				**Total**	**$359,508**		
9	Original Cost						
9.1					**$269,000**		

Note 1: Reference to "Completed similar projects (FP#'s)" is to be provided when the item estimate is based on work of similar scope for a recently completed project

TRE Turbine Control Valve Refurbishment
Summary of Alternatives & Assumptions

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Budget Year :	**2012**	**Date :**	**20-Oct-11**
Division :	Power Production	**CI Number:**	41503
Department :	Trenton	**Project No. :**	
Originator :			

	Alternative	After Tax WACC	PV of EVA / NPV	Rank	IRR	Disc Pay
A	Refurbish Control Valves	6.67%	148,706	1	38.14%	2.5 years
B	Test 2	6.67%	0	2	#NUM!	0.0 years
C	Test 3	6.67%	0	2	#NUM!	0.0 years
D	Test 4	6.67%	0	2	#NUM!	0.0 years

Recommendation :

Based on a positive NPV, it is recommended that the control valves be refurbished.

Assumptions

Incremental replacement energy costs and annual operating costs in the years following 2013 are escalated at 2% annually.

Calculations:
Total annual avoided cost = [Replacement energy costs] + [Avoided unplanned repair costs]

Avoided replacement energy cost = [Incremental replacement energy cost] x [Quantity of predicted annual unit outages / de-ratings] x [capacity factor] x [Probability of failure] x [Derating/outage] x [Duration of Derating]

Avoided unplanned repair costs = [cost of Labour and materials in event of failure] x [Probability of failure] x [quantity of predicted annual unit outages / de-ratings]

Calculation of probability of failure in Year 2

The probability of the unit failing in year 2 is: (Probability of unit not failing in year 1) x (probability the unit will fail in year 2 if no failure accured in year 1)

Example: Refurbish Control Valves

1	
-25%	Minus the Probability of failure in year 1
75%	Probability control valve does not fail in year 1
x	
50%	Probability of a control valve failing in year 2 if no failure occurs in year 1
38%	**Probability of a control valve failing in year 2**

Avoided Cost Calculations

Budget Year :	2012	Date :	20-Oct-11
Division :	Power Production	CI Number:	41503
Department :	Trenton	Project No.	
Originator :			

Refurbish Control Valves	
Capital Cost	$ 359,507.00
Avoided Replacement Energy costs (2012) =	[redacted] MWh x 1 outages x 90% x 25% x [redacted] MW x 96 h = $66,029
Avoided Unplanned Repair Costs (2012)	$ 434,307.00 x 25% x 1 = $ 108,577
Total Annual Avoided costs	$174,605.92
Avoided Replacement Energy costs (2013) =	[redacted] MWh x 1 outages x 90% x 38% x [redacted] MW x 96 h = $99,044
Avoided Unplanned Repair Costs (2013)	$ 442,993.14 x 38% x 1 = $ 166,122
Total Annual Avoided costs	$ 265,166.19

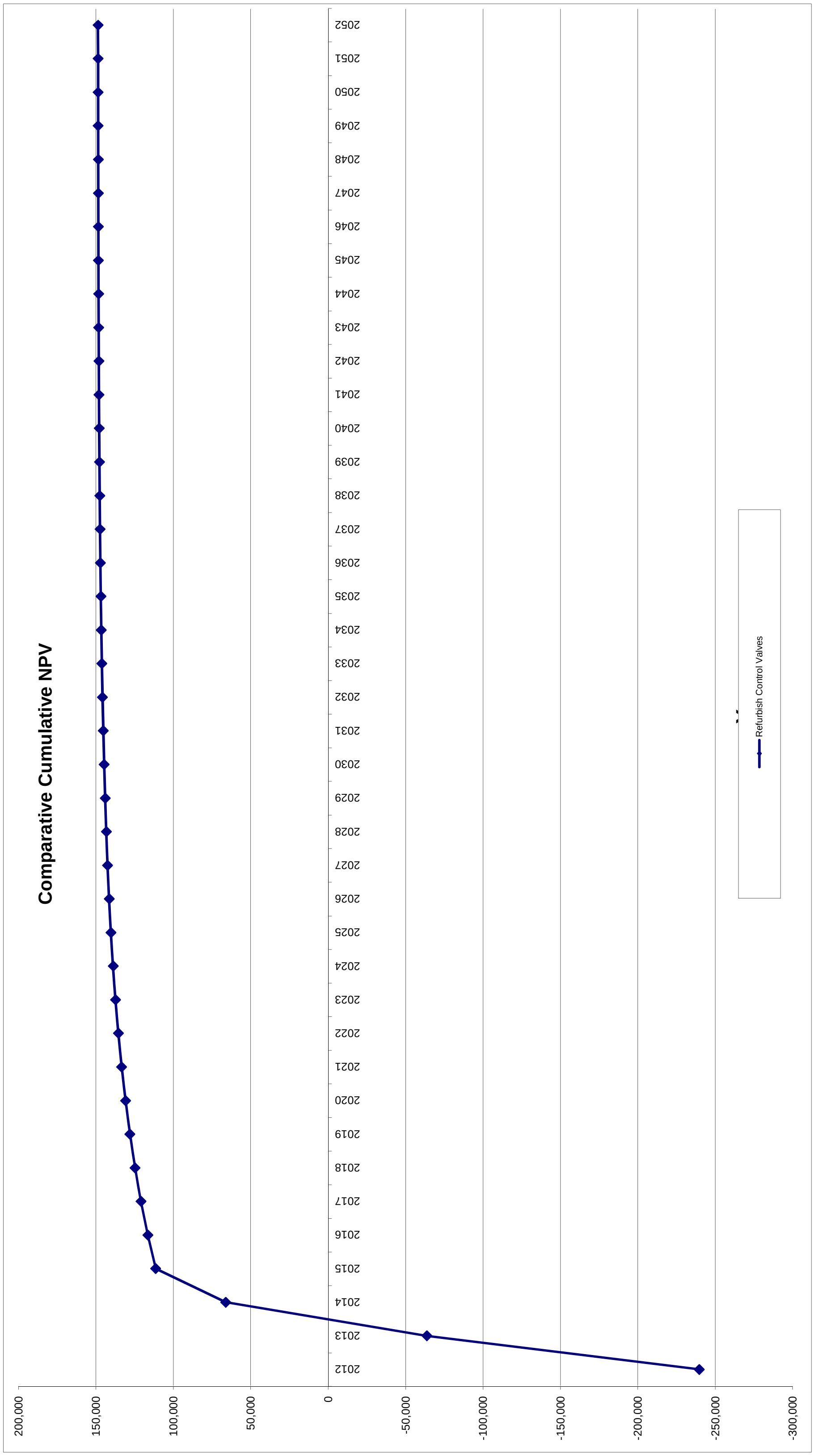
Test 2	
Capital Cost	
Avoided Replacement Energy costs (2012) =	
Avoided Unplanned Repair Costs (2012)	
Total Annual Avoided costs	
Avoided Replacement Energy costs (2013) =	
Avoided Unplanned Repair Costs (2013)	
Total Annual Avoided costs	

Test 3	
Capital Cost	
Avoided Replacement Energy costs (2012) =	
Avoided Unplanned Repair Costs (2012)	
Total Annual Avoided costs	
Avoided Replacement Energy costs (2013) =	
Avoided Unplanned Repair Costs (2013)	
Total Annual Avoided costs	

Test 4	
Capital Cost	
Avoided Replacement Energy costs (2012) =	
Avoided Unplanned Repair Costs (2012)	
Total Annual Avoided costs	
Avoided Replacement Energy costs (2013) =	
Avoided Unplanned Repair Costs (2013)	
Total Annual Avoided costs	

TRE Turbine Control Valve Refurbishment
Refurbish Control Valves

Year	Total Revenue	Operating Costs	Capital	CCA	UCC	CFBT	Applicable Taxes	CFAT	Discount Factor	PV of CF	CNPV
2012	-	174,606	(359,507)	14,380	345,127	(184,901)	(54,761)	(239,663)	1	(239,663)	(239,663)
2013	-	265,166	-	27,610	317,517	265,166	(77,366)	187,800	1	176,057	(63,606)
2014	-	202,852	-	25,401	292,115	202,852	(55,060)	147,792	1	129,887	66,281
2015	-	68,970	-	23,369	268,746	68,970	(14,136)	54,834	1	45,177	111,459
2016	-	-	-	21,500	247,246	-	6,622	6,622	1	5,115	116,574
2017	-	-	-	19,780	227,467	-	6,132	6,132	1	4,440	121,013
2018	-	-	-	18,197	209,269	-	5,641	5,641	1	3,829	124,843
2019	-	-	-	16,742	192,528	-	5,190	5,190	1	3,303	128,145
2020	-	-	-	15,402	177,126	-	4,775	4,775	1	2,848	130,994
2021	-	-	-	14,170	162,956	-	4,393	4,393	1	2,457	133,450
2022	-	-	-	13,036	149,919	-	4,041	4,041	1	2,119	135,569
2023	-	-	-	11,994	137,926	-	3,718	3,718	0	1,827	137,397
2024	-	-	-	11,034	126,891	-	3,421	3,421	0	1,576	138,973
2025	-	-	-	10,151	116,740	-	3,147	3,147	0	1,359	140,332
2026	-	-	-	9,339	107,401	-	2,895	2,895	0	1,172	141,505
2027	-	-	-	8,592	98,809	-	2,664	2,664	0	1,011	142,516
2028	-	-	-	7,905	90,904	-	2,450	2,450	0	872	143,388
2029	-	-	-	7,272	83,632	-	2,254	2,254	0	752	144,140
2030	-	-	-	6,691	76,941	-	2,074	2,074	0	649	144,789
2031	-	-	-	6,155	70,786	-	1,908	1,908	0	560	145,348
2032	-	-	-	5,663	65,123	-	1,755	1,755	0	483	145,831
2033	-	-	-	5,210	59,913	-	1,615	1,615	0	416	146,247
2034	-	-	-	4,793	55,120	-	1,486	1,486	0	359	146,606
2035	-	-	-	4,410	50,711	-	1,367	1,367	0	310	146,916
2036	-	-	-	4,057	46,654	-	1,258	1,258	0	267	147,183
2037	-	-	-	3,732	42,921	-	1,157	1,157	0	230	147,413
2038	-	-	-	3,434	39,488	-	1,064	1,064	0	199	147,612
2039	-	-	-	3,159	36,329	-	979	979	0	171	147,783
2040	-	-	-	2,906	33,422	-	901	901	0	148	147,931
2041	-	-	-	2,674	30,749	-	829	829	0	127	148,058
2042	-	-	-	2,460	28,289	-	763	763	0	110	148,168
2043	-	-	-	2,263	26,026	-	702	702	0	95	148,263
2044	-	-	-	2,082	23,944	-	645	645	0	82	148,344
2045	-	-	-	1,915	22,028	-	594	594	0	71	148,415
2046	-	-	-	1,762	20,266	-	546	546	0	61	148,476
2047	-	-	-	1,621	18,645	-	503	503	0	52	148,528
2048	-	-	-	1,492	17,153	-	462	462	0	45	148,573
2049	-	-	-	1,372	15,781	-	425	425	0	39	148,612
2050	-	-	-	1,262	14,518	-	391	391	0	34	148,646
2051	-	-	-	1,161	13,357	-	360	360	0	29	148,675
2052	-	-	-	1,069	12,288	-	407	407	0	31	148,706
Total	-	711,594	(359,507)	347,219	4,172,769	352,087	(121,789)	230,298	15	148,706	5,148,433


Comparative Cumulative NPV
Refurbish Control Valves

CI Number: 41508

Title: **TRE6 - Turbine/Generator Fire Protection**

Start Date: 2012/05
Final Cost Date: 2012/11
Function: Generation
Forecast Amount: $347,079

DESCRIPTION:

This project includes the addition of a fixed fire protection system for the Unit #6 steam turbine and generator at the Trenton Generating Station. At the time of original construction, the fire protection infrastructure was adequate, but a recent risk analysis identified that existing fire protection around the turbine generator no longer meets current industry standards. Construction will be similar to work undertaken in the Lingan Generating Station.

Summary of Related CI's +/- 2 years:
2010 CI 40483 TRE U&U Burner Front Fire Protection $55,252
2011 CI 40444 TRE6 Burner Front Fire Protection $56,915
2012 CI 41524 TRE6 Motor Control Centre (MCC) $173,605
2012 CI 41527 TRE6 4kV Switchgear Room Fire Protection $151,152

JUSTIFICATION:

Justification Criteria: Health & Safety

Why do this project?

In the recent assessment of fire protection systems at all NSPI thermal plants, the highest risk items are associated with the turbine generator area of the plants. This risk is best mitigated by applying a fixed fire protection system around the equipment in this area as well as drainage for hydraulic oils and lubricants. A system of similar design was successfully installed at LIN Unit #4 in 2009 and LIN Unit #1 in 2010. The system design and construction will serve as a model for applying a similar solution for this project.

Why do this project now?

As a result of recent inspections, NSPI's insurance providers have recommended the need to introduce additional fire system risk-control measures. NSPI believes these modifications are important now as the plant's age and a staged installation with one unit at a time is appropriate to reduce risk in the long term. Unit #6 is scheduled for a maintenance outage in 2012 which will facilitate installation of fire suppression equipment.

Why do this project this way?

The benchmark study used for assessing loss control practices was predicated on fire protection practices, NFPA 850 and FM DS7-1 01. Although they are recommended practices, they have become industry guidelines, widely used by insurers in risk assessments for power generation facilities. The new fire protection system will be integrated into the current system that exists at the plant.

CI Number : 41508 - TRE6 - Turbine/Generator Fire Protection **Project Number**

Parent CI Number : -

Cost Centre : 345 - 345-Trenton unit 6 Capital **Budget Version** 2012 ACE Plan

Capital Item Accounts

Acct	Actv	Account	Activity	Forecast Amount	Amount	Variance
094		094 - Interest Capitalized		4,884	0	4,884
095		095-Thermal Term Labour AO		10,564	0	10,564
095		095-Thermal & Hydro Contracts AO		[redacted]	0	[redacted]
095		095-Thermal Regular Labour AO		9,604	0	9,604
095		095-Thermal Overtime Labour AO		384	0	384
001	010	001 - THERMAL Regular Labour	010 - SGP - Turbo Gen.Instal.	32,000	0	32,000
002	010	002 - THERMAL Overtime Labour	010 - SGP - Turbo Gen.Instal.	3,200	0	3,200
004	010	004 - THERMAL Term Labour	010 - SGP - Turbo Gen.Instal.	44,000	0	44,000
011	010	011 - Travel Expense	010 - SGP - Turbo Gen.Instal.	3,000	0	3,000
012	010	012 - Materials	010 - SGP - Turbo Gen.Instal.	[redacted]	0	[redacted]
013	010	013 - POWER PRODUCTION Contracts	010 - SGP - Turbo Gen.Instal.	[redacted]	0	[redacted]
021	010	021 - Telephones	010 - SGP - Turbo Gen.Instal.	500	0	500
041	010	041 - Meals & Entertainment	010 - SGP - Turbo Gen.Instal.	1,500	0	1,500
001	085	001 - THERMAL Regular Labour	085 Design	6,000	0	6,000
001	087	001 - THERMAL Regular Labour	087 Field Super.& Ops.	2,000	0	2,000
			Total Cost:	347,079	0	347,079
			Original Cost:			

Capital Project Detailed Estimate

Location: Trenton
FP#: 41508
Title: TRE6 - Turbine/Generator Fire Protection

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Item	Description	Unit	Quantity	Unit Estimate	Total Estimate	Cost support Reference	Completed Similar Projects (FP#'s) Note 1
1	**001 Regular Labour**						
1.1	Regular labour	hr	[redacted]	[redacted]	$32,000		
1.2	Internal Engineering	hr	[redacted]	[redacted]	6,000		
1.3	internal supervisor	hr	[redacted]	[redacted]	2,000		
1.4	Term labour	hr	[redacted]	[redacted]	44,000		
1.5					-		
				Sub-Total	84,000		40148, 40427
2	**012 Materials**						
2.1	Materials (Piping/Sprinkler heads, etc)	lot	1	[redacted]	[redacted]		
				Sub-Total	[redacted]		40148, 40427
3	**013 Power Production Contracts**						
3.1	Installation/Commissioning	lot	1	[redacted]	[redacted]	Quote T-1112 see note 2	
3.2	Contingency for masonry, carpentry work, hoses				[redacted]		40148, 40427
				Sub-Total	[redacted]		
4	**002 Overtime Labour**						
4.1	Labour OT	hr	40	80.00	3,200		
4.2							
				Sub-Total	3,200		
5	**011 Travel Expenses**						
5.1	Travel	lot	1	3,000	3,000		
5.2							
5.3							
				Sub-Total	3,000		
6	**Miscellaneous**						
6.1	Telephones	lot	1	500	500		
6.2	Meals and entertainment	lot	1	1,500	1,500		
6.3					-		
				Sub-Total	2,000		
7	**094 Interest Capitalized**						
7.1	Interest Capitalized				4,884		
				Sub-Total	4,884		
8	**095 Administrative Overhead**						
8.1	Thermal Regular Labour AO				9,604		
8.2	Thermal Term Labour AO				10,564		
8.3	Thermal OT labour AO				384		
8.4	Thermal and Hydro Contracts AO				[redacted]		
				Sub-Total	[redacted]		
Project Cost Estimate				**Total**	$347,079		
10	Original Cost						

Note 1: Reference to "Completed similar projects (FP#'s)" is to be provided when the item estimate is based on work of similar scope for a recently completed project

Note 2: Quote T1112 represents the cost for two units, whereas this project only includes one unit. Quote is for Lingan Units 2 and 3 but is used as a basis for this estimate for Trenton Unit #6 as scope of work is similar.

CI Number: 41524

Title: **TRE6 – Motor Control Center (MCC) Room Fire Protection**

Start Date: 2012/04
Final Cost Date: 2012/11
Function: Generation
Forecast Amount: $173,605

DESCRIPTION:

This project includes the addition of a fire protection system for the Unit #6 Motor Control Center (MCC) Room at the Trenton Generating Station. At the time of original construction, the fire protection infrastructure was adequate, but a recent risk analysis identified that existing fire protection in the MCC Room no longer meets current industry standards.

Summary of Related CI's +/- 2 years:
2010 CI 40483 TRE U&U Burner Front Fire Protection $55,252
2011 CI 40444 TRE6 Burner Front Fire Protection $56,915
2012 CI 41527 TRE6 4kV Switchgear Room Fire Protection $151,152
2012 CI 41508 – TRE6 – Turbine / Generator Fire Protection $347,079

JUSTIFICATION:

Justification Criteria: Health & Safety

Why do this project?

In the recent assessment of fire protection systems at all NSPI thermal plants, the Motor Control Center (MCC) Room for Unit #6 was identified as an area requiring additional fire suppression.

Why do this project now?

As a result of recent inspections, NSPI's insurance providers have recommended the need to introduce additional fire system risk-control measures. NSPI believes these modifications are important now as the plants age and a staged installation plan is appropriate to reduce risk in the long term. Unit #6 is scheduled for a maintenance outage in 2012, which will facilitate installation of fire suppression equipment.

Why do this project this way?

The benchmark study used for assessing loss control practices was predicated on fire protection practices, NFPA 850 and FM DS7-1 01. Although they are recommended practices, they have become industry guidelines, widely used by insurers in risk assessments for power generation facilities. The new fire protection system will be integrated into the current system that exists at the plant.

CI Number: 41527

Title:	**TRE6 – 4 kV Switchgear Room Fire Protection**
Start Date:	2012/06
Final Cost Date:	2012/10
Function:	Generation
Forecast Amount:	$151,152

DESCRIPTION:

This project includes the addition of a fire protection system for the Unit #6 4kV Switchgear Room at the Trenton Generating Station. At the time of original construction, the fire protection infrastructure was adequate, but a recent risk analysis identified that existing fire protection in the Switchgear Room no longer meets current industry standards.

Summary of Related CI's +/- 2 years:
2010 CI 40483 TRE U&U Burner Front Fire Protection $55,252
2011 CI 40444 TRE6 Burner Front Fire Protection $56,915
2012 CI 41524 TRE6 Motor Control Center (MCC) Room Fire Protection $173,605
2012 CI 41508 – TRE6 – Turbine / Generator Fire Protection $347,079

JUSTIFICATION:

Justification Criteria: Health & Safety

Why do this project?

In the recent assessment of fire protection systems at all NSPI thermal plants, the 4kV Switchgear Room for Unit #6 was identified as an area requiring additional fire suppression.

Why do this project now?

As a result of recent inspections, NSPI's insurance providers have recommended the need to introduce additional fire system risk-control measures. NSPI believes these modifications are important now as the plants age and a staged installation plan is appropriate to reduce risk in the long term. Unit #6 is scheduled for a maintenance outage in 2012, which will facilitate installation of fire suppression equipment.

Why do this project this way?

The benchmark study used for assessing loss control practices was predicated on fire protection practices, NFPA 850 and FM DS7-1 01. Although they are recommended practices, they have become industry guidelines, widely used by insurers in risk assessments for power generation facilities. The new fire protection system will be integrated into the current system that exists at the plant.

CI Number: 41584

Title: **POT - Vacuum Pump Replacement**

Start Date: 2012/04
Final Cost Date: 2012/11
Function: Generation
Forecast Amount: $332,994

DESCRIPTION:

The Point Tupper Unit 2 air extraction system (condenser vacuum) was constructed utilizing Allis Chalmer's Ro-Flo vacuum pumps. Air and gases are compressed by being trapped between blades in pump rotor segments which become smaller as the segment rotates from its position at maximum blade projection to the point where the segment is open to the pumps' discharge port.

This project consists of replacing two of the existing vacuum pumps at the Point Tupper Generating Station with liquid-ring vacuum pumps. The existing pumps are original to the plant (installed in 1976) and have reached the end of their useful life.

Summary of Related CI's +/- 2 years:
No projects for 2010,2011,2012, 2013 & 2014

JUSTIFICATION:

Justification Criteria: Thermal

Sub Criteria: Equipment Replacement

Why do this project?

The current operating logic for the existing pumps involves running one pump continuously and having a second pump as a backup. The pump that is normally running is now only able to achieve full vacuum once it is has been in operation for approximately one half hour. If the other pump is operating to achieve full vacuum, there is no reserve vacuum pump capacity available. Loss of the vacuum pumps could result in either a major increase in turbine back pressure (and associated efficiency loss), or the complete loss of generation due to an inability to maintain condenser vacuum. In order to maintain the availability and reliability of Unit #2, the air extraction system must be maintained at a reliable service condition. Replacing two of the existing vacuum pumps will allow the Unit to continue operating reliably.

Why do this project now?

The current pumps have reached the end of their useful lives and must be replaced. In addition, spare parts are no longer available for these pumps. Completing the project now will mitigate the risk of unplanned outage due to vacuum pump failure.

Why do this project this way?

Replacing the existing pumps is the most feasible option. Rebuilding the existing pumps is no longer an option as parts are no longer available and the existing pumps are obsolete.

CI Number : 41584 - POT Vacuum Pump Replacement **Project Number**

Parent CI Number : -

Cost Centre : 351 - 351-Pt.Tupper Admin./Capital **Budget Version** 2012 ACE Plan

Capital Item Accounts

Acct	Actv	Account	Activity	Forecast Amount	Amount	Variance
001		001 - THERMAL Regular Labour		22,000	0	22,000
002		002 - THERMAL Overtime Labour		10,000	0	10,000
004		004 - THERMAL Term Labour		[redacted]	0	[redacted]
011		011 - Travel Expense		500	0	500
012		012 - Materials		[redacted]	0	[redacted]
013		013 - POWER PRODUCTION Contracts		[redacted]	0	[redacted]
028		028 - Consulting		5,000	0	5,000
041		041 - Meals & Entertainment		500	0	500
094		094 - Interest Capitalized		4,321	0	4,321
095		095-Thermal Regular Labour AO		5,282	0	5,282
095		095-Thermal Overtime Labour AO		1,201	0	1,201
095		095-Thermal & Hydro Contracts AO		[redacted]	0	[redacted]
095		095-Thermal Term Labour AO		[redacted]	0	[redacted]
			Total Cost:	332,994	0	332,994
			Original Cost:	64,059		

Capital Project Detailed Estimate

Location: Point Tupper
FP#: 41584
Title: POT - Vacuum Pump Replacement

Item	Description	Unit	Quantity	Unit Estimate	Total Estimate	Cost Support Reference	Completed Similar Projects (FP#'s) Note 1
1	**001 Regular Labour, 002 Ovetime Labour & 004 Term Labour**						
1.1	Mechanical Labour	Lot	1	22,000	$22,000		
1.2	Ovetime Labour	Lot	1	10,000	10,000		
1.3	Term Labour	Lot	1	[redacted]	[redacted]		
				Sub-Total	[redacted]		29882
2	**012 Materials**						
2.1	Replacement pumps	Lot	1	[redacted]	[redacted]		29882
2.2	Misc. and consumables	Lot	1	[redacted]	[redacted]		
				Sub-Total	[redacted]		
3	**013 Power Production Contracts**						
3.1	Contractor Labour for installation	Lot	1	[redacted]	[redacted]		29882
				Sub-Total	[redacted]		
4	**028 Consulting**						
4.1	Engineering	Lot	1	5,000	5,000		
				Sub-Total	5,000		
5	**011 Travel Expenses**						
5.1	Travel	Lot	1	500	500		
5.2					-		
5.3					-		
				Sub-Total	500		
6	**041 Meals and Entertainment**						
6.1	Meals/expenses	Lot	1	500	500		
				Sub-Total	500		
7	**094 Interest Capitalized**						
7.1	Interest	Lot	1	4,321	4,321		
				Sub-Total	4,321		
8	**095 Administrative Overhead**						
8.1	Overhead	Lot	1	15,674	15,674		
				Sub-Total	15,674		
Project Cost Estimate				**Total**	**$332,994**		
9	Original Cost				$64,058		
9.1							

Note 1: Reference to "Completed similar projects (FP#'s)" is to be provided when the item estimate is based on work of similar scope for a recently completed project

POT Replace Vacuum Pumps
Summary of Alternatives & Assumptions

Budget Year :	**2012**	**Date :**	**20-Oct-11**
Division :	Power Production	**CI Number:**	41584
Department :	Point Tupper	**Project No. :**	
Originator :			

	Alternative	After Tax WACC	PV of EVA / NPV	Rank	IRR	Disc Pay
A	Replace Vacuum Pumps	6.67%	23,432	1	9.00%	9.9 years
B	Test 2	6.67%	0	2	#NUM!	0.0 years
C	Test 3	6.67%	0	2	#NUM!	0.0 years
D	Test 4	6.67%	0	2	#NUM!	0.0 years

Recommendation :

Based on a positive NPV, it is recommended that the Vacuum Pumps be replaced

Assumptions

Incremental replacement energy costs and annual operating costs in the years following 2013 are escalated at 2% annually.

Calculations:
Total annual avoided cost = [Replacement energy costs] + [Avoided unplanned repair costs]

Avoided replacement energy cost = [Incremental replacement energy cost] x [Quantity of predicted annual unit outages / de-ratings] x [capacity factor] x [Probability of failure] x [Derating/outage] x [Duration of Derating]

Avoided unplanned repair costs = [cost of Labour and materials in event of failure] x [Probability of failure] x [quantity of predicted annual unit outages / de-ratings]

Calculation of probability of failure in Year 2

The probability of the unit failing in year 2 is: (Probability of unit not failing in year 1) x (probability the unit will fail in year 2 if no failure accured in year 1)

Example: Replace Vacuum Pumps

1	
-25%	Minus the Probability of failure in year 1
75%	Probability that the vacuum pump does not fail in year 1
x	
26%	Probability of vacuump failing in year 2 if no failure occurs in year 1
20%	**Probability of the vacuum pump failing in year 2**

Avoided Cost Calculations

Budget Year :	2012	Date :	20-Oct-11
Division :	Power Production	CI Number:	41584
Department :	Point Tupper	Project No.	
Originator :			

Replace Vacuum Pumps	
Capital Cost	$ 332,994.23
Avoided Replacement Energy costs (2012) =	[redacted] MWh x 2 outages x 90% x 25% x [redacted] MW x 48 h = $8,637
Avoided Unplanned Repair Costs (2012)	$ 209,377.12 x 25% x 2 = $ 104,689
Total Annual Avoided costs	$113,325.79
Avoided Replacement Energy costs (2013) =	[redacted] MWh x 2 outages x 90% x 20% x [redacted] MW x 48 h = $6,737
Avoided Unplanned Repair Costs (2013)	$ 214,423.41 x 20% x 2 = $ 83,625
Total Annual Avoided costs	$ 90,362.17

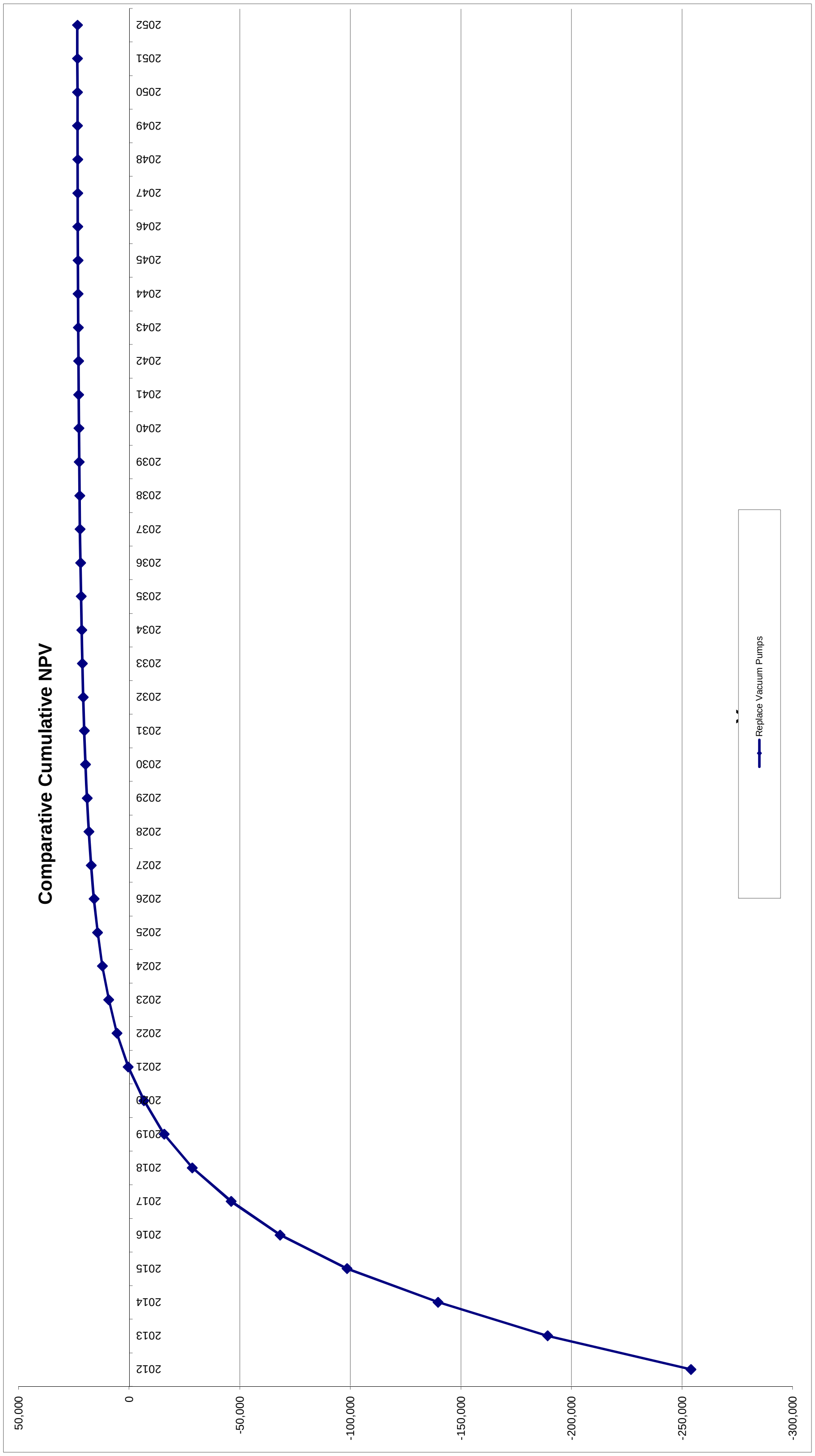
Test 2	
Capital Cost	
Avoided Replacement Energy costs (2012) =	
Avoided Unplanned Repair Costs (2012)	
Total Annual Avoided costs	
Avoided Replacement Energy costs (2013) =	
Avoided Unplanned Repair Costs (2013)	
Total Annual Avoided costs	

Test 3	
Capital Cost	
Avoided Replacement Energy costs (2012) =	
Avoided Unplanned Repair Costs (2012)	
Total Annual Avoided costs	
Avoided Replacement Energy costs (2013) =	
Avoided Unplanned Repair Costs (2013)	
Total Annual Avoided costs	

Test 4	
Capital Cost	
Avoided Replacement Energy costs (2012) =	
Avoided Unplanned Repair Costs (2012)	
Total Annual Avoided costs	
Avoided Replacement Energy costs (2013) =	
Avoided Unplanned Repair Costs (2013)	
Total Annual Avoided costs	

POT Replace Vacuum Pumps
Replace Vacuum Pumps

Year	Total Revenue	Operating Costs	Capital	CCA	UCC	CFBT	Applicable Taxes	CFAT	Discount Factor	PV of CF	CNPV
2012	-	113,326	(332,994)	13,320	319,674	(219,668)	(34,266)	(253,934)	1	(253,934)	(253,934)
2013	-	90,362	-	25,574	294,100	90,362	(21,205)	69,157	1	64,833	(189,101)
2014	-	71,096	-	23,528	270,572	71,096	(14,793)	56,303	1	49,482	(139,619)
2015	-	62,621	-	21,646	248,926	62,621	(12,702)	49,919	1	41,128	(98,491)
2016	-	47,876	-	19,914	229,012	47,876	(8,708)	39,169	1	30,253	(68,238)
2017	-	36,055	-	18,321	210,691	36,055	(5,498)	30,557	1	22,126	(46,112)
2018	-	30,038	-	16,855	193,836	30,038	(4,087)	25,952	1	17,616	(28,496)
2019	-	21,962	-	15,507	178,329	21,962	(2,001)	19,961	1	12,702	(15,794)
2020	-	15,810	-	14,266	164,063	15,810	(479)	15,332	1	9,146	(6,647)
2021	-	12,465	-	13,125	150,938	12,465	205	12,669	1	7,086	438
2022	-	8,702	-	12,075	138,863	8,702	1,046	9,748	1	5,111	5,549
2023	-	5,979	-	11,109	127,754	5,979	1,590	7,569	0	3,721	9,270
2024	-	4,460	-	10,220	117,533	4,460	1,786	6,245	0	2,878	12,148
2025	-	2,968	-	9,403	108,131	2,968	1,995	4,963	0	2,144	14,291
2026	-	1,943	-	8,650	99,480	1,943	2,079	4,022	0	1,629	15,920
2027	-	1,370	-	7,958	91,522	1,370	2,043	3,412	0	1,295	17,215
2028	-	867	-	7,322	84,200	867	2,001	2,868	0	1,021	18,236
2029	-	540	-	6,736	77,464	540	1,921	2,460	0	821	19,057
2030	-	359	-	6,197	71,267	359	1,810	2,169	0	678	19,735
2031	-	216	-	5,701	65,566	216	1,701	1,916	0	562	20,297
2032	-	127	-	5,245	60,320	127	1,587	1,714	0	471	20,769
2033	-	-	-	4,826	55,495	-	1,496	1,496	0	386	21,154
2034	-	-	-	4,440	51,055	-	1,376	1,376	0	332	21,487
2035	-	-	-	4,084	46,971	-	1,266	1,266	0	287	21,773
2036	-	-	-	3,758	43,213	-	1,165	1,165	0	247	22,021
2037	-	-	-	3,457	39,756	-	1,072	1,072	0	213	22,234
2038	-	-	-	3,180	36,576	-	986	986	0	184	22,418
2039	-	-	-	2,926	33,650	-	907	907	0	159	22,577
2040	-	-	-	2,692	30,958	-	835	835	0	137	22,713
2041	-	-	-	2,477	28,481	-	768	768	0	118	22,831
2042	-	-	-	2,278	26,202	-	706	706	0	102	22,933
2043	-	-	-	2,096	24,106	-	650	650	0	88	23,021
2044	-	-	-	1,929	22,178	-	598	598	0	76	23,097
2045	-	-	-	1,774	20,404	-	550	550	0	65	23,162
2046	-	-	-	1,632	18,771	-	506	506	0	56	23,218
2047	-	-	-	1,502	17,270	-	466	466	0	49	23,267
2048	-	-	-	1,382	15,888	-	428	428	0	42	23,309
2049	-	-	-	1,271	14,617	-	394	394	0	36	23,345
2050	-	-	-	1,169	13,448	-	363	363	0	31	23,376
2051	-	-	-	1,076	12,372	-	334	334	0	27	23,403
2052	-	-	-	990	11,382	-	377	377	0	29	23,432
Total	-	529,142	(332,994)	321,612	3,865,034	196,148	(68,735)	127,414	15	23,432	(218,735)


Comparative Cumulative NPV
Replace Vacuum Pumps
50,000
0
-50,000
-100,000
-150,000
-200,000
-250,000
-300,000
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
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2051
2052

CI Number: 28645

Title: **TRE6 Turbine Controls Power Supply Replacement**

Start Date: 2012/03
Final Cost Date: 2012/11
Function: Generation
Forecast Amount: $321,691

DESCRIPTION:

This project includes replacement of the power supplies in the control system for the Unit #6 turbine. The control system power supplies have reached the age where replacement is required.

Summary of Related CI's +/- 2 years:
No projects for 2010,2011,2012, 2013 & 2014

JUSTIFICATION:

Justification Criteria: Thermal

Sub Criteria: Equipment Replacement

Why do this project?

Replacing the control system power supplies will mitigate the risk of an unplanned failure and potential loss of generation.

Why do this project now?

These components have been in service since 1991 and are beyond the Original Equipment Manufacturer (OEM) -recommend age for replacement. To mitigate the risk of unplanned failures, the power supplies must be replaced now.

Why do this project this way?

Replacement of the power supplies is the only option.

CI Number : 28645-S795 - TRE6 - Turbine Controls Power Supplies Replacement **Project Number** S795

Parent CI Number : -

Cost Centre : 345 - 345-Trenton unit 6 Capital **Budget Version** 2012 ACE Plan

Capital Item Accounts

Acct	Actv	Account	Activity	Forecast Amount	Amount	Variance
094		094 - Interest Capitalized		9,584	0	9,584
095		095-Thermal Overtime Labour AO		960	0	960
095		095-Thermal & Hydro Contracts AO		[redacted]	0	[redacted]
095		095-Thermal Regular Labour AO		3,457	0	3,457
001	011	001 - THERMAL Regular Labour	011 - SGP - Plant Control and Inst	9,600	0	9,600
002	011	002 - THERMAL Overtime Labour	011 - SGP - Plant Control and Inst	8,000	0	8,000
012	011	012 - Materials	011 - SGP - Plant Control and Inst	[redacted]	0	[redacted]
013	011	013 - POWER PRODUCTION Contracts	011 - SGP - Plant Control and Inst	[redacted]	0	[redacted]
001	085	001 - THERMAL Regular Labour	085 Design	2,400	0	2,400
011	085	011 - Travel Expense	085 Design	500	0	500
021	085	021 - Telephones	085 Design	500	0	500
041	085	041 - Meals & Entertainment	085 Design	1,000	0	1,000
001	087	001 - THERMAL Regular Labour	087 Field Super.& Ops.	2,400	0	2,400
028	087	028 - Consulting	087 Field Super.& Ops.	5,600	0	5,600
			Total Cost:	321,691	0	321,691
			Original Cost:	240,000		

Capital Project Detailed Estimate

Location: Trenton
FP#: 28645
Title: TRE6 Turbine Controls Power Supplies Upgrade

Item	Description	Unit	Quantity	Unit Estimate	Total Estimate	Cost Support Reference	Completed Similar Projects (FP#'s) Note 1
1	**001 Regular Labour**						
1.1	Electrical Labour	hr	240	40.00	$9,600		
1.2	Engineering	hr	[redacted]		2,400		
1.3	Supervisor	hr	40	60.00	2,400		
				Sub-Total	14,400		
2	**012 Materials**						
2.1	Power Supplies and Associated Parts	lot	1	[redacted]		March 7, 2011 quote attached	
2.2	Contingency	%	10				
2.3	Misc. parts / Materials	lot	1	11,034	11,034		
2.4							
				Sub-Total	[redacted]		
3	**013 Power Production Contracts**						
3.1	Technician - Hitachi	lot	[redacted]				
3.2	Contingency	%					
3.3							
				Sub-Total	[redacted]		
4	**002 Overtime Labour**						
4.1	Electrical Overtime	hr	100	80.00	8,000		
4.2							
4.3							
				Sub-Total	8,000		
5	**028 Consulting**						
5.1	External Engineering	hr	[redacted]		5,600		
5.2							
5.3							
				Sub-Total	5,600		
6	**Telephones & Meals and Entertainment**						
6.1	Telephones	lot	1	500	500		
6.2	Meals and Entertainment	lot	1	1,000	1,000		
6.3					-		
				Sub-Total	1,500		
7	**011 Travel Expenses**						
7.1	Travel expenses	lot	1	500	500		
7.2					-		
7.3					-		
				Sub-Total	500		
8	**094 Interest Capitalized**						
8.1	Interest	lot	1	9,584	9,584		
8.2							
8.3							
				Sub-Total	9,584		
9	**095 Administrative Overhead**						
9.1	AO	lot	1	[redacted]			
9.2					-		
9.3					-		
				Sub-Total	[redacted]		
Project Cost Estimate				**Total**	**$321,691**		
10	Original Cost						
10.1					$240,000		

Note 1: Reference to "Completed similar projects (FP#'s)" is to be provided when the item estimate is based on work of similar scope for a recently completed project

TRE Turbine Controls Power Supplies
Summary of Alternatives & Assumptions

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Budget Year :	**2012**	**Date :**	**29-Oct-11**
Division :	Power Production	**CI Number:**	28645
Department :	Trenton	**Project No. :**	
Originator :			

	Alternative	After Tax WACC	PV of EVA / NPV	Rank	IRR	Disc Pay
A	Replace Power Supplies	6.67%	815,640	1	#NUM!	0.0 years
B	Test 2	6.67%	0	2	#NUM!	0.0 years
C	Test 3	6.67%	0	2	#NUM!	0.0 years
D	Test 4	6.67%	0	2	#NUM!	0.0 years

Recommendation :

Based on a positive NPV, it is recommended that the power supplies be replaced

Assumptions

Incremental replacement energy costs and annual operating costs in the years following 2013 are escalated at 2% annually.

Calculations:
Total annual avoided cost = [Replacement energy costs] + [Avoided unplanned repair costs]

Avoided replacement energy cost = [Incremental replacement energy cost] x [Quantity of predicted annual unit outages / de-ratings] x [capacity factor] x [Probability of failure] x [Derating/outage] x [Duration of Derating]

Avoided unplanned repair costs = [cost of Labour and materials in event of failure] x [Probability of failure] x [quantity of predicted annual unit outages / de-ratings]

Calculation of probability of failure in Year 2

The probability of the unit failing in year 2 is: (Probability of unit not failing in year 1) x (probability the unit will fail in year 2 if no failure accured in year 1)

Example: **Replace Power Supplies**

1	
-30%	Minus the Probability of failure in year 1
70%	Probability that unit does not fail in year 1
x	
35%	Probability of unit failing in year 2 if no failure occurs in year 1
25%	**Actual probability of the unit failing in year 2**

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Avoided Cost Calculations

Budget Year :	2012	Date :	31-Oct-11
Division :	Power Production	CI Number:	28645
Department :	Trenton	Project No.	
Originator :			

Replace Power Supplies	
Capital Cost	$ 321,691.00
Avoided Replacement Energy costs (2012) =	[redacted] MWh x 1 outages x 90% x 30% x [redacted] MW x 480 h = $396,175
Avoided Unplanned Repair Costs (2012)	$ 404,000.00 x 30% x 1 = $ 121,200
Total Annual Avoided costs	$517,375
Avoided Replacement Energy costs (2013) =	[redacted] MWh x 1 outages x 90% x 24.5% x [redacted] MW x 480 h = $323,543
Avoided Unplanned Repair Costs (2013)	$ 420,169.60 x 24.5% x 1 = $ 102,942
Total Annual Avoided costs	$ 426,484

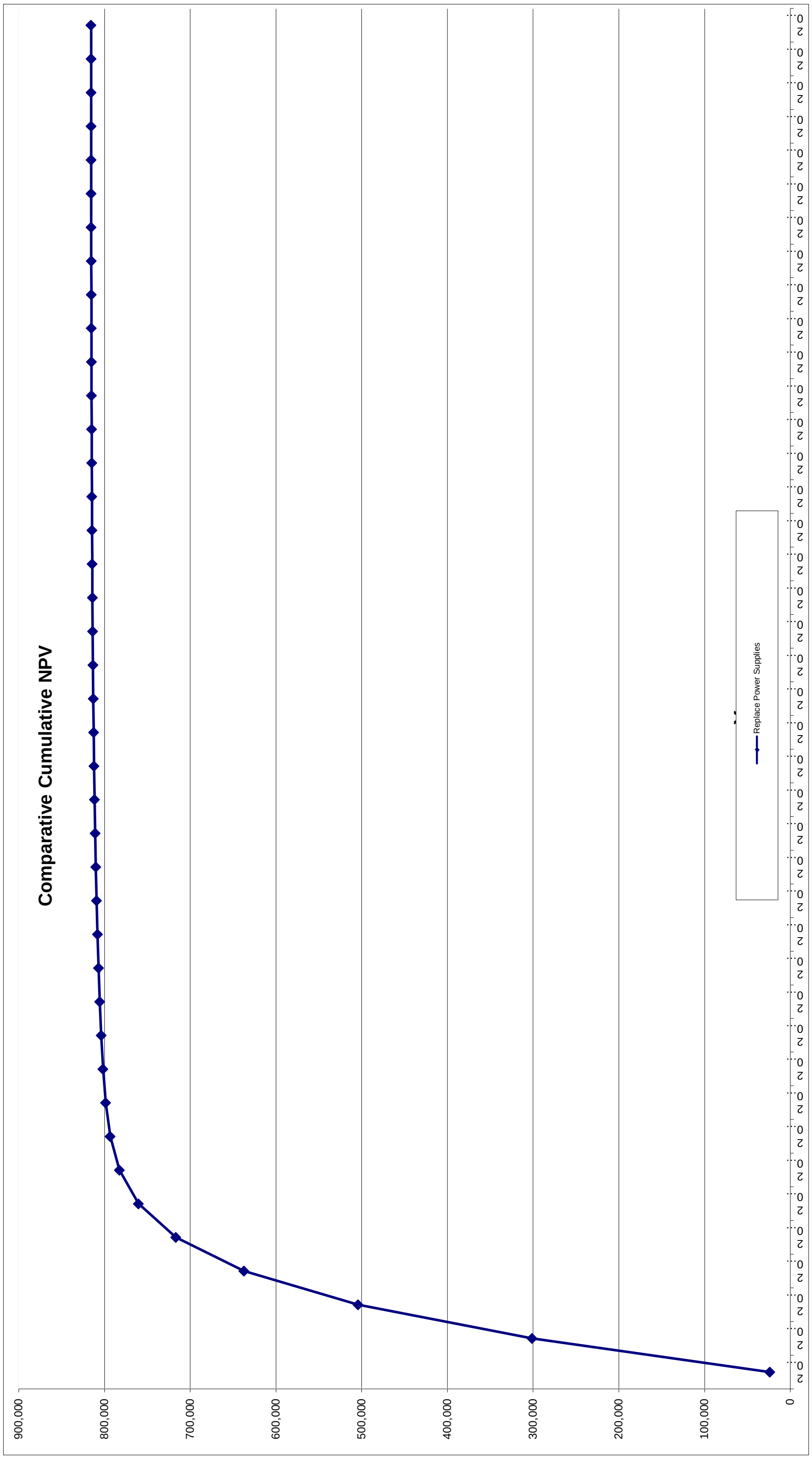
Test 2	
Capital Cost	
Avoided Replacement Energy costs (2012) =	
Avoided Unplanned Repair Costs (2012)	
Total Annual Avoided costs	
Avoided Replacement Energy costs (2013) =	
Avoided Unplanned Repair Costs (2013)	
Total Annual Avoided costs	

Test 3	
Capital Cost	
Avoided Replacement Energy costs (2012) =	
Avoided Unplanned Repair Costs (2012)	
Total Annual Avoided costs	
Avoided Replacement Energy costs (2013) =	
Avoided Unplanned Repair Costs (2013)	
Total Annual Avoided costs	

Test 4	
Capital Cost	
Avoided Replacement Energy costs (2012) =	
Avoided Unplanned Repair Costs (2012)	
Total Annual Avoided costs	
Avoided Replacement Energy costs (2013) =	
Avoided Unplanned Repair Costs (2013)	
Total Annual Avoided costs	

TRE Turbine Controls Power Supplies
Replace Power Supplies

Year	Total Revenue	Operating Costs	Capital	CCA	UCC	CFBT	Applicable Taxes	CFAT	Discount Factor	PV of CF	CNPV
2012	-	517,375	(321,691)	12,868	308,823	195,684	(171,787)	23,897	1	23,897	23,897
2013	-	426,484	-	24,706	284,117	426,484	(130,722)	295,763	1	277,269	301,166
2014	-	324,685	-	22,729	261,388	324,685	(93,651)	231,033	1	203,044	504,210
2015	-	224,620	-	20,911	240,477	224,620	(63,150)	161,470	1	133,035	637,245
2016	-	140,697	-	19,238	221,239	140,697	(37,690)	103,006	1	79,560	716,805
2017	-	79,322	-	17,699	203,540	79,322	(19,103)	60,219	1	43,603	760,408
2018	-	39,918	-	16,283	187,257	39,918	(7,327)	32,591	1	22,123	782,531
2019	-	17,734	-	14,981	172,276	17,734	(853)	16,880	1	10,742	793,273
2020	-	6,853	-	13,782	158,494	6,853	2,148	9,001	1	5,370	798,643
2021	-	2,259	-	12,680	145,814	2,259	3,230	5,489	1	3,070	801,713
2022	-	618	-	11,665	134,149	618	3,425	4,042	1	2,119	803,832
2023	-	135	-	10,732	123,417	135	3,285	3,420	0	1,681	805,513
2024	-	22	-	9,873	113,544	22	3,054	3,076	0	1,417	806,930
2025	-	2	-	9,084	104,460	2	2,815	2,818	0	1,217	808,147
2026	-	0	-	8,357	96,104	0	2,591	2,591	0	1,049	809,196
2027	-	-	-	7,688	88,415	-	2,383	2,383	0	905	810,101
2028	-	-	-	7,073	81,342	-	2,193	2,193	0	780	810,882
2029	-	-	-	6,507	74,835	-	2,017	2,017	0	673	811,555
2030	-	-	-	5,987	68,848	-	1,856	1,856	0	580	812,135
2031	-	-	-	5,508	63,340	-	1,707	1,707	0	501	812,636
2032	-	-	-	5,067	58,273	-	1,571	1,571	0	432	813,068
2033	-	-	-	4,662	53,611	-	1,445	1,445	0	372	813,440
2034	-	-	-	4,289	49,322	-	1,330	1,330	0	321	813,761
2035	-	-	-	3,946	45,376	-	1,223	1,223	0	277	814,038
2036	-	-	-	3,630	41,746	-	1,125	1,125	0	239	814,277
2037	-	-	-	3,340	38,407	-	1,035	1,035	0	206	814,483
2038	-	-	-	3,073	35,334	-	952	952	0	178	814,661
2039	-	-	-	2,827	32,507	-	876	876	0	153	814,814
2040	-	-	-	2,601	29,907	-	806	806	0	132	814,946
2041	-	-	-	2,393	27,514	-	742	742	0	114	815,060
2042	-	-	-	2,201	25,313	-	682	682	0	98	815,159
2043	-	-	-	2,025	23,288	-	628	628	0	85	815,244
2044	-	-	-	1,863	21,425	-	578	578	0	73	815,317
2045	-	-	-	1,714	19,711	-	531	531	0	63	815,380
2046	-	-	-	1,577	18,134	-	489	489	0	54	815,434
2047	-	-	-	1,451	16,683	-	450	450	0	47	815,481
2048	-	-	-	1,335	15,349	-	414	414	0	40	815,522
2049	-	-	-	1,228	14,121	-	381	381	0	35	815,557
2050	-	-	-	1,130	12,991	-	350	350	0	30	815,587
2051	-	-	-	1,039	11,952	-	322	322	0	26	815,613
2052	-	-	-	956	10,996	-	364	364	0	28	815,640
Total	-	1,780,723	(321,691)	310,695	3,733,841	1,459,032	(477,284)	981,748	15	815,640	31,323,296


Comparative Cumulative NPV
900,000
800,000
700,000
600,000
500,000
400,000
300,000
200,000
100,000
0
Replace Power Supplies

CI Number: 38163

Title: **TRE6 - Pulverizer Refurbishment**

Start Date: 2012/06
Final Cost Date: 2012/10
Function: Generation
Forecast Amount: $311,074

DESCRIPTION:

Unit #6 at the Trenton Generating Station utilizes two ball mill coal pulverizers to prepare coal for combustion in the boiler. These mills were originally installed and commissioned in 1991 and have been subjected to continuous use.

The scope of this project includes refurbishment of the 6A and 6B pulverizer rotating elements and improving the performance of the raw coal supply system to each pulverizer. Components to be replaced or refurbished will be determined based on the condition assessment completed when disassembly is undertaken as part of the planned outage for each pulverizer.

Summary of Related CI's +/- 2 years:
2010 CI38622 TRE6 Pulverizer Refurbishment $277,432

JUSTIFICATION:

Justification Criteria: Thermal

Sub Criteria: Maintenance

Why do this project?

As Unit #6 has only two pulverizers, an unplanned pulverizer failure would have a significant impact on production and could also limit peak generation of the unit depending on the fuel blend in service. This makes it imperative that the pulverizers are available and able to operate for extended lengths between scheduled outages.

Why do this project now?

An evaluation of the pulverizers identified several items that need to be addressed in order for the pulverizers to meet availability targets. Replacement parts are now needed due to age and wear on many of the components. Some of the components are worn beyond Original Equipment Manufacturer (OEM) tolerances and must be replaced.

Why do this project this way?

A phased refurbishment program allows for scheduled outages of selected pulverizers and reduces the risk of extended unplanned outages. An unplanned outage could require in excess of 16 weeks based on material lead time and labor requirements.

CI Number : 38163 - TRE6 Pulverizer Refurbishments **Project Number**

Parent CI Number : -

Cost Centre : 345 - 345-Trenton unit 6 Capital **Budget Version** 2012 ACE Plan

Capital Item Accounts

Acct	Actv	Account	Activity	Forecast Amount	Amount	Variance
094		094 - Interest Capitalized		4,713	0	4,713
095		095-Thermal Regular Labour AO		12,581	0	12,581
095		095-Thermal & Hydro Contracts AO		[redacted]	0	[redacted]
095		095-Thermal Term Labour AO		[redacted]	0	[redacted]
095		095-Thermal Overtime Labour AO		768	0	768
001	013	001 - THERMAL Regular Labour	013 - SGP - Boiler	46,400	0	46,400
002	013	002 - THERMAL Overtime Labour	013 - SGP - Boiler	6,400	0	6,400
004	013	004 - THERMAL Term Labour	013 - SGP - Boiler	[redacted]	0	[redacted]
012	013	012 - Materials	013 - SGP - Boiler	136,000	0	136,000
013	013	013 - POWER PRODUCTION Contracts	013 - SGP - Boiler	[redacted]	0	[redacted]
001	085	001 - THERMAL Regular Labour	085 Design	2,000	0	2,000
001	087	001 - THERMAL Regular Labour	087 Field Super.& Ops.	4,000	0	4,000
011	087	011 - Travel Expense	087 Field Super.& Ops.	400	0	400
013	087	013 - POWER PRODUCTION Contracts	087 Field Super.& Ops.	[redacted]	0	[redacted]
021	087	021 - Telephones	087 Field Super.& Ops.	300	0	300
041	087	041 - Meals & Entertainment	087 Field Super.& Ops.	300	0	300
			Total Cost:	311,074	0	311,074
			Original Cost:	240,000		

Capital Project Detailed Estimate

Location: Trenton
FP#: 38163
Title: TRE6 Pulverizer Refurbishments

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Item	Description	Unit	Quantity	Unit Estimate	Total Estimate	Cost Support Reference	Completed Similar Projects (FP#'s) Note 1
1	**001 Regular Labour**						
1.1	Utility	hr	320	25	8,000		
1.2	Mechanical	hr	960	40	38,400		
1.3	Engineering	lot	[redacted]				
1.4	Supervisor	lot	1	4,000	4,000		
				Sub-Total	52,400		39970, 39971
2	**012 Materials**						
2.1	Raw coal inlet gate valve	each	[redacted]		36,000		
2.2	Raw coal pipes	lot	[redacted]		7,000		
2.3	Ribbion Conveyors	each	[redacted]		72,000		
2.4	Trunnion bearing seals	each	[redacted]		12,000		
2.5	Ribbon Conveyor Bearings	each	[redacted]		4,000		
2.6	Miscellaneous	lot	1	5,000	5,000		
2.7					-		
				Sub-Total	[redacted]		39970, 39971
3	**013 Power Production Contracts**						
3.1	Rentals	lot	1	[redacted]			
3.2	External Supervision	lot	1	[redacted]			
3.3	Vacuum Truck	lot	1	[redacted]			
3.4	Machining/fabrics	lot	1	[redacted]			
				Sub-Total	[redacted]		
4	**004 Term Labour**						
4.1	Term - Utility	hr	[redacted]				
4.2	Term - E/I	hr	[redacted]				
4.3	Term Mechanical	hr	[redacted]				
				Sub-Total	[redacted]		39970, 39971
5	**002 Overtime Labour**						
5.1	Overtime labour	hr	80	80	6,400		
5.2					-		
5.3					-		
				Sub-Total	6,400		
6	**011 Travel Expenses**						
6.1	Travel Expenses	lot	1	400	400		
6.2							
6.3							
				Sub-Total	400		
7	**Miscellaneous Items**						
7.1	Telephones	lot	1	300	300		
7.2	Meals and Entertainment	lot	1	300	300		
7.3					-		
				Sub-Total	600		
8	**094 Interest Capitalized**						
8.1	Interest	lot	1	4,713	4,713		
8.2							
8.3							
				Sub-Total	4,713		
8	**095 Administrative Overhead**						
8.1	AO	lot	1	29,560	29,560		
8.2							
8.3							
				Sub-Total	29,560		
Project Cost Estimate				**Total**	$ 311,073		
9	Original Cost						
9.1					$ 240,000		

Note 1: Reference to "Completed similar projects (FP#'s)" is to be provided when the item estimate is based on work of similar scope for a recently completed project

TRE6 Pulverizer Refurbishment
Summary of Alternatives & Assumptions

Nova Scotia POWER An Emera Company energy everywhere.

Budget Year :	**2012**	**Date :**	**20-Oct-11**
Division :	Power Production	**CI Number:**	38163
Department :	Trenton	**Project No. :**	
Originator :			

	Alternative	After Tax WACC	PV of EVA / NPV	Rank	IRR	Disc Pay
A	Refurbish Pulverizers	6.67%	97,341	1	36.74%	2.6 years
B	Test 2	6.67%	0	2	#NUM!	0.0 years
C	Test 3	6.67%	0	2	#NUM!	0.0 years
D	Test 4	6.67%	0	2	#NUM!	0.0 years

Recommendation :

Based on a positive NPV, it is recommended that the TRE6 pulverizers be refurbished

Assumptions

Incremental replacement energy costs and annual operating costs in the years following 2013 are escalated at 2% annually.

Calculations:
Total annual avoided cost = [Replacement energy costs] + [Avoided unplanned repair costs]

Avoided replacement energy cost = [Incremental replacement energy cost] x [Quantity of predicted annual unit outages / de-ratings] x [capacity factor] x [Probability of failure] x [Derating/outage] x [Duration of Derating]

Avoided unplanned repair costs = [cost of Labour and materials in event of failure] x [Probability of failure] x [quantity of predicted annual unit outages / de-ratings]

Calculation of probability of failure in Year 2

The probability of the unit failing in year 2 is: (Probability of unit not failing in year 1) x (probability the unit will fail in year 2 if no failure accured in year 1)

Example: Refurbish Pulverizers

1	
-45%	Minus the Probability of failure in year 1
55%	Probability that pulverizers do not fail in year 1
x	
50%	Probability of pulverizers failing in year 2 if no failure occurs in year 1
28%	**Actual probability of the pulverizers failing in year 2**

Avoided Cost Calculations

Budget Year :	2012	**Date :**	**20-Oct-11**
Division :	Power Production	**CI Number:**	38163
Department :	Trenton	**Project No.**	
Originator :			

Refurbish Pulverizers	
Capital Cost	**$ 311,073.00**
Avoided Replacement Energy costs (2012) =	**[redacted] MWh x 1 outages x 95% x 45% x [redacted] MW x 336 h = $54,887**
Avoided Unplanned Repair Costs (2012)	**$ 429,373.00 x 45% x 1 = $ 193,218**
Total Annual Avoided costs	**$248,104.60**
Avoided Replacement Energy costs (2013) =	**[redacted] MWh x 1 outages x 95% x 28% x [redacted] MW x 336 h = $33,542**
Avoided Unplanned Repair Costs (2013)	**$ 437,294.46 x 28% x 1 = $ 120,256**
Total Annual Avoided costs	**$ 153,797.88**

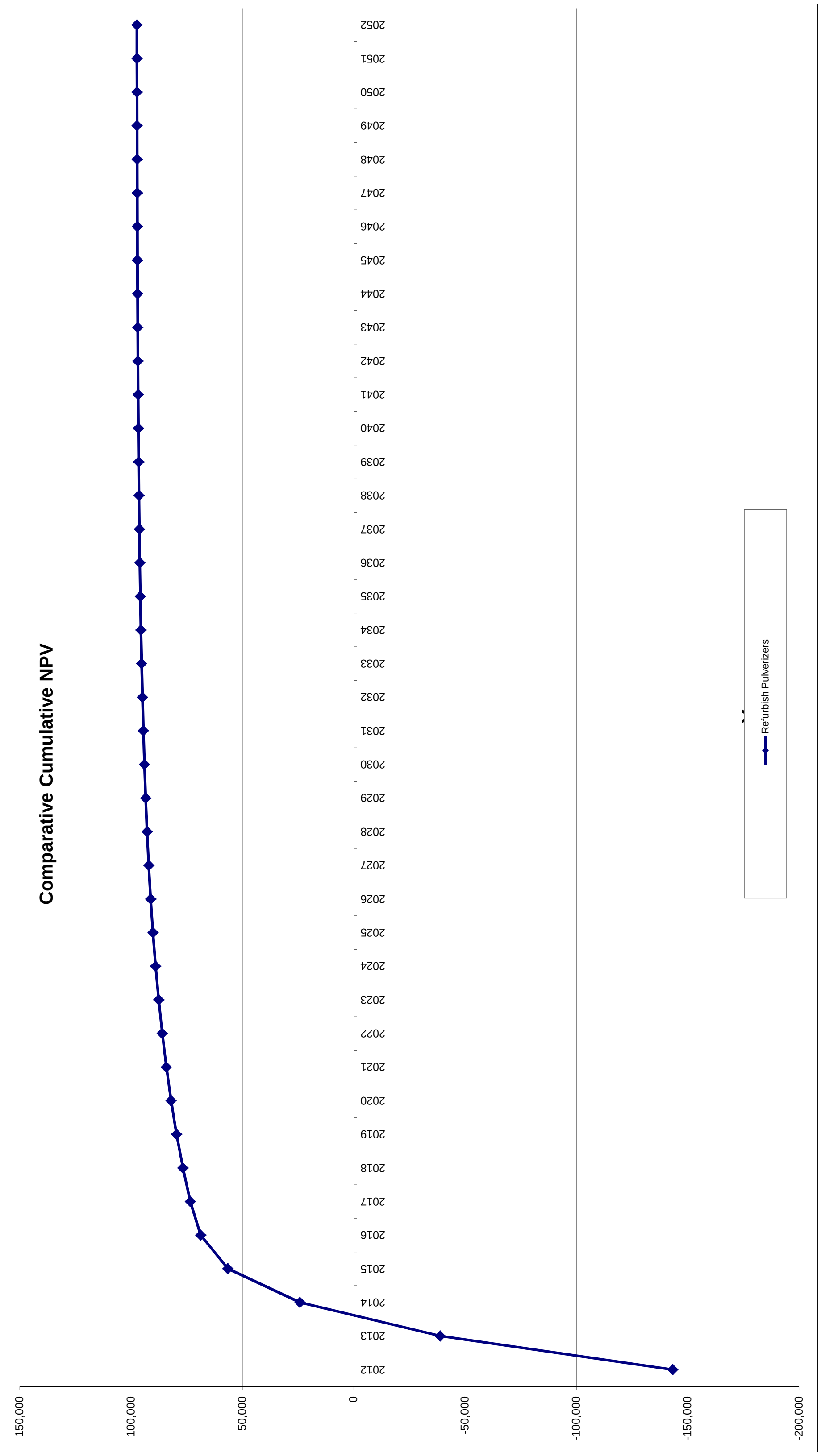
Test 2	
Capital Cost	
Avoided Replacement Energy costs (2012) =	
Avoided Unplanned Repair Costs (2012)	
Total Annual Avoided costs	
Avoided Replacement Energy costs (2013) =	
Avoided Unplanned Repair Costs (2013)	
Total Annual Avoided costs	

Test 3	
Capital Cost	
Avoided Replacement Energy costs (2012) =	
Avoided Unplanned Repair Costs (2012)	
Total Annual Avoided costs	
Avoided Replacement Energy costs (2013) =	
Avoided Unplanned Repair Costs (2013)	
Total Annual Avoided costs	

Test 4	
Capital Cost	
Avoided Replacement Energy costs (2012) =	
Avoided Unplanned Repair Costs (2012)	
Total Annual Avoided costs	
Avoided Replacement Energy costs (2013) =	
Avoided Unplanned Repair Costs (2013)	
Total Annual Avoided costs	

TRE6 Pulverizer Refurbishment
Refurbish Pulverizers

Year	Total Revenue	Operating Costs	Capital	CCA	UCC	CFBT	Applicable Taxes	CFAT	Discount Factor	PV of CF	CNPV
2012	-	248,105	(311,073)	12,443	298,630	(62,968)	(80,371)	(143,340)	1	(143,340)	(143,340)
2013	-	153,798	-	23,890	274,740	153,798	(42,359)	111,439	1	104,471	(38,869)
2014	-	94,014	-	21,979	252,760	94,014	(22,375)	71,640	1	62,961	24,092
2015	-	47,892	-	20,221	232,540	47,892	(8,578)	39,314	1	32,391	56,483
2016	-	14,639	-	18,603	213,936	14,639	1,192	15,831	1	12,227	68,710
2017	-	1,657	-	17,115	196,822	1,657	4,792	6,449	1	4,670	73,380
2018	-	-	-	15,746	181,076	-	4,881	4,881	1	3,313	76,693
2019	-	-	-	14,486	166,590	-	4,491	4,491	1	2,858	79,551
2020	-	-	-	13,327	153,263	-	4,131	4,131	1	2,465	82,015
2021	-	-	-	12,261	141,002	-	3,801	3,801	1	2,126	84,141
2022	-	-	-	11,280	129,721	-	3,497	3,497	1	1,833	85,974
2023	-	-	-	10,378	119,344	-	3,217	3,217	0	1,581	87,556
2024	-	-	-	9,547	109,796	-	2,960	2,960	0	1,364	88,920
2025	-	-	-	8,784	101,013	-	2,723	2,723	0	1,176	90,096
2026	-	-	-	8,081	92,932	-	2,505	2,505	0	1,014	91,110
2027	-	-	-	7,435	85,497	-	2,305	2,305	0	875	91,985
2028	-	-	-	6,840	78,657	-	2,120	2,120	0	755	92,740
2029	-	-	-	6,293	72,365	-	1,951	1,951	0	651	93,391
2030	-	-	-	5,789	66,576	-	1,795	1,795	0	561	93,952
2031	-	-	-	5,326	61,249	-	1,651	1,651	0	484	94,436
2032	-	-	-	4,900	56,350	-	1,519	1,519	0	418	94,854
2033	-	-	-	4,508	51,842	-	1,397	1,397	0	360	95,214
2034	-	-	-	4,147	47,694	-	1,286	1,286	0	311	95,524
2035	-	-	-	3,816	43,879	-	1,183	1,183	0	268	95,792
2036	-	-	-	3,510	40,368	-	1,088	1,088	0	231	96,023
2037	-	-	-	3,229	37,139	-	1,001	1,001	0	199	96,223
2038	-	-	-	2,971	34,168	-	921	921	0	172	96,394
2039	-	-	-	2,733	31,434	-	847	847	0	148	96,543
2040	-	-	-	2,515	28,920	-	780	780	0	128	96,670
2041	-	-	-	2,314	26,606	-	717	717	0	110	96,781
2042	-	-	-	2,128	24,478	-	660	660	0	95	96,876
2043	-	-	-	1,958	22,519	-	607	607	0	82	96,958
2044	-	-	-	1,802	20,718	-	558	558	0	71	97,029
2045	-	-	-	1,657	19,060	-	514	514	0	61	97,090
2046	-	-	-	1,525	17,536	-	473	473	0	53	97,142
2047	-	-	-	1,403	16,133	-	435	435	0	45	97,188
2048	-	-	-	1,291	14,842	-	400	400	0	39	97,227
2049	-	-	-	1,187	13,655	-	368	368	0	34	97,260
2050	-	-	-	1,092	12,562	-	339	339	0	29	97,290
2051	-	-	-	1,005	11,557	-	312	312	0	25	97,315
2052	-	-	-	925	10,633	-	352	352	0	27	97,341
Total	-	560,105	(311,073)	300,440	3,610,599	249,032	(89,915)	159,117	15	97,341	3,301,746


Comparative Cumulative NPV
Refurbish Pulverizers
150,000
100,000
50,000
0
-50,000
-100,000
-150,000
-200,000
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CI Number: 41251

Title: **TUC- Unit #3 Turbine High Pressure (HP) Cylinder Fastener Replacement**

Start Date: 2012/04
Final Cost Date: 2012/11
Function: Generation
Forecast Amount: $275,729

DESCRIPTION:

This project includes the replacement of the Unit #3 steam turbine high-pressure cylinder fasteners (bolts and studs) to ensure the integrity of the steam turbine for continued safe and efficient operation. High-pressure fasteners are monitored for life cycle maintenance as described in NSPI's TMP (Thermal Maintenance Practice) - Steam Turbine - High Temperature Bolting Maintenance Practice. The practice applies to the high-pressure outer casing, high-pressure inner casing, intermediate-pressure outer casing, intermediate-pressure inner casing, main stop valve cover, control valves, reheat stop valve covers, intercept valve covers, and combined reheat valve covers that are exposed to high temperatures. The Unit #3 high-pressure cylinder fasteners are exposed to operating temperatures in excess of 700 degrees Fahrenheit.

The basic criteria for evaluating the consumed life for steam turbine high-temperature bolts are the material, number of times the bolts have been tightened, number of unit start/stop cycles, running hours, bolt operating temperature and critical maintenance data.

Evaluation of Unit #3 high-pressure cylinder fasteners using Original Equipment Manufacturer (OEM) criteria indicated that these fasteners are now at the end of their service life and must be replaced.

Summary of Related CI's +/- 2 years:
2012 CI 41228 TUC Unit 3 Turbine High Pressure (HP) Impulse Blades Replacement $882,152

JUSTIFICATION:

Justification Criteria: Health & Safety

Why do this project?

The function of these fasteners is to maintain a tight joint with no steam leakage into other sections of the turbine or into the plant. High pressure steam leaking from high-pressure joints is a critical safety issue and may require maintenance outages and costly repairs. Leaking joints within the steam turbine can result in steam bypassing portions of the intended steam path and resultant loss of efficiency.

Why do this project now?

These bolts will exceed the calculated consumed fastener life criteria recommended by the OEM if they are not replaced during the planned maintenance shutdown in 2012.

Why do this project this way?

In addition to ensuring safe and reliable operation of the turbine is maintained, completing the bolting replacement during the 2012 planned outage represents the most cost effective solution by minimizing the cost associated with potential unplanned outages going forward.

CI Number	: 41251	- TUC3 - Turbine High Pressure (HP) Cylinder Fastener Replacement	**Project Number**
Parent CI Number	:	-	
Cost Centre	: 311	- 311-Tufts Cove Admin./Common Capita	**Budget Version** 2012 ACE Plan

Capital Item Accounts

Acct	Actv	Account	Activity	Forecast Amount	Amount	Variance
094		094 - Interest Capitalized		11,925	0	11,925
095		095-Thermal Regular Labour AO		[redacted]	0	[redacted]
095		095-Thermal & Hydro Contracts AO		[redacted]	0	[redacted]
001	010	001 - THERMAL Regular Labour	010 - SGP - Turbo Gen.Instal.	19,200	0	19,200
012	010	012 - Materials	010 - SGP - Turbo Gen.Instal.	[redacted]	0	[redacted]
013	010	013 - POWER PRODUCTION Contracts	010 - SGP - Turbo Gen.Instal.	[redacted]	0	[redacted]
			Total Cost:	275,729	0	275,729
			Original Cost:	71,437		

Location: Tuft's Cove
CI#: 41251
Title: TUC3 – Turbine High Pressure (HP) Cylinder Fastener Replacement

Item	Description	Unit	Quantity	Unit Estimate	Total Estimate	Cost Support Reference	Completed Similar Projects (CI#'s) Note 1
1	**001 Regular Labour**						
1.1	Generation Services Engineering	hr	[redacted]		$3,000		
1.2	Electrical/ Mechanical Tradesperson	hr	360	45.00	16,200		
1.3					-		
				Sub-Total	19,200		
2	**012 Materials**						
2.1	Bolting	lot	[redacted]			Quote EH3882	
2.2							
2.3							
2.4							
2.5							
				Sub-Total	[redacted]		
3	**013 Power Production Contracts**						
3.1	Removal and Installation	lot	[redacted]				
3.2					-		
3.3					-		
				Sub-Total	[redacted]		
4	**094 Interest Capitalized**						
4.1	Interest				11,925		
				Sub-Total	11,925		
5	**095 Administrative Overhead**						
5.1	Construction AO				5,604		
					-		
					-		
				Sub-Total	5,604		
Cost Estimate				**Total**	$275,729		
6	Original Cost						
6.1					$41,437		

Note 1: Reference to "Completed similar projects (CI#'s)" is to be provided when the item estimate is based on work of similar scope for a recently completed project

TUC3 - Turbine HP Cylinder Fastener Replacement
Summary of Alternatives & Assumptions

Nova Scotia POWER An Emera Company energy everywhere.

Budget Year :	**2012**	**Date :**	**20-Oct-11**
Division :	Power Production	**CI Number:**	41251
Department :	Tufts Cove	**Project No. :**	
Originator :			

	Alternative	After Tax WACC	PV of EVA / NPV	Rank	IRR	Disc Pay
A	Replace Fasteners	6.67%	87,303	1	26.64%	3.1 years
B	Test 2	6.67%	0	2	#NUM!	0.0 years
C	Test 3	6.67%	0	2	#NUM!	0.0 years
D	Test 4	6.67%	0	2	#NUM!	0.0 years

Recommendation :

Based on a positive NPV, it is recommended that the HP Cylinder Fasteners be replaced

Assumptions

Incremental replacement energy costs and annual operating costs in the years following 2013 are escalated at 2% annually.

Calculations:
Total annual avoided cost = [Replacement energy costs] + [Avoided unplanned repair costs]

Avoided replacement energy cost = [Incremental replacement energy cost] x [Quantity of predicted annual unit outages / de-ratings] x [capacity factor] x [Probability of failure] x [Derating/outage] x [Duration of Derating]

Avoided unplanned repair costs = [cost of Labour and materials in event of failure] x [Probability of failure] x [quantity of predicted annual unit outages / de-ratings]

Calculation of probability of failure in Year 2

The probability of the unit failing in year 2 is: (Probability of unit not failing in year 1) x (probability the unit will fail in year 2 if no failure accured in year 1)

Example: Replace Fasteners

1	
-25%	Minus the Probability of failure in year 1
75%	Probability that fasteners do not fail in year 1
x	
45%	Probability of fasteners failing in year 2 if no failure occurs in year 1
34%	**Probability of the fasteners failing in year 2**

Avoided Cost Calculations

Budget Year :	2012	Date :	20-Oct-11
Division :	Power Production	CI Nur	41251
Department :	Tufts Cove	Projec	
Originator :			

Replace Fasteners	
Capital Cost	$ 275,729
Avoided Replacement Energy costs (2012) =	[redacted] MWh x 1 outages x 70% x 25% x [redacted] MW x 504 h = $46,555.93
Avoided Unplanned Repair Costs (2012)	$ 311,500.00 x 25% x 1 = $ 77,875
Total Annual Avoided costs	$124,430.93
Avoided Replacement Energy costs (2013) =	[redacted] MWh x 1 outages x 70% x 34% x [redacted] MW x 504 h = $62,850.51
Avoided Unplanned Repair Costs (2013)	$ 317,730.00 x 34% x 1 = $ 107,234
Total Annual Avoided costs	$ 170,084.39

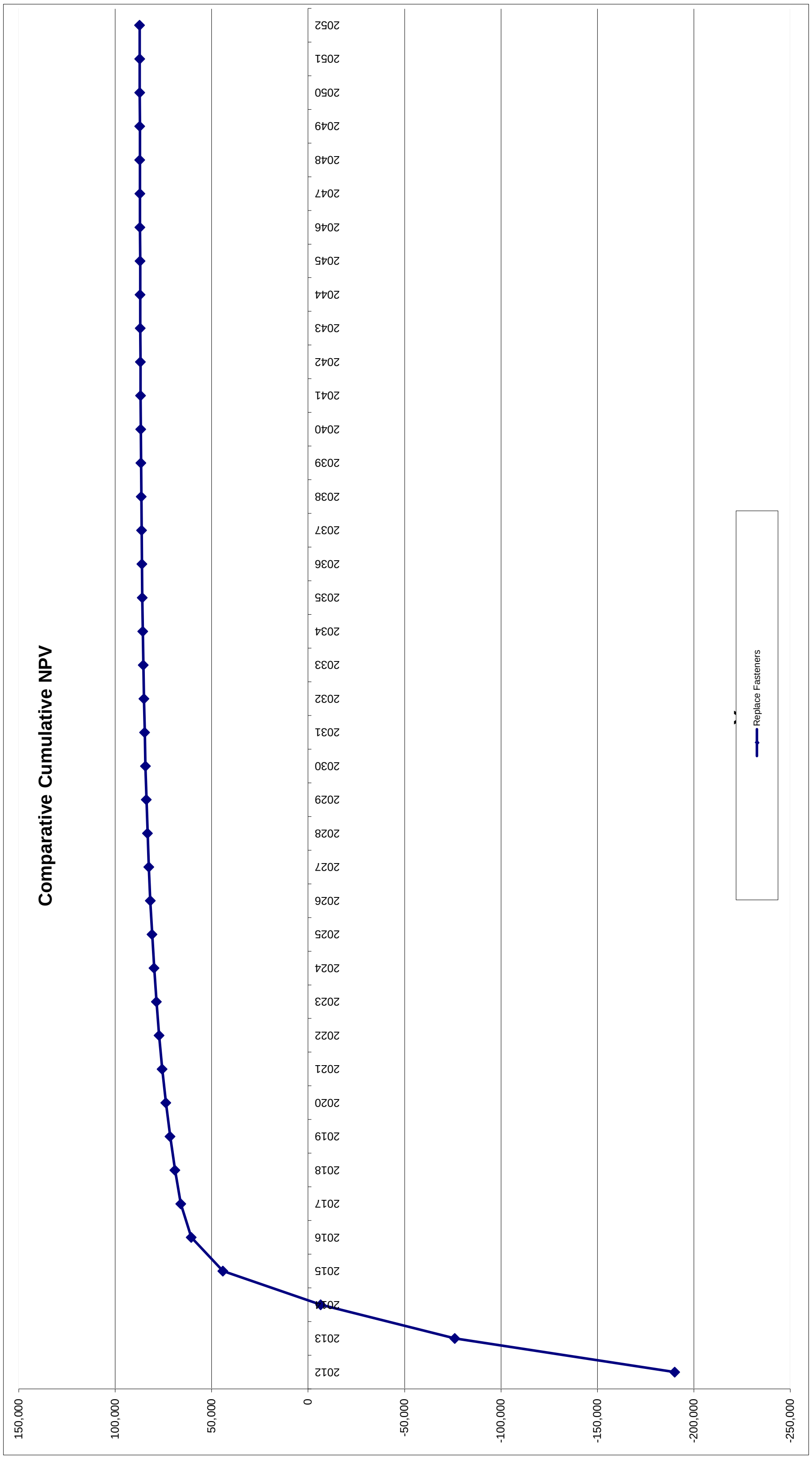
Test 2	
Capital Cost	
Avoided Replacement Energy costs (2012) =	
Avoided Unplanned Repair Costs (2012)	
Total Annual Avoided costs	
Avoided Replacement Energy costs (2013) =	
Avoided Unplanned Repair Costs (2013)	
Total Annual Avoided costs	

Test 3	
Capital Cost	
Avoided Replacement Energy costs (2012) =	
Avoided Unplanned Repair Costs (2012)	
Total Annual Avoided costs	
Avoided Replacement Energy costs (2013) =	
Avoided Unplanned Repair Costs (2013)	
Total Annual Avoided costs	

Test 4	
Capital Cost	
Avoided Replacement Energy costs (2012) =	
Avoided Unplanned Repair Costs (2012)	
Total Annual Avoided costs	
Avoided Replacement Energy costs (2013) =	
Avoided Unplanned Repair Costs (2013)	
Total Annual Avoided costs	

TUC3 - Turbine HP Cylinder Fastener Replacement
Replace Fasteners

Year	Total Revenue	Operating Costs	Capital	CCA	UCC	CFBT	Applicable Taxes	CFAT	Discount Factor	PV of CF	CNPV
2012	-	124,430.9	(275,729)	11,029.2	264,699.8	(151,298.1)	(38,775.0)	(190,073.0)	1.000	(190,073.0)	(190,073.0)
2013	-	170,084.4	-	21,176.0	243,523.9	170,084.4	(48,518.5)	121,565.9	0.937	113,964.4	(76,108.6)
2014	-	106,019.3	-	19,481.9	224,041.9	106,019.3	(26,865.2)	79,154.0	0.879	69,564.6	(6,544.0)
2015	-	81,104.7	-	17,923.4	206,118.6	81,104.7	(19,586.2)	61,518.5	0.824	50,684.9	44,141.0
2016	-	23,439.3	-	16,489.5	189,629.1	23,439.3	(2,187.1)	21,252.1	0.772	16,414.7	60,555.7
2017	-	4,008.1	-	15,170.3	174,458.8	4,008.1	3,460.3	7,468.4	0.724	5,407.7	65,963.4
2018	-	215.2	-	13,956.7	160,502.1	215.2	4,259.9	4,475.0	0.679	3,037.7	69,001.1
2019	-	-	-	12,840.2	147,661.9	-	3,980.5	3,980.5	0.636	2,533.0	71,534.1
2020	-	-	-	11,813.0	135,849.0	-	3,662.0	3,662.0	0.597	2,184.6	73,718.8
2021	-	-	-	10,867.9	124,981.0	-	3,369.1	3,369.1	0.559	1,884.2	75,603.0
2022	-	-	-	9,998.5	114,982.6	-	3,099.5	3,099.5	0.524	1,625.1	77,228.0
2023	-	-	-	9,198.6	105,783.9	-	2,851.6	2,851.6	0.492	1,401.6	78,629.6
2024	-	-	-	8,462.7	97,321.2	-	2,623.4	2,623.4	0.461	1,208.8	79,838.5
2025	-	-	-	7,785.7	89,535.5	-	2,413.6	2,413.6	0.432	1,042.6	80,881.0
2026	-	-	-	7,162.8	82,372.7	-	2,220.5	2,220.5	0.405	899.2	81,780.2
2027	-	-	-	6,589.8	75,782.9	-	2,042.8	2,042.8	0.380	775.5	82,555.8
2028	-	-	-	6,062.6	69,720.2	-	1,879.4	1,879.4	0.356	668.9	83,224.6
2029	-	-	-	5,577.6	64,142.6	-	1,729.1	1,729.1	0.334	576.9	83,801.5
2030	-	-	-	5,131.4	59,011.2	-	1,590.7	1,590.7	0.313	497.6	84,299.1
2031	-	-	-	4,720.9	54,290.3	-	1,463.5	1,463.5	0.293	429.1	84,728.2
2032	-	-	-	4,343.2	49,947.1	-	1,346.4	1,346.4	0.275	370.1	85,098.3
2033	-	-	-	3,995.8	45,951.3	-	1,238.7	1,238.7	0.258	319.2	85,417.5
2034	-	-	-	3,676.1	42,275.2	-	1,139.6	1,139.6	0.242	275.3	85,692.8
2035	-	-	-	3,382.0	38,893.2	-	1,048.4	1,048.4	0.226	237.4	85,930.3
2036	-	-	-	3,111.5	35,781.7	-	964.6	964.6	0.212	204.8	86,135.1
2037	-	-	-	2,862.5	32,919.2	-	887.4	887.4	0.199	176.6	86,311.7
2038	-	-	-	2,633.5	30,285.7	-	816.4	816.4	0.187	152.3	86,464.0
2039	-	-	-	2,422.9	27,862.8	-	751.1	751.1	0.175	131.4	86,595.4
2040	-	-	-	2,229.0	25,633.8	-	691.0	691.0	0.164	113.3	86,708.7
2041	-	-	-	2,050.7	23,583.1	-	635.7	635.7	0.154	97.7	86,806.5
2042	-	-	-	1,886.6	21,696.4	-	584.9	584.9	0.144	84.3	86,890.7
2043	-	-	-	1,735.7	19,960.7	-	538.1	538.1	0.135	72.7	86,963.4
2044	-	-	-	1,596.9	18,363.9	-	495.0	495.0	0.127	62.7	87,026.1
2045	-	-	-	1,469.1	16,894.8	-	455.4	455.4	0.119	54.1	87,080.2
2046	-	-	-	1,351.6	15,543.2	-	419.0	419.0	0.111	46.6	87,126.9
2047	-	-	-	1,243.5	14,299.7	-	385.5	385.5	0.104	40.2	87,167.1
2048	-	-	-	1,144.0	13,155.7	-	354.6	354.6	0.098	34.7	87,201.8
2049	-	-	-	1,052.5	12,103.3	-	326.3	326.3	0.092	29.9	87,231.7
2050	-	-	-	968.3	11,135.0	-	300.2	300.2	0.086	25.8	87,257.5
2051	-	-	-	890.8	10,244.2	-	276.1	276.1	0.081	22.3	87,279.8
2052	-	-	-	819.5	9,424.7	-	312.4	312.4	0.076	23.6	87,303.4
Total	-	509,301.9	(275,729.0)	266,304.3	3,200,364.1	233,572.9	(81,319.6)	152,253.3	14.9	87,303.4	2,824,447.0


Comparative Cumulative NPV
150,000
100,000
50,000
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-50,000
-100,000
-150,000
-200,000
-250,000
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2052
Replace Fasteners

CI Number: 41620

Title: **TUC- Unit 3 Turbine-Generator Area Fire Protection**

Start Date: 2012/05
Final Cost Date: 2012/12
Function: Generation
Forecast Amount: $272,743

DESCRIPTION:

This project includes the addition of a fixed fire protection system for the Unit #3 steam turbine and generator at the Tufts Cove Generating Station. At the time of original construction, the fire protection infrastructure was adequate, but a recent risk analysis identified that existing fire protection around the turbine generator no longer meets current industry standards. Construction will be similar to work recently undertaken in the Lingan Generating Station.

Summary of Related CI's +/- 2 years:
No projects for 2010,2011,2012, 2013 & 2014

JUSTIFICATION:

Justification Criteria: Health & Safety

Why do this project?

In the recent assessment of fire protection systems at all NSPI thermal plants, the highest risk areas identified are associated with the turbine generator area of the plants. This risk is best mitigated by applying a fixed fire protection system around the equipment in this area as well as drainage for hydraulic oils and lubricants. A system of similar design was successfully installed at LIN Unit #4 in 2009 and LIN Unit #1 in 2010. The system design and construction will serve as a model for applying a similar solution for this project.

Why do this project now?

As a result of recent inspections, NSPI's insurance providers have recommended the need to introduce additional fire system risk-control measures. NSPI believes these modifications are important now as the plants age and a staged installation with one unit at a time is appropriate to reduce risk in the long term. Unit #3 is scheduled for a maintenance outage in 2012 which will facilitate installation of fire suppression equipment.

Why do this project this way?

The benchmark study used for assessing loss control practices was predicated on fire protection practices, NFPA 850 and FM DS7-1 01. Although they are recommended practices, they have become industry guidelines, widely used by insurers in risk assessments for power generation facilities. The new fire protection system will be integrated into the current system that exists at the plant.

CI Number	: 41620	- TUC3 Turbine Generator Fire Protection	**Project Number**		
Parent CI Number	:	-			
Cost Centre	: 319	- 319-TC Unit 3 Capital	**Budget Version**	2012 ACE Plan	

Capital Item Accounts

Acct	Actv	Account	Activity	Forecast Amount	Amount	Variance
094		094 - Interest Capitalized		8,746	0	8,746
095		095-Thermal & Hydro Contracts AO		[redacted]	0	[redacted]
095		095-Thermal Regular Labour AO		10,949	0	10,949
001	004	001 - THERMAL Regular Labour	004 - SGP - Misc.Equipment	45,600	0	45,600
012	004	012 - Materials	004 - SGP - Misc.Equipment	[redacted]	0	[redacted]
013	004	013 - POWER PRODUCTION Contracts	004 - SGP - Misc.Equipment	[redacted]	0	[redacted]
028	004	028 - Consulting	004 - SGP - Misc.Equipment	[redacted]	0	[redacted]
			Total Cost:	272,743	0	272,743
			Original Cost:			

Capital Project Detailed Estimate

Location: Tuft's Cove
FP#: 41620
Title: TUC3 Turbine Generator Fire Protection

Item	Description	Unit	Quantity	Unit Estimate	Total Estimate	Cost Support Reference	Completed Similar Projects (FP#'s) Note 1
1	**001 Regular Labour**						
1.1	Generation Services Engineering	hr	[redacted]		6,000		
1.2	CADD Operator	hr	[redacted]		3,600		
1.3	Electrical/Mechanical labour	hr	800	45	36,000		
				Sub-Total	45,600		40148, 40427
2	**012 Materials**						
2.1	Panel, Sensors, Cable	lot	[redacted]				
2.2	Misc. Materials	lot					
2.3							
2.4							
2.5							
				Sub-Total	[redacted]		40148, 40427
3	**013 Power Production Contracts**						
3.1	Mechanical Materials and labour	lot	1	[redacted]			
3.2	Scaffoldding	lot	1				
3.3							
				Sub-Total	[redacted]		40148, 40427
4	**028 Consulting**						
4.1	Consulting	lot	1	[redacted]			
4.2							
4.3							
				Sub-Total	[redacted]		40148, 40427
5							
5.1					$ -		
5.2					$ -		
5.3					$ -		
6	**094 Interest Capitalized**						
6.1	Interest				8,746.00		
6.2							
6.3							
				Sub-Total	8,746.00		
7	**095 Administrative Overhead**						
7.1	AO				[redacted]		
7.2							
7.3							
				Sub-Total	[redacted]		
Project Cost Estimate				**Total**	272,744		
8	Original Cost						

Note 1: Reference to "Completed similar projects (FP#'s)" is to be provided when the item estimate is based on work of similar scope for a recently completed project

Generating Station	Area	Protection	Investment Timeframe				
			2010	2011	2012	2013	2014
Lingan	Unit 1 Turbine - Generator Sprinkler System	Pre-Action Water Sprinkler	X				
	Fire System Electrical Panel Upgrades		X				
	Fire System Valve Replacement		X				
	Unit 1 Burner Front	Wet Automatic Sprinkler	X				
	Unit 2 Burner Front	Wet Automatic Sprinkler	X				
	Unit 2 Turbine - Generator Sprinkler System	Pre-Action Water Sprinkler		X			
	Unit 3 Turbine - Generator Sprinkler System	Pre-Action Water Sprinkler		X			
	Unit 3 Burner Front	Wet Automatic Sprinkler		X			
	Unit 4 Burner Front	Wet Automatic Sprinkler		X			
	Unit 1/2 Cable Spreading Room Elev. 112.5 m (4 m X 12 m X 36 m) 1728 cubic metres, 61,000 cubic feet	Clean Gaseous (Novec 1230, Inergen), Victaulic Vortex or VEWFD with Pre-Action			X		
	Unit 1/2 Cable Spreading Room Elev. 120.2 m (3 m X 12 m X 42.3 m) 1522 cubic metres, 54,000 cubic feet	Clean Gaseous (Novec 1230, Inergen), Victaulic Vortex or VEWFD with Pre-Action			X		
	Unit 3/4 Cable Spreading Room Elev. 112.5 m (4 m X 12 m X 36 m) 1728 cubic metres, 61,000 cubic feet	Clean Gaseous (Novec 1230, Inergen), Victaulic Vortex or VEWFD with Pre-Action			X		
	Unit 3/4 Cable Spreading Room Elev. 120.2 m (3 m X 12 m X 42.3 m) 1522 cubic metres, 54,000 cubic feet	Clean Gaseous (Novec 1230, Inergen), Victaulic Vortex or VEWFD with Pre-Action			X		
Point Aconi	Unit 1 Burner Fronts	Wet Automatic Sprinkler		X			
	Unit 1 Switch Gear Room Elevation 107.2 m (25 m X 14.5 m X 6 m) 2175 cubic metres, 77,000 cubic feet	Clean Gaseous (Novec 1230, Inergen), Victaulic Vortex or VEWFD with Pre-Action		X			
	Unit 1 Relay Room Elevation 113.2 m (25 m X 14.5 m X 6 m) 2175 cubic metres, 77,000 cubic feet	Clean Gaseous (Novec 1230, Inergen), Victaulic Vortex or VEWFD with Pre-Action		X			
	Unit 1 Turbine - Generator Sprinkler System	Pre-Action Water Sprinkler					X
Point Tupper	Unit 1/2 Cable Spreading Room Elevation (100 m X 5 m X 2.5 m) 1250 cubic metres, 45,000 cubic feet	Clean Gaseous (Novec 1230, Inergen), Victaulic Vortex or VEWFD with Pre-Action				X	
	Fire System Electrical Panel Upgrade					X	
	Unit 1 Turbine - Generator Sprinkler System	Pre-Action Water Sprinkler					X
	Replace Fire Pumps - More Capacity						X
Trenton	Fire System Upgrades		X				
	Unit 5 Burner Front	Wet Automatic Sprinkler	X				
	Unit 6 Burner Front	Wet Automatic Sprinkler		X			
	Unit 5 Turbine - Generator Sprinkler System	Pre-Action Water Sprinkler			X		
	Unit 6 Turbine - Generator Sprinkler System	Pre-Action Water Sprinkler			X		
	Unit 6 4160 Switchgear Cable Spreading Room Elevation 29.8 m (7.6 m X 37.8 m X 3 m) 860 cubic metres, 30,000 cubic feet	Clean Gaseous (Novec 1230, Inergen), Victaulic Vortex or VEWFD with Pre-Action			X		
	Unit 6 MCC Cable Spreading Room Elevation 22.7 m (7.6 m X 37.8 m X 3 m) 860 cubic metres, 30,000 cubic feet	Clean Gaseous (Novec 1230, Inergen), Victaulic Vortex or VEWFD with Pre-Action			X		
	Unit 5 Relay Room Elev 42 ft (50 ft X 30 ft X 12 ft) 18,000 cubic feet	Clean Gaseous (Novec 1230, Inergen), Victaulic Vortex or VEWFD with Pre-Action				X	
	Unit 5 4160 v Switch Gear Room Elev. 73' 0" (100' X 20' X 15') 30,000 cubic feet	Clean Gaseous (Novec 1230, Inergen), Victaulic Vortex or VEWFD with Pre-Action				X	
	Unit 5 4160 v Switch Gear Cable Area Elev. 57' 6" (100' X 20' X 15') 30,000 cubic feet	Clean Gaseous (Novec 1230, Inergen), Victaulic Vortex or VEWFD with Pre-Action				X	
Tufts Cove	Unit 1 Burner Front	Wet Automatic Sprinkler	X				
	Unit 2 Burner Front	Wet Automatic Sprinkler	X				
	Unit 3 Burner Front	Wet Automatic Sprinkler	X				
	TUC 6 Turbine-Generator and Lube Oil Sprinkler, Transformer Deluge.	Pre Action Water Sprinkler and Deluge	X				
	Unit 2 Turbine - Generator Sprinkler System	Pre-Action Water Sprinkler				X	
	Unit 3 Turbine - Generator Sprinkler System	Pre-Action Water Sprinkler				X	
	Fire System Electrical Panel Upgrade					X	
	Unit 1 Turbine - Generator Sprinkler System	Pre-Action Water Sprinkler					X
	Cable Spreading/Relay Room	Clean Gaseous (Novec 1230, Inergen), Victaulic Vortex or VEWFD with Pre-Action					X

CI Number: 41561

Title: **POT - Maintenance Facilities Refurbishment**

Start Date: 2012/04
Final Cost Date: 2012/12
Function: Generation
Forecast Amount: $258,558

DESCRIPTION:

The Point Tupper Generating Station was originally built in 1969. Although regular building maintenance and some additions and modifications to the buildings have taken place over the last forty years, some of the maintenance facilities (maintenance washrooms, shower and locker room facilities) are no longer completely functional and must be refurbished.

Summary of Related CI's +/- 2 years:
No projects for 2010,2011,2012, 2013 & 2014

JUSTIFICATION:

Justification Criteria: Health & Safety

Sub Criteria: Buildings

Why do this project?

The maintenance employee washroom, locker room, and shower facilities have reached the end of their useful life and must be refurbished to modern-day standards to ensure appropriate facilities are provided to those using them.

Why do this project now?

This project must be completed now as the existing facilities have degraded through decades of use and have reached the end of useful life.

Why do this project this way?

Refurbishment of the maintenance facilities is the most viable option and will reduce the likelihood of more costly repairs in the future.

CI Number : 41561 - POT - Maintenance facilities Refurbishment **Project Number**

Parent CI Number : -

Cost Centre : 351 - 351-Pt.Tupper Admin./Capital **Budget Version** 2012 ACE Plan

Capital Item Accounts

Acct	Actv	Account	Activity	Forecast Amount	Amount	Variance
001		001 - THERMAL Regular Labour		3,000	0	3,000
002		002 - THERMAL Overtime Labour		1,000	0	1,000
004		004 - THERMAL Term Labour		3,000	0	3,000
011		011 - Travel Expense		250	0	250
012		012 - Materials		[redacted]	0	[redacted]
013		013 - POWER PRODUCTION Contracts		[redacted]	0	[redacted]
028		028 - Consulting		[redacted]	0	[redacted]
041		041 - Meals & Entertainment		250	0	250
094		094 - Interest Capitalized		2,527	0	2,527
095		095-Thermal Term Labour AO		[redacted]	0	[redacted]
095		095-Thermal Regular Labour AO		720	0	720
095		095-Thermal Overtime Labour AO		120	0	120
095		095-Thermal & Hydro Contracts AO		[redacted]	0	[redacted]
			Total Cost:	258,558	0	258,558
			Original Cost:	49,739		

Capital Project Detailed Estimate

Location: Point Tupper
FP#: 41561
Title: POT - Maintenance facilities Refurbishment

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Item	Description	Unit	Quantity	Unit Estimate	Total Estimate	Cost Support Reference	Completed Similar Projects (FP#'s) Note 1
1	**001 Regular Labour, 002 Overtime Labour , 004 Term Labour**						
1.1	Regular	hr	75	40.00	$3,000		
1.2	Overtime Labour	hr	15	66.50	$1,000		
1.3	Term Labour	hr	[redacted]		3,000		
				Sub-Total	7,000		
2	**012 Materials**						
2.1	Gyproc, flooring, fixtures, etc.	lot	1	[redacted]			
				Sub-Total	[redacted]		38895
3	**013 Power Production Contracts**						
3.1	Installation Contract	lot	1	[redacted]			
				Sub-Total	[redacted]		38895
4	**028 Consulting**						
4.1	Detailed Engineering	lot	1	[redacted]			
4.2							
4.3							
				Sub-Total	[redacted]		38895
5	**041 Meals and Entertainment**						
5.1	Meals/expenses	lot	1	500	500		
5.2							
5.3							
				Sub-Total	500		
6	**094 Interest Capitalized**						
6.1	Interest				2,527		
6.2							
6.3							
				Sub-Total	2,527		
7	**095 Administrative Overhead**						
7.1	Overhead				6,531		
7.2							
7.3							
				Sub-Total	6,531		
Project Cost Estimate				**Total**	$258,558		
8	Original Cost						
8.1					$49,739		

Note 1: Reference to "Completed similar projects (FP#'s)" is to be provided when the item estimate is based on work of similar scope for a recently completed project

CI Number: 41124

Title: **LIN – Cooling Water (CW) Screen Refurbishment**

Start Date: 2012/03
Final Cost Date: 2012/12
Function: Generation
Forecast Amount: $251,544

DESCRIPTION:

There are 8 travelling screens (2 per Unit) at the Lingan Generating Station. The self-cleaning screens remove sea debris from the incoming sea water before it enters the CW pump and downstream cooling systems.

The screens consist of bottom, top and intermediate sections. The bottom section includes the tail sprocket assembly and support structure. The top section is comprised of the drive sprocket assembly and the support structure. The intermediate section spans vertically between the bottom and top sections and supports the entire structure. The screens' intermediate sections and top sections require replacement, as they have corroded over time. These sections will be replaced with stainless steel components.

During periods of low seaweed loading in the cooling water intake, one of the two screens on each unit is taken out of service and refurbished. The plan is to refurbish two screens per year until all eight screens have been upgraded. Screens 3B and 4B were completed in 2011. Screens 2B and 4A are planned for 2012. Two additional projects will be advanced in 2013 and 2014 to complete refurbishment of all 8 traveling screens.

Summary of Related CI's +/- 2 years:
No projects for 2010,2011,2012, 2013 & 2014

JUSTIFICATION:

Justification Criteria: Thermal

Sub Criteria: Equipment Replacement

Why do this project?

Eel grass passing through degraded or non-functioning traveling screen panels results in downstream fouling of strainers at CW and ACW locations and increases the risk of unit de-rating or outages due to inadequate cooling capacity, particularly during the late summer and fall. The degree of fouling also often results in high mechanical loading on the screens and circulating water pumps. This high loading causes component failure at the screens and CW pumps and increases the risk of de-rating or unit outages due to the loss of cooling water.

Why do this project now?

Completing this project will reduce existing issues with the circulating water system during periods of heavy seaweed and debris. This will reduce the risk of unit de-ratings and subsequent associated replacement energy costs.

Why do this project this way?

The screens operate in an aggressive seawater environment and have experienced normal corrosion and wear. The most cost effective solution is to replace the corroded and worn components as opposed to replacing the complete screen. Primary components to be refurbished include the top drives (sprocket refurbishment, bearing replacement, shaft refurbishment, top boot replacement with stainless steel material), Intermediate Section (guides, supports and screen panels replacement) and Lower Section (sprocket refurbishment, bearing replacement, shaft refurbishment, bottom boot replacement with stainless steel material).

CI Number : 41124 - LIN-Cooling Water (CW) Screen Refurbishment **Project Number**

Parent CI Number : -

Cost Centre : 301 - 301-Lingan Admin./Common Capital **Budget Version** 2012 ACE Plan

Capital Item Accounts

Acct	Actv	Account	Activity	Forecast Amount	Amount	Variance
094		094 - Interest Capitalized		6,424	0	6,424
095		095-Thermal & Hydro Contracts AO		[redacted]	0	[redacted]
095		095-Thermal Regular Labour AO		24,274	0	24,274
001	014	001 - THERMAL Regular Labour	014 - SGP - Circ.Water Sys.	101,100	0	101,100
012	014	012 - Materials	014 - SGP - Circ.Water Sys.	104,000	0	104,000
013	014	013 - POWER PRODUCTION Contracts	014 - SGP - Circ.Water Sys.	[redacted]	0	[redacted]
			Total Cost:	251,544	0	251,544
			Original Cost:	214,000		

Capital Project Detailed Estimate

Location: Lingan
FP#:41124
Title: LIN-Cooling Water (CW) Screen Refurbishment

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Item	Description	Unit	Quantity	Unit Estimate	Total Estimate	Cost Support Reference	Completed Similar Projects (CI#'s)
1	**001 Regular Labour**						
1.1	Plant / GS Engineering - Technical and Project Support	hr	[redacted]		$ 1,000		
1.2	Mech Trades - (6 @10wks@8hr/day@5 day/wk). Inc Crane Ops)	hr	2400	39.50	$ 94,800		
1.3	El Trades - diconnects / connects	hr	40	42.50	$ 1,700		
1.4	Utility Trades	hr	120	30.00	$ 3,600		
				Sub-Total	$ 101,100		37743, 40223
2	**012 Materials**						
2.1	Top boot screen components	ea	[redacted]		40,000		
2.2	Screen Section Panels -stainless	ea			22,000		
2.3	Bottom Boot screen components	ea			42,000		
				Sub-Total	$ 104,000		37743, 40223
3	**013 Power Production Contracts**						
3.1	Machining and Refurbishment Contingecy	ea	2	[redacted]			
				Sub-Total	[redacted]		
6	**094 Interest Capitalized**						
6.1			1	6,424	6,424		
				Sub-Total	6,424		
7	**095 Administrative Overhead**						
7.1	Therm & Hydro Contracts AO				[redacted]		
7.2	Thermal Regualr labour AO				24,274		
				Sub-Total	[redacted]		
Project Cost Estimate				**Total**	$251,544		
8	**Original Cost**						
8.1					$214,000		

Note 1: Reference to "Completed similar projects (CI#'s)" is to be provided when the item estimate is based on work of similar scope for a recently completed project

LIN CW Screen Refurbishment
Summary of Alternatives & Assumptions

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Budget Year :	**2012**		**Date :**	**20-Oct-11**
Division :	Power Production		**CI Number:**	41124
Department :	Lingan		**Project No. :**	
Originator :				

	Alternative	After Tax WACC	PV of EVA / NPV	Rank	IRR	Disc Pay
A	CW Screen Refurbishment	6.67%	21,607	1	23.33%	5.3 years
B	Test 2	6.67%	0	2	#NUM!	0.0 years
C	Test 3	6.67%	0	2	#NUM!	0.0 years
D	Test 4	6.67%	0	2	#NUM!	0.0 years

Recommendation :

Based on a positive NPV, it is recommended that the CW screens be refurbished

Assumptions

Incremental replacement energy costs and annual operating costs in the years following 2013 are escalated at 2% annually.

Calculations:
Total annual avoided cost = [Replacement energy costs] + [Avoided unplanned repair costs]

Avoided replacement energy cost = [Incremental replacement energy cost] x [Quantity of predicted annual unit outages / de-ratings] x [capacity factor] x [Probability of failure] x [Derating/outage] x [Duration of Derating]

Avoided unplanned repair costs = [cost of Labour and materials in event of failure] x [Probability of failure] x [quantity of predicted annual unit outages / de-ratings]

Calculation of probability of failure in Year 2

The probability of the unit failing in year 2 is: (Probability of unit not failing in year 1) x (probability the unit will fail in year 2 if no failure accured in year 1)

Example: CW Screen Refurbishment

1	
-100%	Minus the Probability of failure in year 1
0%	Probability that CW screen does not fail in year 1
x	
60%	Probability of CW Screen failing in year 2 if no failure occurs in year 1
0%	**Probability of the CW Screen failing in year 2**

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Avoided Cost Calculations

Budget Year :	2012	Date :	20-Oct-11
Division :	Power Production	CI Number:	41124
Department :	Lingan	Project No. :	
Originator :			

CW Screen Refurbishment	
Capital Cost	$ 251,544
Avoided Replacement Energy costs (2012) =	[redacted] MWh x 1 outages x 80% x 100% x [redacted] MW x 240 h = $24,176.73
Avoided Unplanned Repair Costs (2012)	$ 322,943.64 x 100% x 1 = $ 322,944
Total Annual Avoided costs	$347,120.37
Avoided Replacement Energy costs (2013) =	[redacted] MWh x 2 outages x 80% x 0% x [redacted] MW x 240 h = $0.00
Avoided Unplanned Repair Costs (2013)	$ 72,967.92 x 0% x 2 = $ -
Total Annual Avoided costs	$ -

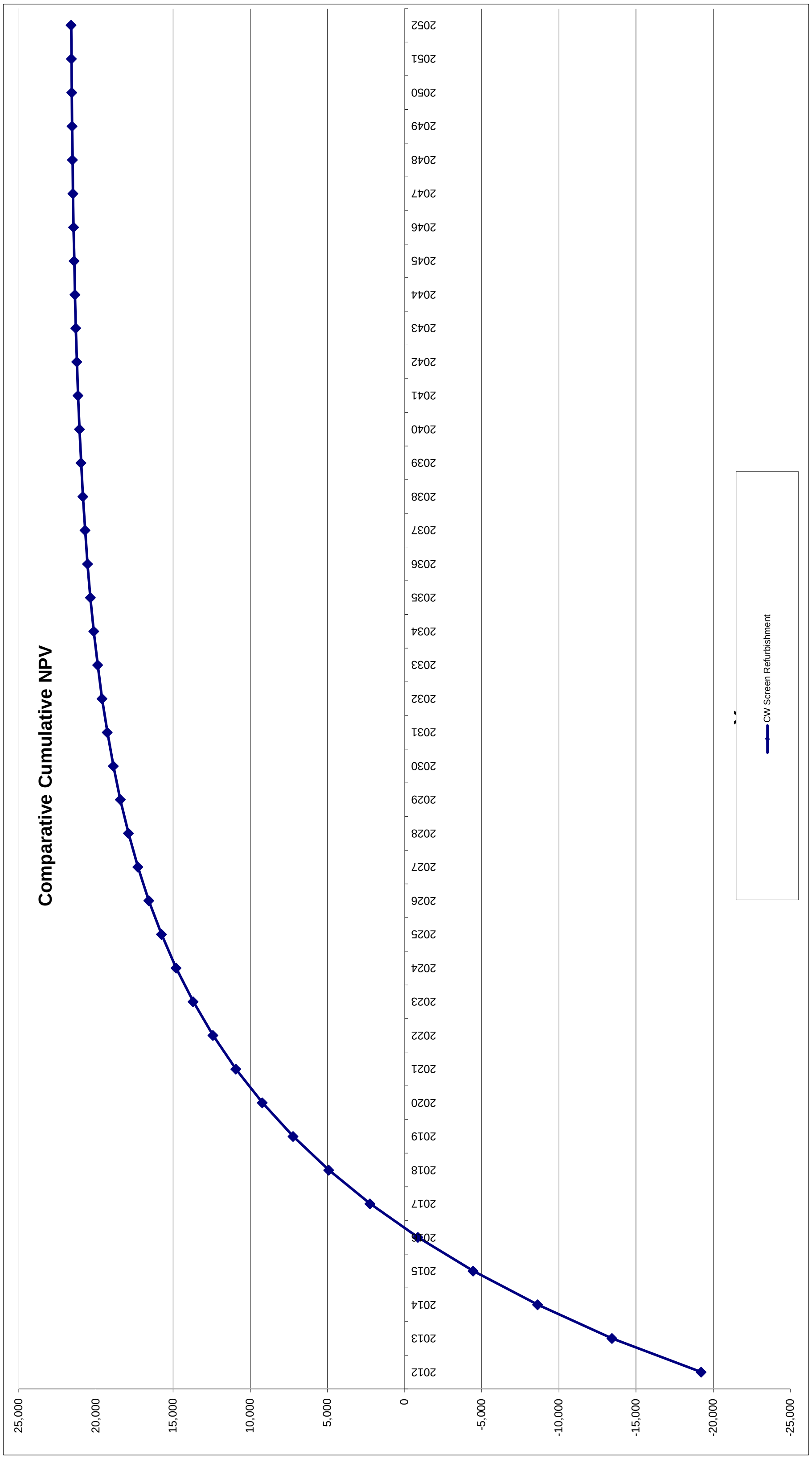
Test 2	
Capital Cost	
Avoided Replacement Energy costs (2012) =	
Avoided Unplanned Repair Costs (2012)	
Total Annual Avoided costs	
Avoided Replacement Energy costs (2013) =	
Avoided Unplanned Repair Costs (2013)	
Total Annual Avoided costs	

Test 3	
Capital Cost	
Avoided Replacement Energy costs (2012) =	
Avoided Unplanned Repair Costs (2012)	
Total Annual Avoided costs	
Avoided Replacement Energy costs (2013) =	
Avoided Unplanned Repair Costs (2013)	
Total Annual Avoided costs	

Test 4	
Capital Cost	
Avoided Replacement Energy costs (2012) =	
Avoided Unplanned Repair Costs (2012)	
Total Annual Avoided costs	
Avoided Replacement Energy costs (2013) =	
Avoided Unplanned Repair Costs (2013)	
Total Annual Avoided costs	

LIN CW Screen Refurbishment
CW Screen Refurbishment

Year	Total Revenue	Operating Costs	Capital	CCA	UCC	CFBT	Applicable Taxes	CFAT	Discount Factor	PV of CF	CNPV
2012	-	347,120.4	(251,544)	10,061.7	241,481.9	95,576.7	(114,799.2)	(19,222.4)	1.000	(19,222.4)	(19,222.4)
2013	-	-	-	19,318.6	222,163.3	-	6,166.1	6,166.1	0.937	5,780.5	(13,441.9)
2014	-	-	-	17,773.1	204,390.3	-	5,474.4	5,474.4	0.879	4,811.2	(8,630.7)
2015	-	-	-	16,351.2	188,039.1	-	5,068.9	5,068.9	0.824	4,176.2	(4,454.5)
2016	-	-	-	15,043.1	172,995.9	-	4,633.5	4,633.5	0.772	3,578.8	(875.7)
2017	-	-	-	13,839.7	159,156.3	-	4,290.3	4,290.3	0.724	3,106.5	2,230.9
2018	-	-	-	12,732.5	146,423.8	-	3,947.1	3,947.1	0.679	2,679.3	4,910.2
2019	-	-	-	11,713.9	134,709.9	-	3,631.3	3,631.3	0.636	2,310.8	7,221.0
2020	-	-	-	10,776.8	123,933.1	-	3,340.8	3,340.8	0.597	1,993.0	9,214.0
2021	-	-	-	9,914.6	114,018.4	-	3,073.5	3,073.5	0.559	1,718.9	10,932.9
2022	-	-	-	9,121.5	104,896.9	-	2,827.7	2,827.7	0.524	1,482.5	12,415.5
2023	-	-	-	8,391.8	96,505.2	-	2,601.4	2,601.4	0.492	1,278.6	13,694.1
2024	-	-	-	7,720.4	88,784.8	-	2,393.3	2,393.3	0.461	1,102.8	14,796.9
2025	-	-	-	7,102.8	81,682.0	-	2,201.9	2,201.9	0.432	951.1	15,748.0
2026	-	-	-	6,534.6	75,147.4	-	2,025.7	2,025.7	0.405	820.3	16,568.4
2027	-	-	-	6,011.8	69,135.6	-	1,863.7	1,863.7	0.380	707.5	17,275.9
2028	-	-	-	5,530.9	63,604.8	-	1,714.6	1,714.6	0.356	610.2	17,886.1
2029	-	-	-	5,088.4	58,516.4	-	1,577.4	1,577.4	0.334	526.3	18,412.4
2030	-	-	-	4,681.3	53,835.1	-	1,451.2	1,451.2	0.313	453.9	18,866.3
2031	-	-	-	4,306.8	49,528.3	-	1,335.1	1,335.1	0.293	391.5	19,257.8
2032	-	-	-	3,962.3	45,566.0	-	1,228.3	1,228.3	0.275	337.6	19,595.4
2033	-	-	-	3,645.3	41,920.7	-	1,130.0	1,130.0	0.258	291.2	19,886.6
2034	-	-	-	3,353.7	38,567.1	-	1,039.6	1,039.6	0.242	251.2	20,137.8
2035	-	-	-	3,085.4	35,481.7	-	956.5	956.5	0.226	216.6	20,354.4
2036	-	-	-	2,838.5	32,643.2	-	879.9	879.9	0.212	186.8	20,541.2
2037	-	-	-	2,611.5	30,031.7	-	809.6	809.6	0.199	161.1	20,702.4
2038	-	-	-	2,402.5	27,629.2	-	744.8	744.8	0.187	139.0	20,841.3
2039	-	-	-	2,210.3	25,418.9	-	685.2	685.2	0.175	119.9	20,961.2
2040	-	-	-	2,033.5	23,385.3	-	630.4	630.4	0.164	103.4	21,064.6
2041	-	-	-	1,870.8	21,514.5	-	580.0	580.0	0.154	89.2	21,153.7
2042	-	-	-	1,721.2	19,793.4	-	533.6	533.6	0.144	76.9	21,230.6
2043	-	-	-	1,583.5	18,209.9	-	490.9	490.9	0.135	66.3	21,296.9
2044	-	-	-	1,456.8	16,753.1	-	451.6	451.6	0.127	57.2	21,354.1
2045	-	-	-	1,340.2	15,412.8	-	415.5	415.5	0.119	49.3	21,403.5
2046	-	-	-	1,233.0	14,179.8	-	382.2	382.2	0.111	42.5	21,446.0
2047	-	-	-	1,134.4	13,045.4	-	351.7	351.7	0.104	36.7	21,482.7
2048	-	-	-	1,043.6	12,001.8	-	323.5	323.5	0.098	31.7	21,514.4
2049	-	-	-	960.1	11,041.7	-	297.6	297.6	0.092	27.3	21,541.7
2050	-	-	-	883.3	10,158.3	-	273.8	273.8	0.086	23.5	21,565.2
2051	-	-	-	812.7	9,345.7	-	251.9	251.9	0.081	20.3	21,585.5
2052	-	-	-	747.7	8,598.0	-	285.0	285.0	0.076	21.5	21,607.1
Total	-	347,120.4	(251,543.6)	242,945.6	2,919,646.6	95,576.7	(42,439.7)	53,137.0	14.9	21,607.1	594,071.4


Comparative Cumulative NPV
CW Screen Refurbishment
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15,000
10,000
5,000
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-5,000
-10,000
-15,000
-20,000
-25,000
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4 Integrated Customer Service

Integrated Customer Services (ICS) incorporates all aspects of NSPI Customer related operation and service functions, including Transmission and Distribution operations, Resource Management Centre, Customer Care Centre , Contact Centre and Revenue Operations.

In order to provide further insight into NSPI's ICS capital investment plan, the following tables provide the investment plan by investment category. All 2012 individual transmission and distribution projects are included within one of the following investment categories:

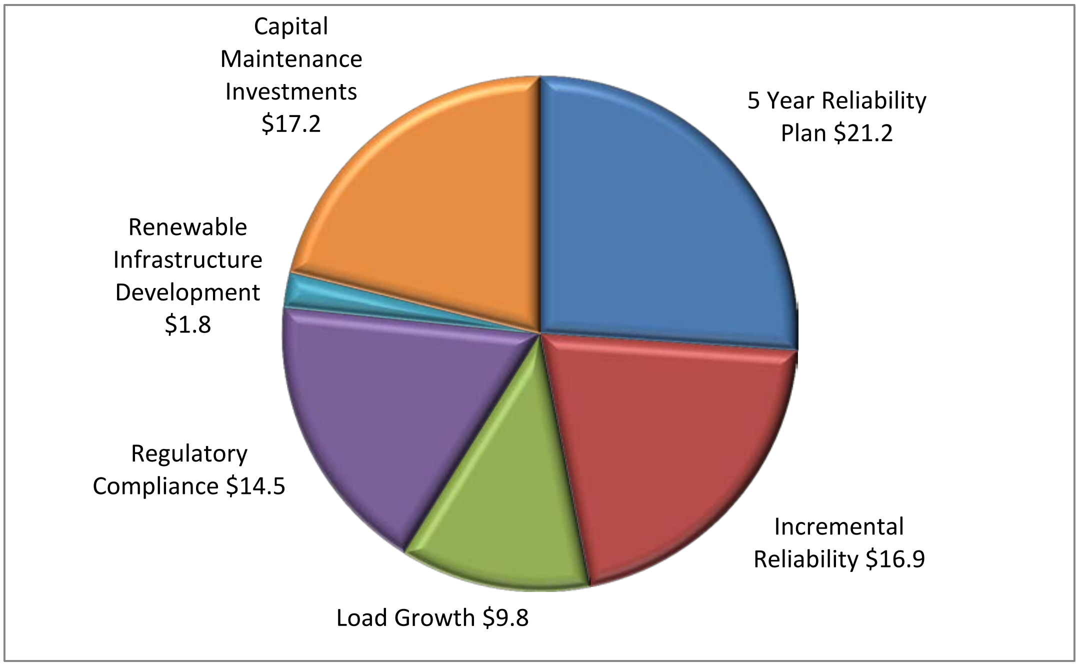
- Reliability; 5 Year Plan & Incremental Reliability Investments
- Load Growth
- Regulatory Compliance
- Renewable Infrastructure Development
- Capital Maintenance Investments

To achieve the most effective execution of required work the Resource Management Centre (RMC) is responsible for resource planning, scheduling and dispatch of work resources (NSPI and external contractors) for most Transmission and Distribution capital projects. Generally, the construction of new Transmission and Distribution assets are planned and executed by the Technical and Construction Services (T&CS) group. Considerations incorporated into the capital planning and execution work plans include:

- Synergies with other operating, or capital work
- The nature of the work to be undertaken (e.g. transmission versus distribution, live line versus deadline, customer requested versus new construction);
- The availability and cost of NSPI's resources versus contracting options
- The scope of the project (i.e. Is the project better matched with NSPI crew availability/size or a contractor crew);
- Project location, duration, resource requirements.

The breakdown of 2012 ICS capital projects by investment category is illustrated below in figure 4.0.1.

Figure 4.0.1 Integrated Customer Service- Capital Projects by Investment Category



4.1 Integrated Customer Service – Capital Projects Presented by Investment Category

Reliability: The capital expenditures identified in this investment category serve to maintain and enhance the reliability of NSPI's electrical system and improve performance. Investments in reliability are focused on aging assets and deteriorated equipment replacements, system performance improvements, technology improvements and storm hardening. All projects in this investment category are included in Table 4.1.0.

Table 4.1.0: Reliability Investment Capital Projects

CI#	Project Title	2012 ACE Plan	Total Estimate	Related Capital items 2012 & +/- 2 years
40281	2011 Transmission Line Insulator Replacement	$150,000	$3,018,100	2010 – CI 38110 2010 Transmission Line Insulator Replacement $2,236,148 2012 - CI 41517 L6535 Lidar Upgrades & Maintenance $2,361,250 2013 - CI TBD 2013 Transmission Line Insulator Replacements $TBD
41387	2012 Transmission Line Insulator Replacements	3,619,166	3,619,166	2010 – CI 38110 2010 Transmission Line Insulator Replacement $2,236,148 2011 – CI 40281 2011 Transmission Line Insulator Replacement $3,018,100 2012 - CI 41517 L6535 Lidar Upgrades & Maintenance $2,361,250 2013 - CI TBD 2013 Transmission Line Insulator Replacements $TBD
41430	2012 Substation Recloser Replacement	2,120,686	2,120,686	2011 - CI 40287 Substation Recloser Replacement - $3,764,921 2013 CI TBD Substation Recloser Replacement $TBD
41426	2012 Transmission Switch & Breaker Upgrades	2,000,849	2,000,849	2010 - CI 38027 2010 Trans Switch & Breaker Upgrades $2,070,094 2011 - CI 40280 2011 Trans Switch & Breaker Upgrade $2,866,718 2013 - CI TBD Transmission Switch & Breaker Upgrades $TBD
41536	2012 Reliability Technologies Transmission	877,747	958,276	NA

CI#	Project Title	2012 ACE Plan	Total Estimate	Related Capital items 2012 & +/- 2 years
41399	2012 Substation Insulator & Cutout Replacements	800,013	800,013	2010 - CI 38878 2010 Subs Cutout and Insul. Replacement $1,506,414
41392	2012 Distribution Cutout Replacements	2,596,796	2,596,796	2010 – CI 38024 Distribution Cutout Replacements $2,000,606 2011 – CI 39270 Distribution Cutout Replacements $2,916,035 2013, 2014 – CI TBD Distribution Cutout Replacements $TBD
41534	2012 Reliability Technologies Distribution	$2,423,179	$2,496,069	2010 – CI 38914 2010 Animal Guard Installations $100,038 2011 – CI 40545 2011 New Reliability Technologies $110,769
41349	2012 Off Road To Roadside	884,869	884,869	2010 - CI 38062 Off Road to Roadside - $1,000,119 2011 - CI 40227 Off Road to Roadside - $2,500,000 2013, 2014 – CI TBD Off Road to Roadside $TBD
41383	2012 Halifax Underground Feeder Replacement	596,760	596,760	2010 – CI 38903 Halifax UG Cable Replacement 1H-403 & 405 - $473,599 2011 – CI 40220 Halifax Underground Cable Replacement - $418,861 2013 - CI TBD Halifax Underground Cable Replacement $TBD
41351	2012 Distribution Automation	553,965	553,965	2011 – CI 39269 Recloser Additions - $444,765
41353	2012 Downline Recloser Additions	543,284	543,284	2010 – CI 38022 2010 Recloser Additions $1,400,271 2011 – CI 39269 2011 Recloser Additions $444,765 2013 - CI TBD Downline Recloser Additions $TBD
41355	2012 Remote Communication on Reclosers	536,258	536,258	NA
41339	2012 Distribution Feeder Ties	492,873	492,873	2010 - CI 38847 - 2010 Distribution Feeder Ties - $531,609 2011 - CI 39272 - 2011 Distribution Feeder Ties - $500,000 2013 - CI TBD - 2013 Distribution Feeder Ties - $ TBD

CI#	Project Title	2012 ACE Plan	Total Estimate	Related Capital items 2012 & +/- 2 years
41325	Replacement of 3H and 6H Reclosers	465,327	465,327	2010- CI 38867 - Replacement of 3H and 6H Reclosers - 253,331 2011- CI40211 3H/6H Replacement Program -306,895
41384	2012 Feeder Exit Cable Replacement	374,542	374,542	2011 - CI 40328 Feeder Exit Cable Replacements $317,587 2013 - CI TBD Feeder Exit Replacement $TBD
41338	20H-301 Targeted Feeder Replacement	371,361	371,361	NA
40211	2011 3H/6H Replacement Program	110,711	342,219	NA
41393	2012 Automatic Sleeve Replacements	287,831	287,831	NA
41337	1N-405 Targeted Feeder Replacement	%283,892	$283,892	NA
41334	16N-301 Targeted Feeder Replacement	214,378	214,378	NA
41340	5N-301 Targeted Feeder Replacement	172,695	172,695	NA
41354	519N-201 Partial Feeder Voltage Conversion to 25KV	164,814	164,814	NA
41329	11W-202 Voltage Conversion to 12 kV	98,382	98,382	2012 - CI 41592 - 88W New Recloser and Relocate 88W-322 $111,171 2012 - CI 41363 - 88W New Feeder $269,616
41343	81S-302 Targeted Feeder Replacements	96,642	96,642	NA
41344	81S-305 Targeted Feeder Replacements	80,992	80,992	NA
41326	103C-311 Targeted Feeder Replacements	74,612	74,612	NA
41332	15S-302 Targeted Feeder Replacements	73,023	73,023	NA
41345	82S-303 Targeted Feeder Replacements	61,625	61,625	NA
41342	81S-301 Targeted Feeder Replacements	50,632	50,632	NA
41328	103W-312 Targeted Feeder Replacements	47,851	47,851	NA
Five Year Reliability Plan Total		**$21,225,754**	**$25,880,076**	

CI#	Project Title	2012 ACE Plan	Total Estimate	Related Capital items 2012 & +/- 2 years
Incremental Year Reliability Plan				
33624	Spare Generator Transformer	$3,682,026	$4,142,622	NA
40317	Additional Water Street Transformer & Low Side 25 kV Breakers	2,367,466	3,947,034	NA
41555	Spare Wind Farm Generator Transformer	2,535,465	2,535,465	NA
41553	Dartmouth East Transformer Addition	2,307,615	2,307,615	NA
41552	131H Lucasville Transformer Addition	1,893,150	1,893,150	NA
41434	Procure Additional 42 MVA Spare Transformer	1,043,984	1,043,984	NA
40868	64V-T1 Transformer Replacement U&U - Greenwood	391,662	945,187	NA
40862	101H-T61 Transformer Refurbishment U&U - Cobequid	$255,853	$919,893	NA
41550	Spare 30MVA 69KV 25/12KV Transformer	728,999	859,852	NA
41437	104H-T62 Kempt Road Transformer Rewind	790,201	790,201	2011 - CI 39723 104H- T63 Transformer Refurbishment $753,177 2011 - CI 40185 104H- T61 Transformer Refurbishment $946,675
41589	22N-Church St Replace 25 kV Bus and Feeder Exit	734,302	734,302	NA
40867	59C-T61 Transformer Refurbishment U&U - St. Peter's	208,039	725,671	NA
Incremental Reliability Total		**$16,938,764**	**$20,844,977**	

Load Growth Capital Investments: Capital expenditures identified in this investment category are developed as a result of an increase in customer energy demand. Load growth generally occurs through natural growth of a service area resulting from increased prosperity, productivity or population growth. All projects in this investment category are included in Table 4.1.1.

Table 4.1.1.: Load Growth Capital Projects

CI#	Project Title	2012 ACE Plan	Total Estimate	Related Capital items 2012 & +/- 2 years
Transmission				
41519	Harbour East 138 kV Transmission Line	$211,410	$7,859,669	2012 - CI 41520 - Harbour East Substation - Eastern Passage - $3,490,007 2012 - CI 41522 - 138kV Line Terminal at Dartmouth East Substation - $788,149 2012 - CI 38849- Harbour East Land Purchase and ROW - $179,680
41520	Harbour East Substation - Eastern Passage	394,305	3,490,007	CI 41519 - Harbour East 138 kV Tx Transmission Line CI 41522 - 138kV Line Terminal at Dartmouth East Substation 2012 CI 38849- Harbour East Land Purchase and ROW
40322	New Prospect Road Substation	3,153,291	3,184,409	2011 - CI 40321 Canaan Road to Prospect Transmission Line $2,0024,763 2011- CI 40323Canaan Road Line Terminal $ 738,632 2011 - CI 41540 99V Highbury Rd New Feeders $1,093,229
40321	Install Canaan Road to Prospect Road Transmission Line	2,104,620	2,182,578	2011 - CI 40322 New Prospect Road Substation $3,153,291 2011- CI 40323Canaan Road Line Terminal $ 1,004,202 2011 - CI 41540 99V Highbury Rd New Feeders $1,093,229
41005	Parrsboro Tidal Interconnection	1,522,568	1,746,574	2008 – CI28678Renewable-In-Stream Tidal Generator $3,300,000
40323	Canaan Road Line Terminal	967,187	1,004,202	2011 - CI 40321 Canaan Road to Prospect Transmission Line $2,081,197 2011 - CI 40322 New Prospect Road Substation $3,068,581 2011 - CI 41540 99V Highbury Rd New Feeders $1,093,229
41522	138kV Line Terminal at Dartmouth East Substation	40,743	788,149	CI 41519 - Harbour East 138 kV Tx Line - $TBD CI 41520 - Harbour East Substation - Eastern Passage - $3,490,007
Transmission Load Growth Total		**$8,394,123**	**$20,255,587**	

CI#	Project Title	2012 ACE Plan	Total Estimate	Related Capital items 2012 & +/- 2 years
Distribution				
41540	99V Highbury Rd New Feeders	$1,093,229	$1,093,229	2011 - CI 40321 Canaan Road to Prospect Transmission Line $2,081,197 2011 - CI 40322 New Prospect Road Substation $3,153,291 2011 - CI 40323Canaan Road Line Terminal $ 1,004,202
41341	1H-Water Street New Feeder	280,657	280,657	NA
Distribution - Load Growth Total		**$1,373,886**	**$1,373,886**	
Total Load Growth		**$9,768,009**	**$21,629,474**	

Regulatory Compliance Capital Investments: In certain cases, capital investments are made in order to comply with recognized Canadian Standards Association (CSA) which are routinely incorporated into provincial regulations, internationally recognized reliability standards such as NERC/NPCC, Environment Canada PCB regulations, etc. Examples of projects in this investment category include the Protection Upgrades at Tufts Cove, Lakeside and Onlsow that are required to comply with North American Electric Reliability Corporation (NERC) standards. All projects in this investment category are included in Table 4.1.2.

Table 4.1.2: Regulatory Compliance Capital Projects

CI#	Project Title	2012 ACE Plan	Total Estimate	Related Capital items 2012 & +/- 2 years
40320	LED Street Light Conversion	$5,739,651	$100,000,000	NA
40233	2011 Protection Upgrades TUC	2,513,370	3,998,885	2010 – CI 38266 2010 Protection Upgrades $313,331 2011 – CI 40231 Protection Upgrades Lakeside $1,609,905 2012 – CI 41348 Protection Upgrades Onslow $2,274,015 2013 – CI 41347 Protection Upgrades Brushy Hill $1,873,614
41348	2012 Protection Upgrades Onslow	2,274,015	2,274,015	2010 – CI 38266 2010 Protection Upgrades $313,331 2011 – CI 40231 Protection Upgrades Lakeside $1,609,905 2011 – CI 40233 2011 Protection Upgrades TUC $3,928,932 2013 – CI 41347 Protection Upgrades Brushy Hill $1,873,614

CI#	Project Title	2012 ACE Plan	Total Estimate	Related Capital items 2012 & +/- 2 years
41429	2012 Substation PCB Equipment Removal	1,854,665	1,854,665	2010 – CI 38122 2010 PCB Equipment Removal/Destruction - $ 1,487,135 2011 – CI 40288 2011 Substation PCB Equipment Removal - $2,510,193 2013 – CI TBD PCB Equipment Removal $TBD 2014 – CI TBD PCB Equipment Removal $TBD
40231	2011 Protection Upgrades LAK	1,536,649	1,579,848	2010 – CI 38266 2010 Protection Upgrades $313,331 2011 – CI 40231 Protection Upgrades Lakeside $1,609,905 2011 – CI 40233 2011 Protection Upgrades TUC $3,928,932 2013 – CI 41347 Protection Upgrades Brushy Hill $1,873,614
41386	2012 Pole Retreatment	$556,017	$556,017	2010 – CI 38860 2010 Pole Retreatment $495,505 2011 – CI 40279 2011 Pole Retreatment $516,341 2013 – CI TBD Pole Retreatment $TBD
Regulatory Compliance Total		**$14,474,367**	**$110,263,430**	

Renewable Infrastructure Development Investments: The capital expenditures identified in this investment category are required to support the interconnection of renewable projects to NSPI's transmission and distribution systems. All projects in this investment category are included in Table 4.1.3.

Table 4.1.3: 2012 Renewable Infrastructure Investment

CI#	Project Title	2012 ACE Plan	Total Estimate	Related Capital items 2012 & +/- 2 years
41537	Amherst 138kV Substation	$1,808,362	$2,781,762	NA
Renewable Infrastructure Total		**$1,808,362**	**$2,781,762**	

Capital Maintenance Investments: On an annual basis, through planned inspections and performance monitoring NSPI identifies deteriorating components on the electrical system. The capital expenditures identified in this investment category are required to ensure the continued reliable operation of these assets. All projects in this investment category are included in Table 4.1.4.

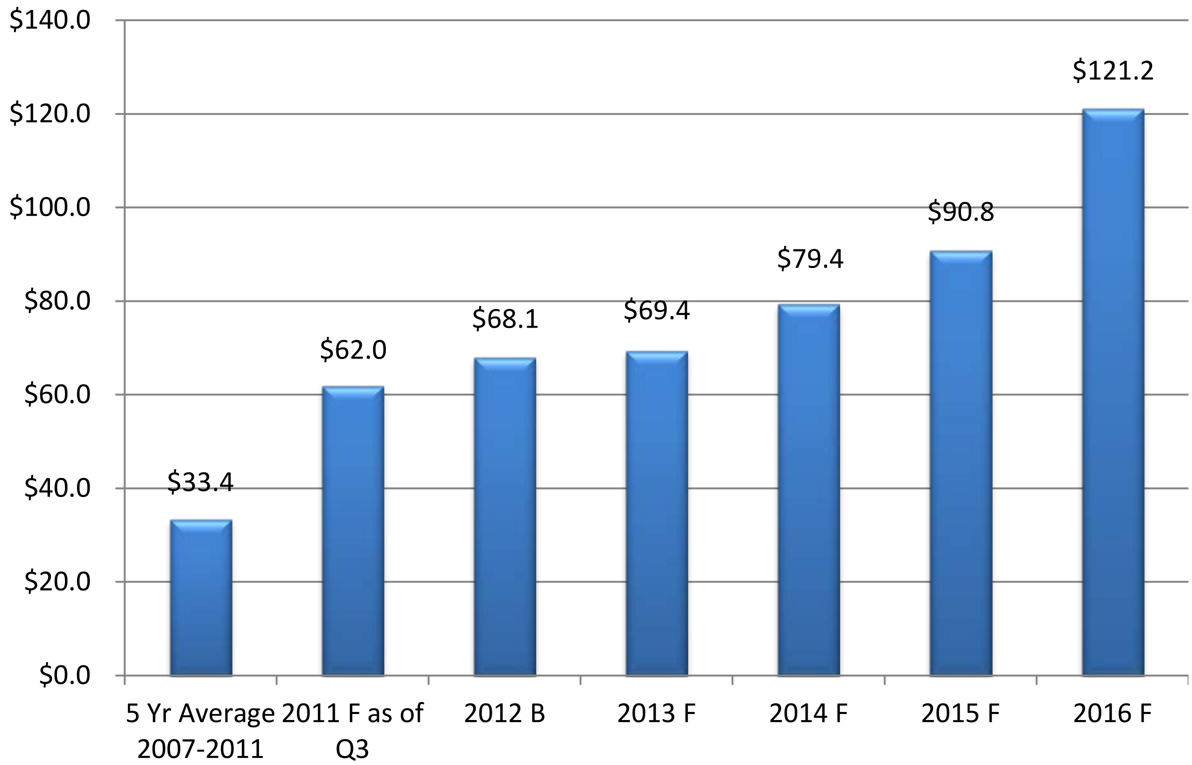
Table 4.1.4: 2012 Capital Maintenance Investments

CI#	Project Title	2012 ACE Plan	Total Estimate	Related Capital items 2012 & +/- 2 years
Transmission				
41592	88W New Recloser and Relocate 88W-322	$111,171	$111,171	2012 – CI 41363 - 88W New Feeder $269,619 2012 – CI 41329 - 11W-202 Voltage Conversion to 12 kV $98,329
41432	L7009 Lidar Upgrades & Maintenance	2,942,809	2,942,809	NA
41517	L6535 Lidar Upgrades & Maintenance	2,361,250	2,361,250	2012 – CI 41387 - 2012 Transmission Line Insulator Replacement $3,619,166
41535	2012 Steel Tower Painting	1,270,605	1,270,605	NA
41844	Reinsulate Transmission Lines L8004 & L7005	1,139,264	1,139,264	NA
40266	L6002 Deteriorated Replacements	157,029	1,136,031	NA
40310	Circuit Switcher Additions	680,990	680,990	NA
41551	Glentosh Substation Footing Remediation	552,201	552,201	NA
41391	L6025 Spar Arm Reinforcement	489,925	489,925	NA
41422	Onslow Spares Storage Upgrades	415,661	415,661	NA
41439	Mobile Refurbishments 5P & 6P	367,409	367,409	NA
41438	85S-Wreck Cove Cable Termination Replacement	291,194	291,194	NA
41362	7H Beaufort Switchgear Retirement	278,071	278,071	2012 – CI 41388 7H Beaufort Conversion $174,253
41390	7V Methals Hydro Transformer Replacement	258,506	258,506	NA
41395	8H Fairview Switchgear Retirement	213,288	213,288	NA
Transmission Total		**$11,529,375**	**$12,508,376**	

CI#	Project Title	2012 ACE Plan	Total Estimate	Related Capital items 2012 & +/- 2 years
Distribution				
41797	Brier Island Crossing	$1,006,642	$1,006,642	NA
41398	2012 Padmount Transformer Replacements	827,340	827,340	NA
41359	79V-402 Feeder Load Reduction	797,378	797,378	NA
41389	8H Fairview Conversion	417,695	417,695	2012 – CI 41395 8H Fairview Switchgear Retirement $213,288
40224	78W-301 Second Peninsula	406,598	406,598	NA
41333	16N-301 Stewiacke Reconductor	353,467	353,467	NA
41327	103W-311 Gold River Reconductor Phase 2	310,296	310,296	2011 – CI 40203 103W-311 Gold River Phase 1 - $434,415 2013 – CI TBD 103W-311 Gold River Phase 3 $TBD 2014 – CI TBD 103W-311 Gold River Phase 4 $TBD
41363	88W New Feeder	269,616	269,616	2012 – CI 41592 - 88W New Recloser and Relocate 88W-322 $111,171 2012 – CI 41329 - 11W-202 Voltage Conversion to 12kV $98,382
41356	35V-312 Windsor Causeway	252,137	252,137	NA
40219	2011 Recloser Control Replacements	216,786	216,786	NA
41388	7H Beaufort Conversion	174,253	174,253	2012 CI 41362 Beaufort Switchgear Retirement $278,071
41431	1C-411/22C-404 Transfer Scheme	149,850	149,850	NA
41360	82V-423 Hardwood Lands Deteriorated Plant Replacement	437,192	437,192	NA
41397	2012 Padmount Switchgear Replacement	67,738	67,738	NA
Distribution Total		**$5,686,987**	**$5,686,987**	
Total Capital Maintenance		**$17,216,362**	**$18,195,363**	

5. Transmission

Millions of Dollars)



5.1 Transmission – Five-year Plan and Highlights

The focus for Transmission capital investments in 2012 continues to reflect growth in the customer base and customer reliability. The $68.1M Transmission capital investment plan for 2012 is comprised of the following:

i	New 2012 capital spending for projects with total estimated project spend greater than $250K and for which approval is sought	$26.2
ii	New 2012 capital spending for projects with total estimated project spend greater than $250K for subsequent approval	$20.1
iii	New capital spending for projects with total estimated spend less than $250K for which approval is not sought	$0.3
iv	Carry-over capital spending	$10.4
v	Routine capital spending	$11.1
vi	**Total 2012 Transmission capital investment plan**	**$68.1M**
vii	**Request for ACE approval (Items i + v)**	**$37.2M**

5.2 Transmission – Carry-over capital Spending Summary

Table 5.2 Transmission Carry-over Capital Spending Summary

Project Number	CI#	Project Title	Start Date	Final Date	Previous Expenditure	2012 Budget	Subsequent Spending	Total Estimate
Transmission Plant								
T639	33624	Spare Generator Transformer	2010/06	2012/11	$460,596	$3,682,026	$0	$4,142,622
T662	40233	2011 Protection Upgrades TUC	2011/01	2012/08	1,485,516	2,513,370	0	3,998,885
T688	40231	2011 Protection Upgrades LAK	2011/07	2012/12	43,198	1,536,649	0	1,579,848
T691	41005	Parrsboro Tidal Interconnection	2011/07	2012/06	224,006	1,522,568	0	1,746,574
	40868	64V-T1 Transformer Replacement	2011/07	2012/03	553,524	391,662	0	945,187
T696	40862	101H-T61 Transformer Refurbishment	2011/08	2012/03	664,040	255,853	0	919,893
	40867	59C-T61 Transformer Refurbishment	2011/05	2012/03	517,632	208,039	0	725,671
T671	40266	L6002 Deteriorated Replacements	2011/05	2012/06	979,001	157,029	0	1,136,031
T668	40281	2011 Tx Line Insulator Replacement	2011/03	2012/08	4,269,394	150,000	0	4,419,393
	Total Transmission Plant				**$9,196,908**	**$10,417,196**	**$0**	**$19,614,104**
Total Transmission Carry Over Spending					**$9,196,908**	**$10,417,196**	**$0**	**$19,614,104**

5.3 Transmission – New 2012 Capital items for ACE Approval

Table 5.3 Transmission – New 2012 Capital Items for ACE Approval

Tab#	CI#	Project Title	2012 Budget	Project Total
	Transmission Plant			
T01	41387	2012 Transmission Line Insulator Replacements	$3,619,166	$3,619,166
T02	41432	L7009 Lidar Upgrades & Maintenance	2,942,809	2,942,809
T03	41517	L6535 Lidar Upgrades & Maintenance	2,361,250	2,361,250
T04	41348	2012 Protection Upgrades Onslow	2,274,015	2,274,015
T05	41430	2012 Substation Recloser Replacement	2,120,686	2,120,686
T06	41426	2012 Transmission Switch & Breaker Upgrades	2,000,849	2,000,849
T07	41429	2012 Substation PCB Equipment Removal	1,854,665	1,854,665
T08	41535	2012 Steel Tower Painting	1,270,605	1,270,605
T09	41844	Reinsulate Transmission Lines L8004 & L7005	1,139,264	1,139,264
T10	41434	Procure Additional 42 MVA Spare Transformer	1,043,984	1,043,984
T11	41399	2012 Substation Insulator & Cutout Replacements	800,013	800,013
T12	41437	104H-T62 Kempt Road Transformer Rewind	790,201	790,201
T13	41589	22N-Church St Replace 25 kV Bus and Feeder Exit	734,302	734,302
T14	41386	2012 Pole Retreatment	556,017	556,017
T15	41551	Glentosh Substation Footing Remediation	552,201	552,201
T16	41391	L6025 Spar Arm Reinforcement	489,925	489,925
T17	41422	Onslow Spares Storage Upgrades	415,661	415,661
T18	41439	Mobile Refurbishments 5P & 6P	367,409	367,409
T19	41438	85S-Wreck Cove Cable Termination Replacement	291,194	291,194
T20	41362	7H Beaufort Switchgear Retirement	278,071	278,071
T21	41390	7V Methals Hydro Transformer Replacement	258,506	258,506
		Total Transmission Plant	**$26,160,795**	**$26,160,795**
	Total Transmission New Spending		**$26,160,795**	**$26,160,795**

Transmission CIs 1 – 21

CI Number: 41387

Title: **2012 Transmission Line Insulator Replacements**

Start Date: 2012/02
Final Cost Date: 2012/12
Function: Transmission
Forecast Amount: $3,619,166

DESCRIPTION:

This project provides for costs associated with the replacement of insulators on five transmission circuits in 2012. Insulators targeted for replacement have a known failure mechanism resulting from cement growth which lead to unplanned transmission outages and customer outages. This CI only covers the replacement of insulators in 2012. NSPI intends to submit a separate Cl's for insulator replacements in future years.

Replacement of insulators on the following five lines:

L6004 Sackville to Canaan Road – 7728 insulators
L5521 Onslow to Willow Lane – 120 insulators
L7002 forty structures only near the Brushy Hill end of the line – 1650 insulators
L5536B Pleasant St to Hebron – 1077 insulators
L6535 Maccan to NB - 1686 insulators

Summary of Related CI's +/- 2 years:
2010 CI 38110 2010 Transmission Line Insulator Replacement $2,236,168
2011 CI 40281 2011 Transmission Line Insulator Replacement $3,018,100
2012 CI 41517 L6535 Lidar Upgrades & Maintenance $2,361,250
2013 CI TBD 2013 Transmission Line Insulator Replacements $TBD

JUSTIFICATION:

Justification Criteria: Transmission Plant

Sub Criteria: Outage Performance

Why do this project?

This work is being undertaken as part of the overall customer reliability improvement investment. This is year three of a five year (2010-2014) plan to improve reliability to NSPI's customers. The insulator failure mechanism is well known and previously replaced insulators have been performing well.

Why do this project now?

This project is required because throughout NSPI's system, the type of installed insulator on these circuits has failed due to an industry known cement growth failure mechanism.

Why do this project this way?

Replacing the existing defective insulators with a new type of improved insulator is the only option. Based on the scope of the work and availability of NSPI's Power Line Technician workforce, the Company plans to engage a contractor to perform this work.

The labour for this project will be sourced through NSPI's existing Power Line Technician (PLT) Service Agreement with EUS. This is aligned with NSPI's workforce planning model which is designed to optimize the allocation and execution of PLT resources among work requirements.

CI Number : 41387 - 2012 Transmission Line Insulator Replacements **Project Number**

Parent CI Number : -

Cost Centre : 800 - 800-Services - Admin. **Budget Version** 2012 ACE Plan

Capital Item Accounts

Acct	Actv	Account	Activity	Forecast Amount	Amount	Variance
092		092-Vehicle T&D Reg. Labour AO		24,127	0	24,127
094		094 - Interest Capitalized		74,103	0	74,103
095		095-COPS Regular Labour AO		36,754	0	36,754
095		095-COPS Contracts AO		620,071	0	620,071
012	035	012 - Materials	035 - TP - Wood Poles	8,670	0	8,670
013	035	013 - COPS Contracts	035 - TP - Wood Poles	[redacted]	0	[redacted]
012	038	012 - Materials	038 - TP - Insulators	104,039	0	104,039
013	038	013 - COPS Contracts	038 - TP - Insulators	[redacted]	0	[redacted]
012	039	012 - Materials	039 - TP - O/H Cond.	60,689	0	60,689
013	039	013 - COPS Contracts	039 - TP - O/H Cond.	[redacted]	0	[redacted]
001	085	001 - T&D Regular Labour	085 Design	47,615	0	47,615
001	087	001 - THERMAL Regular Labour	087 Field Super.& Ops.	0	0	0
002	087	002 - THERMAL Overtime Labour	087 Field Super.& Ops.	0	0	0
			Total Cost:	3,619,166	0	3,619,166
			Original Cost:	466,704		

CI 41387 2012 Transmission Line Insulator Replacements

The following is a breakdown of costs associated with the 2012 Transmission Line Insulator Replacements project:

Administrative Overhead and Interest	$ 755,055
Materials	$ 173,398
Contracts	$ 2,643,098
COPS Labour	$ 47,615
Total	$ 3,619,166

The work associated with this project is expected to be sourced through NSPI's existing Power Line Technician (PLT) contract with Emera Utility Services, at a rate of approximately [redacted] per compatible unit hour. NSPI will be providing field supervision for this project.

The materials amount of this project is based on costs associated with 12,261 porcelain 10" disc insulators and associated hardware.

CI Number: 41432

Title: **L7009 Lidar Upgrades & Maintenance**

Start Date: 2012/06
Final Cost Date: 2012/12
Function: Transmission
Forecast Amount: $2,942,809

DESCRIPTION:

This transmission circuit is almost 40 years old and conductor to ground clearance issues have been identified. The conductor will be cut and re-sagged to increase clearances and a number of structures will be replaced with taller poles as required to meet Canadian Standards Association (CSA) clearance requirements. Additionally, a portion of this project will address deteriorated plant which has been identified through NSPI's inspection program.

Summary of Related CI's +/- 2 years:
No projects for 2010, 2011, 2012, 2013 & 2014

JUSTIFICATION:

Justification Criteria: Transmission Plant

Sub Criteria: Maintenance

Why do this project?

This project is required to increase the ground clearance from energized conductors in locations that do not meet minimum CSA standards for ground clearance along with replacing deteriorated plant. Ground Clearance issues exist due to the sag of lines over time, updated CSA requirements or a combination of the two. This work will involve replacing 130 structures.

Why do this project now?

This project will ensure proper clearances are met and operating ratings can be maintained, and will also address deteriorated plant issues.

Why do this project this way?

This project provides for raising the height of spans that do not meet the CSA standard requirement by installing a mid-span structure or changing out existing structures with higher structures.

The labour for this project will be sourced through NSPI's existing Power Line Technician (PLT) Service Agreement with EUS. This is aligned with NSPI's workforce planning model which is designed to optimize the allocation and execution of PLT resources among work requirements.

CI Number : 41432 - L7009 Lidar Upgrades & Maintenance **Project Number**

Parent CI Number : -

Cost Centre : 800 - 800-Services - Admin. **Budget Version** 2012 ACE Plan

Capital Item Accounts

Acct	Actv	Account	Activity	Forecast Amount	Amount	Variance
092		092-Vehicle T&D Reg. Labour AO		12,005	0	12,005
094		094 - Interest Capitalized		13,096	0	13,096
095		095-Thermal Regular Labour AO		467	0	467
095		095-COPS Regular Labour AO		18,288	0	18,288
095		095-COPS Contracts AO		370,954	0	370,954
012	035	012 - Materials	035 - TP - Wood Poles	506,630	0	506,630
013	035	013 - COPS Contracts	035 - TP - Wood Poles	[redacted]	0	[redacted]
013	038	013 - COPS Contracts	038 - TP - Insulators	[redacted]	0	[redacted]
012	039	012 - Materials	039 - TP - O/H Cond.	303,978	0	303,978
013	039	013 - COPS Contracts	039 - TP - O/H Cond.	[redacted]	0	[redacted]
012	040	012 - Materials	040 - TP - O/H Cond.Devices	110,537	0	110,537
001	085	001 - THERMAL Regular Labour	085 Design	1,945	0	1,945
002	085	002 - T&D Overtime Labour	085 Design	0	0	0
001	087	001 - T&D Regular Labour	087 Field Super.& Ops.	23,692	0	23,692
002	087	002 - T&D Overtime Labour	087 Field Super.& Ops.	0	0	0
			Total Cost:	2,942,809	0	2,942,809
			Original Cost:	425,041		

CI 41432 L7009 Lidar Upgrades & Maintenance

The following is a breakdown of costs associated with the L7009 Lidar Upgrades & Maintenance project:

Administrative Overhead and Interest	$ 414,810
Materials	$ 921,145
Contracts	$ 1,581,218
COPS Labour	$ 25,637
Total	$ 2,942,810

The work associated with this project is expected to be sourced through NSPI's existing Power Line Technician (PLT) contract with Emera Utility Services, at a rate of approximately [redacted] per compatible unit hour. NSPI will be providing field supervision and engineering design for this project. The materials forecast is based on costs associated with similar projects in which deteriorated poles were replaced and conductor upgraded to achieve higher ratings.

230kV Transmission Line L7009 - Bridgewater 99W to Brushy Hill 120H
50°C Max Operating Temperature
Upgrade Summary

Structure	Structure Type	New Structure Requirements: Pole Length (ft)	Min. Pole Class	Min Class for 35' Spar Arm	Min Class for 30' Spar Arm	Required Raise (ft)	Nip (m)	Tuck (m)	Additional Comments
99W	Bridgewater Sub								
1	3 Pole Deadend								
2	Tangent Gulfport								
3	3 Pole Deadend						0.15		
4	Tangent Gulfport							0.10	
5	Tangent Gulfport								
5A	Non-Typical								
6	3 Pole Deadend								
7	3 Pole Deadend								
8	3 Pole Deadend								
9	3 Pole Deadend								
10	Tangent Gulfport	75	3	6	5	9.0			
11	3 Pole Deadend	New DE requires 58ft Insulator Attachment Ht AGL				13.5			Crossing Wire, Str Raise Coincides with maintenance plan
12	Tangent Gulfport								
13	3 Pole Deadend								
14	3 Pole Deadend	New DE requires 44ft Insulator Attachment Ht AGL				4.5			
15	3 Pole Deadend	New DE requires 48ft Insulator Attachment Ht AGL				4.5			
16	3 Pole Deadend	New DE requires 54ft Insulator Attachment Ht AGL				4.5			
17	Tangent Gulfport								
18	Tangent Gulfport								
19	Tangent Gulfport								
20	3 Pole Deadend								
21	3 Pole Deadend								
22	Tangent Gulfport							-0.20	
23	Tangent Gulfport								
24	Tangent Gulfport								
25	Tangent Gulfport								
26	Tangent Gulfport								
27	Tangent Gulfport	75	3	6	6	9.0			
28	Non-Typical	New Angle requires 73ft Conductor Susp. Ht AGL				22.5			Water Crossing
29	3 Pole Deadend	New DE requires 83ft Insulator Attachment Ht AGL				22.5			Water Crossing
30	Tangent Gulfport	105	1	6 (x2)	5	13.5			Water Crossing. Add another set of cross braces to this structure. This size of wood pole may not be available but Steel Poles/Towers or Laminated Wood Structures can be used as well.
31	3 Pole Deadend	New DE requires 56ft Insulator Attachment Ht AGL				13.5			Steep Incline
32	Tangent Gulfport	80	3	6	5	13.5	0.35		Steep Incline
33	3 Pole Deadend								
34	Tangent Gulfport								
35	Tangent Gulfport								
36	3 Pole Deadend	New DE requires 45ft Insulator Attachment Ht AGL				9.0			
37	Tangent Gulfport								
38	Tangent Gulfport								
39	3 Pole Med.Angle	New Angle requires 53ft Conductor Susp. Ht AGL				9.0			Dist Line
40	Tangent Gulfport								
41	3 Pole Deadend								
42	Tangent Gulfport								
43	3 Pole Deadend						0.15		
44	Tangent Gulfport								
45	Tangent Gulfport								
46	3 Pole Deadend	New DE requires 55ft Insulator Attachment Ht AGL				13.5			
47	Tangent Gulfport								
48	Tangent Gulfport								
49	Tangent Gulfport								
50	3 Pole Deadend								
51	3 Pole Deadend								
52	Tangent Gulfport								
53	Tangent Gulfport								
54	3 Pole Deadend								
55	3 Pole Deadend	New DE requires 59ft Insulator Attachment Ht AGL				9.0			
56	3 Pole Deadend								
57	3 Pole Deadend						0.15		
58	3 Pole Deadend								
59	Tangent Gulfport						0.40	-0.15	
60	Tangent Gulfport							0.10	
61	Tangent Gulfport							0.10	
62	3 Pole Deadend								
63	3 Pole Deadend								
64	Tangent Gulfport								
65	Tangent Gulfport								
66	3 Pole Deadend								
67	3 Pole Deadend								
68	Tangent Gulfport								
69	Tangent Gulfport								
70	Tangent Gulfport								
71	Tangent Gulfport								
72	Tangent Gulfport								
73	Tangent Gulfport								
74	Tangent Gulfport	65	3	6	6	4.5			Coincides with maintenance planned for structure
75	Tangent Gulfport								
76	Tangent Gulfport	65	3	6	6	4.5			
77	Tangent Gulfport								
78	Tangent Gulfport								
79	Tangent Gulfport	70	3	6	6	4.5			
80	Tangent Gulfport								

		New Structure Requirements							
Structure	Structure Type	Pole Length (ft)	Min. Pole Class	Min Class for 35' Spar Arm	Min Class for 30' Spar Arm	Required Raise (ft)	Nip (m)	Tuck (m)	Additional Comments
81	Tangent Gulfport							0.10	
82	Tangent Gulfport						0.25	0.10	
83	Tangent Gulfport								
84	Tangent Gulfport						0.25		
85	Tangent Gulfport							0.10	
86	Tangent Gulfport								
87	Tangent Gulfport								
88	Non-Typical								
89	Tangent Gulfport								
90	Tangent Gulfport	75	3	6	5	4.5			
91	Tangent Gulfport								
92	Tangent Gulfport								
93	Tangent Gulfport								
94	Tangent Gulfport								
95	Tangent Gulfport								
96	3 Pole Med.Angle								
97	Tangent Gulfport								
98	Tangent Gulfport								
99	Tangent Gulfport								
100	Tangent Gulfport								
101	Tangent Gulfport	75	3	6	6	9.0			Coincides with maintenance planned for structure
102	Tangent Gulfport								
103	Tangent Gulfport								
104	Tangent Gulfport								
105	Tangent Gulfport								
106	Tangent Gulfport								
107	Tangent Gulfport								
108	Tangent Gulfport	70	3	6	5	9.0			
109	Tangent Gulfport								
110	Tangent Gulfport								
111	Tangent Gulfport								
112	Tangent Gulfport								
113	Tangent Gulfport								
114	Tangent Gulfport								
115	3 Pole Med.Angle								
116	Tangent Gulfport								
117	Tangent Gulfport								
118	3 Pole Deadend								
119	3 Pole Deadend	New DE requires 40ft Insulator Attachment Ht AGL				4.5			
120	Tangent Gulfport								
121	Tangent Gulfport								
122	Tangent Gulfport								
123	3 Pole Med.Angle								
124	Tangent Gulfport								
125	Tangent Gulfport								
126	Tangent Gulfport								
127	Tangent Gulfport								
127A	Tangent Gulfport								
128	Tangent Gulfport								
129	Tangent Gulfport								
130	3 Pole Deadend								
131	3 Pole Deadend								
132	3 Pole Deadend								
133	3 Pole Deadend	New DE requires 44ft Insulator Attachment Ht AGL				4.5			
134	Tangent Gulfport								
135	Non-Typical								
136	3 Pole Med.Angle	New Angle requires 60ft Conductor Susp. Ht AGL				9.0			
137	Tangent Gulfport								
138	3 Pole Deadend								
139	3 Pole Deadend								
140	Tangent Gulfport	75	3	6	5	4.5			
141	3 Pole Deadend								
142	Tangent Gulfport								
143	3 Pole Deadend						0.15		
144	Tangent Gulfport								
145	Tangent Gulfport								
146	Tangent Gulfport								
147	Tangent Gulfport								
148	Tangent Gulfport								
149	Tangent Gulfport								
150	3 Pole Deadend								
151	3 Pole Deadend								
152	3 Pole Deadend	New DE requires 53ft Insulator Attachment Ht AGL				9.0			
153	Tangent Gulfport								
154	Tangent Gulfport	65	3	6	6	4.5			
155	3 Pole Deadend								
156	Tangent Gulfport								
157	Tangent Gulfport	65	3	6	6	4.5			
158	Tangent Gulfport								
159	Tangent Gulfport								
160	Tangent Gulfport						0.15		
161	Tangent Gulfport								
162	Tangent Gulfport								
163	3 Pole Deadend								
164	Tangent Gulfport								
165	Tangent Gulfport								
166	Tangent Gulfport	60	3	6	6	4.5			
167	Tangent Gulfport								

Structure	Structure Type	New Structure Requirements: Pole Length (ft)	Min. Pole Class	Min Class for 35' Spar Arm	Min Class for 30' Spar Arm	Required Raise (ft)	Nip (m)	Tuck (m)	Additional Comments
168	3 Pole Deadend	New DE requires 48ft Insulator Attachment Ht AGL				9.0			Add one (1) bell to strain insulators on Span 168-169 side. This bell is needed to reduce the tension in dead end section from Structure 168-169.
169	3 Pole Deadend								
170	Tangent Gulfport								
171	Tangent Gulfport	60	3	6	6	4.5			
172	Tangent Gulfport								
173	Tangent Gulfport								
174	Tangent Gulfport								
175	Tangent Gulfport								
176	3 Pole Deadend								
177	Tangent Gulfport								
178	3 Pole Deadend								
179	3 Pole Deadend								
180	Tangent Gulfport	70	3	6	4	4.5			
181	3 Pole Deadend								Add one (1) bell to strain insulators on Span 180-181 side. This bell is needed to reduce the tension in dead end section from Structure 179-181.
182	Tangent Gulfport	65	3	6	4	4.5			
183	3 Pole Deadend								
184	Tangent Gulfport	75	3	6	6	9.0			
185	Tangent Gulfport								
186	Tangent Gulfport	70	3	6	5	4.5			
187	Tangent Gulfport								
188	Tangent Gulfport								
189	Tangent Gulfport								
190	Tangent Gulfport	60	3	6	5	4.5			
191	Tangent Gulfport						0.15		
192	Tangent Gulfport								
193	Tangent Gulfport	70	3	6	5	4.5			
194	Tangent Gulfport								
195	Tangent Gulfport								
196	Tangent Gulfport	75	3	6	6	4.5			
197	Tangent Gulfport								
198	Tangent Gulfport								
199	Tangent Gulfport								
200	Tangent Gulfport	75	3	6	6	9.0			
201	Tangent Gulfport	70	3	6	6	9.0			
202	Tangent Gulfport								
203	Tangent Gulfport								
204	Tangent Gulfport	80	3	6	5	13.5			
205	Tangent Gulfport						0.25	-0.05	
206	Tangent Gulfport							0.05	
207	Tangent Gulfport								
208	Tangent Gulfport								
209	Tangent Gulfport								
210	Tangent Gulfport	65	3	6	6	4.5			
210A	Tangent Gulfport								
211	Tangent Gulfport								
212	Tangent Gulfport								
213	Tangent Gulfport								
214	Tangent Gulfport								
215	3 Pole Deadend								
216	Tangent Gulfport								
217	Tangent Gulfport								
218	Tangent Gulfport	80	3	6	5	9.0			Water Crossing
219	3 Pole Deadend								
220	3 Pole Deadend	New DE requires 53ft Insulator Attachment Ht AGL				4.5			
221	Tangent Gulfport								
222	Tangent Gulfport								
223	3 Pole Deadend	New DE requires 64ft Insulator Attachment Ht AGL				13.5			Water Crossing
224	3 Pole Deadend	New DE requires 58ft Insulator Attachment Ht AGL				9.0			Water Crossing
225	Tangent Gulfport								
226	3 Pole Deadend								
227	Tangent Gulfport								
228	Tangent Gulfport								
229	Tangent Gulfport								
230	Tangent Gulfport								
231	Tangent Gulfport								
232	Tangent Gulfport								
233	Tangent Gulfport								
234	Tangent Gulfport	70	3	6	6	4.5			
235	Tangent Gulfport								
236	Tangent Gulfport								
237	Tangent Gulfport	80	3	6	6	9.0		-0.10	
238	Tangent Gulfport						0.30	-0.20	
239	Tangent Gulfport							0.05	
240	Tangent Gulfport						0.40		
241	Tangent Gulfport							0.10	
242	Tangent Gulfport								
243	Tangent Gulfport						0.15		
244	Tangent Gulfport								
245	Tangent Gulfport								
246	Tangent Gulfport								
247	Tangent Gulfport								
248	Tangent Gulfport	70	3	6	4	9.0			
249	Tangent Gulfport								
250	Tangent Gulfport								

Structure	Structure Type	New Structure Requirements: Pole Length (ft)	New Structure Requirements: Min. Pole Class	New Structure Requirements: Min Class for 35' Spar Arm	New Structure Requirements: Min Class for 30' Spar Arm	Required Raise (ft)	Nip (m)	Tuck (m)	Additional Comments
251	Tangent Gulfport	65	3	6	6	4.5			
252	3 Pole Deadend	New DE requires 45ft Insulator Attachment Ht AGL				4.5			Add one (1) bell to strain insulators on Span 252-253 side. This bell is needed to reduce the tension in dead end section from Structure 252-253.
253	3 Pole Deadend								
254	Tangent Gulfport								
255	3 Pole Med.Angle								
256	Tangent Gulfport								
257	3 Pole Deadend	New DE requires 49ft Insulator Attachment Ht AGL				9.0			Coincides with maintenance planned for structure
258	Tangent Gulfport								
259	Tangent Gulfport	70	3	6	6	4.5			
260	Tangent Gulfport	80	3	6	5	9.0			
261	Non-Typical								
262	Tangent Gulfport								
263	Tangent Gulfport								
264	3 Pole Deadend								
265	3 Pole Deadend	New DE requires 58ft Insulator Attachment Ht AGL				9.0			
266	Non-Typical								
267	Tangent Gulfport								
268	Tangent Gulfport	75	3	6	6	9.0			
269	Tangent Gulfport								
270	Tangent Gulfport						0.15		
271	Tangent Gulfport								
272	Tangent Gulfport	85	3	6	6	9.0			
273	Tangent Gulfport								
274	Tangent Gulfport						0.15		
275	Tangent Gulfport								
276	3 Pole Deadend								
277	3 Pole Deadend								
278	Tangent Gulfport						0.25		
279	Tangent Gulfport								
280	3 Pole Deadend								
281	3 Pole Deadend								
282	3 Pole Deadend	New DE requires 44ft Insulator Attachment Ht AGL				9.0			Fill added in this Span.
283	Tangent Gulfport	75	3	6	5	9.0			
284	Non-Typical	New Angle requires 59ft Conductor Susp. Ht AGL				9.0			Raise Required to Prevent Uplift
285	Tangent Gulfport								
286	Tangent Gulfport								
287	Tangent Gulfport								
288	Tangent Gulfport								
289	Tangent Gulfport								
290	Tangent Gulfport								
291	3 Pole Deadend						0.40		Due to Steep Decline from 291 to 292, Structure Raise AND Nip are
292	3 Pole Deadend	New DE requires 47ft Insulator Attachment Ht AGL				9.0			required to achieve desired clearance
293	Tangent Gulfport								
294	3 Pole Deadend								
295	Tangent Gulfport								
296	3 Pole Deadend								
297	Tangent Gulfport								
298	Tangent Gulfport	85	3	6	6	18.0			Water Crossing
299	3 Pole Deadend	New DE requires 63ft Insulator Attachment Ht AGL				22.5			Water Crossing
300	Tangent Gulfport	80	3	6	6	13.5	0.15		Dist Line
301	3 Pole Med.Angle								
302	Tangent Gulfport						0.30	-0.10	
303	3 Pole Deadend								
304	Tangent Gulfport								
305	Tangent Gulfport								
306	Tangent Gulfport								
307	Tangent Gulfport	80	3	6	5	9.0			
308	Non-Typical								
309	Tangent Gulfport								
310	Tangent Gulfport	80	3	6	6	4.5			
311	Non-Typical								
312	Tangent Gulfport								
313	3 Pole Deadend	New DE requires 64ft Insulator Attachment Ht AGL				22.5			Water Crossing
314	3 Pole Deadend	New DE requires 78ft Insulator Attachment Ht AGL				27.0			Water Crossing
315	Tangent Gulfport	75	3	6	6	9.0			
316	Tangent Gulfport	70	3	6	6	9.0			
317	Tangent Gulfport							-0.10	
318	Tangent Gulfport						0.50	-0.20	
319	Tangent Gulfport							0.15	
320	Tangent Gulfport	80	3	6	5	13.5		0.10	
321	Tangent Gulfport								
322	3 Pole Med.Angle								
323	Tangent Gulfport	80	3	6	5	9.0			
324	Tangent Gulfport								
325	Tangent Gulfport								Dist Line
326	Tangent Gulfport	80	3	6	5	4.5			3.55m excess clearance at 50deg C sag after raising structure 4.5ft. Str Raise is required to gain clearance to distribution crossing line in Span 325-326
327	Tangent Gulfport								0.21m excess clearance at 50deg C sag.
328	Tangent Gulfport								2.31m excess clearance at 50deg C sag.
329	Tangent Gulfport								4.62m excess clearance at 50deg C sag.
330	Tangent Gulfport								0.29m excess clearance at 50deg C sag.
331	Tangent Gulfport								5.05m excess clearance at 50deg C sag.
332	Tangent Gulfport								
333	3 Pole Deadend								
334	Tangent Gulfport								

Upgrade Summary

Structure	Structure Type	New Structure Requirements: Pole Length (ft)	Min. Pole Class	Min Class for 35' Spar Arm	Min Class for 30' Spar Arm	Required Raise (ft)	Nip (m)	Tuck (m)	Additional Comments
335	Tangent Gulfport								
336	Tangent Gulfport								
337	Tangent Gulfport								
338	Tangent Gulfport								
339	Non-Typical								
340	Non-Typical								
341	Non-Typical								
342	Double Circuit Deadend								
343	Double Circuit Tangent								
344	Double Circuit Tangent								
345	Double Circuit Tangent								
346	Double Circuit Tangent								
347	Double Circuit Tangent								
348	Double Circuit Tangent								
349	Double Circuit Tangent								
350	Double Circuit Tangent								
351	Double Circuit Deadend								
352	3 Pole Deadend Heavy Angle								
353	3 Pole Deadend Heavy Angle								
354	Tangent Gulfport								
355	Tangent Gulfport								
356	3 Pole Deadend								
357	Tangent Gulfport								
358	Tangent Gulfport								
359	Tangent Gulfport								
360	Tangent Gulfport								
361	Tangent Gulfport								
362	Tangent Gulfport								
363	Tangent Gulfport								
364	Tangent Gulfport								
365	Tangent Gulfport								
366	Tangent Gulfport								
367	Tangent Gulfport								
368	Tangent Gulfport								
369	Tangent Gulfport								
370	Tangent Gulfport								
371	Tangent Gulfport								
372	Tangent Gulfport								
373	3 Pole Med.Angle								
374	3 Pole Deadend								
375	Double Circuit Deadend								
376	Double Circuit Tangent								
377	Double Circuit Tangent								
378	Double Circuit Tangent								
379	Double Circuit Tangent								
380	Double Circuit Tangent								
381	Double Circuit Tangent								
382	Double Circuit Tangent								
383	Double Circuit Tangent								
384	Double Circuit Tangent								
385	Double Circuit Tangent								
386	Double Circuit Deadend								
387	Double Circuit Tangent								
388	Double Circuit Tangent								
389	Double Circuit Tangent								
390	Double Circuit Tangent								
391	Double Circuit Tangent								
392	Double Circuit Deadend								
120H	Brushy Hill Sub								
						Raises	Nips	Tucks	
						73	21	19	

NOTES

A Nip refers to the specified length of wire removed from the span between the listed structure and next structure (ie, a nip for structure 1 refers to removal of wire in the span from Str 1-2.
A -ve Tuck refers to a Tuck towards the back span (lower structure number)
A +ve Tuck refers to a Tuck towards the ahead span (higher structure number)
The Required Pole Raise has already been taken into account in the "New Structure Requirements" columns
For Gulfport Structure Geometry, refer to NSPI Structure No. T7009-1-510-01-001

CI Number: 41517

Title:	**L6535 Lidar Upgrades & Maintenance**
Start Date:	2012/08
Final Cost Date:	2012/10
Function:	Transmission
Forecast Amount:	$2,361,250

DESCRIPTION:

This transmission circuit is almost 40 years old and conductor to ground clearance issues have been identified. The conductor will be cut and re-sagged to increase clearances and a number of structures will be replaced with taller poles as required to meet Canadian Standards Association (CSA) clearance requirements. In addition the line will be retensioned and some structures will be modified to address the increased tension. Work will be completed on 56 structures.

Summary of Related CI's +/- 2 years:
2012 - CI 41387 2012 Transmission Line Insulator Replacement $3,619,166

JUSTIFICATION:

Justification Criteria: Transmission Plant

Sub Criteria: Maintenance

Why do this project?

This project is required to increase the ground clearance from energized conductors in locations that do not meet minimum Canadian Standards Association (CSA) standards for ground clearance along with replacing deteriorated plant. Ground Clearance issues exist due to the sag of lines over time, updated CSA requirements or a combination of the two.

Why do this project now?

This project will ensure proper clearances are met and operating ratings can be maintained, and will address deteriorated plant issues.

Why do this project this way?

This is a steel tower transmission line similar to a 138 Kv steel tower transmission circuit between Onslow and Burnside. The modifications to L-6535 will be similar to the Onslow – Burnside circuit which includes retensioning, cutting some conductor, resagging and possibly the addition of some midspan structures.

The labour for this project will be sourced through NSPI's existing Power Line Technician (PLT) Service Agreement with EUS. This is aligned with NSPI's workforce planning model which is designed to optimize the allocation and execution of PLT resources among work requirements.

CI Number : 41517 - L6535 Lidar Upgrades & Maintenance **Project Number**

Parent CI Number : -

Cost Centre : 800 - 800-Services - Admin. **Budget Version** 2012 ACE Plan

Capital Item Accounts

Acct	Actv	Account	Activity	Forecast Amount	Amount	Variance
092		092-Vehicle Cust. Serv. Reg. Labour		1,013	0	1,013
092		092-Vehicle T&D Reg. Labour AO		53,986	0	53,986
094		094 - Interest Capitalized		36,271	0	36,271
095		095-COPS Contracts AO		336,651	0	336,651
095		095-COPS Regular Labour AO		83,785	0	83,785
012	035	012 - Materials	035 - DP - Wood Poles	100,000	0	100,000
013	035	013 - COPS Contracts	035 - DP - Wood Poles	[redacted]	0	[redacted]
012	037	012 - Materials	037 - DP - Steel Towers	150,000	0	150,000
013	037	013 - COPS Contracts	037 - DP - Steel Towers	[redacted]	0	[redacted]
012	038	012 - Materials	038 - DP - Insulators	45,000	0	45,000
013	038	013 - COPS Contracts	038 - DP - Insulators	[redacted]	0	[redacted]
012	039	012 - Materials	039 - DP - O/H Cond.	5,000	0	5,000
013	039	013 - COPS Contracts	039 - DP - O/H Cond.	[redacted]	0	[redacted]
001	085	001 - T&D Regular Labour	085 Design	56,544	0	56,544
001	085	001 - CUST. SERV. Regular Labour	085 Design	2,000	0	2,000
001	085	001 - Regular Labour (No AO)	085 Design	6,000	0	6,000
002	085	002 - Overtime Labour (No AO)	085 Design	0	0	0
002	085	002 - T&D Overtime Labour	085 Design	0	0	0
001	087	001 - T&D Regular Labour	087 Field Super.& Ops.	50,000	0	50,000
002	087	002 - T&D Overtime Labour	087 Field Super.& Ops.	0	0	0
			Total Cost:	2,361,250	0	2,361,250
			Original Cost:			

CI 41517 L6535 Lidar Upgrades & Maintenance

The following is a breakdown of costs associated with the L6535 Lidar Upgrades & Maintenance project:

Administrative Overhead and Interest	$ 511,706
Materials	$ 300,000
Contracts	$ 1,435,000
COPS Labour	$ 114,544
Total	$ 2,361,250

The work associated with this project is expected to be sourced through NSPI's existing Power Line Technician (PLT) contract with Emera Utility Services, at a rate of approximately [redacted] per compatible unit hour. NSPI will be providing field supervision and engineering design for this project. The materials forecast is based on costs associated with similar projects in which deteriorated poles were replaced and conductor upgraded to achieve higher ratings.

CI Number: 41348

Title: **2012 Protection Upgrades Onslow**

Start Date: 2012/03
Final Cost Date: 2012/12
Function: Transmission
Forecast Amount: $2,274,015

DESCRIPTION:

This project provides for the costs to upgrade the protections system at 1 N-Onslow to comply with Northeast Power Coordination Council (NPCC) reliability criteria for bulk power systems.

Summary of Related CI's +/- 2 years:
2010 CI 38266 2010 Protection Upgrades $313,331
2011 CI 40231 Protection Upgrades Lakeside $1,609,905
2011 CI 40233 2011 Protection Upgrades TUC $3,928,932
2013 CI 41347 Protection Upgrades Brushy Hill $1,873,614

JUSTIFICATION:

Justification Criteria: Transmission Plant

Sub Criteria: System Protection

Why do this project?

In 2008, NPCC approved new criteria (Criteria Document A-10 – Attachment #2) for determining whether a substation bus is categorized as bulk power. The criterion is used to identify substation busses that, if a fault was not successfully cleared by protection, the situation could result in disturbances outside the local operating area. Stations identified through this criterion are required to have fully redundant protection, control and communication schemes as defined in NPCC Directory #4 – Bulk Power System Protection Criteria (Attachment #3). The 1N-Onslow substation bus meets the criteria for a bulk power element and currently does not have fully redundant protection, control, and communication schemes in place.

Why do this project now?

Implementation of the redundant protection schemes are based on agreement with NPCC which requires completion by the end of 2013. Because this work is technically complex and involves modifications to energized equipment, NSPI has developed a plan to complete the modifications to the five stations requiring this upgrade over a four year period. A portion of 79N-Hopewell was completed in 2010 and will be finished in 2011. The 138kV portion of 103H-Lakeside will be completed in 2012 as well as 91H-Tufts Cove. 20H-Brushy Hill will be submitted in the 2013 ACE Plan.

Why do this project this way?

To comply with the updated NPCC standards, fully redundant protection, control and communication systems must be installed for all bulk power elements identified under the A-10 Criteria.

CI Number : 41348 - 2012 Protection Upgrades Onslow **Project Number**

Parent CI Number : -

Cost Centre : 800 - 800-Services - Admin. **Budget Version** 2012 ACE Plan

Capital Item Accounts

Acct	Actv	Account	Activity	Forecast Amount	Amount	Variance
092		092-Vehicle T&D Reg. Labour AO		127,898	0	127,898
094		094 - Interest Capitalized		52,437	0	52,437
095		095-COPS Contracts AO		[redacted]	0	[redacted]
095		095-COPS Regular Labour AO		194,838	0	194,838
095		095-Thermal Regular Labour AO		25,687	0	25,687
013	003	013 - COPS Contracts	003 - TP - Bldg.,Struct.Grnd.	[redacted]	0	[redacted]
001	022	001 - T&D Regular Labour	022 - TP - Elec Contr.Equip.	62,316	0	62,316
002	022	002 - T&D Overtime Labour	022 - TP - Elec Contr.Equip.	0	0	0
012	022	012 - Materials	022 - TP - Elec Contr.Equip.	431,250	0	431,250
013	022	013 - COPS Contracts	022 - TP - Elec Contr.Equip.	[redacted]	0	[redacted]
066	022	066 - Other Goods & Services	022 - TP - Elec Contr.Equip.	143,000	0	143,000
001	023	001 - T&D Regular Labour	023 - TP - Power Equip.-Station S	7,002	0	7,002
002	023	002 - T&D Overtime Labour	023 - TP - Power Equip.-Station S	0	0	0
012	023	012 - Materials	023 - TP - Power Equip.-Station S	43,700	0	43,700
013	023	013 - COPS Contracts	023 - TP - Power Equip.-Station S	[redacted]	0	[redacted]
001	043	001 - T&D Regular Labour	043 - TP - Substn Dev.	32,733	0	32,733
002	043	002 - T&D Overtime Labour	043 - TP - Substn Dev.	0	0	0
012	043	012 - Materials	043 - TP - Substn Dev.	391,000	0	391,000
066	043	066 - Other Goods & Services	043 - TP - Substn Dev.	46,904	0	46,904
001	061	001 - T&D Regular Labour	061 - TP - Switched Telecomm. Sys	4,901	0	4,901
002	061	002 - T&D Overtime Labour	061 - TP - Switched Telecomm. Sys	0	0	0
012	061	012 - Materials	061 - TP - Switched Telecomm. Sys	46,460	0	46,460
001	085	001 - THERMAL Regular Labour	085 Design	106,985	0	106,985
002	085	002 - THERMAL Overtime Labour	085 Design	0	0	0
001	086	001 - T&D Regular Labour	086 Commissioning	145,462	0	145,462
002	086	002 - T&D Overtime Labour	086 Commissioning	0	0	0
013	087	013 - COPS Contracts	087 Field Super.& Ops.	[redacted]	0	[redacted]
			Total Cost:	2,274,015	0	2,274,015
			Original Cost:	74,713		

CI 41348 - 2012 Protection Upgrade Onslow

The following is a breakdown of costs associated with the Onslow Protection Upgrade project:

Administrative Overhead and Interest	[redacted]
Materials	$912,410
Contracts	[redacted]
COPS Labour	$359,399
Other	$189,904
Total	$2,274,015

The contracts cost estimate for this project is based on work being performed in the Onslow substation by outside contractors and is not expected to be completed by an affiliate. NSPI COPS labour will be carried out by NSPI personnel at a rate of approximately [redacted] / person day along with engineering design work. The project estimate is based on a similar project carried out in 2010 at Hopewell substation.

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Implementation Plan for Revised NPCC Document A-10

Approved by Full Member Ballot – December 01, 2009

This Implementation Plan provides for testing in accordance with the revised NPCC *Classification of Bulk Power System Elements*, Document A-10, to be completed as follows:

- Testing in accordance with the revised A-10 methodology shall be performed on all facilities that have not been evaluated under the existing A-10 methodology as of the date the revised A-10 is approved.
- Testing in accordance with the revised A-10 methodology shall be performed on all facilities within five years from the date the revised A-10 is approved.

Each **Area** shall ensure that this Implementation Plan is followed within its **Area**.

Document A-10

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Classification of Bulk Power System Elements

Adopted by the Members of the Northeast Power Coordinating Council Inc., this April 28, 2007 based on recommendation by the Reliability Coordinating Committee, in accordance with Section VIII of the NPCC Inc. Bylaws dated May 18, 2006 as amended to date.

1.0 Introduction

NPCC defines specific requirements applicable to design, operation, and **protection** of the **bulk power system**. The object of this *Classification of **Bulk Power System Elements*** (Document A-10) is to provide the methodology to identify the **bulk power system elements**, or parts thereof, of the interconnected NPCC Region.

The methodology in this document is used to classify **elements** of the **bulk power system** and may result in **elements** being added to or removed from the NPCC **Bulk Power System** List. The methodology in this document is based on the following:

- Results of an analysis done on a bus basis can be applied to identify which **elements,** or portions thereof, connected to the bus are part of the **bulk power system**.

- **Elements** shall not automatically be included or excluded from the **bulk power system** based on voltage class. Application of this methodology may be omitted at buses that can be logically excluded from the **bulk power system** based on study results at other buses tested using this methodology. If a bus is determined to be **bulk power system**, all other buses with elements connected to that bus must be tested.

- **Elements** shall be evaluated based on this methodology when significant changes occur on the system that could change an **element**'s **bulk power system** status; the evaluation may be limited to the affected part of the system.

- **Areas** and facility owners may adopt methodologies that exceed the requirements set forth in this document for their own purposes. However, only **elements** classified as **bulk power system** as a result of testing described in this document shall be included on the NPCC's list of **bulk power system elements**. NPCC criteria and compliance monitoring shall consider only the system **elements** listed on NPCC's list of **bulk power system elements**.

The Classification of **Bulk Power System Elements** is based on three defined terms: **bulk power system**, **local area** and **significant adverse impact**.

2.0 Definitions

Terms in italics in this document are defined in this section.

Terms in bold are defined in the *NPCC Glossary of Terms* (Document A-7).

2.1 *Bus*

Within this document the term *bus* refers to a junction with sensing or **protection** equipment within a substation or switching station at which the terminals of two or more **elements** are connected, regardless of whether circuit breakers are provided. In this context, *bus* may not have a direct correlation to the use of this term in substation design or a power flow data set.

In some configurations a *bus* may include more than one physical *bus*, such as in a breaker-and-a-half arrangement or a single-line-single-breaker arrangement in which two physical *buses* are connected through a *bus*-tie breaker. The examples in Figure 1 depict two of many possible configurations where two physical *buses* are tested as a single *bus*. *Buses* that are separated by normally open *bus*-tie breakers are considered as separate *buses*. The termination of line sections through switches should not be considered as a *bus* requiring testing unless the switches are activated as part of a **protection system** for the line which they sectionalize as part of normal **protection system** actions.

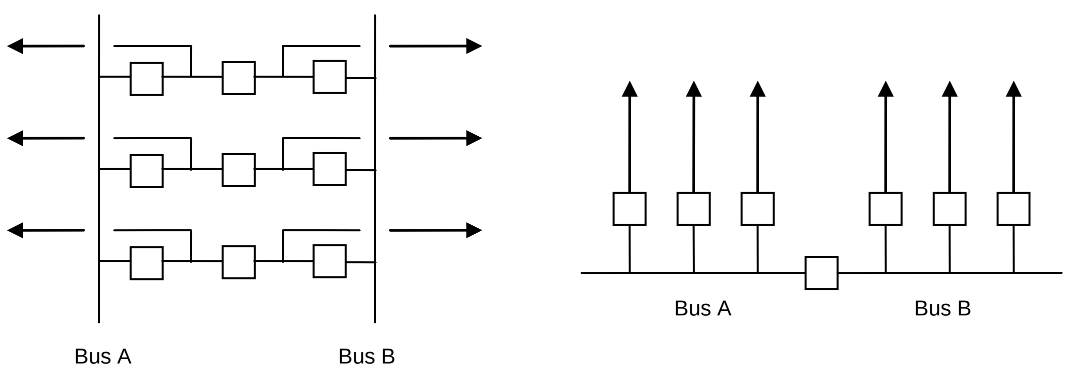

Figure 1 – Configurations where *Bus* A and *Bus* B are tested as one *bus*.

In some configurations **elements** may not be terminated to the *bus* through circuit breakers, such as the generator *bus* for a unit connected generator or a *bus* between a transmission line and transformer that are switched as a single circuit. The examples in Figure 2 depict two of many configurations where two physical *buses* are tested as separate *buses*.

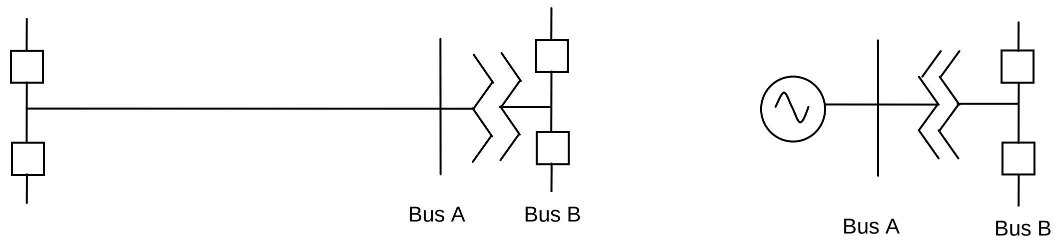

Figure 2 – Configurations where *Bus* A and *Bus* B are tested as two separate *buses*.

2.2 *Uncleared Locally*

Within this document the phrase *uncleared locally* is used to denote failure of the **protection** including **Special Protection Systems** for the *bus* under test to initiate tripping of all associated interrupting devices regardless of their location.

Protection located at other *buses* is assumed to operate as designed when that **protection** cannot be disabled by failure of a single component in common with the **protection** at the *bus* under test. For example, consider the case where the **protection** for **elements** connected to higher voltage level and lower voltage level *buses* in the same station share a dc source, and an independent dc source is provided for second **protection groups** associated with **elements** connected to the higher voltage level *bus*. In this case, it is acceptable when testing the lower voltage level *bus* to assume correct operation of any **protection groups** associated with **elements** connected to the higher voltage level *bus* capable of detecting the **fault** and supplied by the independent dc source.

In cases where circuit breakers are not provided at the terminals of the **element** at the *bus* under test (as shown in Figure 2, *bus* A), *uncleared locally* includes a failure to clear a **fault** by circuit breakers located at another *bus* within the same substation, unless back-up **protection** at that other *bus* using an independent dc source would detect the **fault** and initiate clearing.

3.0 Classification of Bulk Power System Elements

3.1 Testing Conditions and Assumptions

Studies conducted for the purpose of determining the **elements** of the **bulk power system** shall assume the following conditions:

3.1.1. Power flow transfers, **load** and **generation** patterns expected to exist for the period under study which stress the system in a manner critical to the classification of the *bus* to be tested. All **reclosing** facilities rendered inoperative.

3.1.2. Operation of **Special Protection Systems**, undervoltage **load shedding** and underfrequency **load shedding** modeled as designed.

3.1.3. Load models used in the **Transient Stability** Test are consistent with **Area** practices for the studies of rotor angle stability.

3.1.4. Load models used for steady state testing are either constant MVA or are based on actual system testing with LTC movement.

3.1.5. Stability simulation runs until the system response can be clearly determined.

3.1.6. Generic or detailed relay models to monitor, after tripping of remote terminals, the potential for tripping of un-faulted **elements**.

3.2 <u>Test Methodology</u>

Both **transient stability** and steady-state tests are used to determine the impact on system performance resulting from power system **faults**.

Testing is based on application of a *bus* **fault** at a single voltage level that is *uncleared locally*. Tripping of un-faulted **elements** associated with clearing the test **fault** does not constitute a **significant adverse impact**.

Depending on system configuration or topology, testing only **faults** at *buses* can fail to uncover **significant adverse impacts** arising <u>from a design criteria contingency involving the loss of two adjacent transmission circuits on a common tower.</u> Hence, specific tests in 1c and 2c below are designed to assess this contingency for its potential **significant adverse impact** outside of the **local area**.

A **transient stability** test may be done first to identify *buses* at which **faults** may cause a **significant adverse impact** outside of the **local area**.

For those *buses* which are not classified as **bulk power system** in the **transient stability** test, a steady-state test is used to identify *buses* at which **faults** may cause a **significant adverse impact** outside of the **local area**.

Step 1 - Transient Stability Test

Simulate the **transient stability** condition of a three-phase **fault** with delayed clearing at the *bus* under test (step 1a). If the test results in a positive **bulk power system** determination, more detailed testing (step 1b) may be applied to obtain a more precise determination.

1a. Apply a three-phase **fault** for at least 10 seconds at the *bus* that is being tested. Do not open any of the **elements** connected to the *bus* for the duration of the **fault**. After 10 seconds, simulate tripping of all terminals of each **element** connected to the *bus* under test. In cases where there is no **fault** interrupting device at the remote terminal of an **element**, open all terminals of all **elements** between the *bus* under test and the interrupting device(s) that will open to clear the **fault**. This test is performed as an efficient, but conservative method for evaluating the impacts of:

- *bus* **faults** which would result in faster clearing time, and
- **faults** off the *bus*.

It is recognized that due to the conservative nature of this test some **elements** could be classified unnecessarily as part of the **bulk power system**. If the above test results in a positive **bulk power system** determination, the following additional testing may be utilized to obtain a more precise determination. Subsequent testing utilizes design clearing times for the conditions being tested, as stated below.

1b. Apply a three-phase **fault** at the *bus*, which is *uncleared locally* and trip the remote terminals of all **elements** that will open to clear the **fault**. Remote clearing times shall be based on design **fault clearing** times, assuming no communications from the station under test to the remote terminals.

Transformers and other **elements** connected to the *bus* shall only be tripped by operation of independent remote **protection groups** capable of clearing a **fault** on the *bus* under test.

Some **protection groups** (e.g. directional comparison blocking) at remote terminals may provide high-speed **fault clearing** for faults at the bus under test. In order to test the effects of longer **fault clearing** times for fault conditions when these remote **protection**

groups would not provide high speed **fault clearing**, for either test (1a) or (1b) above:

- High-speed **fault clearing** at remote terminals must be ignored; or
- Testing must vary the placement of the 3-phase **fault** on the elements connected to the bus under test to include locations beyond the reach of the high-speed tripping relay element at the remote terminal.

However, the **protective relay** settings may be reviewed to determine whether the *bus* could be classified as not part of the **bulk power system** if faster remote **fault** clearing can be achieved. If **protective relay** settings are modified, an assessment shall be conducted to ensure that the faster clearing time does not compromise the security of the **protection system**. Until the **protective relay** settings are modified, the *bus* must be classified as **bulk power system**.

1c. The test above is meant to cover the majority of design criteria contingencies. However, the **elements** associated with the *bus* under test must be reviewed to ensure adverse consequences resulting from a design criteria contingency involving the loss of two adjacent transmission circuits on a common tower are not overlooked.

If a circuit terminating at the *bus* under test shares a multiple circuit tower with an adjacent circuit that does not terminate at the *bus* under test, the adjacent circuit design contingency must also be assessed. In such cases, simultaneous permanent phase to ground **faults** on different phases of each of two adjacent transmission circuits shall be applied at critical common tower locations. The **fault** on the circuit associated with the *bus* under test which is *uncleared locally*, shall be simulated with **normal fault clearing** at the remote terminal and on the adjacent circuit.

If the **fault** has a **significant adverse impact** outside of the **local area**, the *bus* is classified as part of the **bulk power system**.

For *buses* not classified as part of **bulk power system** in Step 1, continue with the Steady State Test in step 2.

Step 2 - Steady State Test

Simulate the post-**contingency** steady-state conditions based on one of the following outcomes of the **fault** applied to the *bus* under test:

2a. If the **fault** was cleared based on design **fault clearing** times in the **Transient Stability** Test, open the same **elements** that were opened to clear the **fault** in the Transient Test. Post-**contingency** conditions shall reflect operation of all automatic devices.

2b. If the **fault** was not cleared based on design **fault clearing** times in the **Transient Stability** Test, assume that the **fault** propagates to the nearest location where it can be detected by independent **protection groups** and open the **elements** that would be opened by the **protection groups** to clear the **fault**. Note that because **fault clearing** will occur at interrupting devices capable of clearing the **fault**, it may be necessary to open multiple **elements** between the *bus* under test and the relevant interrupting devices, for example, a transmission line and transformer in series as shown in Figure 2.

2c. As in Step 1, the steady state test above is meant to cover the majority of design criteria contingencies. However, the **elements** associated with the *bus* under test must be reviewed to ensure adverse consequences resulting from a design criteria contingency involving the loss of two adjacent transmission circuits on a common tower are not overlooked. The post-contingency analysis must assess the loss of any adjacent circuit on common towers with a circuit terminating at the *bus* under test in addition to the **elements** associated with the *bus* under test.

Voltages and thermal loading will be assessed for **significant adverse impact** outside of the **local area** following automatic actions. In cases where a power flow solution is not obtained, other techniques shall be used to assess the impact of the event on the power system.

If the **fault** has a **significant adverse impact** outside of the **local area**, the *bus* is classified as part of the **bulk power system**.

Note that Step 2 can be done prior to Step 1. If a *bus* is classified as part of the **bulk power system** by the Steady State Test (Step 2), the **Transient Stability** Test (Step 1) need not be done for that *bus*.

3.3 Utilization of Test Results to Classify on an **Element**-by-**Element** Basis.

Classification of **bulk power system elements** is achieved by applying the results of the above tests to the **elements** connected to the tested *bus*.

An **element** with only one terminal such as a generator, shunt reactor, or capacitor bank, is classified as part of the **bulk power system** if the *bus* at which it is connected is classified as part of the **bulk power system**.

An **element** with multiple terminals such as a transformer or transmission line is classified as part of the **bulk power system** if any terminal of the **element** is connected to a *bus* that is classified as part of the **bulk power system**. The **bulk power system** classification may be limited to only a portion of the **element** if all of the following conditions are met:

- At least one terminal is connected to a *bus* that is not part of the **bulk power system**.
- The Steady State Test has been applied at the *buses* connected to all terminals of the **element** and none of these *buses* have been classified as part of the **bulk power system** based on results of the Steady State Test.
- The **Transient Stability** Test has been applied between the terminals of the **element** to identify those portions of the **element** for which the **Transient Stability** Test will not result in a **significant adverse impact** outside of the **local area**.

3.4 Documentation

Documentation for **Bulk Power System** classification shall include:

3.4.1 The rationale for the test conditions and assumptions used that are not listed above in 3.1.

3.4.2 The criteria used in evaluating the result of the testing including but not limited to stability, voltage, and thermal performance.

3.4.3 Detailed result of the testing shall be provided upon request.

4.0 Application and List Maintenance

Each **Area** shall be responsible for the application of the *Classification of* **Bulk Power System** *Elements* as described in this document and shall submit proposed changes and supporting documentation to the Task Force on System Studies (TFSS).

The "NPCC **Bulk Power System** List" will be maintained by the TFSS. Additions to and removals from the NPCC **Bulk Power System** List will be submitted by TFSS to the Reliability Coordinating Committee (RCC) for approval.

4.1 Addition of **Elements** to the **Bulk Power System** List

When application of this methodology identifies an **element** that was not part of the **bulk power system** should be classified as a **bulk power system element**, documentation of the analysis shall be presented to the TFSS. Once classification of the **element** is recommended by TFSS and approved by the RCC the **element** will be added to the NPCC **Bulk Power System** List with the appropriate comments and information. All task forces and the Compliance Committee will be notified once an **element** is approved by the RCC to be added to the **Bulk Power System List**. Within three months of an element being added to the **Bulk Power System** List, a plan and schedule for achieving compliance shall be provided to TFSP for review and acceptance. TFSP may require modifications to the proposed plan and schedule.

4.2 Removal of **Elements** from the **Bulk Power System** List

When application of this methodology identifies a **bulk power system element** that no longer should be classified as a **bulk power system element**, documentation of the analysis shall be submitted to the TFSS. If reclassification of the **element** is recommended by TFSS and approved by the RCC, the **element** will be removed from the NPCC **Bulk Power System** List.

Lead Task Force:	Task Force on Coordination of Planning
Reviewed for concurrence by:	TFSS, TFCO, TFSP, and TFIST
Review frequency:	4 years
References:	*Basic Criteria for Design and Operation of Interconnected Power Systems* (Document A-2) *NPCC Glossary of Terms* (Document A-7)

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NPCC
Regional Reliability Reference Directory # 4
Bulk Power System Protection Criteria

Task Force on System Protection Revision Review Record:
December 01, 2009

Adopted by the Members of the Northeast Power Coordinating Council, Inc. December 01, 2009 based on recommendation by the Reliability Coordinating Committee, in accordance with Section VIII of the NPCC Amended and Restated Bylaws dated July 24, 2007 as amended to date.

Revision History

Version	Date	Action	Change Tracking (New, Errata or Revisions)

Table of Content

1.0 Introduction

1.1 Title — Protection Criteria

1.2 Directory Number — 4

1.3 Objective

The purpose of this Directory is to provide the **protection** criteria, for **protection** of the NPCC **bulk power system**. It is not a design specification.

1.4 Effective Date — December 01, 2009

1.5 Background

This Directory was developed from the draft NPCC A-05 Bulk Power Protection Criteria document dated December 4, 2008 and approved B-05, B-07, B-24 and C-22 documents. Guidelines and procedures for consideration in the implementation of this Directory are provided in Appendix A.

1.6 Applicability

1.6.1 Functional Entities

Transmission Owners
Generator Owners

1.6.2 Facilities

1.6.2.1 New Facilities

These criteria shall apply to all new Bulk Power System (BPS) facilities.

1.6.2.2 Existing Facilities

It is the responsibility of individual companies to assess the **protection systems** at existing facilities and to make modifications which are required to meet the intent of these criteria as follows.

1.6.2.2.1 Planned Renewal or Upgrade to Existing BPS Facilities

It is recognized that there may be portions of the **bulk power system,** which existed prior to each member's adoption of the *Bulk Power System Protection Criteria* (Document A-5) that do not meet these criteria. However, if **protection systems** or sub-systems of these facilities are replaced as part of a planned renewal or upgrade to the facility and do not meet all of these criteria, then an assessment shall be conducted for those criteria that are not met.

The result of this assessment shall be reported, It is recommended this reporting be in accordance with the procedure stipulated in Section 4.0 of Appendix A of this Directory and using the appropriate portion of the "Protection System Review forms" (formerly C-22 forms), for review and disposition by the TFSP, or in a form consistent with the intent of the procedure.

1.6.2.2.2 Facility Classification Upgraded to **Bulk Power System**.

These criteria apply to all existing facilities which become classified as **bulk power system**. A mitigation plan shall be required to bring such a facility into compliance with these criteria.

Where the owner of the **protection system** has determined that the cost and risks involved to implement physical separation, as per Section 5.12, cannot be justified, the reason for this determination and an assessment shall be reported to the TFSP.

It is recommended this reporting be in accordance with the procedure stipulated in Section 4.0 of Appendix A of this Directory and using the appropriate portion of the "Protection System Review forms" (formerly C-22 forms), for review and disposition by the TFSP, or in a form consistent with the intent of the procedure.

1.6.2.2.3 Additions to **Bulk Power System** Facilities

If a **bulk power system element** is added to an existing **bulk power system** facility that is recognized under Section 1.6.2.2.1, Planned Renewal or Upgrade to Existing Facilities, these criteria apply to the **protection systems** for the new **element**.

1.6.2.2.4 "In-Kind" Replacement of **Bulk Power System** Equipment

If a **bulk power system element** (e.g., breaker, transformer, capacitor bank, reactor, etc.) or a **protective relay** is replaced "in kind" as a result of an unplanned event, then it is not required to upgrade the associated **protection system** to comply with these criteria.

1.6.2.2.5 Change in **Bulk Power System** Facility Status

When a facility was originally on the BPS list of April 2007 and has been shown to be non-BPS but later was determined to be BPS again, Section 1.6.2.2.1 would apply. When the facility returns to BPS status, it shall be maintained in accordance with Directory #3 within two years timeframe.

1.6.3 Responsibility

Whenever changes are anticipated in generating sources, transmission facilities, or operating conditions, Generator Owners and Transmission Owners shall review those **protection system** applications (i.e., settings, ac and dc supplies) which can reasonably be expected to be impacted by those changes.

2.0 Terms Defined in this Directory

The definitions of terms found in this Directory appearing in bold typeface, can be found in Document A-07, NPCC *Glossary of Terms*.

3.0 NERC ERO Reliability Standard Requirements

The NERC ERO Reliability Standards containing requirements that are associated with this Directory include, but may not be limited to:

3.1 PRC-001
3.2 PRC-002
3.3 PRC-012

4.0 NPCC Regional Reliability Standard Requirements

None.

5.0 NPCC Full Member, More Stringent Criteria

These Criteria are in addition, more stringent or more specific than the NERC or any Regional Reliability standard requirements.

5.1 General Criteria

The intent of the criteria established in this Directory is to ensure dependable and secure operation of the **protection systems** for **Bulk Power System** facilities. For those **protective relays** intended for removal of **faults** from the **bulk power system**, dependability is paramount, and the redundancy provisions of the criteria shall apply. For **Protective relays** installed for reasons other than **fault** sensing such as overload, etc., security is paramount, and the redundancy provisions of the criteria do not apply. The relative effect on the **bulk power system** of a failure of a **protection system** to operate when desired versus an unintended operation shall be weighed carefully in selecting design parameters as follows.

5.2 Criteria for Dependability

5.2.1 Except as identified otherwise in these criteria, all elements of the **bulk power system** shall be protected by two protection **groups**, each of which is independently capable of performing the specified protective function for that **element.** This requirement also applies during energization of the **element.**

5.2.2 Except as identified otherwise in these criteria, the two **protection groups** shall not share the same component**.**

5.2.3 Means shall be provided to trip all necessary local and remote breakers in the event that a breaker fails to clear a fault. This **protection** need not be duplicated.

5.3 Criteria for Security

Protection systems shall be designed to isolate only the faulted **element**, except in those circumstances where additional **elements** are tripped intentionally to preserve system integrity, or where isolating additional **elements** has no impact outside the local area.

5.4 Criteria for Dependability and Security

5.4.1 The thermal capability of all **protection system** components shall be adequate to withstand rated maximum short time and continuous loading of the associated **protected elements**.

5.4.2 Communication link availability, critical switch positions, and trip circuit integrity, shall be monitored to allow prompt attention by appropriate operating authorities.

5.4.3 When remote access to **protection systems** is possible, the design shall include security measures to minimize the probability of unauthorized access to the protection systems.

5.4.4 Short Circuit Models used to assess **protection** scheme design and to develop **protection** settings shall take into account minimum and maximum fault levels and mutual effects of parallel transmission lines. Details of neighboring systems shall be modeled wherever they can affect results significantly.

5.5 Operating Time Criteria

Bulk power system protection shall take corrective action within times determined by studies with due regard to security, dependability and selectivity.

5.6 Current Transformer Criteria

Current transformers (CTs) associated with **protection systems** shall have adequate steady-state and transient characteristics for their intended function as follows:

5.6.1 The output of each current transformer secondary winding shall be designed to remain within acceptable limits for the connected burdens under all anticipated **fault** currents to ensure correct operation of the **protection system**.

5.6.2 The thermal and mechanical capabilities of the CT at the operating tap shall be adequate to prevent damage under maximum **fault** conditions and normal or **emergency** system loading conditions.

5.6.3 For **protection groups** to be independent, they shall be supplied from separate current transformer secondary windings.

5.6.4 Interconnected current transformer secondary wiring shall be grounded at only one point.

5.6.5 Current transformers shall be connected so that adjacent **protection** zones overlap.

5.7 Voltage Transformer and Potential Devices Criteria

Voltage transformers and potential devices associated with **protection systems** shall have adequate steady-state and transient characteristics for their intended functions as follows:

5.7.1 Voltage transformers and potential devices shall have adequate volt-ampere capacity to supply the connected burden while maintaining their **relay** accuracy over their specified primary voltage range.

5.7.2 The two **protection groups** protecting an element shall be supplied from separate voltage sources. The two protection groups may be supplied from separate secondary windings on one transformer or potential device, provided all of the following requirements are met:

5.7.2.1 Complete loss of one or more phase voltages does not prevent all tripping of the protected **element**;

5.7.2.2 Each secondary winding has sufficient capacity to permit fuse **protection** of the circuit;

5.7.2.3 Each secondary winding circuit is adequately fuse protected.

5.7.3 The wiring from each voltage transformer secondary winding shall not be grounded at more than one point.

5.8 Batteries and Direct Current (DC) Supply Criteria

DC supplies associated with **protection** shall be designed to have a high degree of dependability as follows:

5.8.1 No single battery or dc power supply failure shall prevent both independent **protection groups** from performing the intended function. Each battery shall be provided with its own charger. Physical separation shall be maintained between the two station batteries or dc power supplies used to supply the independent **protection groups**.

5.8.2 Each station battery shall have sufficient capacity to permit operation of the station, in the event of a loss of its battery charger or the ac supply source, for the period of time necessary to transfer the **load** to the other station battery or re-establish the supply source. Each station battery and its associated charger shall have sufficient capacity to supply the total dc **load** of the station.

5.8.3 A transfer arrangement shall be provided to permit connecting the total **load** to either station battery without creating areas where, prior to failure of either a station battery or a charger, a single event can disable both dc supplies.

5.8.4 The battery chargers and all dc circuits shall be protected against short circuits. All protective devices shall be coordinated to minimize the number of dc circuits interrupted.

5.8.5 Dc systems shall be continuously monitored or annunciated to detect abnormal voltage levels (both high and low), dc grounds, and loss of ac to the battery chargers, in order to allow prompt attention by the appropriate operating authorities.

5.8.6 **Protection group** dc sources shall be continuously monitored to detect loss of voltage in order to allow prompt attention by the appropriate operating authorities.

5.9 Station Service ac Supply Criteria

On **bulk power system** facilities there shall be two sources of station service ac supply, each capable of carrying at least all the critical **loads** associated with **protection systems**.

5.10 Circuit Breaker

No single trip coil failure shall prevent both independent **protection groups** from performing the intended function. The design of a breaker with two trip coils shall be such that the breaker will operate if both trip coils are energized simultaneously. The correct operation of this design shall be verified by tests.

5.11 Teleprotection Criteria

5.11.1 Communication facilities required for **teleprotection** shall be designed to have a level of performance consistent with that required of the **protection system**, and shall meet the following:

5.11.1.1 Where each of the two **protection groups** protecting the same **bulk power system element** requires a communication channel, the equipment and channel for each **protection group** shall be separated physically and designed to minimize the risk of both **protection groups** being disabled simultaneously by a single event or condition.

5.11.1.2 **Teleprotection** equipment shall be monitored to detect loss of equipment and/or channels to allow prompt attention by the appropriate operating authorities.

5.11.1.3 **Teleprotection** equipment shall be provided with means to test for proper signal adequacy.

5.11.1.4 **Teleprotection** equipment shall be powered by the substation batteries or other sources independent from the power system.

5.11.1.5 Except as identified otherwise in these criteria, the two **teleprotection** groups shall not share the same component.

5.11.1.5.1 The use of a single communication tower for the radio communication systems used by two **protection groups** protecting a single **element** is permitted as long as directional diversity of the communication signals is achieved.

5.12 Environment

5.12.1 Each separate **protection group** and **teleprotection** protecting the same system **element** shall be on different non-adjacent vertical mounting assemblies or enclosures.

5.12.2 Wiring for separate **protection groups** and **teleprotections** protecting the same system **element** shall not be in the same cable.

5.12.3 Cabling for separate **protection groups** and **teleprotections** protecting the same system **element** shall be physically separated. This can be accomplished by being in different raceways, trays, trenches, etc.

5.12.4 In the event a common raceway is used, cabling for separate **protection groups** protecting the same system **element** shall be separated by a fire barrier.

5.13 Grounding Criteria

Station grounding is critical to the correct operation of **protection systems**. The design of the ground grid directly impacts proper **protection system** operation and the probability of false operation from **fault** currents or transient voltages. Each member shall have established as part of its substation design procedures or specifications, a mandatory method of designing the substation ground grid, which:

5.13.1 Can be traced to a recognized calculation methodology

5.13.2 Considers cable shielding

5.13.3 Considers equipment grounding

5.14 Transmission Line Protection Criteria

5.14.1 **Protection system** settings shall not constitute a loading limitation as per NERC requirement/standard. In cases where NERC approved exceptions are used the limits thus imposed shall be adhered to as system operating constraints.

5.14.2 A **pilot protection** shall be so designed that its failure or misoperation will not affect the operation of any other **pilot protection** on that same **element**.

5.15 Breaker Failure Protection Criteria

Means shall be provided to trip all necessary local and remote breakers in the event that a breaker fails to clear a **fault**, as follows.

5.15.1 Breaker failure **protection** shall be initiated by each of the **protection groups** which trip the breaker, with the optional exception of a breaker failure **protection** in an adjacent zone.

5.15.2 Fault current detectors shall be used to determine if a breaker has failed to interrupt a **fault.**

5.16 Generating Station Protection Criteria

All under- and over-frequency **protection systems** designed to disconnect generators from the power system shall be coordinated with automatic under frequency **load shedding** programs, in accordance with the *Emergency Operation Criteria* (Directory #2).

5.17 Automatic Under frequency Load Shedding Protection System Criteria

5.17.1 The requirements and guides for the operation of these **Protection Systems** are detailed in the *Emergency Operation Criteria* (Directory #2). The guideline for automatic under frequency **load shedding protective relaying** design is provided in Appendix A of this Directory.

5.18 HVdc System Protection Criteria

5.18.1 The ac portion of an HVdc converter station, up to the valve-side terminals of the converter transformers, shall be protected in accordance with these criteria.

5.18.2 Multiple commutation failures, unordered power reversals, and **faults** in the converter bridges and the dc portion of the HVdc link which are severe enough to disturb the **bulk power system** shall be detected by more than one independent control or **protection group** and appropriate corrective action shall be taken, in accordance with the considerations in these criteria.

5.19 Protection System Testing and Maintenance Criteria

5.19.1 **Protection systems** shall be maintained in accordance with the *Maintenance Criteria for Bulk Power System Protection* (Directory #3).

5.19.2 The design of **protection systems** both in terms of circuitry and physical arrangement shall facilitate periodic testing and maintenance.

5.19.3 Each **protection group** shall be functionally tested to verify the dependability and security aspects of the design, when initially placed in service and when modifications are made.

5.20 Analysis of Protection Performance Requirements

5.20.1 **Bulk power system** automatic operations shall be analyzed to determine proper **protection system** performance. Corrective measures shall be taken promptly if a **protection group** fails to operate or operates incorrectly.

5.20.2 Event and fault recording capability shall be provided to the extent required to permit analysis of **system disturbances** and **protection system** performance.

5.20.3 Internal clocks in event and **fault** recording equipment shall be time synchronized to within 2 milliseconds or less of Universal Coordinated Time scale. The time zone shall be clearly identified as either universal time zone or local time zone.

5.20.4 Each **protective relay** which trips **Bulk Power System** equipment shall provide separate target indication.

6.0 Measures and Assessments

None developed at this time.

7.0 Compliance Monitoring

7.1 Each member shall provide the Task Force on System Protection (TFSP) with advance notification of any of the member's new **bulk power system protection systems**, or significant changes in the member's existing **bulk power system protection systems**.

7.2 Each member shall also provide the TFSP with advance notification of non-member **protection** facilities as required per *NPCC Bylaws*.

7.3 Each new or revised **protection system** shall be reported to the TFSP. It is recommended this reporting be in accordance with the procedure detailed in Section 4.0 of Appendix A of this Directory, or in a form consistent with the intent of the procedure.

7.4 Adherence to these Criteria shall be reported by the responsible entity in a manner and form designated by the Compliance Committee.

Prepared by: Task Force on System Protection

Review and Approval: Revision to any portion of this Directory will be posted by the lead Task Force in the NPCC Open Process for a 45 day review and comment period. Upon satisfactorily addressing all the comments in this forum, the Directory document will be sent to the remaining Task Forces for their recommendation to seek RCC approval.

Upon approval of the RCC, this Directory will be sent to the Full Member Representatives for their final approval if sections pertaining to the Requirements and Criteria portion have been revised. All voting and approvals will be conducted according to the most current "NPCC. Bylaws" in effect at the time the ballots are cast.

Revisions pertaining to the Appendices or any other portion of the document such as Links glossary terms, etc., only RCC Members will need to conduct the final approval ballot of the document.

This Directory will be updated at least once every three years and as often as necessary to keep it current and consistent with NERC, Regional Reliability Standards and other NPCC documents.

Appendix A
Guideline and Procedure for Bulk Power System Protection

1.0 Introduction

This Appendix provides the guidance for consideration in the implementation of the **bulk power system Protection** criteria stipulated in this Directory, and the procedure on reporting new and revised **bulks power system protection** facilities.

2.0 Design Considerations

2.1 General Considerations

In general, the function of a **protection system** is to limit the severity and extent of **system disturbances** and possible damage to system equipment.

The Directory's criteria objectives can be met only if **protection systems** have a high degree of dependability and security. In this context dependability relates to the degree of certainty that a **protection system** will operate correctly when required to operate. Security relates to the degree of certainty that a **protection system** will not operate when not required to operate.

Often increased security (fewer unintended operations) results in decreased dependability (more failures to operate), and vice versa. As an example, consideration is given to the consequence of applying permissive line **protection** schemes, which often are more secure, but less dependable, than blocking line protection schemes. The relative effect on the **bulk power system** of a failure of a **protection system** to operate when desired versus an unintended operation should be weighed carefully in selecting design parameters. Considerations for specific aspects of **protection** design are provided below.

2.2 Issues Affecting Dependability

2.2.1 Some portions of **elements** may not in themselves be part of the **bulk power system**. Those portions do not require two **protection groups**.

2.2.2 Two identical measuring **relays** should not be used in independent **protection groups** due to the risk of simultaneous failure of both groups because of design deficiencies or equipment problems.

2.2.3 In addition to the separation requirements in the criteria, areas of common exposure should be kept to a minimum to reduce the possibility of both **protection groups** being disabled by a single

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event such as fire, excavation, water leakage, and other such incidents.

2.2.4 On installations where free-standing or column-type current transformers are provided on one side of the breaker only, resulting in a **protection** blind spot, **protection** should be provided to detect a **fault** to ground on the primaries of such current transformers. When frame ground **protection** is used, then frame ground and breaker failure **protections** are the two local independent **protections** for the blind spot between the current transformer and the circuit breaker. Neither of these **protections** need be duplicated. Both of these **protections** should be designed so as to not be disabled by the same failure. The frame ground **protection** and breaker failure **protection** will in fact provide independent **protections** for the blind spot.

2.3 Issues Affecting Security

2.3.1 For **faults** external to the protected zone, each **protection group** should be designed either to not operate, or to operate selectively with other groups and with breaker failure **protection**.

2.3.2 For planned system conditions, **protection systems** should not operate to trip for stable power swings.

2.4 Issues Affecting Dependability and Security

2.4.1 **Protection systems** should be no more complex than required for any given application.

2.4.2 The components and software used in **protection systems** should be of proven quality, as demonstrated either by actual experience or by stringent tests under simulated operating conditions.

2.4.3 **Protection systems** should be designed to minimize the possibility of component failure or malfunction due to electrical transients and interference or external effects such as vibration, shock and temperature.

2.4.4 **Protection system** circuitry and physical arrangements should be designed so as to minimize the possibility of incorrect operations due to personnel error.

2.4.5 **Protection system** automatic self-checking facilities should be designed so as to not degrade the performance of the **protection**

system.

2.4.6 Consideration should be given to the consequences of loss of instrument transformer voltage inputs to **protection systems**.

2.4.7 **Protection systems**, including intelligent electronic devices (IEDs) and communication systems used for **protection**, should comply with applicable industry standards for utility grade **protection** service. Utility Grade **Protection System** Equipment are equipment that are suitable for protecting transmission power system elements, that are required to operate reliably, under harsh environments normally found at substations. Utility grade equipment should meet the applicable sections of all or some of the following types of industry standards, to ensure their suitability for such applications:

- IEEE C37.90.1-2002 (oscillatory surge and fast transient)
- IEEE C37.90.1-2002 (service conditions)
- IEC 60255-22-1, 2005 (1 MHz burst, i.e. oscillatory)
- IEC 61000-4-12, 2001 (oscillatory surge)
- IEC 61000-4-4, 2004 (EFT)
- IEC 60255-22-4, 2002 (EFT)
- IEEE C37.90.2-2004 (narrow-band radiation)
- IEC 60255-22-3, 2000 (narrow-band radiation)
- IEC 61000-4-3, 2002 (narrow-band radiation)
- IEEE 1613 (communications networking devices in Electric power Substations)

2.5 Operating Time

Adequate time margin should be provided taking into account study inaccuracies, differences in equipment, and **protection** operating times. In cases where clearing times are deliberately extended, consideration should be given to the following:

- Effect on system **stability** or reduction of **stability** margins.
- Possibility of causing or increasing damage to equipment and subsequent extended repair and/or outage time.
- Effect of **disturbances** on service to customers.

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2.6 Current Transformer

None.

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2.7 Voltage Transformers and Potential Devices

Voltage transformer installations should be designed with due regard to ferroresonance.

2.7.1 Special attention should be given to the physical properties (e.g. resistance to corrosion, moisture, fatigue) of the fuses used in **protection** voltage circuits.

2.8 Batteries and Direct Current (dc) Supply

2.8.1 The circuitry between each battery and its first protective device cannot be protected and therefore should be designed so as to minimize the possibility of electrical short circuit.

2.8.2 The design for the regulation of the dc voltage should be such that, under all anticipated charging and loading conditions, voltage within acceptable limits will be supplied to all devices, while minimizing ac ripple and voltage transients.

2.9 Station Service ac Supply

None.

2.10 Circuit Breakers

The indication of the circuit breaker position in **protection systems** should be designed to reliably mimic the main contact position.

2.11 Teleprotection

2.11.1 **Teleprotection** systems should be designed to prevent unwanted operations such as those caused by equipment or personnel.

2.11.2 Two identical **teleprotection** equipments should not be used in independent **protection groups**, due to the risk of simultaneous failure of both groups because of design deficiencies or equipment problems.

2.11.3 Areas of common exposure should be kept to a minimum to reduce the possibility of both groups being disabled by a single event such as fire, excavation, water leakage, and other such incidents.

2.11.4 **Teleprotection** systems should be designed to mitigate the effects of signal interference from other communication sources and to

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assure adequate signal transmission during **bulk power system disturbances**.

2.12 Environment

Means should be employed to maintain environmental conditions that are favorable to the correct performance of **protection systems.**

2.13 Grounding

None.

2.14 Transmission Lines Protection

For planned system conditions, line **protection systems** associated with transmission facilities should not operate to trip for stable **power swings**.

2.15 Breaker Failure Protection

2.15.1 It is not necessary to duplicate the breaker failure **protection** itself.

2.15.2 Auxiliary switches may also be required in instances where the **fault** currents are not large enough to operate the **fault** current detectors. In addition, auxiliary switches may be necessary for high-speed detection of a breaker failure condition.

2.16 Generating Station Protection

2.16.1 Each **protection system** should be designed to minimize the effects to **the bulk power system** of **faults** and **disturbances**, while itself experiencing a single failure.

2.16.2 Generators should be protected to limit possible damage to the equipment. The following are some of the abnormal (not necessarily **fault**) conditions that should be detected:

- Unbalanced phase currents, loss of excitation
- Overexcitation, generator out of step, field ground
- inadvertent energization.

2.16.2.1 **Protections** for the above conditions, which are applied for equipment **protection**, need not be duplicated.

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2.16.2.2 When a directional over current or distance **relay** is applied to remove the generator for slowly cleared **faults** on the external system, such **protection** is a backup and need not be duplicated.

2.16.2.3 The apparatus should be protected when the generator is starting up or shutting down as well as running at normal speed; this may require additional **relays** as the normal **relays** may not function satisfactorily at low frequencies.

2.16.2.4 Generator **protection systems** should not operate for stable **power swings** except when that particular generator is out of step with the remainder of the system. This does not apply to **Special Protection Systems** designed to trip the generator as part of an overall plan to maintain **stability** of the power system.

2.16.2.5 Loss of excitation and out of step **relays** should be set with due regard to the performance of the excitation system.

2.16.2.6 It is recognized that the overall **protection** of a generator involves non-electrical considerations that have not been included as a part of the criteria in this Directory.

2.16.2.7 All over frequency, overvoltage and under voltage **protection systems** designed to disconnect generators from the power system should be coordinated with automatic under frequency **load shedding** programs.

2.17 Automatic Under frequency Load Shedding Protection Systems

2.17.1 Automatic under frequency **load shedding protection systems** are not generally located at **bulk power system** stations; however, they have a direct effect on the operation of the **bulk power system** during major **emergencies**.

2.17.2 Automatic under frequency **load shedding protection** need not be duplicated.

2.17.3 Under frequency **relays** which operate at a discrete frequency value are called "under frequency threshold **relays**." Selection of under frequency sensing devices should be on a threshold basis. Alternatively, rate of change of frequency **load shedding** may be used when the requirements of the Balancing Authority indicate that this method will achieve the intent of the **load shedding** program.

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Appropriate studies are necessary to determine the application and settings of the rate of change of frequency **relays** for a particular Balancing Authority area.

2.17.4 In order for each Balancing Authority within NPCC to **shed** approximately the same proportion of **load**, given the same frequency condition, all styles and manufacture of under frequency **relays** should trip at essentially the same time. For electromechanical **relays**, time delay depends on rate of frequency decline, and it is not possible to achieve uniform response for different rates of decline. The recommendations in this guideline are based on the goal of a uniform response at a rate of frequency decline of 0.2 Hz per second.

2.17.5 Additional Application Considerations

2.17.5.1 Where undesired under frequency **relay** operation can be caused by decaying frequency due to isolated generation or motor load, additional supervising undercurrent or voltage **relays** may be used to prevent misoperation.

2.17.5.2 Where the AC voltage source for an under frequency **relay** is derived from a potential device connected to a cable circuit, care should be taken to estimate the voltage present during deenergization of the circuit. The natural frequency of the decaying cable voltage may be less than 60 Hz, and thus cause an incorrect **relay** operation.

2.17.5.3 The AC Voltage Inhibit feature available on some relays may be useful as a security tool to restrain operation during cable deenergization, depending on the voltage decay time constant

2.17.5.4 Due regard should be given to the expected power system voltage during events for which the underfrequency **relays** are expected to operate. The **relay's** minimum AC voltage operating characteristic should not inhibit proper **relay** operation, nor should the Voltage Inhibit feature, where it exists, be set to prevent proper operation.

2.17.6 Settings and Maintenance Recommendations

2.17.6.1 Pickup Time Delay Settings

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Pickup and time delay settings of underfrequency threshold **relays** should be applied in accordance with the requirements specified in Section 5.2 and Section 5.4 of *Emergency Operation Criteria* (Directory #2).

2.17.6.2 Relay Performance Considerations

Any underfrequency **relay** which has been found to have drifted more than ±0.2 Hz from its set point or ±0.1 seconds from its time delay should be recalibrated and then retested in six months. If, at that time, the **relay** has drifted ±0.2 Hz or more from its set point or ±0.1 seconds or more from its fixed time delay, the cause of the drift should be corrected or the **relay** should be replaced.

2.17.6.3 Maintenance

Underfrequency **load shedding relays** have a direct effect on the operation of the **bulk power system** during major **emergencies**. These **relays** should be maintained in accordance with requirements stipulated in *Maintenance Criteria for Bulk Power System Protection* (Directory 3), even though they are usually located in non-**bulk power system** stations**.**

2.18 HVdc Systems Protection

2.18.1 Converter terminals should be protected to avoid excessive equipment stresses and to minimize equipment damage and outage time. These **protections** are usually specific to the design of the converter station(s) and are determined by the manufacturer to comply with availability guarantees. The followings are some conditions which should be detected:

- ac and dc undervoltage,
- ac and dc overvoltage,
- valve misfire,
- excessive harmonics on the dc,
- dc ground **faults** and open circuits,
- dc switching device failures,
- thyristor failures,
- valve and snubber circuit overloads.

2.18.2 The overall **protection** and control of an HVdc link may also involve the initiation of actions in response to abnormal conditions

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on the ac interconnected system. The control and **protection systems** associated with such conditions are not considered part of the HVdc systems **protection**.

2.19 Protection System Testing and Maintenance

Test facilities and test procedures should be designed such that they do not compromise the independence of **protection groups** protecting the same **bulk power system element**. Test devices or switches should be used to eliminate the necessity for removing or disconnecting wires during testing.

2.20 Analysis of Protection System

Insofar as possible, each active protective function within a **protective relay** should provide separate target information.

2.21 Transmission Station Protection

2.21.1 The **protection systems** should operate properly for the anticipated range of currents.

2.21.2 For planned system conditions, all station **protection systems** should not operate for **load** current or stable **power swings.**

2.21.3 **Load** responsive **protection relays** applied to transmission autotransformers should allow all possible load ability, consistent with equipment **protection** requirements.

2.21.4 Fault pressure or Buchholz **relays** used on transformers, phase shifters or regulators should be applied so as to minimize the likelihood of their misoperation due to through **faults**.

2.22 Capacitor Banks

2.22.1 Each **protection system** should be designed to minimize the effects to the **bulk power system** of **faults** and **disturbances**, while itself experiencing a single failure.

2.22.2 Capacitor bank **protection** should be applied with due consideration for capacitor bank transients, power system voltage unbalance, and system harmonics.

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2.22.3 Protection may be provided to minimize the impact of failures of individual capacitor units on the remaining capacitor units, however, these types of **protections** do not need to be duplicated:

a. Overvoltage Protection
b. Individual fuses for each capacitor unit
c. Overvoltage Protection for each capacitor units

2.23 Static Var Compensation (SVC) Protection

2.23.1 The low voltage branch circuits contain the reactive controlling equipment, filters, etc. These may include all or some of the following:

a. Thyristor Controlled Reactors (TCR)
b. Thyristor Switched Capacitors (TSC)
c. Switched or Fixed Capacitors
d. Harmonic Filters

2.23.2 **Protection** for the branch circuits that are not part of the **bulk power system** need not be duplicated. **Protection** for these branch circuits should be applied with due consideration for capacitor bank transients, power system voltage unbalance, and system harmonics.

2.23.3 **Protection** against abnormal non-**fault** conditions within the SVC via control of the TSC and TCR valves should be designed so as to not interfere with the proper operation of the SVC.

2.24 Logic System

The design should recognize the effects of contact races, spurious operation due to battery grounds, dc transients, radio frequency interference or other such influences.

It is recognized that timing is often critical in logic schemes. Operating times of different devices vary. Known timing differences should be accounted for in the overall design.

2.25 Microprocessor-Based Equipment and Software

Appendix A

A **protection system** may incorporate microprocessor-based equipment. Information from this equipment may support other functions such as power system operations. In such cases, the software and the interface should be designed so as to not degrade the **protection system** functions.

2.26 Control Cable, Wiring and Ancillary Control Devices

Control cables and wiring and ancillary control devices should be highly dependable and secure. Due consideration should be given to published codes and standards, fire hazards, current-carrying capacity, voltage drop, insulation level, mechanical strength, routing, shielding, grounding and environment.

2.27 Environment

Means should be employed to maintain environmental conditions that are favorable to the correct performance of **protection systems**.

3.0 Guideline for Application of Remote Access to Protection System

The following guideline is established for the application of remote access to **protection system** Intelligent Electronic Devices (IEDs), such as relays, programmable logic controllers (PLC), and teleprotection equipment that have remote access capabilities, and are designed and configured for remote access applications. It is intended to assist in meeting the requirement stipulated in Section 5.1.3.3 of this Directory, and Section 3.3.1.6 of the *Special Protection System Criteria* (Directory 7).

This guideline assumes that appropriate physical measures are in place, and that they meet all applicable standards.

3.1 Definitions for Use in this Guideline Only

The flowing defined terms are used for illustration of the guideline presented in this Section only. These terms are not defined in Appendix A of this Directory, or any other NPCC documents.

IED - Intelligent Electronic Device, normally computer based, equipped with digital communication abilities, some examples are **protective relays**, RTUs, SERs, DFRs, PLCs, data concentrators, telecommunications equipment, and general monitoring equipment.

PLC - Programmable Logic Controller, used to create and implement logical actions and automation.

Appendix A

Remote Access - accessing a device from a remote geographical area via a communications link; once accessed, provides similar local device functionality, at a distance.

Authenticate - to prove to be genuine or is an approved user.

Intrusion - An unauthorized electronic entry into an IED. Access normally provides user access to the functionality of the device.

Cryptography – is the study and application of codes and ciphers. Codes or encryption is used to transform data into a form that is not directly usable. Decryption transforms encrypted data using a decryption key back into the original useful form.

VPN – Virtual Private Network. It uses encryption to provide a private channel between private networks using a public network as its carrier i.e., two users using the Internet to provide confidentiality, integrity, and authentication.

3.2 Governing Principles

The industry has become more reliant on computer technology for power **system protection**, control, communications, and automation of its power system. Electromechanical and solid-state technologies are being replaced with microprocessor devices, offering, among other functions, local and remote communications access. **Protection system** IEDs are employed to protect, and or operate power system elements. Unauthorized access to an IED could result in interruption of electric service, damage to the power system equipment, major **disturbances**, or a danger to life and property. **Protection system** IEDs also contain a large amount of information that utility personnel have come to rely on, including telemetry, power system **disturbance** analysis, fault location, preventive maintenance information, as well as asset condition and optimization data. However, this technology has also created vulnerabilities that are similar to those seen in traditional computer networks. Therefore, the following should be the governing principles of any cyber security program:

- Prevent penetration from cyber attacks.
- Prevent local and remote access to critical cyber assets by non-authorized personnel.
- Monitor cyber assets to detect unauthorized access or attempts to access.
- Limit exposure.

3.3 Guideline

Appendix A

3.3.1 Authentication

One of the foundations of the cyber security program is controlled, or secure, access. This dictates that some form of user authentication be used. Three common means of authenticating a user's identity are:

3.3.1.1 Something the user knows, such as passwords, or IP addresses.

3.3.1.2 Something the user has, such as a key, or cryptographic token.

3.3.1.3 Something the user is, such as fingerprints and voiceprints

At minimum, at least two factors of authentication should be used, e.g., passwords, and a destination – telephone number, or an IP address. The use of more factors such as encryption, etc. will result in providing more secure authentication. However, most present day and legacy **protection system** IEDs do not yet support this technology. Existing equipment often contains some level of security features. At a minimum, they usually provide multi-level passwords. These features should be activated as a first step in security implementation

3.3.2 Substation IED Access Point

A list of all substation IEDs that have remote electronic access configured should be compiled and maintained. This list should also include the access method(s) (e.g., dial-in, WAN, etc), the associated phone numbers and/or IP address, passwords, and other pertinent data.

3.3.3 Approved Remote Access Authorization List

A list of approved users, and the station IEDs they are authorized to access, should be established and maintained. It is vital that all such access information be classified as confidential, and managed as such.

Appendix A

3.3.4 Remote Access Configuration

Protection system IEDs should be configured to afford remote access only where needed and approved, and then, only when proper authentication is provided.

3.3.5 Password

Most **protection system** IEDs offer multiple access levels, each with separate passwords. Normally, a “view” only level is provided which allows a user to extract and or view information only. An alternate access level is provided to allow trained and authorized users to “make” settings and configuration changes, and initiate breaker operations. It is this level of access that is susceptible to an intrusion which could cause the most damage to the power system. Only limited users should have access to this level by considering the followings:

3.3.5.1 Establish multi-tiered passwords with different privileges for different classes of users.

3.3.5.2 Default passwords should be changed when remote access is configured.

3.3.5.3 Make sure that all IEDs have "strong" passwords, i.e., passwords that are not dictionary words, not easily guessable, not blank, or have no password at all. It is recommended that all passwords contain a combination of letters and numbers, and should be at least six characters long.

3.3.6 Logging/Alarming

When remote connections are used to access the relay beyond “view-only” mode, this should be alarmed and/or logged where possible.

3.3.7 Controlling Authority Approval

For both local and remote communications, excluding viewing, notification and approval of the Controlling Authority should be required to access in-service **protection system** IEDs. Only authorized users, as per Sections 3.3.3 and 3.3.5 above, should have remote access capabilities.

Appendix A

3.3.8 Disable User Function

Often, **protection system** IEDs are put into service with functions that are not used. These functions can create vulnerabilities, and therefore, should be disabled if possible.

3.4 Other Available Higher Level Authentication Factors and Some General Good Practices

As stated in Section 3.3.1, a minimum of two factors of authentication should be used. However, the use of more factors will result in providing more secure authentication. This Section is intended to provide additional factors and practices that could be implemented where warranted, and where the technology allows.

3.4.1 For WAN based access systems, implement Virtual Private Network (VPN) technology. VPN technology is also applicable when using ISDN, DSL, and cable.

3.4.2 Limit, as far as possible, dependence on the public telephone network for substation communications to IEDs. Instead, use secure communications facilities whenever possible.

3.4.3 Call back (where the IED device or modem hangs up on the original caller and calls back on a second line to a preconfigured phone number) may be utilized as a portion of an IED's security to prevent unauthorized access. This security measure added to other security measures will improve the IEDs security. Security can be further enhanced by using a different telephone line for the return call.

3.4.4 For dial-up modem access, use a hardware lock and key dongle on the analog phone line at each modem and the lock and key combination will act as a gatekeeper. When a call is initiated, the lock at the called modem will verify the existence of a valid key at the calling modem Time.

Appendix A

3.4.5 Isolation from the Business/Corporate Network

Isolation of the substation **protection system** IEDs from the Corporate Network should be provided where possible. Data can be transferred from the substation IEDs to a server connected to a Corporate Network via appropriate firewalls. This practice is warranted because most Corporate Networks are Internet connected and therefore are exposed to external users.

4.0 Procedure for Reporting New and Revised **Protection Systems**

Paragraph 7.1 of this criteria states that **Protection system** owners shall provide the Task Force on System Protection (TFSP) with advance notification of any of their new **bulk power system protection** facilities, or significant changes in their existing **bulk power system protection** facilities. Paragraph 7.2 of this criteria states that **Protection system** owners shall also provide the TFSP with advance notification of non-member **protection** facilities as required per NPCC Bylaws . Notification will be made to the TFSP early in the engineering design stage.

4.1 Additional Requirements for Presentation and Review

4.1.1 A presentation will be made to the TFSP on new facilities or a modification to an existing facility when requested by either a member entity or the TFSP.

4.1.2 A presentation will be made to the TFSP when the design of the **protection** facility deviates from the criteria set forth in this Directory.

4.1.3 A presentation will be made to the TFSP when a member entity is in doubt as to whether a design meets the **protection** criteria set forth in this Directory.

4.2 Data Required for Presentation and Review of Proposed Protection Facilities

4.2.1 The **protection system** owner will advise the TFSP of the basic design of the proposed system. The data will be supplied on the "Protection System Review Forms" (formerly C-22 forms) as listed below, accompanied by a geographical map, a one-line diagram of all affected areas, and the associated **protection** and control function diagrams. A physical layout of **protection** panels and batteries for the purpose of illustrating physical separation will also be included.

Appendix A

Protection System Details
Line Relaying (Phase)
Line Relaying (Ground)
Transformer/Reactor Relaying
Generator Relaying
Bus Relaying
Shunt Capacitors and Filters Relaying
HVdc Converter Relaying
Special Protection Systems
Communication links
Equipment Details
Current Transformers
Voltage Transformers
Station Battery
Physical Separation
Breakers
Disturbance Monitoring Equipment
Transmission Relay Loadability
Exception Request

4.2.2 The proposed **protection system** will be explained with due emphasis on any special conditions or design restrictions existing on the particular power system.

4.3 Procedure for Presentation

4.3.1 The **protection system** owner will arrange to have a technical presentation made to the TFSP

4.3.2 To facilitate scheduling, the chairman of the TFSP will be notified approximately four months prior to the desired date of presentation.

4.3.3 Copies of materials to be presented will be distributed to TFSP members 30 days prior to the date of the presentation.

4.4 TFSP Procedures

4.4.1 The TFSP will review the material presented and develop a position statement concerning the proposed **protection system**. This statement will indicate one of the following:

4.4.1.1 The need for additional information to enable the TFSP to reach a decision.

Appendix A

4.4.1.2 Acceptance of the member statement of conformance to the Protection Criteria.

4.4.1.3 Acceptance of the submitted proposal

4.4.1.4 Conditional acceptance of the submitted proposal*.

4.4.1.5 Rejection of the submitted proposal*.

* Position Statements 4.4.1.4 and 4.4.1.5 will include an indication of areas of departure from the intent of the **protection** criteria and suggestions for modifications to bring the **protection system** into conformance with the NPCC criteria.

4.4.2 The results of the TFSP review will be documented in the following manner:

4.4.2.1 A position statement will be included in the minutes of the meeting at which the proposed **protection system** was reviewed.

4.4.2.2 If necessary, a letter outlining areas of nonconformance with the **protection** criteria stipulated in this Directory and recommendations for correction will be submitted to the **protection system** owner. If necessary, the matter will be brought to the attention of the RCC.

4.4.2.3 The Task Force will maintain a record of all the reviews it has conducted.

CI Number: 41430

Title: **2012 Substation Recloser Replacement**

Start Date: 2012/02
Final Cost Date: 2012/12
Function: Transmission
Forecast Amount: $2,120,686

DESCRIPTION:

This project provides for the costs associated with purchasing 45 substation reclosers for installation throughout the province.

Summary of Related CI's +/- 2 years:
2011 CI 40287 Substation Recloser Replacement $3,764,921
2013 CI TBD Substation Recloser Replacement $TBD

JUSTIFICATION:

Justification Criteria: Transmission Plant

Sub Criteria: Outage Performance

Why do this project?

In late 2010 and 2011, a number of substation recloser failures identified that some substation reclosers are reaching the end of their useful life raising a reliability and safety issue. In 2012 reclosers reaching the end of their useful life will be replaced based on their potential effects on reliability.

Why do this project now?

The average age of substation reclosers currently in service is 33 years, corresponding to 1978 manufacture. Life expectancy is in the range of 30 to 35 years. Recently, failures of substation reclosers have occurred at the following locations: 113H-Dartmouth East, 126H – Porters Lake, 131H-Lucasville, 129H-Kearney Lake Road, and 101H-Cobequid Road. The associated reliability implications make it necessary to mitigate the reliability issues with this equipment through removal and replacement.

Why do this project this way?

For those models and vintages of reclosers that have recently failed, removal from service and replacement with new equipment is the only option and improves the reliability of NSPI's system.

CI Number : 41430 - 2012 Substation Recloser Replacement **Project Number**

Parent CI Number : -

Cost Centre : 800 - 800-Services - Admin. **Budget Version** 2012 ACE Plan

Capital Item Accounts

Acct	Actv	Account	Activity	Forecast Amount	Amount	Variance
092		092-Vehicle T&D Reg. Labour AO		134,603	0	134,603
092		092-Vehicle T&D OT Labour AO		19,217	0	19,217
094		094 - Interest Capitalized		64,700	0	64,700
095		095-Thermal Regular Labour AO		11,464	0	11,464
095		095-COPS Overtime Labour AO		29,274	0	29,274
095		095-COPS Regular Labour AO		205,052	0	205,052
095		095-COPS Contracts AO		[redacted]	0	[redacted]
001	043	001 - T&D Regular Labour	043 - TP - Substn Dev.	233,246	0	233,246
002	043	002 - T&D Overtime Labour	043 - TP - Substn Dev.	75,850	0	75,850
011	043	011 - Travel Expense	043 - TP - Substn Dev.	8,000	0	8,000
012	043	012 - Materials	043 - TP - Substn Dev.	1,187,250	0	1,187,250
013	043	013 - COPS Contracts	043 - TP - Substn Dev.	[redacted]	0	[redacted]
001	085	001 - THERMAL Regular Labour	085 Design	47,745	0	47,745
001	085	001 - Regular Labour (No AO)	085 Design	23,745	0	23,745
001	087	001 - T&D Regular Labour	087 Field Super.& Ops.	32,400	0	32,400
011	087	011 - Travel Expense	087 Field Super.& Ops.	6,750	0	6,750
041	087	041 - Meals & Entertainment	087 Field Super.& Ops.	2,500	0	2,500
			Total Cost:	2,120,686	0	2,120,686
			Original Cost:	608,095		

CI 41430 2012 Substation Recloser Replacement

The following is a breakdown of costs associated with the 2012 Substation Recloser Replacement project:

Administrative Overhead and Interest	[redacted]
Materials	$ 1,187,250
Contracts	[redacted]
COPS Labour	$ 412,986
Other	$ 17,250
Total	$ 2,120,686

The labour associated with this project will be performed by NSPI personnel at a rate of approximately [redacted] per person day, along with some engineering design work. The materials forecast for this project provides estimates for the new reclosers and accessories based on the costs of the recloser replacement program in 2011. The contract forecast is associated with crane and boom truck services.

CI Number: 41426

Title:	**2012 Transmission Switch & Breaker Upgrades**
Start Date:	2012/03
Final Cost Date:	2012/12
Function:	Transmission
Forecast Amount:	$2,000,849

DESCRIPTION:

This project provides for costs associated with reliability improvements on the NSPI transmission system through the replacement of 24 disconnect switches and 15 circuit breakers. The replacement scope and breaker age includes: 1C-688 (1968), 1C-684 (1968), 50N-508 (1968), 50N-511 (1956), 50N-521 (1973), 50N-522 (1956), 82V-411 (1971), 17V-502 (1953), 17V-504 (1955), 43V-501 (1953), 43V-503 (1958), 15V-505 (1959), 50W-503 (1952), 99H-507 (1966), and 3W-502 (1968).

A combination of service time, operating experience, ambient exposure, availability of spare parts and Original Equipment Manufacturer support were considered in determining the priority for replacement.

Summary of Related CI's +/- 2 years:
2010 CI 38027 2010 Trans Switch & Breaker Upgrades $2,070,094
2011 CI 40280 2011 Trans Switch & Breaker Upgrade $2,866,718
2013 CI TBD Transmission Switch & Breaker Upgrades $TBD

JUSTIFICATION:

Justification Criteria: Transmission Plant

Sub Criteria: Equipment Replacement

Why do this project?

This project scope is being undertaken as part of the overall customer reliability improvement investment. This is year three of a five year (2010-2014) plan to improve reliability to NSPI's customers. This project will replace circuit breakers that are malfunctioning due to age and experienced service conditions. In addition, disconnect switch modifications/additions will result in improved customer reliability.

Why do this project now?

Doing this project now will result in mitigating transmission supply interruptions and provide reliability improvements for customers.

Why do this project this way?

In the majority of cases, the circuit breakers are being replaced for which spare parts are no longer available due to the age of the devices. Various switches are being modified or changed out due to either operational issues, or targeted at improving the capability of the switch. These modifications will result in improved customer reliability.

CI Number : 41426 - 2012 Transmission Switch & Breaker Upgrades **Project Number**

Parent CI Number : -

Cost Centre : 800 - 800-Services - Admin. **Budget Version** 2012 ACE Plan

Capital Item Accounts

Acct	Actv	Account	Activity	Forecast Amount	Amount	Variance
092		092-Vehicle T&D Reg. Labour AO		138,698	0	138,698
092		092-Vehicle T&D OT Labour AO		14,359	0	14,359
094		094 - Interest Capitalized		52,926	0	52,926
095		095-COPS Regular Labour AO		211,291	0	211,291
095		095-COPS Contracts AO		[redacted]	0	[redacted]
095		095-COPS Overtime Labour AO		21,875	0	21,875
095		095-Thermal Regular Labour AO		14,406	0	14,406
001	043	001 - T&D Regular Labour	043 - TP - Substn Dev.	218,728	0	218,728
002	043	002 - T&D Overtime Labour	043 - TP - Substn Dev.	56,678	0	56,678
011	043	011 - Travel Expense	043 - TP - Substn Dev.	16,800	0	16,800
012	043	012 - Materials	043 - TP - Substn Dev.	1,017,900	0	1,017,900
013	043	013 - COPS Contracts	043 - TP - Substn Dev.	[redacted]	0	[redacted]
001	085	001 - Regular Labour (No AO)	085 Design	23,102	0	23,102
001	085	001 - THERMAL Regular Labour	085 Design	60,000	0	60,000
002	085	002 - THERMAL Overtime Labour	085 Design	0	0	0
002	085	002 - Overtime Labour (No AO)	085 Design	0	0	0
041	085	041 - Meals & Entertainment	085 Design	750	0	750
001	087	001 - T&D Regular Labour	087 Field Super.& Ops.	55,000	0	55,000
011	087	011 - Travel Expense	087 Field Super.& Ops.	11,250	0	11,250
041	087	041 - Meals & Entertainment	087 Field Super.& Ops.	3,750	0	3,750
			Total Cost:	2,000,849	0	2,000,849
			Original Cost:	259,448		

CI 41426 2012 Transmission Switch & Breaker Upgrades

The following is a breakdown of costs associated with the 2012 Transmission Switch & Breaker Upgrades project:

Administrative Overhead and Interest	[redacted]
Materials	$ 1,017,900
Contracts	[redacted]
COPS Labour	$ 413,508
Other	$ 32,550
Total	$ 2,000,849

The labour associated with this project is expected to be completed by NSPI resources at an approximate rate of $[redacted] per person day along with engineering design work. The material forecasts provide for new circuit breakers and are based on costs from a similar project. The contract forecast is for boom truck and crane services.

CI Number: 41429

Title: **2012 Substation PCB Equipment Removal**

Start Date: 2012/02
Final Cost Date: 2012/12
Function: Transmission
Forecast Amount: $1,854,665

DESCRIPTION:

This project provides for the costs associated with the removal of substation devices with 500 mg/kg, or more of PCBs, to be in compliance with 2008 Federal Environmental PCB Regulations.

Summary of Related CI's +/- 2 years:
2010 CI 38122 2010 PCB Equipment Removal/Destruction $ 1,487,135
2011 CI 40288 2011 Substation PCB Equipment Removal $2,510,193
2013 CI TBD PCB Equipment Removal $TBD
2014 CI TBD PCB Equipment Removal $TBD

JUSTIFICATION:

Justification Criteria: Transmission Plant

Sub Criteria: Requirement to Serve

Why do this project?

This is year three of an agreed upon five year program with Environment Canada to remove PCB containing transmission equipment as per the federal regulatory requirement and associated timelines.

Why do this project now?

Regulations require that transmission substation equipment that does not meet federal PCB concentration limits must be removed from service prior to 2015.

Why do this project this way?

The sampling and possible replacement of equipment containing greater than 500 mg/kg concentration of PCBs must be planned over a period of several years to ensure bulk power system element outages are scheduled in a timely manner. Present Environment Canada regulations require completion by 2015.

CI Number : 41429 - 2012 Substation PCB Equipment Removal **Project Number**

Parent CI Number : -

Cost Centre : 800 - 800-Services - Admin. **Budget Version** 2012 ACE Plan

Capital Item Accounts

Acct	Actv	Account	Activity	Forecast Amount	Amount	Variance
092		092-Vehicle T&D Reg. Labour AO		146,297	0	146,297
092		092-Vehicle T&D OT Labour AO		3,854	0	3,854
094		094 - Interest Capitalized		32,741	0	32,741
095		095-Thermal Regular Labour AO		2,017	0	2,017
095		095-COPS Regular Labour AO		222,868	0	222,868
095		095-COPS Overtime Labour AO		5,872	0	5,872
095		095-COPS Contracts AO		[redacted]	0	[redacted]
001	043	001 - T&D Regular Labour	043 - TP - Substn Dev.	231,734	0	231,734
002	043	002 - T&D Overtime Labour	043 - TP - Substn Dev.	13,327	0	13,327
012	043	012 - Materials	043 - TP - Substn Dev.	596,000	0	596,000
013	043	013 - COPS Contracts	043 - TP - Substn Dev.	[redacted]	0	[redacted]
066	043	066 - Other Goods & Services	043 - TP - Substn Dev.	30,753	0	30,753
001	044	001 - T&D Regular Labour	044 - TP - Substn.Transf.	15,742	0	15,742
002	044	002 - T&D Overtime Labour	044 - TP - Substn.Transf.	1,887	0	1,887
012	044	012 - Materials	044 - TP - Substn.Transf.	153,499	0	153,499
001	085	001 - Regular Labour (No AO)	085 Design	7,500	0	7,500
001	085	001 - THERMAL Regular Labour	085 Design	8,400	0	8,400
002	085	002 - THERMAL Overtime Labour	085 Design	0	0	0
001	087	001 - T&D Regular Labour	087 Field Super.& Ops.	41,250	0	41,250
			Total Cost:	1,854,665	0	1,854,665
			Original Cost:	295,291		

CI 41429 - 2012 Substation PCB Equipment Removal

The following is a breakdown of costs associated with the 2012 Substation PCB Equipment Removal project:

Administrative Overhead and Interest	[redacted]
Materials	$ 749,499
Contracts	[redacted]
COPS Labour	$ 319,840
Other	$ 30,753
Total	$ 1,854,665

The labour associated with this project is expected to be completed by NSPI resources at an approximate rate $[redacted] per person day along with engineering design work. The material forecast estimates are based on a similar projects in 2010/2011 to replace PCB contaminated bushings, instrument transformers, circuit breakers, and insulating oil. This project also includes contract costs for the disposal of PCB contaminated insulating oils and solid materials.

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Part II

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SOR/2008-247 to 290 and SI/2008-93 to 107

Pages 1882 to 2241

NOTICE TO READERS

The *Canada Gazette* Part II is published under authority of the *Statutory Instruments Act* on January 9, 2008, and at least every second Wednesday thereafter.

Part II of the *Canada Gazette* contains all "regulations" as defined in the *Statutory Instruments Act* and certain other classes of statutory instruments and documents required to be published therein. However, certain regulations and classes of regulations are exempted from publication by section 15 of the *Statutory Instruments Regulations* made pursuant to section 20 of the *Statutory Instruments Act.*

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Copies of Statutory Instruments that have been registered with the Clerk of the Privy Council are available, in both official languages, for inspection and sale at Room 418, Blackburn Building, 85 Sparks Street, Ottawa, Canada.

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Partie II

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DORS/2008-247 à 290 et TR/2008-93 à 107

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AVIS AU LECTEUR

La Partie II de la *Gazette du Canada* est publiée en vertu de la *Loi sur les textes réglementaires* le 9 janvier 2008, et au moins tous les deux mercredis par la suite.

La Partie II de la *Gazette du Canada* est le recueil des « règlements » définis comme tels dans la loi précitée et de certaines autres catégories de textes réglementaires et de documents qu'il est prescrit d'y publier. Cependant, certains règlements et catégories de règlements sont soustraits à la publication par l'article 15 du *Règlement sur les textes réglementaires*, établi en vertu de l'article 20 de la *Loi sur les textes réglementaires*.

On peut consulter la Partie II de la *Gazette du Canada* dans la plupart des bibliothèques.

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PCB Regulations

P.C. 2008-1659 September 5, 2008

Whereas, pursuant to subsection 332(1)[a] of the *Canadian Environmental Protection Act, 1999*[b], the Minister of the Environment published in the *Canada Gazette*, Part I, November 4, 2006, a copy of the proposed *PCB Regulations*, substantially in the annexed form, and persons were given an opportunity to file comments with respect to the proposed Regulations or to file a notice of objection requesting that a board of review be established and stating the reasons for the objection;

Whereas, pursuant to subsection 93(3) of that Act, the National Advisory Committee has been given an opportunity to provide its advice under section 6[c] of that Act;

And whereas, in the opinion of the Governor in Council, pursuant to subsection 93(4) of that Act, the proposed Regulations do not regulate an aspect of a substance that is regulated by or under any other Act of Parliament in a manner that provides, in the opinion of the Governor in Council, sufficient protection to the environment and human health;

Therefore, Her Excellency the Governor General in Council, on the recommendation of the Minister of the Environment and the Minister of Health, pursuant to subsection 93(1) and section 97 of the *Canadian Environmental Protection Act, 1999*[b], hereby makes the annexed *PCB Regulations*.

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(*This table is not part of the Regulations.*)

[a] S.C. 2004, c. 15, s. 31
[b] S.C. 1999, c. 33
[c] S.C. 2002, c. 7, s. 124

Enregistrement
DORS/2008-273 Le 5 septembre 2008

LOI CANADIENNE SUR LA PROTECTION DE L’ENVIRONNEMENT (1999)

Règlement sur les BPC

C.P. 2008-1659 Le 5 septembre 2008

Attendu que, conformément au paragraphe 332(1)[a] de la *Loi canadienne sur la protection de l’environnement (1999)*[b], le ministre de l’Environnement a fait publier dans la *Gazette du Canada* Partie I, le 4 novembre 2006, le projet de règlement intitulé *Règlement sur les BPC*, conforme en substance au texte ci-après, et que les intéressés ont ainsi eu la possibilité de présenter leurs observations à cet égard ou un avis d’opposition motivé demandant la constitution d’une commission de révision;

Attendu que, conformément au paragraphe 93(3) de cette loi, le comité consultatif national s’est vu accorder la possibilité de formuler ses conseils dans le cadre de l’article 6[c] de celle-ci;

Attendu que la gouverneure en conseil est d’avis que, aux termes du paragraphe 93(4) de cette loi, le projet de règlement ne vise pas un point déjà réglementé sous le régime d’une autre loi fédérale de manière à offrir une protection suffisante pour l’environnement et la santé humaine,

À ces causes, sur recommandation du ministre de l’Environnement et du ministre de la Santé et en vertu du paragraphe 93(1) et de l’article 97 de la *Loi canadienne sur la protection de l’environnement (1999)*[b], Son Excellence la Gouverneure générale en conseil prend le *Règlement sur les BPC*, ci-après.

TABLE DES MATIÈRES

(*La présente table ne fait pas partie du Règlement.*)

[a] L.C. 2004, ch. 15, art. 31
[b] L.C. 1999, ch. 33
[c] L.C. 2002, ch. 7, art. 124

PCB REGULATIONS

PART 1

GENERAL

Definitions

1. (1) The following definitions apply in these Regulations.

"Act" « *Loi* »

"Act" means the *Canadian Environmental Protection Act, 1999*.

"authorized facility" « *installation agréée* »

"authorized facility" means a facility, including a transfer site, that is authorized by the authorities of the jurisdiction in which it is located to process PCBs or products containing PCBs or to conduct laboratory analysis or research with PCBs or products containing PCBs.

"National Fire Code" « *Code national de prévention des incendies* »

"National Fire Code" means the National Fire Code of Canada 2005, NRCC No. 47667, issued by the Canadian Commission on Building and Fire Codes, National Research Council of Canada, as amended from time to time.

RÈGLEMENT SUR LES BPC

PARTIE 1

GÉNÉRALITÉS

Définitions

1. (1) Les définitions qui suivent s'appliquent au présent règlement.

« BPC » "*PCB*"

« BPC » Tout biphényle chloré visé à l'article 1 de la liste des substances toxiques de l'annexe 1 de la Loi.

« Code national de prévention des incendies » "*National Fire Code*"

« Code national de prévention des incendies » Le *Code national de prévention des incendies — Canada 2005*, CNRC 47667F, avec ses modifications successives, publié par la Commission canadienne des codes du bâtiment et de prévention des incendies du Conseil national de recherches du Canada.

« installation agréée » "*authorized facility*"

« installation agréée » Installation — notamment un centre de transfert — qui est autorisée par les autorités du territoire où elle est située à transformer

"PCB" « *BPC* »

"PCB" means any chlorobiphenyl described in item 1 of the List of Toxic Substances in Schedule 1 to the Act.

"process" « *transformer* »

"process" includes to mix with a product.

"product" « *produit* »

"product" includes equipment.

Concentration — several matrices

(2) For the purposes of these Regulations, if a solid or a liquid containing PCBs is composed of several matrices, the concentration of PCBs is based on the mass of the matrix in which the PCBs are located.

Concentration and quantity

(3) For the purposes of these Regulations, the concentration and quantity of PCBs shall be determined

(*a*) by a laboratory

(i) accredited by the Standards Council of Canada (SCC), the Canadian Association for Environmental Analytical Laboratories Inc. (CAEAL), or any other accreditation body that is a signatory to the *International Laboratory Accreditation Cooperation (ILAC) Mutual Recognition Arrangement*, and the laboratory shall be accredited in accordance with the International Organization for Standardization standard ISO/IEC 17025:2005 entitled *General Requirements for the Competence of Testing and Calibration Laboratories*, as amended from time to time, and

(ii) for which the scope of accreditation shall include the analytical method used to determine the concentration of PCBs in the matrix in which the PCBs are located; or

(*b*) by a laboratory

(i) accredited in accordance with the *Environmental Quality Act*, R.S.Q., c. Q-2, as amended from time to time, and

(ii) for which the scope of accreditation shall include the analytical method used to determine the concentration of PCBs in the matrix in which the PCBs are located.

Sampling method

(4) For the purposes of these Regulations, other than section 13, the concentration of PCBs in a matrix is determined using a provincially, nationally or internationally recognized sampling method for PCBs in the matrix in which the PCBs are located.

Sampling method — bulk solid products

(5) For the purposes of section 13, the concentration of PCBs is determined using a sampling method for bulk solid products, which is set out in either federal or provincial legislation, as amended from time to time, or approved by the United States Environmental Protection Agency for compliance with the *Resource Conservation and Recovery Act* or with the regulations made under that Act, as amended from time to time.

des BPC ou des produits qui en contiennent, ou à les utiliser pour des analyses de laboratoire ou des recherches.

« Loi » "*Act*"

« Loi » La *Loi canadienne sur la protection de l'environnement (1999)*.

« produit » "*product*"

« produit » S'entend notamment d'une pièce d'équipement.

« transformer » "*process*"

« transformer » S'entend notamment du fait de mélanger avec tout produit.

Concentration — plusieurs matrices

(2) Pour l'application du présent règlement, lorsqu'un solide ou un liquide qui contient des BPC est composé de plusieurs matrices, la concentration de BPC est basée sur la masse de la matrice dans laquelle les BPC se trouvent.

Concentration et quantité

(3) Pour l'application du présent règlement, la concentration et la quantité de BPC sont déterminées :

a) soit par tout laboratoire :

(i) qui est accrédité à la norme de l'Organisation internationale de normalisation intitulée *Exigences générales concernant la compétence des laboratoires d'étalonnages et d'essais* (ISO/IEC 17025:2005), avec ses modifications successives, par le Conseil canadien des normes (CCN), l'Association canadienne des laboratoires d'analyse environnementale (ACLAE) ou tout autre organisme d'accréditation signataire de l'*International Laboratory Accreditation Cooperation (ILAC) Mutual Recognition Arrangement*,

(ii) dont la portée d'accréditation couvre la méthode d'analyse utilisée pour déterminer la concentration des BPC dans la matrice dans laquelle les BPC se trouvent;

b) soit par tout laboratoire :

(i) qui est accrédité conformément à la *Loi sur la qualité de l'environnement*, L.R.Q., ch. Q-2, avec ses modifications successives,

(ii) dont la portés d'accréditation couvre la méthode d'analyse utilisée pour déterminer la concentration des BPC dans la matrice dans laquelle se trouvent les BPC.

Méthode d'échantillonnage

(4) Pour l'application du présent règlement, sauf l'article 13, la concentration de BPC se trouvant dans une matrice est déterminée au moyen de toute méthode d'échantillonnage pour les BPC dans cette matrice qui est reconnue à l'échelle provinciale, nationale ou internationale.

Méthode d'échantillonnage — produits solides en vrac

(5) Pour l'application de l'article 13, la concentration de BPC est déterminée au moyen de toute méthode d'échantillonnage pour les produits solides en vrac qui est prévue par une loi ou un règlement fédéral ou provincial, avec ses modifications successives, ou qui est approuvée par la United States Environmental Protection Agency pour l'application de la loi des États-Unis intitulée *Resource Conservation and Recovery Act* ou de ses règlements avec leurs modifications successives.

Application

2. (1) These Regulations apply to PCBs and to any products containing PCBs.

Non-application

(2) These Regulations do not apply to the following:

(*a*) the export and import of PCBs that are hazardous waste or hazardous recyclable material within the meaning of the *Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations* or the export of PCBs that are waste within the meaning of the *PCB Waste Export Regulations, 1996*;

(*b*) the sale, importation or advertising of liquids containing PCBs for use in microscopy, including immersion oils, but not including refractive index oils, which is prohibited under section 4 of the *Hazardous Products Act*; and

(*c*) the offer for sale, sale and use of land contaminated with PCBs or with products containing PCBs.

Sale of property

3. Nothing in these Regulations shall be construed as preventing the sale of

(*a*) personal property or movables that contain PCBs, or real property or immovables that have PCBs or products containing PCBs, and that form part of the sale of the whole or part of a business, including a manufacturing or a processing business;

(*b*) real property or immovables that have products containing PCBs if the products continue to be used after the sale for the same purpose at the same place and are an integral part of the property or immovable; or

(*c*) real property or immovables on which a PCB storage site is located.

Compliance

4. In addition to the persons who must comply with the requirements set out in these Regulations, a person who owns PCBs or products containing PCBs shall ensure that the requirements of these Regulations with respect to those PCBs or products are met.

PART 2

PROHIBITIONS AND PERMITTED ACTIVITIES

PROHIBITIONS

Release into the environment

5. (1) No person shall release PCBs into the environment, other than from the equipment referred to in subsection (2), in a concentration of

(*a*) 2 mg/kg or more for a liquid containing PCBs; or

(*b*) 50 mg/kg or more for a solid containing PCBs.

Release from equipment

(2) No person shall release more than one gram of PCBs into the environment from equipment

Application

2. (1) Le présent règlement s'applique aux BPC et à tout produit qui en contient.

Exclusion

(2) Il ne s'applique toutefois pas aux activités suivantes :

a) l'exportation et l'importation de BPC qui sont des déchets dangereux ou des matières recyclables dangereuses au sens du *Règlement sur l'exportation et l'importation de déchets dangereux et de matières recyclables dangereuses* et l'exportation de déchets contenant des BPC au sens du *Règlement sur l'exportation de déchets contenant des BPC (1996)*;

b) la vente, l'importation ou la publicité des liquides pour usage en microscopie qui contiennent des BPC, y compris les huiles à immersion mais à l'exclusion des huiles à indice de réfraction, interdites par l'article 4 de la *Loi sur les produits dangereux*;

c) la mise en vente, la vente et l'utilisation de terrains contaminés par des BPC ou des produits qui en contiennent.

Vente de biens

3. Le présent règlement n'a pas pour effet d'empêcher la vente des biens suivants :

a) tout bien meuble ou personnel qui contient des BPC ou tout bien immeuble ou réel où se trouvent des BPC ou des produits qui en contiennent, lesquels biens sont compris dans la vente de tout ou partie d'une entreprise, y compris une entreprise de fabrication ou de transformation;

b) tout bien immeuble ou réel dont font partie intégrante les produits qui contiennent des BPC qui s'y trouvent, si les produits continuent d'être utilisés aux mêmes fins et au même endroit après la vente;

c) tout bien immeuble ou réel où se trouve un dépôt de BPC.

Conformité

4. En plus des personnes auxquelles il incombe des obligations en vertu du présent règlement, le propriétaire de BPC ou de produits qui en contiennent veille à ce que les exigences du présent règlement concernant ces BPC ou produits soient remplies.

PARTIE 2

INTERDICTIONS ET ACTIVITÉS PERMISES

INTERDICTIONS

Rejet dans l'environnement

5. (1) Il est interdit de rejeter dans l'environnement, autrement qu'à partir d'une pièce d'équipement visée au paragraphe (2), des BPC de l'une ou l'autre des concentrations suivantes :

a) dans le cas d'un liquide qui contient des BPC, une concentration égale ou supérieure à 2 mg/kg;

b) dans le cas d'un solide qui contient des BPC, une concentration égale ou supérieure à 50 mg/kg.

Rejet à partir d'une pièce d'équipement

(2) Il est interdit de rejeter plus d'un gramme de BPC dans l'environnement à partir d'une pièce

referred to in section 16 that is in use or from equipment in use for which an extension has been granted under section 17.

Prohibited activities

6. Except as provided in these Regulations, no person shall

(*a*) manufacture, export or import PCBs or a product containing PCBs in a concentration of 2 mg/kg or more;

(*b*) offer for sale or sell PCBs or a product containing PCBs in a concentration of 50 mg/kg or more; or

(*c*) process or use PCBs or a product containing PCBs.

PERMITTED ACTIVITIES

Laboratory analysis

7. A person may manufacture, export, import, offer for sale, sell, process and use PCBs or products containing PCBs for the purpose of laboratory analysis if the analysis is conducted

(*a*) in an authorized facility that is authorized for that purpose; or

(*b*) in a facility that conforms to internationally recognized guidelines on best laboratory practices, if the authorities of the jurisdiction in which the facility is located do not have a mechanism in place to authorize the facility to conduct the analysis.

Research

8. (1) A person may offer for sale or sell PCBs or products containing PCBs to be processed or used for the purpose of research to determine the effects of those PCBs or products on human health or on the environment, if the facility in which they are processed or used is

(*a*) an authorized facility that is authorized for that purpose; or

(*b*) a facility that conforms to internationally recognized guidelines on best laboratory practices, if the authorities of the jurisdiction in which the facility is located do not have a mechanism in place to authorize the facility to conduct the research.

Processing and use

(2) A person may process and use the PCBs or products containing PCBs for the purpose of the research referred to in subsection (1) at a facility that meets the requirement set out in paragraph (1)(*a*) or (*b*).

Electrical capacitor

9. A person may offer for sale, sell and use an electrical capacitor containing PCBs if the electrical capacitor

(*a*) is an integral part of a consumer product;

(*b*) is fusion sealed; and

(*c*) would be rendered inoperable and irreparable if the PCBs were removed from it.

Aircraft, ships, trains and other vehicles

10. A person may export, import, offer for sale, sell and use for transportation purposes aircraft, ships, trains and other vehicles that contain PCBs

d'équipement visée à l'article 16 qui est en usage ou d'une pièce d'équipement dont l'usage fait l'objet d'une prolongation en vertu de l'article 17 et qui est en usage.

Activités interdites

6. Sauf dans la mesure prévue par le présent règlement, il est interdit :

a) de fabriquer, d'exporter ou d'importer des BPC ou tout produit qui en contient en une concentration égale ou supérieure à 2 mg/kg;

b) de mettre en vente ou de vendre des BPC ou tout produit qui en contient en une concentration égale ou supérieure à 50 mg/kg;

c) de transformer ou d'utiliser des BPC ou tout produit qui en contient.

ACTIVITÉS PERMISES

Analyses de laboratoire

7. Il est permis de fabriquer, d'exporter, d'importer, de mettre en vente, de vendre, de transformer et d'utiliser des BPC et des produits qui en contiennent pour des analyses de laboratoire, si celles-ci sont effectuées :

a) dans toute installation agréée à cette fin;

b) dans le cas où les autorités du territoire où elle est située ne disposent d'aucun mécanisme l'autorisant à les effectuer, dans toute installation qui est conforme à des lignes directrices, reconnues à l'échelle internationale, sur les pratiques exemplaires en laboratoire.

Recherches

8. (1) Il est permis de mettre en vente ou de vendre des BPC ou des produits qui en contiennent pour qu'ils soient utilisés ou transformés à des fins de recherche visant à déterminer les effets des BPC ou des produits sur la santé humaine ou l'environnement, si l'installation où ils sont utilisés ou transformés se conforme à l'une ou l'autre des exigences suivantes :

a) elle est agréée à cette fin;

b) dans le cas où les autorités du territoire où elle est située ne disposent d'aucun mécanisme l'autorisant à effectuer des recherches, elle est conforme à des lignes directrices, reconnues à l'échelle internationale, sur les pratiques exemplaires en laboratoire.

Transformation et utilisation

(2) Il est permis de transformer et d'utiliser des BPC et des produits qui en contiennent pour effectuer les recherches visées au paragraphe (1) dans une installation qui se conforme à l'une ou l'autre des exigences prévues à ce paragraphe.

Condensateurs électriques

9. Il est permis de mettre en vente, de vendre et d'utiliser tout condensateur électrique qui contient des BPC, si les conditions suivantes sont réunies :

a) il fait partie intégrante d'un produit de consommation;

b) ses joints sont thermoscellés;

c) il ne fonctionnerait plus et serait irréparable si les BPC en étaient extraits.

Aéronefs, navires, trains et autres véhicules

10. Il est permis d'exporter, d'importer, de mettre en vente, de vendre et d'utiliser pour le transport, tout aéronef, navire, train ou autre véhicule only in their communication, navigation or electronic control equipment or cables.

Colouring pigment

11. (1) A person may manufacture, export, import, offer for sale, sell, process and use a colouring pigment containing PCBs produced incidentally if the concentration of the PCBs is less than 50 mg/kg.

Annual average concentration

(2) Despite subsection (1), the annual average concentration of PCBs produced incidentally in colouring pigment that a person may manufacture, export, import, offer for sale, sell, process and use shall not exceed 25 mg/kg.

Destruction

12. A person may process PCBs or products containing PCBs for the purpose of destroying PCBs or recovering PCBs for the purpose of destroying them in an authorized facility that is authorized for that purpose.

Solid products

13. (1) A person may manufacture solid products containing PCBs in a concentration of less than 50 mg/kg using bulk solid products containing PCBs in a concentration of less than 50 mg/kg, and may use those solid products.

Application

(2) Subsection (1) only applies to the manufacture of the types of products that are manufactured before the day on which these Regulations come into force.

Exception

(3) No person shall offer for sale or sell the products manufactured in accordance with subsection (1) unless the products are used in the course of a commercial or industrial activity.

Cables, pipelines, electrical capacitors and other equipment

14. (1) A person may use the following products containing PCBs:

(*a*) cables, if they remain in place on the day on which these Regulations come into force;

(*b*) pipelines that transport natural gas, petroleum or petroleum products and any associated equipment that is in contact with the natural gas, petroleum or petroleum products if the pipelines and the equipment remain in place on the day on which these Regulations come into force;

(*c*) fusion sealed capacitors if they are used in relation to communication equipment or electronic control equipment; and

(*d*) the following equipment containing PCBs in a concentration of less than 50 mg/kg if the equipment is used for the purpose for which it was manufactured:

(i) electrical capacitors, other than light ballasts, and electrical transformers and their auxiliary electrical equipment, other than pole-top electrical transformers and their pole-top auxiliary electrical equipment,

(ii) electromagnets that are not used in the handling of food, feed or any additive to food or feed, and

dont seuls l'équipement de communication, de navigation ou de commande électronique ou les câbles contiennent des BPC.

Pigments pour la coloration

11. (1) Il est permis de fabriquer, d'exporter, d'importer, de mettre en vente, de vendre, de transformer et d'utiliser des pigments pour la coloration qui contiennent des BPC produit par inadvertance en une concentration inférieure à 50 mg/kg.

Moyenne annuelle maximale

(2) Toutefois, la concentration moyenne annuelle de BPC produit par inadvertance dans les pigments pour la coloration fabriqués, exportés, importés, mis en vente, vendus, transformés et utilisés par toute personne ne peut dépasser 25 mg/kg.

Destruction

12. Il est permis, dans une installation agréée à cette fin, de transformer des BPC et des produits qui en contiennent pour les détruire ou pour les récupérer afin de les détruire.

Produits solides

13. (1) Il est permis de fabriquer des produits solides qui contiennent des BPC en une concentration inférieure à 50 mg/kg à partir de produits solides en vrac qui eux-mêmes contiennent des BPC en une concentration inférieure à 50 mg/kg et d'utiliser ces produits solides.

Application

(2) Le paragraphe (1) ne s'applique qu'aux types de produits qui sont fabriqués avant l'entrée en vigueur du présent règlement.

Exception

(3) Il est interdit de mettre en vente ou de vendre des produits fabriqués conformément au paragraphe (1) pour tout usage en dehors d'une activité commerciale ou industrielle.

Câbles, pipelines, condensateurs électriques et pièces d'équipements

14. (1) Il est permis d'utiliser les produits ci-après qui contiennent des BPC :

a) tout câble, s'il demeure à l'endroit où il se trouvait à l'entrée en vigueur du présent règlement;

b) tout pipeline qui transporte du gaz naturel, du pétrole ou des produits pétroliers, ainsi que tout équipement connexe qui est en contact avec le gaz naturel, le pétrole ou les produits pétroliers, si le pipeline et l'équipement demeurent à l'endroit où ils se trouvaient à l'entrée en vigueur du présent règlement;

c) tout condensateur électrique dont les joints sont thermoscellés et qui est utilisé à des fins de communication ou de commande électronique;

d) les pièces d'équipement ci-après qui contiennent des BPC en une concentration inférieure à 50 mg/kg et qui sont utilisées aux fins auxquelles elles étaient destinées lors de leur fabrication :

(i) les condensateurs électriques, autres que les ballasts de lampes, et les transformateurs électriques et tout équipement électrique connexe, à l'exception des transformateurs sur poteaux et de tout équipement électrique connexe sur poteaux,

(iii) heat transfer equipment, hydraulic equipment, vapour diffusion pumps and bridge bearings.

Electrical capacitors

(2) A person may import fusion sealed capacitors containing PCBs for use in relation to communication tactical equipment or electronic control tactical equipment.

Liquids for servicing — concentration less than 2 mg/kg

15. (1) A person may use liquids containing PCBs in a concentration of less than 2 mg/kg for the purpose of servicing equipment containing PCBs.

Liquids for servicing — concentration of 500 mg/kg or more

(2) A person may use liquids containing PCBs in a concentration of 500 mg/kg or more for the purpose of servicing equipment containing PCBs in a concentration of 500 mg/kg or more until December 31, 2009.

END-OF-USE DATES AND EXTENSION

Equipment referred to in subparagraphs 14(1)(*d*)(i) to (iii)

16. (1) A person may use the equipment referred to in subparagraphs 14(1)(*d*)(i) to (iii) until the following dates if the equipment is in use on the day on which these Regulations come into force:

(*a*) in the case of equipment containing PCBs in a concentration of 500 mg/kg or more, December 31, 2009; and

(*b*) in the case of equipment containing PCBs in a concentration of at least 50 mg/kg but less than 500 mg/kg,

(i) December 31, 2009, if the equipment is located at a drinking water treatment plant or food or feed processing plant, in a child care facility, preschool, primary school, secondary school, hospital or senior citizens' care facility or on the property on which the plant or facility is located and within 100 m of it, and

(ii) December 31, 2025, if the equipment is located at any other place.

Light ballasts and pole-top electrical transformers

(2) A person may use the following equipment containing PCBs in a concentration of 50 mg/kg or more until December 31, 2025, if the equipment is in use on the day on which these Regulations come into force:

(*a*) light ballasts; and

(*b*) pole-top electrical transformers and their pole-top auxiliary electrical equipment.

Liquid — concentration of 2 mg/kg or more

(3) A person may use a liquid containing 2 mg/kg or more of PCBs that is in equipment until the day on which the liquid is removed from the equipment.

(ii) les électroaimants ne servant pas à la manutention des aliments destinés aux humains ou aux animaux, ou de tout additif à ces aliments,

(iii) l'équipement caloporteur, l'équipement hydraulique, les pompes à diffusion de vapeur et les appareils d'appui de pont.

Condensateurs électriques

(2) Il est permis d'importer tout condensateur électrique qui contient des BPC et dont les joints sont thermoscellés pour qu'il soit utilisé à des fins de communication tactique ou de commande électronique tactique.

Liquides pour entretien — concentration inférieure à 2 mg/kg

15. (1) Il est permis d'utiliser tout liquide qui contient des BPC en une concentration inférieure à 2 mg/kg pour l'entretien de toute pièce d'équipement qui contient des BPC.

Liquide pour entretien — concentration de 500 mg/kg ou plus

(2) Il est également permis, jusqu'au 31 décembre 2009, d'utiliser tout liquide qui contient des BPC en une concentration égale ou supérieure à 500 mg/kg pour l'entretien de toute pièce d'équipement qui elle-même contient des BPC en une concentration égale ou supérieure à 500 mg/kg.

UTILISATION — DATES LIMITES ET PROLONGATION

Pièces d'équipement visées aux sous-alinéas 14(1)*d*)(i) à (iii)

16. (1) Il est permis d'utiliser les pièces d'équipement visées aux sous-alinéas 14(1)*d*)(i) à (iii) qui sont en usage à l'entrée en vigueur du présent règlement jusqu'aux dates suivantes :

a) si elles contiennent des BPC en une concentration égale ou supérieure à 500 mg/kg, jusqu'au 31 décembre 2009;

b) si elles contiennent des BPC en une concentration égale ou supérieure à 50 mg/kg mais inférieure à 500 mg/kg :

(i) jusqu'au 31 décembre 2009, si elles se trouvent dans une usine de traitement d'eau potable ou de transformation des aliments destinés aux humains ou aux animaux, dans une garderie, dans une école — de niveau préscolaire, primaire ou secondaire —, dans un hôpital ou dans une résidence pour personnes âgées ou sur le terrain d'un tel établissement, à 100 m ou moins de celui-ci,

(ii) jusqu'au 31 décembre 2025, si elles se trouvent à tout autre endroit.

Ballasts de lampes et transformateurs sur poteaux

(2) Il est permis, jusqu'au 31 décembre 2025, d'utiliser les pièces d'équipement ci-après qui sont en usage à l'entrée en vigueur du présent règlement et qui contiennent des BPC en une concentration égale ou supérieure à 50 mg/kg :

a) les ballasts de lampes;

b) les transformateurs sur poteaux ainsi que tout équipement électrique connexe sur poteaux.

Liquides — concentration de 2 mg/kg ou plus

(3) Il est permis d'utiliser tout liquide qui contient des BPC en une concentration égale ou supérieure à 2 mg/kg dans une pièce d'équipement jusqu'à ce qu'il en soit extrait.

Extension of end-of-use date

17. (1) Despite subsection 15(2), paragraph 16(1)(*a*) and subparagraph 16(1)(*b*)(i), a person may use the equipment and the liquids used for servicing that equipment, referred to in those provisions, until the date set out in an extension granted by the Minister under subsection (2) for that equipment and those liquids.

Application

(2) The Minister shall, on receiving a written application containing the information set out in subsection (3), grant an extension up to the date applied for but no later than December 31, 2014, if either of the following conditions are met:

(*a*) the equipment is being replaced with equipment that is engineered to order, and

(i) it is not technically feasible to replace the equipment on or before December 31, 2009,

(ii) the applicant is taking all necessary measures to minimize or eliminate any harmful effect of the PCBs in the equipment on the environment and on human health,

(iii) a plan has been prepared, along with timelines, to end the use of the equipment by the date applied for,

(iv) a plan has been prepared for inspecting the equipment on a monthly basis for the period of the extension for damage that could lead to the release of PCBs, and

(v) the equipment bears the label required under section 29; or

(*b*) the equipment is located at a facility that is scheduled for permanent closure on or before December 31, 2014, and

(i) the applicant is taking all necessary measures to minimize or eliminate any harmful effect of the PCBs in the equipment on the environment and on human health,

(ii) a plan has been prepared, along with timelines, to end the use of the equipment by the date applied for,

(iii) a plan has been prepared for inspecting the equipment on a monthly basis, for the period of the extension, for damage that could lead to the release of PCBs, and

(iv) the equipment bears the label required under section 29.

Information

(3) The application shall contain the following:

(*a*) the name, civic and mailing addresses, telephone number, fax number, if any, and e-mail address, if any, of the applicant and of any person authorized to act on the applicant's behalf;

(*b*) a technical description of the equipment which is the subject of the application, including

(i) the type and function of the equipment,

(ii) the quantity of liquid containing PCBs that is in the equipment and the quantity of liquid needed for servicing that equipment, expressed in litres,

Prolongation de la date de fin d'utilisation

17. (1) Malgré le paragraphe 15(2), l'alinéa 16(1)*a*) et le sous-alinéa 16(1)*b*)(i), il est permis d'utiliser les pièces d'équipement et les liquides utilisés pour leur entretien visés à ces dispositions jusqu'à l'expiration de toute prolongation accordée par le ministre en vertu du paragraphe (2) pour ces pièces d'équipement et ces liquides.

Demande

(2) Sur réception d'une demande écrite comportant les renseignements prévus au paragraphe (3), le ministre accorde une prolongation jusqu'à la date prévue dans la demande mais au plus tard jusqu'au 31 décembre 2014, si l'une ou l'autre des conditions suivantes est remplie :

a) la pièce d'équipement doit être remplacée par une pièce d'équipement conçue et fabriquée sur mesure et :

(i) il est techniquement impossible de le faire le 31 décembre 2009 ou avant cette date,

(ii) le demandeur prend les mesures nécessaires pour éliminer ou atténuer tout effet nocif des BPC contenus dans la pièce sur l'environnement et la santé humaine,

(iii) un plan, incluant un échéancier, a été dressé afin que l'utilisation de la pièce cesse au plus tard à la date prévue dans la demande,

(iv) un plan a été dressé pour l'inspection de la pièce une fois par mois durant la prolongation afin que soit décelé tout dommage pouvant mener au rejet de BPC,

(v) la pièce porte l'étiquette exigée par l'article 29;

b) la pièce d'équipement se trouve dans une installation dont la fermeture permanente est prévue au plus tard pour le 31 décembre 2014 et :

(i) le demandeur prend les mesures nécessaires pour éliminer ou atténuer tout effet nocif des BPC contenus dans la pièce sur l'environnement et la santé humaine,

(ii) un plan, incluant un échéancier, a été dressé afin que l'utilisation de la pièce cesse au plus tard à la date prévue dans la demande,

(iii) un plan a été dressé pour l'inspection de la pièce une fois par mois durant la prolongation afin que soit décelé tout dommage pouvant mener au rejet de BPC;

(iv) la pièce porte l'étiquette exigée par l'article 29.

Renseignements

(3) La demande comporte :

a) les nom, adresses municipale et postale et numéro de téléphone du demandeur et de toute personne autorisée à agir en son nom et, le cas échéant, leurs numéro de télécopieur et adresse électronique;

b) les caractéristiques techniques de la pièce d'équipement qui fait l'objet de la demande, notamment :

(i) son type et sa fonction,

(ii) la quantité de liquide qui contient des BPC qui s'y trouve et la quantité de liquide nécessaire pour son entretien, exprimées en litres,

(iii) the concentration of PCBs in the liquid, expressed in milligrams of PCBs per kilogram of liquid,

(iv) the quantity of PCBs in the liquid that is in the equipment, expressed in kilograms, and

(v) the name-plate description, if any, and the manufacturer's serial number, if any;

(*c*) the unique identification number that is on the label required under section 29;

(*d*) the name, if any, and civic address of the facility where the equipment is located, or, if there is no civic address, the location using the owner's site identification system, and the function and technical description of the facility;

(*e*) information demonstrating that

(i) it is not technically feasible to replace the equipment on or before December 31, 2009, or

(ii) the facility where the equipment is located is scheduled for permanent closure on or before December 31, 2014;

(*f*) information demonstrating that the applicant is taking all necessary measures to minimize or eliminate any harmful effect of the PCBs that are contained in the equipment on the environment and on human health;

(*g*) the plan, along with timelines, for ending the use of the equipment; and

(*h*) the plan for inspecting the equipment.

Notice of change to information

(4) The applicant shall notify the Minister in writing of any change to the information provided under subsection (3) within 30 days after the day on which the change occurs.

False or misleading information

(5) The Minister shall refuse to grant an extension if the Minister has reasonable grounds to believe that the applicant has provided false or misleading information in support of its application.

Revocation

(6) The Minister shall revoke the extension if

(*a*) the requirements set out in subsection (2) are no longer met during the period of the extension; or

(*b*) the Minister has reasonable grounds to believe that the applicant has provided false or misleading information to the Minister in support of its application.

Reasons for revocation

(7) The Minister shall not revoke the extension unless the Minister provides the applicant with

(*a*) written reasons for the revocation; and

(*b*) an opportunity to be heard, by written representation, in respect of the revocation.

(iii) la concentration de BPC dans le liquide, exprimée en milligrammes de BPC par kilogramme de liquide,

(iv) la quantité de BPC dans le liquide qui s'y trouve, exprimée en kilogrammes,

(v) s'il y a lieu, l'information figurant sur la plaque d'identification et le numéro de série de son fabricant;

c) le numéro d'identification unique figurant sur l'étiquette en application de l'article 29;

d) le nom, s'il y a lieu, et l'adresse municipale de l'installation où se trouve la pièce d'équipement ou, à défaut, l'endroit où elle se trouve d'après le système d'identification de site du propriétaire, et la fonction et les caractéristiques techniques de l'installation;

e) les renseignements qui établissent :

(i) soit qu'il est techniquement impossible de remplacer la pièce d'équipement le 31 décembre 2009 ou avant cette date,

(ii) soit que la fermeture permanente de l'installation dans laquelle se trouve la pièce d'équipement est prévue au plus tard pour le 31 décembre 2014;

f) les renseignements qui établissent que les mesures nécessaires ont été prises par le demandeur pour éliminer ou atténuer tout effet nocif des BPC contenus dans la pièce d'équipement sur l'environnement et la santé humaine;

g) le plan et l'échéancier qui seront mis en œuvre afin que cesse l'utilisation de la pièce d'équipement;

h) le plan d'inspection de la pièce d'équipement.

Avis de changement des renseignements

(4) Le demandeur est tenu d'aviser le ministre par écrit de tout changement des renseignements fournis en application du paragraphe (3) dans les trente jours suivant la date du changement.

Renseignements faux ou trompeurs

(5) Le ministre refuse d'accorder une prolongation s'il a des motifs raisonnables de croire que le demandeur a fourni des renseignements faux ou trompeurs au soutien de sa demande.

Révocation

(6) Il révoque la prolongation :

a) si, durant la prolongation, les conditions prévues au paragraphe (2), selon le cas, ne sont plus remplies;

b) s'il a des motifs raisonnables de croire que le demandeur lui a fourni des renseignements faux ou trompeurs au soutien de sa demande.

Motifs de révocation

(7) Il ne peut toutefois révoquer la prolongation que si, à la fois :

a) il a avisé le titulaire par écrit des motifs de la révocation;

b) il lui a donné la possibilité de présenter des observations écrites au sujet de celle-ci.

PART 3

STORAGE

Application — concentration of 50 mg/kg or more

18. (1) Subject to subsection (3), this Part applies to a solid or liquid product containing PCBs in a concentration of 50 mg/kg or more

(*a*) that is in an amount equal to or greater than 100 L if the product is a liquid, or in an amount equal to or greater than 100 kg if the product is a solid; or

(*b*) that is in a lesser amount if the product contains 1 kg or more of PCBs.

Determination of amount

(2) For the purposes of subsection (1), the amount of PCBs or products containing PCBs is the aggregate of all amounts of PCBs and products that are located at a particular site.

Non-application

(3) This Part does not apply in respect of the following products containing PCBs:

(*a*) solid or liquid products that are processed daily or used;

(*b*) pipelines that transport natural gas, petroleum or petroleum products, and any associated equipment that is in contact with the natural gas, petroleum or petroleum products, if they remain in place on the day on which these Regulations come into force; and

(*c*) cables, if they remain in place on the day on which these Regulations come into force.

Requirement to store

19. (1) A person who owns, controls or possesses PCBs or products containing PCBs that are not processed daily or used shall, within 30 days after the day on which those PCBs or products are no longer processed or used or within 30 days after the day on which these Regulations come into force, whichever is later, either

(*a*) send them for destruction to an authorized facility that is authorized for that purpose; or

(*b*) store them at a PCB storage site for the period during which they are not processed daily or used.

Remote from or no access to roadway

(2) Despite subsection (1), if the PCBs or products containing PCBs are remote from a roadway system or if there is no access to a roadway system, the person who owns, controls or possesses the PCBs or products may store them at a PCB storage site as soon as feasible but no later than one year after the day on which they are not processed daily or used or one year after the day on which these Regulations come into force, whichever is later. That person shall use best management practices for them from the time that they cease to be processed daily or used until the time that they are stored at a PCB storage site.

Prohibition against storage

20. (1) Effective one year after the day on which these Regulations come into force, no person shall store PCBs or products containing PCBs at the

PARTIE 3

STOCKAGE

Application — Concentration égale ou supérieure à 50 mg/kg

18. (1) Sous réserve du paragraphe (3), la présente partie s'applique aux produits liquides ou solides qui contiennent des BPC en une concentration égale ou supérieure à 50 mg/kg et :

a) dont la quantité est égale ou supérieure à 100 L, dans le cas d'un produit liquide, ou à 100 kg, dans le cas d'un produit solide;

b) dont la quantité est moindre, si ces produits renferment 1 kg ou plus de BPC.

Détermination des quantités

(2) Pour l'application du paragraphe (1), la quantité de BPC ou de produits qui en contiennent correspond à la somme de toutes les quantités de BPC et de produits qui se trouvent dans un même emplacement.

Exclusion

(3) La présente partie ne s'applique pas aux produits ci-après qui contiennent des BPC :

a) les produits liquides ou solides qui sont transformés quotidiennement ou utilisés;

b) tout pipeline qui transporte du gaz naturel, du pétrole ou des produits pétroliers, ainsi que tout équipement connexe qui est en contact avec le gaz naturel, le pétrole ou les produits pétroliers, si le pipeline et l'équipement demeurent à l'endroit où ils se trouvaient à l'entrée en vigueur du présent règlement;

c) les câbles, s'ils demeurent à l'endroit où ils se trouvaient à l'entrée en vigueur du présent règlement.

Obligation de stocker

19. (1) Le propriétaire de BPC ou de produits qui en contiennent ou la personne qui en a la possession ou le contrôle est tenu, dans les trente jours suivant la date où ceux-ci cessent d'être transformés quotidiennement ou utilisés ou celle de l'entrée en vigueur du présent règlement, selon la plus tardive de ces dates :

a) soit de les expédier pour qu'ils soient détruits dans une installation agréée à cette fin;

b) soit de les stocker dans un dépôt de BPC pendant qu'ils ne sont pas transformés quotidiennement ou utilisés.

Endroit éloigné ou inaccessible

(2) Si les BPC ou les produits qui en contiennent sont éloignés de tout système routier ou se trouvent à un endroit où il n'y a pas d'accès à un tel système, le propriétaire ou la personne peut les stocker dans un dépôt de BPC le plus tôt possible, sans toutefois dépasser un an à compter de la date où ils cessent d'être transformés quotidiennement ou utilisés ou celle de l'entrée en vigueur du présent règlement, selon la plus tardive de ces dates. Ils sont tenus d'appliquer des pratiques exemplaires de gestion pour les BPC et les produits dès qu'ils cessent d'être transformés quotidiennement ou utilisés, et ce, jusqu'à leur stockage dans un dépôt de BPC.

Interdiction

20. (1) À compter d'un an après la date d'entrée en vigueur du présent règlement, il est interdit de stocker des BPC ou des produits qui en contiennent following plants or facilities or on the land on which those plants or facilities are located and within 100 m of them:

(*a*) a drinking water treatment plant or a food or feed processing plant; or

(*b*) a child care facility, preschool, primary school, secondary school, hospital, or senior citizens' care facility.

Light ballasts

(2) Subsection (1) does not apply to light ballasts.

Maximum storage periods

21. (1) Despite any other provision in these Regulations and subject to section 22, no person shall store PCBs or products containing PCBs, other than those referred to in section 23, beyond the following time limits:

(*a*) one year, beginning on the day on which their use is no longer permitted under these Regulations or the day on which they are no longer processed daily or used, whichever is sooner, if the PCBs or products are stored at a facility that is not referred to in paragraph (1)(*b*) or (*c*);

(*b*) one year, if the PCBs or products are stored at an authorized facility that is a transfer site; and

(*c*) two years, if the PCBs or products are stored at an authorized facility that is authorized to destroy them.

Transfer sites

(2) If the PCBs or products containing PCBs are sent from one transfer site to another, the period referred to in paragraph (1)(*b*) begins when they are received at the first transfer site.

Destruction

(3) The owner or operator of the facility referred to in paragraph (1)(*a*) or (*b*) shall send the PCBs or products containing PCBs for destruction to an authorized facility that is authorized for that purpose within the time limit set out in those paragraphs.

Exceptions to maximum storage periods

22. (1) Section 21 does not apply to the storage of

(*a*) liquids referred to in subsection 15(2) or for which an extension has been granted under subsection 17; or

(*b*) solids and liquids containing PCBs in a concentration of 50 mg/kg or more resulting from environmental restoration work and stored on site for the duration of the work, if the requirements set out in subsections (2) and (3) are complied with.

Information to be provided

(2) The owner of the land where the solids and liquids referred to in paragraph (1)(*b*) are located shall submit to the Minister at least 30 days before the storage of the solids or liquids or within 30 days after the day on which these Regulations come into force, whichever is later, the following information:

(*a*) the civic address of the restoration work site or if there is no civic address, the location using the Global Positioning System;

(*b*) the date of commencement of the restoration work;

(*c*) the anticipated date of completion of the restoration work; and

dans l'un des établissements ci-après ou sur le terrain d'un tel établissement, à 100 m ou moins de celui-ci :

a) une usine de traitement d'eau potable ou de transformation des aliments destinés aux humains ou aux animaux;

b) une garderie, une école — de niveau préscolaire, primaire ou secondaire —, un hôpital ou une résidence pour personnes âgées.

Ballasts de lampes

(2) Le paragraphe (1) ne s'applique pas aux ballasts de lampes.

Périodes maximales de stockage

21. (1) Malgré toute autre disposition du présent règlement mais sous réserve de l'article 22, il est interdit de stocker des BPC et des produits qui en contiennent, autres que ceux visés à l'article 23, au-delà de la période applicable suivante :

a) un an à compter du jour où le présent règlement ne permet plus l'utilisation des BPC et des produits ou de celui, s'il est antérieur, où ils ont cessé d'être transformés quotidiennement ou utilisés, s'ils sont stockés à une installation qui n'est pas visée aux alinéas (1)*b*) ou *c*);

b) un an, s'ils sont stockés dans une installation agréée qui est un centre de transfert;

c) deux ans, s'ils sont stockés dans une installation agréée qui est autorisée à les détruire.

Centres de transfert

(2) Si les BPC et les produits qui en contiennent sont expédiés d'un centre de transfert à un autre, la période prévue à l'alinéa (1)*b*) commence à courir le jour de leur réception au premier centre de transfert.

Destruction

(3) Le propriétaire ou l'exploitant de l'installation visée aux alinéas (1)*a*) ou *b*) est tenu d'expédier, dans le délai prévu à ces alinéas, les BPC ou les produits qui en contiennent pour qu'ils soient détruits dans une installation agréée à cette fin.

Périodes maximales de stockage — exceptions

22. (1) L'article 21 ne s'applique pas au stockage :

a) des liquides visés au paragraphe 15(2) ou pour lesquels une prolongation a été accordée en vertu de l'article 17;

b) des solides et des liquides qui contiennent des BPC en une concentration égale ou supérieure à 50 mg/kg et qui sont issus de travaux de restauration de l'environnement et stockés sur place pendant la durée des travaux, si les exigences prévues aux paragraphes (2) et (3) sont respectées.

Renseignements à fournir

(2) Le propriétaire du terrain où se trouvent les solides ou les liquides visés à l'alinéa (1)*b*) fournit au ministre, au plus tard trente jours avant la date de leur stockage ou après celle de l'entrée en vigueur du présent règlement, selon la plus tardive de ces dates, les renseignements suivants :

a) l'adresse municipale de l'endroit où sont effectués les travaux de restauration ou, à défaut, sa localisation d'après le système mondial de localisation;

b) la date de début des travaux de restauration;

c) la date prévue pour la fin des travaux de restauration;

(*d*) the anticipated date of the end of storage of the solids or liquids.

Changes to information

(3) The person referred to in subsection (2) shall notify the Minister in writing of the changes to be made at least 30 days before making any changes to the information provided under that subsection.

PCBs or products containing PCBs stored at the coming into force

23. The person who owns PCBs or products containing PCBs, other than liquids for which an extension has been granted under section 17, that are stored on the day on which these Regulations come into force shall send them no later than December 31, 2009 for destruction to an authorized facility that is authorized for that purpose.

PCB storage site

24. PCBs or products containing PCBs shall be stored at a site that is

(*a*) a building, room, shipping container or other enclosed structure; or

(*b*) an area that is enclosed by a woven mesh wire fence or any other fence or wall with similar security characteristics, and the fence or wall shall be at least 1.83 m high.

Storage requirements

25. The owner or operator of a PCB storage site shall

(*a*) store all PCBs or products containing PCBs that are in liquid form in

(i) sealed containers, other than drums, that are made of steel or other metals that provide sufficient durability and strength to prevent those PCBs or products from being affected by the weather or released, or

(ii) drums that are

(A) of a capacity not greater than 205 L,

(B) a closed-head double-bung drum made of steel having a gauge of 16 or heavier, and

(C) painted or treated to prevent rusting;

(*b*) store all PCBs or products containing PCBs that are in solid form in

(i) containers, other than drums, that are made of steel or other materials that provide sufficient durability and strength to prevent those PCBs or products from being affected by the weather or released, or

(ii) drums that are

(A) of a capacity not greater than 205 L,

(B) made of steel having a gauge of 18 or heavier,

(C) equipped with a securely attached, removable steel lid and a gasket made of material that is resistant to the PCBs or the products containing PCBs that are stored in the drums, and

(D) painted or treated to prevent rusting;

(*c*) store equipment containing PCB liquids in

(i) containers, other than drums, that are made of steel or other materials that provide sufficient durability and strength to prevent the equipment from being affected by the weather and

d) la date prévue pour la cessation du stockage des solides ou des liquides.

Modification des renseignements

(3) Il avise également le ministre par écrit, au moins trente jours à l'avance, de toute modification apportée aux renseignements fournis.

BPC et produits qui en contiennent stockés à l'entrée en vigueur

23. Le propriétaire de BPC ou de produits qui en contiennent, autres que des liquides pour lesquels une prolongation a été accordée en vertu de l'article 17, qui sont stockés à l'entrée en vigueur du présent règlement est tenu de les expédier, au plus tard le 31 décembre 2009, pour qu'ils soient détruits dans une installation agréée à cette fin.

Dépôt de BPC

24. Les BPC et les produits qui en contiennent doivent être stockés dans un dépôt qui est :

a) soit un bâtiment, une pièce, un conteneur ou tout autre ouvrage fermé;

b) soit un endroit entouré d'une clôture grillagée ou d'un autre genre de clôture ou d'un mur présentant des caractéristiques similaires sur le plan de la sécurité, la clôture ou le mur ayant au moins 1,83 m de haut.

Exigences relatives au stockage

25. Le propriétaire ou l'exploitant d'un dépôt de BPC :

a) stocke les BPC et les produits en contenant qui sont des liquides dans :

(i) soit des contenants étanches, autres que des fûts, faits d'acier ou d'autres métaux offrant une durabilité et une solidité suffisantes pour que ces BPC et ces produits ne soient pas affectés par les conditions climatiques ni rejetés,

(ii) soit des fûts qui, à la fois :

(A) ont une capacité d'au plus 205 L,

(B) sont faits d'acier d'épaisseur minimale 16, ont un dessus non amovible et sont munis de deux bondes,

(C) sont enduits d'une peinture ou d'un revêtement antirouille;

b) stocke les BPC et les produits en contenant qui sont des solides dans :

(i) soit des contenants, autres que des fûts, faits d'acier ou d'autres matériaux offrant une durabilité et une solidité suffisantes pour que ces BPC et ces produits ne soient pas affectés par les conditions climatiques ni rejetés,

(ii) soit des fûts qui, à la fois :

(A) ont une capacité d'au plus 205 L,

(B) sont faits d'acier d'épaisseur minimale 18,

(C) sont dotés d'un couvercle d'acier amovible solidement fixé et d'un joint fait d'un matériau résistant aux BPC et aux produits en contenant qui y sont stockés,

(D) sont enduits d'une peinture ou d'un revêtement antirouille;

c) stocke les pièces d'équipement qui renferment des liquides contenant des BPC dans :

(i) soit des contenants, autres que des fûts, faits d'acier ou d'autres matériaux offrant une to prevent any PCB liquid that leaks from the equipment from being released, or

(ii) drums described in subparagraph (*b*)(ii);

(*d*) store all equipment that is not in a container, other than drained equipment, if that equipment contains PCB liquid, and all containers of PCB liquid, on a floor or surface that is made of steel, concrete or any other similar durable material and that is constructed with curbing or sides that are capable of containing

(i) if one piece of equipment or one container is being stored, 125% of the volume of the PCB liquid in the equipment or container, and

(ii) if more than one piece of equipment or more than one container is being stored, the greater of twice the volume of the PCB liquid in the largest piece of equipment or the largest container and 25% of the volume of all the PCB liquid stored on the floor or surface;

(*e*) if the material of the floor or surface or the curbing or sides referred to in paragraph (*d*) are capable of absorbing any PCB liquid or other product containing PCBs, seal the floor, surface, curbing or sides with an impervious, durable, PCB-resistant coating;

(*f*) ensure that all floor drains, sumps or other openings in the floor or surface referred to in paragraph (*d*) are

(i) closed and sealed to prevent the release of liquids, or

(ii) connected to a drainage system suitable for liquid dangerous goods that terminates at a location where any spilled liquids will be contained and recovered and where the spilled liquids will not create a fire hazard or a risk to public health or safety;

(*g*) place on skids or pallets all equipment containing PCBs and containers of PCBs or products containing PCBs that are not permanently secured to the floor or a surface;

(*h*) stack containers of PCBs and products containing PCBs, other than drums, only if the containers are designed for stacking, and stack containers of PCB liquid not more than two containers high;

(*i*) if drums containing PCBs or products containing PCBs are stacked, separate the drums from each other with pallets and, in the case of drums of PCB liquid, stack the drums not more than two drums high;

(*j*) store equipment containing PCBs, and containers of PCBs or products containing PCBs, in a manner that makes them accessible for inspection;

(*k*) store PCBs or products containing PCBs in a manner that prevents them from catching fire or being released;

(*l*) store PCBs or products containing PCBs together, and separate them from other stored materials;

durabilité et une solidité suffisantes pour que les pièces d'équipement ne soient pas affectées par les conditions climatiques et que les liquides, s'ils fuient des pièces, ne soient pas rejetés,

(ii) soit des fûts visés au sous-alinéa *b*)(ii);

d) stocke les pièces d'équipement — autres que celles contenant des BPC qui ont été vidangées — qui ne sont pas dans un contenant et qui renferment des liquides contenant des BPC, ainsi que tout contenant qui renferme de tels liquides, sur un plancher ou une surface fait d'acier, de béton ou d'un autre matériau durable semblable et entouré d'un rebord ou de côtés capables de retenir :

(i) si une seule pièce d'équipement ou un seul contenant est stocké, 125 % du volume des liquides contenant des BPC que renferme cette pièce d'équipement ou le contenant,

(ii) si plus d'une pièce d'équipement ou plus d'un contenant est stocké, le plus élevé des volumes suivants : le double du volume des liquides contenant des BPC que renferme la plus grosse pièce d'équipement ou le plus grand contenant ou 25 % du volume de l'ensemble des liquides contenant des BPC qui sont stockés sur le plancher ou la surface;

e) scelle, au moyen d'un revêtement étanche, durable et résistant aux BPC, le plancher, la surface, le rebord ou les côtés visés à l'alinéa *d*), lorsqu'ils peuvent absorber des liquides ou d'autres produits qui contiennent des BPC;

f) veille à ce que les drains de sol, puisards et autres ouvertures dans le plancher ou la surface visés à l'alinéa *d*) soient, selon le cas :

(i) obturés et scellés pour empêcher le rejet de liquides,

(ii) reliés à un réseau de drainage convenant aux marchandises dangereuses liquides, qui se jette dans un lieu où les liquides déversés seront confinés et récupérés et où ils ne constitueront pas un risque d'incendie ni un risque pour la santé et la sécurité publiques;

g) place sur des patins ou des palettes les pièces d'équipement contenant des BPC et les contenants renfermant des BPC ou des produits en contenant qui ne sont pas fixés de façon permanente à un plancher ou à une surface;

h) empile les contenants de BPC et de produits qui en contiennent, autres que les fûts, seulement s'ils sont conçus à cette fin et, dans le cas des contenants renfermant des liquides qui contiennent des BPC, ne les empile pas à plus de deux contenants de haut;

i) s'ils sont empilés, sépare les fûts de BPC et de produits qui en contiennent les uns des autres avec des palettes et, dans le cas des fûts renfermant des liquides qui contiennent des BPC, ne les empile pas à plus de deux fûts de haut;

(*m*) if reasonably practicable, equip any indoor PCB storage site having a mechanical exhaust system with heat or smoke sensory controls that stop the fan and close the intake and exhaust dampers in the event of a fire;

(*n*) if equipment or containers of PCB liquid are stored outdoors, cover all PCB equipment that is not in a container, other than drained equipment, if that equipment contains PCB liquid, and all containers of PCB liquid, with a weatherproof roof or barrier that protects the equipment and containers and prevents rain or snow from entering the curbing and the sides of the floor and the surface under them; and

(*o*) ensure that all drained PCB equipment and all containers of any PCB solid or PCB equipment are structurally sound and weatherproof if stored outdoors.

j) stocke les pièces d'équipement qui contiennent des BPC et les contenants renfermant des BPC ou des produits qui en contiennent de manière à ce qu'ils soient accessibles à des fins d'inspection;

k) stocke les BPC et les produits qui en contiennent de façon à empêcher leur inflammation ou leur rejet;

l) stocke les BPC et les produits qui en contiennent ensemble, à l'écart des autres matériaux stockés;

m) dans la mesure du possible, munit tout dépôt de BPC intérieur ayant un dispositif mécanique de ventilation de commandes sensibles à la chaleur ou à la fumée qui, en cas d'incendie, arrêtent le ventilateur et ferment les registres d'admission et d'évacuation d'air;

n) s'ils sont stockés dehors, couvre les pièces d'équipement — autres que celles contenant des BPC qui ont été vidangées — qui ne sont pas dans un contenant et qui renferment des liquides contenant des BPC, ainsi que tout contenant qui renferme de tels liquides, d'une toiture ou d'un écran à l'épreuve des intempéries qui les protège et empêche la pluie et la neige de pénétrer à l'intérieur du rebord et des côtés du plancher et de la surface sur lesquels ils sont posés;

o) s'ils sont stockés dehors, veille à ce que les pièces d'équipement contenant des BPC qui ont été vidangées et tout contenant qui renferme des solides ou des pièces d'équipement contenant des BPC aient une structure en bon état et soient à l'épreuve des intempéries.

Access to PCB storage site

26. The owner or operator of a PCB storage site shall keep all points of access to the PCB storage site locked or guarded.

Accès au dépôt de BPC

26. Le propriétaire ou l'exploitant d'un dépôt de BPC tient chaque point d'accès au dépôt verrouillé ou veille à ce qu'il soit gardé.

Inspection and maintenance of a PCB storage site

27. The owner or operator of a PCB storage site shall

(*a*) inspect all floors, curbing, sides, drains, drainage systems, weatherproof roofs and barriers, fences and walls of the PCB storage site, any fire alarm system, fire extinguishers and fire suppression system and all equipment containing PCBs, containers used for the storage of PCBs or products containing PCBs and materials for clean-up at the PCB storage site

(i) each month,

(ii) at intervals of more than one month, if the Minister, on the written request of the owner or operator, determines that it is not reasonably practicable to inspect the site each month, due to its remote location, or

(iii) at intervals of less than one month, if more frequent inspections are necessary for the safe operation of the site; and

(*b*) keep in good condition and, if damaged, immediately repair or replace the floors, curbing, sides, drains, drainage systems, weatherproof roofs or barriers, fences, walls, fire alarm system, fire extinguishers, fire suppression system, equipment containing PCBs and containers and immediately clean up any contaminated area.

Inspection et entretien des dépôts de BPC

27. Le propriétaire ou l'exploitant d'un dépôt de BPC :

a) en inspecte les planchers, les rebords, les côtés, les drains, les réseaux de drainage, les toitures et écrans à l'épreuve des intempéries, les clôtures, les murs, le système d'alarme-incendie, les extincteurs et le réseau d'extinction automatique, ainsi que les pièces d'équipement qui contiennent des BPC, les contenants servant au stockage des BPC ou des produits qui en contiennent et les agents de nettoyage qui s'y trouvent :

(i) tous les mois,

(ii) à des intervalles de plus d'un mois, si le ministre, à la demande écrite du propriétaire ou de l'exploitant, a déterminé qu'il est en pratique impossible d'inspecter le dépôt tous les mois en raison de son isolement,

(iii) à des intervalles de moins d'un mois, si l'exploitation du dépôt en toute sécurité exige des inspections plus fréquentes;

b) les garde en bon état et, en cas de dommage, les répare ou les remplace immédiatement et nettoie sur-le-champ les aires contaminées.

Fire protection and emergency procedures

28. (1) The owner or operator of a PCB storage site shall

(*a*) develop and implement at the PCB storage site a fire protection and emergency procedures plan and shall

(i) update and test the plan once per year,

(ii) keep a written copy of the latest plan at the PCB storage site and another at their principal place of business, and

(iii) make the latest plan readily available to persons who implement the plan and to the local fire department or to the local officer appointed by the provincial Fire Marshall if there is no local fire department or to any other local authority responsible for fire protection;

(*b*) ensure that all employees who are authorized to enter the PCB storage site are familiar with the contents of the latest plan;

(*c*) equip the indoor PCB storage site with a fully operative fire alarm system that is maintained, inspected and tested in accordance with articles 6.3.1.1 and 6.3.1.2 of the National Fire Code and with

(i) portable fire extinguishers that are selected and installed in accordance with article 2.1.5.1 of the National Fire Code and maintained, inspected and tested in accordance with article 6.2.1.1 of that Code, or

(ii) an automatic fire suppression system that meets the requirements of article 3.2.7.9 of the National Fire Code, if required;

(*d*) keep a copy of the records referred to in sections 43 and 44 at the PCB storage site and make a copy readily available to the local fire department and, if there is no local fire department, to the local officer appointed by the provincial Fire Marshall or to any other local authority responsible for fire protection;

(*e*) ensure that all employees who are authorized to enter the PCB storage site are made aware of the hazards of PCBs and are familiar with the use of protective equipment and clothing and the clean-up procedures referred to in the *Guidelines for the Management of Wastes Containing Polychlorinated Biphenyls (PCBs)*, CCME-TS/WM-TRE008, September 1989, as amended from time to time, issued by the Canadian Council of Ministers of the Environment; and

(*f*) store absorbent materials for clean-up near the PCB storage site.

Shipping containers

(2) Despite paragraph (1)(*c*), if the indoor PCB storage site is a shipping container, the owner or operator of the site does not have to equip that site with a fire alarm system.

Protection contre les incendies et mesures d'urgence

28. (1) Le propriétaire ou l'exploitant d'un dépôt de BPC :

a) élabore et met en œuvre un plan d'intervention d'urgence et de lutte contre les incendies et :

(i) le met à jour et le vérifie annuellement,

(ii) en conserve une copie écrite à jour au dépôt et à son établissement principal,

(iii) en met une copie à jour à la disposition de toute personne qui participe à sa mise en œuvre et au service d'incendie local ou, à défaut, au fonctionnaire local nommé par le commissaire provincial aux incendies ou à toute autre autorité locale chargée de la protection contre les incendies,

b) veille à ce que tous les employés autorisés à entrer dans le dépôt connaissent bien le contenu du plan à jour;

c) s'agissant d'un dépôt intérieur, le munit d'un système d'alarme-incendie en état de fonctionnement qui est entretenu, inspecté et mis à l'essai conformément aux exigences des articles 6.3.1.1 et 6.3.1.2 du Code national de prévention des incendies, ainsi que :

(i) soit d'extincteurs portatifs qui sont choisis et installés conformément à l'article 2.1.5.1 de ce code et qui sont entretenus, inspectés et mis à l'essai conformément aux exigences de l'article 6.2.1.1 de ce code,

(ii) soit d'un réseau d'extinction automatique conforme aux exigences de l'article 3.2.7.9 du même code, si celles-ci s'appliquent;

d) conserve au dépôt une copie des documents et registres visés aux articles 43 et 44 respectivement et en met une à la disposition du service d'incendie local ou, à défaut, au fonctionnaire local nommé par le commissaire provincial aux incendies ou à toute autre autorité locale chargée de la protection contre les incendies;

e) veille à ce que tous les employés autorisés à entrer dans le dépôt soient informés des dangers que présentent les BPC et connaissent bien l'utilisation du matériel et des vêtements de protection et les méthodes de nettoyage mentionnées dans le *Guide pour la gestion des déchets contenant des biphényles polychlorés (BPC)* CCME-TS/WM-TRE008, septembre 1989, avec ses modifications successives, publié par le Conseil canadien des ministres de l'environnement;

f) garde les matériaux absorbants servant au nettoyage près du dépôt.

Conteneur

(2) Malgré l'alinéa (1)*c*), le propriétaire ou l'exploitant d'un dépôt de BPC intérieur qui est un conteneur n'est pas tenu de le munir d'un système d'alarme-incendie.

PART 4

LABELLING, REPORTS AND RECORDS

LABELLING

Equipment and liquids used for their servicing

29. (1) The owner of equipment referred to in section 16, other than equipment for which an extension has been applied for under section 17, or of a liquid used in its servicing referred to in subsection 15(2) shall affix a label in a readily visible location on the equipment or on the container of the liquid, no later than 30 days after the day on which it ceases to be used.

Equipment for which extension applied for

(2) The owner of equipment for which an extension has been applied under section 17 shall affix a label in a readily visible location on the equipment.

Exceptions

(3) Subsection (1) does not apply to

(*a*) equipment or containers of liquids that bear a label on the day on which these Regulations come into force that indicates the presence of PCBs; and

(*b*) equipment that is too small, including light ballasts, to bear the label referred to in subsection (4), until the day on which they cease to be used and are placed in a container that bears the label.

Description

(4) The label must

(*a*) state "ATTENTION — contains 50 mg/kg or more of PCBs / contient 50 mg/kg ou plus de BPC" in black lettering on a white background, in a font size of no less than 36 points;

(*b*) measure at least 150 mm by 150 mm or at least 76 mm by 76 mm in the case of capacitors; and

(*c*) in the case of equipment for which an extension is applied for under section 17, state a unique identification number.

Cables and pipelines

30. (1) The owner of a cable, a pipeline or equipment associated with a pipeline, referred to in paragraphs 14(1)(*a*) and (*b*), containing PCBs in a concentration of 50 mg/kg or more that is in a room, a tunnel or a facility shall either

(*a*) affix the label in the form set out in subsection 29(4) in a readily visible location on a part of the cable, pipeline or associated equipment that is accessible; or

(*b*) place a notice in a readily visible location at the entrance of the room, tunnel or facility that states the information set out in paragraph 29(4)(*a*) and measures at least 150 mm by 150 mm.

If dismantled

(2) If a part of the cable, pipeline or associated equipment is dismantled, the owner of the cable, pipeline or associated equipment shall affix on each dismantled part the label in the form set out in

PARTIE 4

ÉTIQUETAGE, RAPPORTS ET DOSSIERS

ÉTIQUETAGE

Pièces d'équipement et liquides pour leur entretien

29. (1) Le propriétaire d'une pièce d'équipement visée à l'article 16, autre qu'une pièce d'équipement qui fait l'objet d'une demande de prolongation en vertu de l'article 17, ou de tout liquide utilisé pour l'entretien visé au paragraphe 15(2) est tenu d'apposer une étiquette, à un endroit bien en vue sur la pièce d'équipement ou le contenant du liquide, au plus tard trente jours après que la pièce ou le contenant cesse d'être utilisé.

Équipement faisant l'objet d'une demande de prolongation

(2) Le propriétaire d'une pièce d'équipement qui fait l'objet d'une demande de prolongation en vertu de l'article 17 est tenu d'y apposer une étiquette à un endroit bien en vue.

Exceptions

(3) Le paragraphe (1) ne s'applique pas :

a) aux pièces d'équipement et aux contenants de liquide qui portent, à l'entrée en vigueur du présent règlement, une étiquette qui indique la présence de BPC;

b) aux pièces d'équipement qui sont trop petites, y compris les ballasts de lampes, pour que l'étiquette visée au paragraphe (4) y soit apposée, jusqu'à ce qu'elles cessent d'être utilisées et qu'elles soient placées dans un contenant sur lequel l'étiquette est apposée.

Description

(4) L'étiquette doit :

a) porter la mention « ATTENTION — contains 50 mg/kg or more of PCBs / contient 50 mg/kg ou plus de BPC », inscrite en caractères d'au moins 36 points, en noir sur fond blanc;

b) être d'une dimension minimale de 150 mm sur 150 mm ou, dans le cas d'un condensateur, 76 mm sur 76 mm;

c) dans le cas d'une pièce d'équipement qui fait l'objet d'une demande de prolongation en vertu de l'article 17, porter un numéro d'identification unique.

Câbles et pipelines

30. (1) Le propriétaire de câbles, de pipelines ou d'équipement connexe visés aux alinéas 14(1)(*a*) et (*b*) qui contiennent des BPC en une concentration égale ou supérieure à 50 mg/kg et se trouvent dans une pièce, un tunnel ou une installation est tenu :

a) soit d'apposer une étiquette conforme au paragraphe 29(4) à un endroit bien en vue sur toute partie accessible du câble, pipeline ou équipement connexe;

b) soit de placer à l'entrée de la pièce, du tunnel ou de l'installation à un endroit bien en vue une affiche d'une dimension minimale de 150 mm sur 150 mm portant la mention prévue à l'alinéa 29(4)*a*).

Désassemblage

(2) En cas de désassemblage d'une partie du câble, du pipeline ou de l'équipement connexe, le propriétaire de ceux-ci est tenu, dans les trente jours suivant le désassemblage, d'apposer une étiquette

subsection 29(4), no later than 30 days after the day on which it is dismantled.

A facility other than transfer site or destruction facility

31. (1) The owner or operator of a PCB storage site, other than the PCB storage site of an authorized facility that is a transfer site or that is authorized to destroy PCBs, shall affix a label in a readily visible location on any product containing PCBs in a concentration of 50 mg/kg or more and that are stored at the PCB storage site, which

(*a*) is in the form referred to in subsection 29(4); and

(*b*) states “Date of Commencement of Storage” and the date on which the storage begins.

Transfer site or destruction facility

(2) The owner or operator of the PCB storage site of an authorized facility that is a transfer site or that is authorized to destroy PCBs shall affix a label in the form set out in subsection 29(4) in a readily visible location on any container that is a fixed tank and that is used at the facility for the storage of PCBs or products containing PCBs in a concentration of 50 mg/kg or more.

Notice

(3) The owner or operator of a PCB storage site shall place a notice in a readily visible location at the entrance of the site that states the information set out in paragraph 29(4)(*a*) and that measures at least 150 mm by 150 mm.

Exception

(4) Subsections (1) and (2) do not apply if the product or the container bear a label on the day on which these Regulations come into force that indicates the presence of PCBs and that states “Date of Commencement of Storage” and the date on which the storage begins.

Retention of labels

32. The person who is required to affix a label on a product or container in accordance with sections 29 to 31 shall ensure that it bears that label for the duration that the person possesses the product or container.

REPORTS

End of use of equipment and liquids — 2009

33. (1) The owner of the equipment referred to in paragraph 16(1)(*a*) and subparagraph 16(1)(*b*)(i), other than the equipment for which an extension is granted by the Minister in accordance with section 17, or the liquids referred to in subsection 15(2) shall prepare a report that is current to December 31 of each calendar year in which the person owns the equipment or the liquids and that contains the following information:

(*a*) the name, civic and mailing addresses, telephone number, fax number, if any, and e-mail address, if any, of the owner and any person authorized to act on the owner’s behalf;

(*b*) the civic addresses of the facilities where the equipment and liquids are located or, if there is no civic address, their location using the owner’s site identification system;

conforme au paragraphe 29(4) sur chaque partie désassemblée du câble, du pipeline ou de l’équipement connexe.

Installation autre qu’un centre de transfert ou de destruction

31. (1) Le propriétaire ou l’exploitant d’un dépôt de BPC d’une installation autre qu’une installation agréée qui est un centre de transfert ou qui est autorisée à détruire des BPC est tenu d’apposer une étiquette à un endroit bien en vue sur tout produit en contenant qui y sont stockés et qui contiennent des BPC en une concentration égale ou supérieure à 50 mg/kg; l’étiquette

a) est conforme au paragraphe 29(4);

b) porte la mention « Date de début de stockage » et la date de début de stockage.

Centre de transfert ou de destruction

(2) Le propriétaire ou l’exploitant d’un dépôt de BPC d’une installation agréée qui est un centre de transfert ou qui est autorisée à détruire des BPC est tenu d’apposer une étiquette conforme au paragraphe 29(4) à un endroit bien en vue sur tout contenant qui est un réservoir fixe utilisé pour stocker des BPC à l’installation ou des produits qui en contiennent en une concentration égale ou supérieure à 50 mg/kg.

Affiche

(3) Le propriétaire ou l’exploitant d’un dépôt de BPC place à l’entrée du dépôt à un endroit bien en vue une affiche d’une dimension minimale de 150 mm sur 150 mm portant la mention prévue à l’alinéa 29(4)*a*).

Exception

(4) Les paragraphes (1) et (2) ne s’appliquent pas si le produit ou le contenant porte, à l’entrée en vigueur du présent règlement, une étiquette qui indique la présence de BPC, qui porte la mention « Date de début de stockage » et indique la date de début de stockage.

Conservation des étiquettes

32. La personne qui a l’obligation d’apposer une étiquette sur un produit ou un contenant en application des articles 29 à 31 veille à ce que le produit ou le contenant la porte en tout temps pendant qu’il est en sa possession.

RAPPORTS

Date de fin d’utilisation des pièces d’équipement et des liquides — 2009

33. (1) Le propriétaire des pièces d’équipement visées à l’alinéa 16(1)*a*) ou au sous-alinéa 16(1)*b*)(i), autres que celles pour lesquelles une prolongation a été accordée par le ministre en vertu de l’article 17, ou des liquides visés au paragraphe 15(2) est tenu de préparer un rapport, au 31 décembre de chaque année civile durant laquelle il en est propriétaire, comportant les renseignements suivants :

a) ses nom, adresses municipale et postale, numéro de téléphone et, le cas échéant, numéro de télécopieur et adresse électronique, ainsi que ceux de toute personne autorisée à agir en son nom;

b) l’adresse municipale des installations où se trouvent les pièces d’équipement et les liquides ou, à défaut, l’endroit où ils se trouvent d’après le système d’identification de site du propriétaire;

(*c*) the quantity of the liquids containing PCBs in the equipment and of the liquids, expressed in litres,

(i) that are in use on December 31,

(ii) that are stored on December 31 at the person's PCB storage site,

(iii) that are sent, in that calendar year, to an authorized facility that is a transfer site,

(iv) that are sent, in that calendar year, to an authorized facility that is authorized to destroy them, or

(v) that are destroyed in that calendar year; and

(*d*) a certification that the information is accurate and complete and that is dated and signed by the owner or by a person authorized to act on the owner's behalf.

Equipment and liquids for which extension granted

(2) The owner of the equipment referred to in paragraph 16(1)(*a*) and subparagraph 16(1)(*b*)(i) or the liquids referred to in subsection 15(2) for which an extension is granted by the Minister in accordance with section 17 shall prepare a report that is current to December 31 of each calendar year in which the person owns the equipment or the liquids and that contains the following information for each piece of equipment or container of liquid:

(*a*) the information required under paragraphs (1)(*a*) and (*d*);

(*b*) the unique identification number that is on the label referred to in paragraph 29(4)(*c*);

(*c*) the civic address, function and technical description of the facility where the equipment or container of liquid is located or, if there is no civic address, its location using the owner's site identification system;

(*d*) the progress on the plan's implementation and the timelines for ending the use of the equipment;

(*e*) the measures taken to minimize or eliminate any harmful effect of the PCBs in the equipment on the environment and on human health; and

(*f*) the findings of the inspections of the equipment.

End of use of equipment — 2025

(3) The owner of the equipment referred to in subparagraph 16(1)(*b*)(ii) and subsection 16(2) shall prepare a report that is current to December 31 of each calendar year in which the person owns the equipment and that contains the following information:

(*a*) the information required under paragraphs (1)(*a*), (*b*) and (*d*); and

(*b*) the quantity, expressed in litres, of liquids containing PCBs in the equipment, and the concentration, expressed in mg/kg, of the PCBs

(i) that are stored on December 31 at the person's PCB storage site,

c) la quantité, exprimée en litres, de liquides qui contiennent des BPC dans les pièces d'équipement et de liquides :

(i) en usage le 31 décembre,

(ii) stockés à son dépôt le 31 décembre,

(iii) expédiés, au cours de l'année civile, à une installation agréée qui est un centre de transfert,

(iv) expédiés, au cours de l'année civile, à une installation agréée qui est autorisée à les détruire,

(v) détruits au cours de l'année civile;

d) une attestation, datée et signée par lui ou par toute personne autorisée à agir en son nom, portant que les renseignements sont complets et exacts.

Pièces d'équipement et liquides pour lesquels une prolongation a été accordée

(2) Le propriétaire des pièces d'équipement visées à l'alinéa 16(1)*a*) ou au sous-alinéa 16(1)*b*)(i) ou des liquides visés au paragraphe 15(2) pour lesquels une prolongation a été accordée par le ministre en vertu de l'article 17 est tenu de préparer un rapport, au 31 décembre de chaque année civile durant laquelle il en est propriétaire, comportant les renseignements suivants pour chaque pièce d'équipement et contenant de liquides :

a) les renseignements prévus aux alinéas (1)*a*) et *d*);

b) le numéro d'identification unique figurant sur l'étiquette conformément à l'alinéa 29(4)*c*);

c) l'adresse municipale, la fonction et les caractéristiques techniques de l'installation où se trouvent la pièce d'équipement ou le contenant des liquides ou, à défaut, l'endroit où il se trouvent d'après le système d'identification de site du propriétaire;

d) le progrès accompli dans la mise en œuvre du plan et de l'échéancier dressé en vue de la cessation de l'utilisation de la pièce d'équipement;

e) les mesures prises pour éliminer ou atténuer tout effet nocif des BPC contenus dans la pièce d'équipement sur l'environnement et la santé humaine;

f) les résultats des inspections de la pièce d'équipement.

Date de fin d'utilisation des pièces d'équipement — 2025

(3) Le propriétaire des pièces d'équipement visées au sous-alinéa 16(1)*b*)(ii) ou au paragraphe 16(2) est tenu de préparer un rapport, au 31 décembre de chaque année civile durant laquelle il en est propriétaire, comportant les renseignements suivants :

a) les renseignements prévus aux alinéas (1)*a*), *b*) et *d*);

b) la quantité de liquides qui contiennent des BPC dans les pièces d'équipement, exprimée en litres, et la concentration de ces BPC dans les liquides, exprimée en mg/kg :

(i) stockés à son dépôt de BPC le 31 décembre,

(ii) that are sent, in that calendar year, to an authorized facility that is a transfer site,

(iii) that are sent, in that calendar year, to an authorized facility that is authorized to destroy them, or

(iv) that are destroyed in that calendar year.

Research

34. The person who offers for sale, sells, processes or uses PCBs or products containing PCBs for the purpose of research in accordance with section 8 shall prepare a report that is current to December 31 in each calendar year in which the person offers for sale, sells, processes or uses those PCBs or products and that contains the following information:

(*a*) the name, civic and mailing addresses, telephone number, fax number, if any, and e-mail address, if any, of the person and of any person authorized to act on that person's behalf;

(*b*) an indication of whether the person offers for sale, sells, processes or uses the PCBs or products;

(*c*) the quantity of the PCBs or of the products containing PCBs that are offered for sale, sold, processed or used in that calendar year; and

(*d*) a certification that the information is accurate and complete and that is dated and signed by the person or by a person authorized to act on their behalf.

Colouring pigment

35. The person who manufactures, exports or imports colouring pigment in accordance with section 11 shall prepare a report that is current to December 31 in each calendar year in which the person manufactures, imports or exports the colouring pigment and that contains the following information:

(*a*) the name, civic and mailing addresses, telephone number, fax number, if any, and e-mail address, if any, of the person and of any person authorized to act on that person's behalf;

(*b*) an indication of whether the person manufactures, exports or imports colouring pigment;

(*c*) the quantity of colouring pigment, expressed in kilograms, the maximum concentration of PCBs in the colouring pigment, expressed in mg/kg, and the average annual concentration of PCBs in the colouring pigment, expressed in mg/kg, that is manufactured, imported or exported in that calendar year;

(*d*) in the case of importing, the name, telephone number and civic and mailing addresses of the person from whom the colouring pigment is imported and, in the case of exporting, the name, telephone number and civic and mailing addresses of the person to whom the colouring pigment is exported; and

(*e*) a certification that the information is accurate and complete and that is dated and signed by the person or by a person authorized to act on their behalf.

(ii) expédiés, au cours de l'année civile, à une installation agréée qui est un centre de transfert,

(iii) expédiés, au cours de l'année civile, à une installation agréée qui est autorisée à les détruire,

(iv) détruits au cours de l'année civile.

Recherches

34. La personne qui met en vente, vend, transforme ou utilise des BPC ou des produits qui en contiennent en vue d'effectuer des recherches conformément à l'article 8 est tenue de préparer un rapport, au 31 décembre de chaque année civile durant laquelle elle les a mis en vente, vendus, utilisés ou transformés, comportant les renseignements suivants :

a) ses nom, adresses municipale et postale, numéro de téléphone et, le cas échéant, numéro de télécopieur et adresse électronique, ainsi que ceux de toute personne autorisée à agir en son nom;

b) une mention indiquant si elle les a mis en vente, vendus, transformés ou utilisés;

c) la quantité de BPC ou de produits qui ont été mis en vente, vendus, transformés ou utilisés durant l'année civile;

d) une attestation, datée et signée par elle ou par toute personne autorisée à agir en son nom, portant que les renseignements sont complets et exacts.

Pigments pour la coloration

35. La personne qui fabrique, exporte ou importe, conformément à l'article 11, des pigments pour la coloration est tenue de préparer un rapport, au 31 décembre de chaque année civile durant laquelle elle les fabrique, exporte ou importe, comportant les renseignements suivants :

a) ses nom, adresses municipale et postale, numéro de téléphone et, le cas échéant, numéro de télécopieur et adresse électronique, ainsi que ceux de toute personne autorisée à agir en son nom;

b) une mention indiquant si elle les a fabriqués, exportés ou importés;

c) la quantité, exprimée en kilogrammes, de pigments qui ont été fabriqués, exportés ou importés durant l'année civile ainsi que la concentration moyenne annuelle et la concentration maximale en BPC de ces pigments, exprimée en mg/kg;

d) les nom, adresses municipale et postal et numéro de téléphone de la personne de qui proviennent les pigments, dans le cas où ils sont importés, ou à qui ils sont expédiés, dans le cas où ils sont exportés;

e) une attestation, datée et signée par elle ou par toute personne autorisée à agir en son nom, portant que les renseignements sont complets et exacts.

Solid products containing PCBs

36. The person who manufactures solid products containing PCBs in accordance with section 13 shall prepare a report that is current to December 31 in each calendar year in which the person manufactures the products and that contains the following information:

(*a*) the name, civic and mailing addresses, telephone number, fax number, if any, and e-mail address, if any, of the person and of any person authorized to act on that person's behalf;

(*b*) the quantity of solid products manufactured in that calendar year, expressed in kilograms, and the maximum concentration and average concentration of PCBs in the solid products, expressed in mg/kg, for that calendar year;

(*c*) the name, telephone number and civic and mailing addresses of the person to whom the manufacturer sells the products; and

(*d*) a certification that the information is accurate and complete and that is dated and signed by the person or by a person authorized to act on their behalf.

Stored PCBs or products — PCB concentration of 50 mg/kg or more

37. The person who owns and stores PCBs or products containing PCBs in a concentration of 50 mg/kg or more, other than the equipment and liquids referred to in section 33, shall prepare a report that is current to December 31 in each calendar year in which the person stores the PCBs or products at their PCB storage site and that contains the following information:

(*a*) the name, civic and mailing addresses, telephone number, fax number, if any, and e-mail address, if any, of the owner and of any person authorized to act on the owner's behalf;

(*b*) the civic addresses of the PCB storage sites where the PCBs or products are located, or if there is no civic address, their location using the owner's site identification system;

(*c*) the quantity of liquids containing PCBs in the products, expressed in litres, and the quantity of solids containing PCBs in the products, expressed in kilograms, and the concentration of PCBs in the liquids and the solids, expressed in mg/kg

(i) that are stored on December 31 at the person's PCB storage site,

(ii) that are sent, in that calendar year, to an authorized facility that is a transfer site,

(iii) that are sent, in that calendar year, to an authorized facility that is authorized to destroy them, or

(iv) that are destroyed in that calendar year; and

(*d*) a certification that the information is accurate and complete and that is dated and signed by the owner of the PCBs or products containing PCBs or by a person authorized to act on the owner's behalf.

Produits solides qui contiennent des BPC

36. La personne qui fabrique, conformément à l'article 13, des produits solides qui contiennent des BPC est tenue de préparer un rapport, au 31 décembre de chaque année civile durant laquelle elle les fabrique, comportant les renseignements suivants :

a) ses nom, adresses municipale et postale, numéro de téléphone et, le cas échéant, numéro de télécopieur et adresse électronique, ainsi que ceux de toute personne autorisée à agir en son nom;

b) la quantité, exprimée en kilogrammes, de produits qui ont été fabriqués durant l'année civile ainsi que la concentration moyenne et la concentration maximale en BPC de ces produits, exprimée en mg/kg, pour cette année civile;

c) les nom, adresse municipale et postale et numéro de téléphone de la personne à qui elle a vendu les produits;

d) une attestation, datée et signée par elle ou par toute personne autorisée à agir en son nom, portant que les renseignements sont complets et exacts.

BPC ou produits stockés — concentration de BPC de 50 mg/kg ou plus

37. Le propriétaire de BPC ou de produits qui en contiennent en une concentration égale ou supérieure à 50 mg/kg, autres que les pièces d'équipement ou les liquides visés à l'article 33, qui les stocke à son dépôt de BPC est tenu de préparer un rapport, au 31 décembre de chaque année civile durant laquelle il les stocke ainsi, comportant les renseignements suivants :

a) ses nom, adresses municipale et postale, numéro de téléphone et, le cas échéant, numéro de télécopieur et adresse électronique, ainsi que ceux de toute personne autorisée à agir en son nom;

b) l'adresse municipale des dépôts où sont stockés les BPC et les produits ou, à défaut, l'endroit où ils se trouvent d'après le système d'identification de site du propriétaire;

c) la quantité de liquides qui contiennent des BPC dans les produits, exprimée en litres, la quantité de solides qui contiennent des BPC dans les produits, exprimée en kilogrammes, et la concentration de BPC dans les liquides ou les solides, exprimée en mg/kg :

(i) stockés à son dépôt de BPC le 31 décembre,

(ii) expédiés, au cours de l'année civile, à une installation agréée qui est un centre de transfert,

(iii) expédiés, au cours de l'année civile, à une installation agréée qui est autorisée à les détruire,

(iv) détruits au cours de l'année civile,

d) une attestation, datée et signée par lui ou par toute personne autorisée à agir en son nom, portant que les renseignements sont complets et exacts.

Stored PCBs or products — transfer site or destruction facility

38. The owner of an authorized facility that is a transfer site or that is authorized to destroy PCBs or products containing PCBs and who stores them at their PCB storage site, other than the owner referred to in section 37, shall prepare a report that is current to December 31 in each calendar year and that contains the following information:

(*a*) the name, civic and mailing addresses, telephone number, fax number, if any, and e-mail address, if any, of the owner and of any person authorized to act on the owner's behalf;

(*b*) the civic addresses of the sites where the PCBs or products containing PCBs are stored, or if there is no civic address, the location of the sites using the owner's site identification system;

(*c*) the quantity of liquids containing PCBs in the products, expressed in litres, or the quantity of solids containing PCBs in the products, expressed in kilograms, and the concentration of the PCBs in the liquids and the solids, expressed in mg/kg

(i) that are stored on December 31 at the owner's PCB storage site,

(ii) that are sent, in that calendar year, to an authorized facility that is a transfer site,

(iii) that are sent, in that calendar year, to an authorized facility that is authorized to destroy them, or

(iv) that are destroyed in that calendar year; and

(*d*) a certification that the information is accurate and complete and that is dated and signed by the owner of the authorized facility or by a person authorized to act on the owner's behalf.

Date of submission of report

39. (1) The person who is required to prepare a report in accordance with subsection 33(1) or (2) and with any of sections 34 to 38 shall submit it to the Minister on or before March 31 of the year following the calendar year for which the report is made.

Report made under subsection 33(3)

(2) The person who is required to prepare a report in accordance with subsection 33(3) shall submit it to the Minister

(*a*) on or before March 31, 2010 for reports that are current to December 31 of the year that these Regulations come into force up to the year 2009;

(*b*) on or before March 31, 2014 for reports that are current to December 31 of each of the years 2010 to 2013;

(*c*) on or before March 31, 2018 for reports that are current to December 31 of each of the years 2014 to 2017;

(*d*) on or before March 31, 2022 for reports that are current to December 31 of each of the years 2018 to 2021;

(*e*) on or before March 31, 2026 for reports that are current to December 31 of each of the years 2022 to 2025;

BPC ou produits stockés — Centre de transfert ou de destruction

38. Le propriétaire d'une installation agréée qui est un centre de transfert ou qui est autorisée à détruire des BPC et des produits qui en contiennent, autre que le propriétaire visé à l'article 37, et qui les stocke à son dépôt de BPC est tenu de préparer un rapport, au 31 décembre de chaque année civile durant laquelle il les transforme ou les détruit, comportant les renseignements suivants :

a) ses nom, adresses municipale et postale, numéro de téléphone et, le cas échéant, numéro de télécopieur et adresse électronique, ainsi que ceux de toute personne autorisée à agir en son nom;

b) l'adresse municipale des dépôts où sont stockés les BPC et les produits ou, à défaut, l'endroit où ils se trouvent d'après le système d'identification de site du propriétaire;

c) la quantité de liquides qui contiennent des BPC dans les produits, exprimée en litres, la quantité de solides qui contiennent des BPC dans les produits, exprimée en kilogrammes, et la concentration de BPC dans les liquides ou les solides, exprimée en mg/kg :

(i) stockés à son dépôt de BPC le 31 décembre,

(ii) expédiés, au cours de l'année civile, à une installation agréée qui est un centre de transfert,

(iii) expédiés, au cours de l'année civile, à une installation agréée qui est autorisée à les détruire,

(iv) détruits au cours de l'année civile,

d) une attestation, datée et signée par lui ou par toute personne autorisée à agir en son nom, portant que les renseignements sont complets et exacts.

Date de présentation des rapports

39. (1) La personne qui est tenue de préparer tout rapport visé aux paragraphes 33(1) ou (2) ou à l'un des articles 34 à 38 le présente au ministre au plus tard le 31 mars de l'année civile qui suit celle pour laquelle il est établi.

Rapport visé au paragraphe 33(3)

(2) Celle qui est tenue de préparer le rapport visé au paragraphe 33(3) le présente au ministre :

a) au plus tard le 31 mars 2010, s'il porte sur toute année civile suivant l'entrée en vigueur du présent règlement jusqu'à l'année 2009;

b) au plus tard le 31 mars 2014, s'il porte sur l'une ou l'autre des années 2010 à 2013;

c) au plus tard le 31 mars 2018, s'il porte l'une ou l'autre des années 2014 à 2017;

d) au plus tard le 31 mars 2022, s'il porte sur l'une ou l'autre des années 2018 à 2021;

e) au plus tard le 31 mars 2026, s'il porte sur l'une ou l'autre des années 2022 à 2025;

f) au plus tard le 31 mars 2027, s'il porte sur l'année 2026;

g) au plus tard le 31 mars 2030, s'il porte sur l'une ou l'autre des années 2027 à 2029.

(*f*) on or before March 31, 2027 for reports that are current to December 31 of the year 2026; and

(*g*) on or before March 31, 2030 for reports that are current to December 31 of each of the years 2027 to 2029.

Release into the environment

40. (1) For the purposes of paragraph 95(1)(*a*) of the Act, where there occurs or is a likelihood of a release into the environment of PCBs in contravention of section 5, the person who is designated to be provided with a written report is the Manager of Inspection Program, Environmental Enforcement Division, Enforcement Branch of the Department of the Environment in the region where the release occurs or is likely to occur.

Contents

(2) The report shall include the following information:

(*a*) the name, civic and mailing addresses and telephone number of the person who owns or has the charge, management or control of the PCBs that are released into the environment;

(*b*) the date, time and location of the release;

(*c*) a description of the source of the release; and

(*d*) the quantity of liquids containing PCBs released, expressed in litres, the quantity of solids containing PCBs released, expressed in kilograms, and the concentration of PCBs in the liquids and the solids that are released, expressed in mg/kg.

Retention

41. Any person who is required to submit a report under these Regulations shall keep a copy of the report at their principal place of business in Canada for at least five years after the day on which the report is submitted.

Method of submission

42. Each report referred to in sections 33 to 38 shall be submitted electronically in the format provided by the Department of the Environment, but the report shall be submitted in writing if

(*a*) no such format is provided; or

(*b*) it is, owing to circumstances beyond the control of the person required to submit the report, impracticable to submit the report electronically in the format provided.

RECORDS

Records for permitted activities

43. The following persons shall maintain records that demonstrate that they manufacture, process, use, sell, offer for sale, store, import or export PCBs or products containing PCBs in accordance with the Act and these Regulations:

(*a*) the owner of PCBs or products containing PCBs;

(*b*) the person who is engaged in any of these activities; and

(*c*) the owner or operator of a PCB storage site.

Inspection record

44. (1) The owner or operator of a PCB storage site shall maintain a record of all inspections conducted at the PCB storage site under paragraph 27(*a*)

(*a*) listing all items that are inspected;

(*b*) describing any deficiency found;

Rejets dans l'environnement

40. (1) Pour l'application de l'alinéa 95(1)(*a*) de la Loi, en cas de rejet dans l'environnement — effectif ou probable — de BPC en violation de l'article 5, la personne désignée pour recevoir le rapport écrit est le Gestionnaire du programme d'inspection, Direction de l'application de la loi en environnement, Direction générale de l'application de la loi du ministère de l'Environnement, dans la région où a lieu le rejet — effectif ou probable.

Contenu

(2) Le rapport comporte les renseignements suivants :

a) les nom, adresses municipale et postale et numéro de téléphone de la personne qui a toute autorité sur les BPC qui ont été rejetés dans l'environnement ou qui en est propriétaire;

b) les date, heure et lieu du rejet;

c) une description de la source du rejet;

d) la quantité de liquides qui contiennent des BPC rejetés, exprimée en litres, la quantité de solides qui contiennent des BPC rejetés, exprimée kilogrammes, et la concentration de BPC dans les liquides ou les solides rejetés, exprimée en mg/kg.

Conservation

41. Toute personne qui est tenue de présenter un rapport en application du présent règlement en conserve une copie à son établissement principal au Canada pendant au moins cinq ans après la date de sa présentation.

Méthode de présentation

42. Les rapports visés aux articles 33 à 38 sont présentés sous forme électronique selon le modèle établi par le ministère de l'Environnement. Ils sont toutefois présentés par écrit dans les cas suivants :

a) aucun modèle n'a été établi par le ministère;

b) il est pratiquement impossible, pour des raisons indépendantes de la volonté de la personne tenue de les présenter, de le faire sous forme électronique selon le modèle établi.

DOCUMENTS ET REGISTRES

Documents concernant les activités permises

43. Les personnes ci-après conservent les documents établissant que des BPC ou des produits qui en contiennent ont été fabriqués, transformés, utilisés, mis en vente, vendus, stockés, importés ou exportés conformément à la Loi et au présent règlement :

a) le propriétaire des BPC ou des produits;

b) la personne qui exerce l'activité;

c) le propriétaire ou l'exploitant du dépôt de BPC.

Registres d'inspections

44. (1) Le propriétaire ou l'exploitant d'un dépôt de BPC tient un registre de toutes les inspections effectuées au dépôt de BPC en application de l'alinéa 27*a*), lequel fait état :

a) de tous les points inspectés;

(*c*) setting out the measures taken to remedy the deficiency; and

(*d*) specifying the dates of the inspections and the names of the inspectors.

Owner of equipment — extension

(2) The owner of equipment for which an extension of the end-of-use date is applied under section 17 shall maintain a record of all inspections conducted on the equipment that contains the information set out in paragraphs (1)(*a*) to (*d*).

Retention of records

45. The person who is required to maintain a record under sections 43 and 44 shall retain it at their principal place of business in Canada or at the place where they conduct the activity for at least five years

(*a*) after the destruction of the PCBs or the products containing PCBs that are the subject of the record, in the case of the owner of PCBs or products containing PCBs or the owner or operator of the PCB storage site where the PCBs or products containing PCBs are stored; or

(*b*) after the completion of an activity referred to in section 43, in the case of the person who is engaged in that activity.

PART 5

REPEALS AND COMING INTO FORCE

REPEALS

Repeal

46. The *Chlorobiphenyls Regulations*[1] are repealed.

Repeal

47. The *Storage of PCB Material Regulations*[2] are repealed.

COMING INTO FORCE

Coming into force

48. These Regulations come into force on the day on which they are registered.

b) de toutes les lacunes relevées;

c) des mesures à prendre pour y remédier;

d) de la date de l'inspection et du nom de l'inspecteur.

Propriétaire d'une pièce d'équipement — prolongation

(2) Le propriétaire d'une pièce d'équipement dont l'utilisation fait l'objet d'une prolongation en vertu de l'article 17 tient un registre de toutes les inspections de la pièce d'équipement qui ont été effectuées, lequel fait état des renseignements prévus aux alinéas (1)*a*) à *d*).

Conservation des dossiers

45. Toute personne qui est tenue de conserver des documents ou de tenir un registre en application des articles 43 et 44 respectivement les conserve à son établissement principal au Canada ou à l'établissement où l'activité est exercée pendant au moins cinq ans après :

a) dans le cas du propriétaire de BPC ou de produits qui en contiennent ou du propriétaire ou de l'exploitant d'un dépôt de BPC où sont stockés des BPC ou des produits qui en contiennent, la date de destruction des BPC ou des produits qui en contiennent visés par le document ou le registre;

b) dans le cas de la personne qui exerce une activité visée à l'article 43, la date de la fin de l'activité.

PARTIE 5

ABROGATIONS ET ENTRÉE EN VIGUEUR

ABROGATION

Abrogation

46. Le *Règlement sur les biphényles chlorés*[1] est abrogé.

Abrogation

47. Le *Règlement sur le stockage des matériels contenant des BPC*[2] est abrogé.

Entrée en vigueur

Entrée en vigueur

48. Le présent règlement entre en vigueur à la date de son enregistrement.

[1] SOR/91-152
[2] SOR/92-507; SOR/2000-102, s. 15

[1] DORS/91-152
[2] DORS/92-507; DORS/2000-102, a. 15

CI Number: 41535

Title: **2012 Steel Tower Protective Painting System**

Start Date: 2012/05
Final Cost Date: 2012/11
Function: Transmission
Forecast Amount: $1,270,605

DESCRIPTION:

This project provides for the cost to re-apply anti-corrosive paint to lattice steel towers in order to extend the life of the structures. It is planned that 4 towers be painted on the Canso Crossing and 5 towers be painted on the Halifax/Dartmouth Harbour Crossing.

The cost includes the removal and collection of the existing loose lead paint, the proper disposal of the lead paint, working at heights up to 300 feet and in close proximity to energized lines as well as material costs.

Summary of Related CI's +/- 2 years:
No projects for 2010, 2011, 2012, 2013 & 2014

JUSTIFICATION:

Justification Criteria: Transmission Plant

Sub Criteria: Maintenance

Why do this project?

The environmental ambient conditions that these towers are exposed to have deteriorated the protective coating on the structures and they are beginning to show signs of corrosion.

Why do this project now?

Towers require repainting in order to minimize the loss of metal through corrosion, which will shorten the remaining life of the towers if left unchecked. The towers will be prioritized based on the age of the structures and the latest field inspection data.

Why do this project this way?

The most cost effective approach is to repaint the steel towers prior to the corrosion penetrating the existing paint protective system and contacting the metal after which painting is no longer an effective mitigation solution.

CI Number : 41535 - 2012 Steel Tower Painting **Project Number**

Parent CI Number : -

Cost Centre : 800 - 800-Services - Admin. **Budget Version** 2012 ACE Plan

Capital Item Accounts

Acct	Actv	Account	Activity	Forecast Amount	Amount	Variance
092		092-Vehicle T&D Reg. Labour AO		20,775	0	20,775
094		094 - Interest Capitalized		8,941	0	8,941
095		095-Thermal Regular Labour AO		15,184	0	15,184
095		095-COPS Regular Labour AO		31,648	0	31,648
095		095-COPS Contracts AO		[redacted]	0	[redacted]
012	037	012 - Materials	037 - DP - Steel Towers	50,000	0	50,000
013	037	013 - COPS Contracts	037 - DP - Steel Towers	[redacted]	0	[redacted]
001	085	001 - THERMAL Regular Labour	085 Design	63,240	0	63,240
001	085	001 - Regular Labour (No AO)	085 Design	1,000	0	1,000
002	085	002 - THERMAL Overtime Labour	085 Design	0	0	0
002	085	002 - Overtime Labour (No AO)	085 Design	0	0	0
011	085	011 - Travel Expense	085 Design	2,000	0	2,000
001	087	001 - T&D Regular Labour	087 Field Super.& Ops.	41,000	0	41,000
002	087	002 - T&D Overtime Labour	087 Field Super.& Ops.	0	0	0
			Total Cost:	1,270,605	0	1,270,605
			Original Cost:			

CI 41535 2012 Steel Tower Life Extension project

The following is a breakdown of costs associated with the 2012 Steel Tower Life Extension project:

Administrative Overhead and Interest	[redacted]
Materials	$50,000
Contracts	[redacted]
COPS Labour	$105,240
Other	$2,000
Total	$1,270,605

This work is expected to be completed by an external contractor with NSPI supervision. Estimates were based on discussions with those who perform this type of work. The COPS labour portion includes supervision and engineering design for completion of this work.

CI Number: 41844

Title:	**Reinsulate Transmission Lines L8004 & L7005**
Start Date:	2012/05
Final Cost Date:	2012/07
Function:	Transmission
Forecast Amount:	$1,139,264

DESCRIPTION:

This project scope includes the replacement of air spoilers, link assemblies and insulators on the Canso Strait crossing for transmission lines 7005 and 8004. The spans on either side of the crossing leading to the dead end structures will also receive new air spoilers. The main span insulator replacements will be completed with the use of a helicopter.

Summary of Related CI's +/- 2 years:
No projects for 2010, 2011, 2012, 2013 & 2014

JUSTIFICATION:

Justification Criteria: Transmission Plant

Why do this project?
This is a critical transmission crossing and it requires the air spoilers, insulators and link assemblies be replaced as a result of identified component conditions. A climbing inspection revealed deterioration in these components.

Why do this project now?

The air spoilers are breaking free from the conductors, there is excessive wear on components and this will reduce the risk of failure of the conductors.

Why do this project this way?

The Canso Strait crossing is a special design requiring air spoilers to prevent galloping on the main span across the water crossing. This main span, which consists of a critical 345 kV and 230 kV circuit, is required to be completed under live line conditions such that generation is not curtailed on Cape Breton Island. Equipment that requires replacement at the dead end towers will be scheduled one circuit at a time.

The labour for this project will be sourced through NSPI's existing Power Line Technician (PLT) Service Agreement with EUS. This is aligned with NSPI's workforce planning model which is designed to optimize the allocation and execution of PLT resources among work requirements.

CI Number : 41844 - L8004 & L7005 Reinsulate **Project Number**

Parent CI Number : -

Cost Centre : 800 - 800-Services - Admin. **Budget Version** 2012 ACE Plan

Capital Item Accounts

Acct	Actv	Account	Activity	Forecast Amount	Amount	Variance
092		092-Vehicle T&D Reg. Labour AO		11,316	0	11,316
094		094 - Interest Capitalized		2,018	0	2,018
095		095-COPS Regular Labour AO		17,239	0	17,239
095		095-Thermal Regular Labour AO		1,351	0	1,351
095		095-COPS Contracts AO		178,883	0	178,883
012	038	012 - Materials	038 - TP - Insulators	138,000	0	138,000
013	038	013 - COPS Contracts	038 - TP - Insulators	762,500	0	762,500
001	085	001 - THERMAL Regular Labour	085 Design	5,625	0	5,625
001	087	001 - T&D Regular Labour	087 Field Super.& Ops.	22,333	0	22,333
			Total Cost:	1,139,264	0	1,139,264
			Original Cost:	407,811		

CI 41844 L8004 & L7005 Reinsulate

The following is a breakdown of costs associated with the L8004 & L7005 Reinsulate project:

Administrative Overhead and Interest	$210,805
Materials	$138,000
Contracts	$762,500
COPS Labour	$27,958
Total	$1,139,264

The work associated with this project is expected to be sourced through NSPI's existing Power Line Technician (PLT) contract with Emera Utility Services, at a rate of approximately [redacted] per compatible unit hour. Internal technicians, electrician, and linemen will carry out the COPS labor at a rate of approximately $[redacted] per person day along with engineering design work.

CI Number: 41434

Title: **Procure Additional 42 MVA Spare Transformer**

Start Date: 2012/08
Final Cost Date: 2012/12
Function: Transmission
Forecast Amount: $1,043,984

DESCRIPTION:

This project scope provides for the procurement of one transformer with a top-end rating of 42 MVA, including a 138 kV primary winding and dual secondary windings at 69 kV and 25 kV. This transformer is intended to fill a gap in the NSPI spare transformer inventory as described in NSPI's updated Spare Transformer Study.

Summary of Related CI's +/- 2 years:
No projects for 2010, 2011, 2012, 2013 & 2014

JUSTIFICATION:

Justification Criteria: Transmission Plant

Sub Criteria: Requirement to Serve

Why do this project?

The purchase of this transformer was identified by an updated internal NSPI study to be a necessary supplement to the existing inventory of spare transformers. While there is currently a spare of similar MVA capacity, it has a unique winding configuration that prevents it from being compatible with the NSPI system without supplemental engineering effort being undertaken every time it needs to be deployed. A spare with compatible windings will avoid the need for extraneous engineering and the additional cost and time delay associated with it.

Why do this project now?

Several recent power transformer failures caused NSPI to update its internal study on NSPI spare transformer inventory which resulted in identifying several additions to NSPI's spare transformer inventory are necessary to bring backup capability to an acceptable level.

Why do this project this way?

The procurement of an additional spare transformer with the specified configuration is the only way to supplement the NSPI inventory. NSPI has attempted on numerous occasions to locate compatible transformers from other utilities and/or equipment suppliers without success.

CI Number : 41434 - Purchase New 42 MVA Spare Transformer **Project Number**

Parent CI Number : -

Cost Centre : 800 - 800-Services - Admin. **Budget Version** 2012 ACE Plan

Capital Item Accounts

Acct	Actv	Account	Activity	Forecast Amount	Amount	Variance
092		092-Vehicle T&D Reg. Labour AO		2,995	0	2,995
094		094 - Interest Capitalized		[redacted]	0	[redacted]
095		095-COPS Regular Labour AO		4,562	0	4,562
095		095-COPS Contracts AO		[redacted]	0	[redacted]
001	044	001 - T&D Regular Labour	044 - TP - Substn.Transf.	5,910	0	5,910
002	044	002 - T&D Overtime Labour	044 - TP - Substn.Transf.	0	0	0
012	044	012 - Materials	044 - TP - Substn.Transf.	[redacted]	0	[redacted]
013	044	013 - COPS Contracts	044 - TP - Substn.Transf.	[redacted]	0	[redacted]
012	086	012 - Materials	086 Commissioning	[redacted]	0	[redacted]
			Total Cost:	1,043,984	0	1,043,984
			Original Cost:			

CI 41434 Purchase New 42 MVA Spare Transformer

The following is a breakdown of costs associated with the Purchase New 42 MVA Spare Transformer project:

Administrative Overhead and Interest	$ 23,184
Materials	[redacted]
Contracts	[redacted]
COPS Labour	$ 5,910
Total	$ 1,043,984

The labour associated with this project is expected to be completed by NSPI resources at an approximate rate $[redacted] per person day. Material forecast provides for the purchase of the transformer along with oil, bushings, rads, and other dressings necessary to have the transformer ready to be deployed when needed. The contract forecasts include the crane rental to place the transformer on timbers at the Onslow Spares Yard, as well as any necessary shifting of existing spares in order to accommodate the new unit.

CI Number: 41399

Title: **2012 Substation Insulator & Cutout Replacements**

Start Date: 2012/01
Final Cost Date: 2012/12
Function: Transmission
Forecast Amount: $800,013

DESCRIPTION:

This project scope provides for the replacement of porcelain cutouts on select equipment in transmission substations.

Summary of Related CI's +/- 2 years:
2010 CI 38878 2010 Subs Cutout and Insul. Replacement $1,506,414

JUSTIFICATION:

Justification Criteria: Transmission Plant

Sub Criteria: Equipment Replacement

Why do this project?

This work is being undertaken as part of the overall customer reliability improvement investment. This is year three of a five year (2010-2014) plan to improve reliability to NSPI's customers. Porcelain cutouts have been failing resulting in customer outages. These failures come as a result of moisture in hairline cracks which have developed in the porcelain insulator. Transmission outages generally affect a large number of customers as these failures typically interrupt supply to one or more substations.

Why do this project now?

Program cutout replacement on a prioritized substation basis is required to improve customer reliability. Cutout failures contribute to customer outages. Furthermore, preventing device failures at 3C substation (bulk power system) reduces this risk of widespread, multi-substation outages.

Why do this project this way?

The best approach to reduce outages caused by cutout failures is to focus on specific substations and replace the cutouts in kind.

CI Number : 41399 - 2012 Subst Insulator & Cutout Replacements **Project Number**

Parent CI Number : -

Cost Centre : 800 - 800-Services - Admin. **Budget Version** 2012 ACE Plan

Capital Item Accounts

Acct	Actv	Account	Activity	Forecast Amount	Amount	Variance
092		092-Vehicle T&D Reg. Labour AO		109,725	0	109,725
094		094 - Interest Capitalized		21,053	0	21,053
095		095-COPS Regular Labour AO		167,153	0	167,153
095		095-COPS Contracts AO		21,080	0	21,080
001	038	001 - T&D Regular Labour	038 - TP - Insulators	21,607	0	21,607
002	038	002 - T&D Overtime Labour	038 - TP - Insulators	0	0	0
012	038	012 - Materials	038 - TP - Insulators	35,876	0	35,876
013	038	013 - COPS Contracts	038 - TP - Insulators	89,857	0	89,857
001	039	001 - T&D Regular Labour	039 - TP - O/H Cond.	150,606	0	150,606
002	039	002 - T&D Overtime Labour	039 - TP - O/H Cond.	0	0	0
011	039	011 - Travel Expense	039 - TP - O/H Cond.	56,448	0	56,448
014	039	014 - Overtime Meals	039 - TP - O/H Cond.	19,800	0	19,800
012	040	012 - Materials	040 - TP - O/H Cond.Devices	23,100	0	23,100
001	085	001 - Regular Labour (No AO)	085 Design	1,225	0	1,225
002	085	002 - T&D Overtime Labour	085 Design	0	0	0
028	085	028 - Consulting	085 Design	0	0	0
001	087	001 - T&D Regular Labour	087 Field Super.& Ops.	44,335	0	44,335
011	087	011 - Travel Expense	087 Field Super.& Ops.	20,630	0	20,630
041	087	041 - Meals & Entertainment	087 Field Super.& Ops.	2,880	0	2,880
066	087	066 - Other Goods & Services	087 Field Super.& Ops.	14,638	0	14,638
			Total Cost:	800,013	0	800,013
			Original Cost:	244,131		

CI 41399 2012 Substation Insulator & Cutout Replacements

The following is a breakdown of costs associated with the 2012 Substation Insulator & Cutout Replacements:

Administrative Overhead and Interest	$ 319,011
Materials	$ 58,976
Contracts	$ 89,857
COPS Labour	$ 217,773
Other	$ 114,396
Total	$ 800,013

Materials - The material associated with this item will be standard materials, insulators, epoxy cut-outs, conductor, and connectors. Where required, poles and wooden supporting timbers will be replaced.

Contracts – The contract estimate is for services to transport material, crane services, and the disposal of removed material. This work will be completed by outside contractors.

COPS Labour – The labour associated with this project will be performed by NSPI personnel at a rate of approximately [redacted] per person day

CI Number: 41437

Title: **104H-T62 Kempt Road Transformer Rewind**

Start Date: 2012/03
Final Cost Date: 2012/12
Function: Transmission
Forecast Amount: $790,201

DESCRIPTION:

This project provides for the costs associated with the rewind of transformer 104H-T62 at Kempt Road.

Summary of Related CI's +/- 2 years:
2011 CI 39723 104H- T63 Transformer Refurbishment $753,177
2011 CI 40185 104H- T61 Transformer Refurbishment $946,675

JUSTIFICATION:

Justification Criteria: Transmission Plant

Sub Criteria: Requirement to Serve

Why do this project?

104H-T62 is a Canadian General Electric transformer built in 1976. Two other identical transformers (104H-T61, 104H-T63) of the same design have recently experienced mechanical failures that resulted in failure of the windings. The failure mode is due to insufficient coil blocking. Due to the identical design of 104H-T62 to the failed units, there is a high probability that 104H-T62 will fail in a similar mode to the other two identical units.

Why do this project now?

Due to the number of high current "through faults" that 104H-T62 has sustained over its service life, it is highly probable that this transformer will fail in service during a through fault incident. If this transformer were to fail during peak loading periods, there would not be sufficient transformation capacity at Kempt Rd. to carry the entire customer load, and either load would have to be shifted to other adjacent substations, assuming the capability is present, or a mobile transformer would have to be installed for an extended period of time to carry the customer load.

Why do this project this way?

By proactively rewinding this transformer, NSPI will avoid an extended customer outage that would result from the loss of this transformer supply.

CI Number : 41437 - 10H-T62 Kempt Road Transformer Rewind **Project Number**

Parent CI Number : -

Cost Centre : 800 - 800-Services - Admin. **Budget Version** 2012 ACE Plan

Capital Item Accounts

Acct	Actv	Account	Activity	Forecast Amount	Amount	Variance
092		092-Vehicle T&D Reg. Labour AO		13,310	0	13,310
092		092-Vehicle T&D OT Labour AO		1,664	0	1,664
094		094 - Interest Capitalized		20,720	0	20,720
095		095-COPS Regular Labour AO		20,276	0	20,276
095		095-COPS Contracts AO		[redacted]	0	[redacted]
095		095-Thermal Regular Labour AO		934	0	934
095		095-COPS Overtime Labour AO		2,535	0	2,535
001	044	001 - T&D Regular Labour	044 - DP - Substn.Transf.	26,267	0	26,267
002	044	002 - Overtime Labour (No AO)	044 - DP - Substn.Transf.	0	0	0
002	044	002 - T&D Overtime Labour	044 - DP - Substn.Transf.	6,567	0	6,567
012	044	012 - Materials	044 - DP - Substn.Transf.	[redacted]	0	[redacted]
013	044	013 - COPS Contracts	044 - DP - Substn.Transf.	[redacted]	0	[redacted]
001	085	001 - THERMAL Regular Labour	085 Design	3,890	0	3,890
001	085	001 - Regular Labour (No AO)	085 Design	10,580	0	10,580
002	085	002 - THERMAL Overtime Labour	085 Design	0	0	0
011	085	011 - Travel Expense	085 Design	5,000	0	5,000
028	085	028 - Consulting	085 Design	25,000	0	25,000
041	085	041 - Meals & Entertainment	085 Design	1,000	0	1,000
			Total Cost:	790,201	0	790,201
			Original Cost:	171,647		

CI 41437 104H-T62 Kempt Rd Transformer Rewind

The following is a breakdown of costs associated with the 104H-T62 rewind project:

Administrative Overhead and Interest	[redacted]
Materials	[redacted]
Contract	[redacted]
COPS Labour	$47,304
Other	$31,000
Total	$790,203

The labour associated with this project will be performed by NSPI personnel at a rate of approximately [redacted] per person day. The materials forecast includes the cost to rewind the transformer as well as new bushings and new transformer oil. The contract costs include crane lifts, rail shipment and transformer inspection services. The other forecast includes engineering labour and travel.

CI Number: 41589

Title: **22C-Church St Replace 25 kV Bus and Feeder Exit**

Start Date: 2012/04
Final Cost Date: 2012/07
Function: Transmission
Forecast Amount: $734,302

DESCRIPTION:

This project provides for the removal and replacement of the existing 25kV distribution bus at the 22N-Church St. Substation. The 25kV distribution feeder exit cables will be replaced also with overhead wire exits.

Summary of Related CI's +/- 2 years:
No projects for 2010, 2011, 2012, 2013 & 2014

JUSTIFICATION:

Justification Criteria: Transmission Plant

Sub Criteria: Maintenance

Why do this project?

This substation was initially constructed in 1972, additional distribution feeder supply bays were added in 1983 and in 1991 and the transmission supply voltage was upgraded from 69kV to 138kV. The distribution bus and wood pole support structures are 40 years old. The site has a high water table and the wood poles have weathered frost heaving (amounts averaging 300mm). Different amounts of frost heave have also caused considerable bending in the 25kV pipe bus with resultant damage to the 25kV exit cables necessitating replacement.

Why do this project now?

In early 2011, an insulation failure occurred in one of the feeder reclosers. This fault caused considerable damage to other pieces of equipment, as the fault current sought out all possible routes to ground. The accumulation of ongoing deterioration problems, particularly with the 25kV cables, and the recent fault damage has reduced the reliability of the 25kV portion of the substation.

Why do this project this way?

Pro-actively replacing the 40 year old, frost heaved poles, the distorted 25kV tubular bus conductors and eliminating the partially damaged and deteriorated 25kV power cables will avoid further in-service failures and the subsequent loss of supply to the distribution customers supplied from the 22N, 25kV bus.

A portion of the labour associated with this project will be sourced through NSPI's existing Power Line Technician (PLT) Service Agreement with EUS. This is aligned with NSPI's workforce planning model which is designed to optimize the allocation and execution of PLT resources among work requirements.

CI Number : 41589 - 22N-Church St Replace 25 kV Bus and Feeder Exit **Project Number**

Parent CI Number : -

Cost Centre : 800 - 800-Services - Admin. **Budget Version** 2012 ACE Plan

Capital Item Accounts

Acct	Actv	Account	Activity	Forecast Amount	Amount	Variance
092		092-Vehicle T&D Reg. Labour AO		10,115	0	10,115
094		094 - Interest Capitalized		4,807	0	4,807
095		095-Thermal Regular Labour AO		3,936	0	3,936
095		095-COPS Contracts AO		44,828	0	44,828
095		095-COPS Regular Labour AO		15,409	0	15,409
012	003	012 - Materials	003 - TP - Bldg.,Struct.Grnd.	118,784	0	118,784
013	003	013 - COPS Contracts	003 - TP - Bldg.,Struct.Grnd.	137,476	0	137,476
066	003	066 - Other Goods & Services	003 - TP - Bldg.,Struct.Grnd.	17,595	0	17,595
001	023	001 - T&D Regular Labour	023 - TP - Power Equip.-Station S	2,013	0	2,013
002	023	002 - T&D Overtime Labour	023 - TP - Power Equip.-Station S	0	0	0
012	023	012 - Materials	023 - TP - Power Equip.-Station S	11,040	0	11,040
012	035	012 - Materials	035 - TP - Wood Poles	27,600	0	27,600
013	035	013 - COPS Contracts	035 - TP - Wood Poles	18,547	0	18,547
012	038	012 - Materials	038 - TP - Insulators	1,610	0	1,610
013	038	013 - COPS Contracts	038 - TP - Insulators	773	0	773
012	039	012 - Materials	039 - TP - O/H Cond.	1,380	0	1,380
013	039	013 - COPS Contracts	039 - TP - O/H Cond.	21,638	0	21,638
001	043	001 - T&D Regular Labour	043 - TP - Substn Dev.	16,607	0	16,607
002	043	002 - T&D Overtime Labour	043 - TP - Substn Dev.	0	0	0
012	043	012 - Materials	043 - TP - Substn Dev.	157,013	0	157,013
066	043	066 - Other Goods & Services	043 - TP - Substn Dev.	7,360	0	7,360
001	085	001 - THERMAL Regular Labour	085 Design	16,392	0	16,392
002	085	002 - THERMAL Overtime Labour	085 Design	0	0	0
001	086	001 - T&D Regular Labour	086 Commissioning	1,342	0	1,342
002	086	002 - T&D Overtime Labour	086 Commissioning	0	0	0
013	087	013 - COPS Contracts	087 Field Super.& Ops.	12,650	0	12,650
066	088	066 - Other Goods & Services	088 Survey/Mapping	85,388	0	85,388
			Total Cost:	734,302	0	734,302
			Original Cost:			

CI 41589 22 Church St. Replace 25kV Bus and Feeder Exit

The following is a breakdown of costs associated with the 22 Church St. project:

Administrative Overhead and Interest	$79,095
Materials	$317,427
Contracts	$191,084
COPS Labour	$36,354
Other	$110,343
Total	$734,302

The work associated with this project is expected to be sourced through NSPI's existing Power Line Technician (PLT) contract with Emera Utility Services, at a rate of approximately [redacted] per compatible unit hour. NSPI personnel, electrician, and linemen will carry out the COPS labor at a rate of approximately [redacted] per person day along with engineering design work.

CI Number: 41386

Title: **2012 Pole Retreatment**

Start Date: 2012/05
Final Cost Date: 2012/12
Function: Transmission
Forecast Amount: $556,017

DESCRIPTION:

This project provides for the cost of re-treatment of approximately 5000 transmission poles. This is a multi-year program that will continue beyond 2012.

Summary of Related CI's +/- 2 years:
2010 CI 38860 2010 Pole Retreatment $495,505
2011 CI 40279 2011 Pole Retreatment $516,341
2013 CI TBD Pole Retreatment $TBD

JUSTIFICATION:

Justification Criteria: Transmission Plant

Sub Criteria: Maintenance

Why do this project?

Pole re-treatment is a proven and accepted cost effective approach to extend the life of the pole.

Why do this project now?

NSPI re-instated the pole re-treatment program in 2006, a decision supported by the UARB following the November, 2004 Storm Hearing.

Why do this project this way?
Cycle based pole re-treatment is a cost effective way to extend the life of treated wood poles.

CI Number : 41386 - 2012 Pole Retreatment **Project Number**

Parent CI Number : -

Cost Centre : 800 - 800-Services - Admin. **Budget Version** 2012 ACE Plan

Capital Item Accounts

Acct	Actv	Account	Activity	Forecast Amount	Amount	Variance
092		092-Vehicle T&D Reg. Labour AO		11,147	0	11,147
094		094 - Interest Capitalized		12,519	0	12,519
095		095-COPS Contracts AO		[redacted]	0	[redacted]
095		095-Thermal Regular Labour AO		120	0	120
095		095-COPS Regular Labour AO		16,982	0	16,982
012	035	012 - Materials	035 - TP - Wood Poles	[redacted]	0	[redacted]
013	035	013 - COPS Contracts	035 - TP - Wood Poles	[redacted]	0	[redacted]
001	085	001 - Regular Labour (No AO)	085 Design	7,600	0	7,600
001	085	001 - THERMAL Regular Labour	085 Design	500	0	500
002	085	002 - T&D Overtime Labour	085 Design	0	0	0
001	087	001 - T&D Regular Labour	087 Field Super.& Ops.	22,000	0	22,000
002	087	002 - T&D Overtime Labour	087 Field Super.& Ops.	0	0	0
011	087	011 - Travel Expense	087 Field Super.& Ops.	8,000	0	8,000
			Total Cost:	556,017	0	556,017
			Original Cost:			

CI 41386 - 2012 Pole Retreatment

The following is a breakdown of costs associated with the 2012 Pole Retreatment project:

Administrative Overhead and Interest	[redacted]
Materials	[redacted]
Contracts	[redacted]
COPS Labour	$ 30,100
Other	$ 8,000
Total	$ 556,016

This work is expected to be completed by an external contractor with NSPI supervision. Estimates of contracts and materials are based on actual costs incurred in this program in previous years. The COPS labour portion includes NSPI supervision for completion of this work. The list of lines to be completed in 2012 is as follows:

LINES SCHEDULED	OPERATING SECTION NUMBER AND NAME	APPROX. POLE QUANITY
5003	Farrell St (99H) to Sackville (90H)	216
5010	Imperial Oil (58H) to Imperial Oil Res. (111H)	10
5016	St. Croix (9V) to Five Points (20V)	329
5029	Maccan (30N) to Springhill (74N)	360
5501	Trenton (50N) to Stellarton (62N)	126
5502	Trenton (50N) to Abercrombie Pt. (54N)	86
5503	Port Hastings (2C) to Cleveland (22C)	115
5537	Tusket (9W) to Tusket (102W)	44
5551	Lunenburg (79W) to Riverport (Indian Path (80W)	130
6004	Sackville (90H) to Canaan Road (43V)	780
6511	Trenton (50N) to Antigonish (4C) Lochaber Rd.	585
6514	Maccan (30N) to Springhill (74N)	265
6518	Port Hastings (2C) to Stora (47C)	115
7002	Onslow (67N) to Brushy Hill (120H)	703
7018	Onslow (67N) to Brushy Hill (120H)	672
8001	Onslow (67N) to NB Border (L3006)	50
8002	Lakeside (103H) to Onslow (67N)	770
TOTALS		**5356**

CI Number: 41551

Title: **Glentosh Substation Footing Remediation**

Start Date: 2012/06
Final Cost Date: 2012/12
Function: Transmission
Forecast Amount: $552,201

DESCRIPTION:

This project will provide for the installation of steel piles and concrete to remediate the concrete support footings at the Glentosh Substation.

Summary of Related CI's +/- 2 years:
No projects for 2010, 2011, 2012, 2013 & 2014

JUSTIFICATION:

Justification Criteria: Transmission Plant

Sub Criteria: Maintenance

Why do this project?

Ongoing differential settlement of the substation footings due to bedrock of poor quality gypsum deposits has created misalignment and twisting of substation steel structures (bus supports) and steel bus.

Why do this project now?

This project must be completed as further settlement will cause more damage to existing substation bus and structures and result in more extensive repair/replacement scope.

Why do this project this way?

A review and assessment by civil engineering has recommended the installation of steel piles to secure the footings.

CI Number : 41551 - Glentosh Substation Footing Remediation **Project Number**

Parent CI Number : -

Cost Centre : 800 - 800-Services - Admin. **Budget Version** 2012 ACE Plan

Capital Item Accounts

Acct	Actv	Account	Activity	Forecast Amount	Amount	Variance
092		092-Vehicle T&D Reg. Labour AO		30,402	0	30,402
094		094 - Interest Capitalized		6,504	0	6,504
095		095-Thermal Regular Labour AO		3,602	0	3,602
095		095-COPS Regular Labour AO		46,314	0	46,314
095		095-COPS Contracts AO		[redacted]	0	[redacted]
001	003	001 - T&D Regular Labour	003 - TP - Bldg.,Struct.Grnd.	60,000	0	60,000
012	003	012 - Materials	003 - TP - Bldg.,Struct.Grnd.	[redacted]	0	[redacted]
013	003	013 - COPS Contracts	003 - TP - Bldg.,Struct.Grnd.	[redacted]	0	[redacted]
001	085	001 - THERMAL Regular Labour	085 Design	15,000	0	15,000
			Total Cost:	552,201	0	552,201
			Original Cost:			

CI 41551 Glentosh Substation Footing Remediation

The following is a breakdown of costs associated with the Glentosh Substation Footing Remediation project:

Administrative Overhead and Interest	[redacted]
Materials	[redacted]
Contracts	[redacted]
COPS Labour	$75,000
Total	$552,202

The contract portion of this project is proposed to be completed by a contractor and is associated with the civil work required to remediate the footings. The labour associated with this project will be performed by internal personnel at a rate of approximately [redacted] per person day, along with some NSPI design labour. The material forecast consists of poles, guys and conductor required to rearrange circuits in the substation.

CI Number: 41391

Title: **L6025 Spar Arm Reinforcement**

Start Date: 2012/06
Final Cost Date: 2012/11
Function: Transmission
Forecast Amount: $489,925

DESCRIPTION:

This project will provide for the installation of reinforcement bracing to support spar arms on 149 structures on L6025 from Bridgewater to Milton.

Summary of Related CI's +/- 2 years:
No projects for 2010, 2011, 2012, 2013 & 2014

JUSTIFICATION:

Justification Criteria: Transmission Plant

Sub Criteria: Outage Performance

Why do this project?

L6025 was built in 1989 and NSPI's transmission line inspection program has identified a number of spar arms which are drooping. This work will reinforce the spar arms to prevent further spar arm movement and failures. This work will increase the life expectancy of the spar arms.

Why do this project now?

Reinforcement of the arms will prevent unplanned outages on the transmission system.

Why do this project this way?

NSPI has deployed this method of reinforcement on several transmission lines which has proven to be an effective way to address the premature failure of the spar arms.

The labour for this project will be sourced through NSPI's existing Power Line Technician (PLT) Service Agreement with EUS. This is aligned with NSPI's workforce planning model which is designed to optimize the allocation and execution of PLT resources among work requirements.

CI Number : 41391 - L6025 Spar Arm Reinforcement **Project Number**

Parent CI Number : -

Cost Centre : 800 - 800-Services - Admin. **Budget Version** 2012 ACE Plan

Capital Item Accounts

Acct	Actv	Account	Activity	Forecast Amount	Amount	Variance
092		092-Vehicle T&D Reg. Labour AO		17,268	0	17,268
094		094 - Interest Capitalized		3,199	0	3,199
095		095-COPS Contracts AO		55,133	0	55,133
095		095-COPS Regular Labour AO		26,306	0	26,306
012	035	012 - Materials	035 - TP - Wood Poles	116,600	0	116,600
013	035	013 - COPS Contracts	035 - TP - Wood Poles	235,007	0	235,007
001	085	001 - Regular Labour (No AO)	085 Design	2,332	0	2,332
001	087	001 - T&D Regular Labour	087 Field Super.& Ops.	34,080	0	34,080
002	087	002 - THERMAL Overtime Labour	087 Field Super.& Ops.	0	0	0
			Total Cost:	489,925	0	489,925
			Original Cost:			

CI 41391 L6025 Spar Arm Reinforcement

The following is a breakdown of costs associated with the L6025 Spar Arm Reinforcement project:

Administrative Overhead and Interest	$ 101,906
Materials	$ 116,600
Contracts	$ 235,007
COPS Labour	$ 36,412
Total	$ 489,925

The materials forecast for this project provides for additional bracing to support the spar arms. The work associated with this project is expected to be sourced through NSPI's existing Power Line Technician (PLT) contract with Emera Utility Services, at a rate of approximately [redacted] per compatible unit hour.

CI Number: 41422

Title: **Onslow Spares Storage Upgrades**

Start Date: 2012/06
Final Cost Date: 2012/08
Function: Transmission
Forecast Amount: $415,661

DESCRIPTION:

This project will serve to upgrade the spare transformer storage space at the Onslow Spares Yard with two objectives:

(1) Provide more space to accommodate additions to the current spare transformer inventory; and

(2) Provide improved storage area for spare current transformers (CT).

The gated fence leading into the spares yard will be relocated back 80 feet to provide additional room, and the gravel will be upgraded and slightly elevated to provide improved water drainage. In addition, wooden platforms that are holding a variety of CT's and other equipment will be removed and replaced with concrete pads.

Summary of Related CI's +/- 2 years:
No projects for 2010, 2011, 2012, 2013 & 2014

JUSTIFICATION:

Justification Criteria: Transmission Plant

Sub Criteria: Buildings

Why do this project?

There are presently 10 spare system transformers in storage at 67N Onslow. The majority of the storage space is utilized by these 10 units. NSPI plans to increase its spare inventory to 15 transformers in total over the next 2 years and additional storage space is required to accommodate this additional inventory.

The upgrades to the gravel will improve water drainage in the yard, which will slow the decomposition of the timbers used to support the spare transformers.

The two wooden platforms used to store CTs and other electrical equipment have experienced normal deterioration from exposure to the ambient conditions and replacement with concrete pads will provide a permanent solution.

Why do this project now?

The Onslow spare transformer storage yard is located in a geographically-central location with adequate clearances necessary to move and transport the physically large transformers and provides suitable access to the highway system, supporting the timely deployment of a spare transformer in the event of an operating transformer incident. Having the additional capacity prepared at the Onslow storage yard preceding or concurrent to the arrival of new spares would avoid the need to find an alternate storage location.

Why do this project this way?

This project allows for an increase in the storage capacity of the yard while maintaining the flexibility to keep the present equipment stored on-site during the project.

CI Number : 41422 - Onslow Spares Storage Upgrades **Project Number**

Parent CI Number : -

Cost Centre : 800 - 800-Services - Admin. **Budget Version** 2012 ACE Plan

Capital Item Accounts

Acct	Actv	Account	Activity	Forecast Amount	Amount	Variance
092		092-Vehicle T&D Reg. Labour AO		6,080	0	6,080
094		094 - Interest Capitalized		2,292	0	2,292
095		095-Thermal Regular Labour AO		1,308	0	1,308
095		095-COPS Regular Labour AO		9,263	0	9,263
095		095-COPS Contracts AO		59,055	0	59,055
001	003	001 - T&D Regular Labour	003 - TP - Bldg.,Struct.Grnd.	12,000	0	12,000
002	003	002 - T&D Overtime Labour	003 - TP - Bldg.,Struct.Grnd.	0	0	0
012	003	012 - Materials	003 - TP - Bldg.,Struct.Grnd.	67,150	0	67,150
013	003	013 - COPS Contracts	003 - TP - Bldg.,Struct.Grnd.	251,725	0	251,725
001	085	001 - THERMAL Regular Labour	085 Design	5,446	0	5,446
001	085	001 - Regular Labour (No AO)	085 Design	1,343	0	1,343
002	085	002 - Overtime Labour (No AO)	085 Design	0	0	0
002	085	002 - THERMAL Overtime Labour	085 Design	0	0	0
			Total Cost:	415,661	0	415,661
			Original Cost:	0		

CI 41422 Onslow Spares Storage Upgrades

The following is a breakdown of costs associated with the Onslow Spares Storage Upgrades project:

Administrative Overhead and Interest	$ 77,998
Materials	$ 67,150
Contracts	$ 251,725
COPS Labour	$ 18,789
Total	$ 415,662

The material forecasts for this project provide for the concrete necessary to place new pads for current transformer (CT) storage, new gravel, new timbers for transformers, new fencing, and modifications to the existing security system to cover the expanded yard.

The contract forecasts consist of the crane/float rental, demolition of the existing storage building and construction of the new one, as well as a contractor to pour the new concrete pads and place the new gravel.

The NSPI labour forecast provides for contractor supervision.

CI Number: 41439

Title: **Mobile Refurbishments 5P & 6P**

Start Date: 2012/04
Final Cost Date: 2012/12
Function: Transmission
Forecast Amount: $367,409

DESCRIPTION:

This project provides for the costs associated with the upgrade of the 5P and 6P Mobile Substations.

Summary of Related CI's +/- 2 years:
No projects for 2010, 2011, 2012, 2013 & 2014

JUSTIFICATION:

Justification Criteria: Transmission Plant

Sub Criteria: Equipment Replacement

Why do this project?

Maintenance and Emergency Restoration work is highly dependent on the operational condition of these two mobile substations. The required upgrades to be performed on these mobile substations will increase their long term availability.

Why do this project now?

The 6P-MS mobile substation recent Motor Vehicle Inspection (MVI) identified deteriorated undercarriage and air ride systems. These systems must be replaced to make the vehicle road worthy. The low voltage circuit breaker on 6P-MS is deteriorated from usage and will be replaced with a vacuum circuit breaker which is a key component in the operation of this mobile unit. A new vacuum circuit breaker will be added to 5P-MS to replace the existing manual switch on this unit which will improve the flexibility during operation. High voltage side circuit switchers on both mobile substations have recently experienced pole failures, and one pole of each switcher had to be replaced in 2011. Delivery of replacement poles is typically twelve weeks or more. Replacing the remaining two switcher poles on each mobile will avoid future unavailability of these mobile substations.

Why do this project this way?

It is necessary to complete this project in this manner to maintain availability and road worthiness, and increase interconnection flexibility.

CI Number : 41439 - Mobile Refurbishments 5P & 6P **Project Number**

Parent CI Number : -

Cost Centre : 800 - 800-Services - Admin. **Budget Version** 2012 ACE Plan

Capital Item Accounts

Acct	Actv	Account	Activity	Forecast Amount	Amount	Variance
092		092-Vehicle T&D Reg. Labour AO		25,724	0	25,724
094		094 - Interest Capitalized		8,634	0	8,634
095		095-Thermal Regular Labour AO		1,401	0	1,401
095		095-COPS Regular Labour AO		39,187	0	39,187
001	043	001 - T&D Regular Labour	043 - DP - Substn Dev.	45,968	0	45,968
002	043	002 - T&D Overtime Labour	043 - DP - Substn Dev.	0	0	0
012	043	012 - Materials	043 - DP - Substn Dev.	143,000	0	143,000
066	043	066 - Other Goods & Services	043 - DP - Substn Dev.	90,000	0	90,000
001	085	001 - THERMAL Regular Labour	085 Design	5,835	0	5,835
001	085	001 - Regular Labour (No AO)	085 Design	2,860	0	2,860
002	085	002 - THERMAL Overtime Labour	085 Design	0	0	0
001	087	001 - T&D Regular Labour	087 Field Super.& Ops.	4,800	0	4,800
002	087	002 - T&D Overtime Labour	087 Field Super.& Ops.	0	0	0
			Total Cost:	367,409	0	367,409
			Original Cost:	220,058		

CI 41439 5P & 6P Mobile Substation Upgrades

The following is a breakdown of costs associated with the 5P & 6P Mobile Substation Upgrades project:

Administrative Overhead and Interest	$74,946
Materials	$143,000
COPS Labour	$59,463
Other	$90,000
Total	$367,409

The labour associated with this project will be performed by NSPI personnel at a rate of approximately [redacted] per person day, along with some engineering labour associated with the procurement of equipment and redesign of the mobile layout. The materials component of this project will account for the purchase of the new LV circuit breakers, as well as the purchase of new interrupter poles for the circuit switchers which have deteriorated. This will also provide for the purchase of a new LV switch for 5P-MS. The other forecast is associated with the new suspension and undercarriage work.

CI Number: 41438

Title: **85S-Wreck Cove Cable Termination Replacement**

Start Date: 2012/04
Final Cost Date: 2012/12
Function: Transmission
Forecast Amount: $291,194

DESCRIPTION:

This project provides for the replacement of 138KV cable pothead terminations at 85S-Wreck Cove.

Summary of Related CI's +/- 2 years:
No projects for 2010, 2011, 2012, 2013 & 2014

JUSTIFICATION:

Justification Criteria: Transmission Plant

Sub Criteria: Equipment Replacement

Why do this project?

The Wreck Cove Hydro Generation facility power cables are used to connect the generator transformer to the interconnection substation. The pothead terminations have deteriorated and are reaching the end of their useful life.

Why do this project now?

A failure of one of these pothead terminations would result in a loss of connection between the Hydro Facility and the Substation resulting in the generators being unavailable for an extended period. Wreck Cove Hydro generating units provide critical bulk power system support as on-peak capacity during winter months and is increasingly important in wind generation regulation.

Why do this project this way?

The replacement of this equipment will minimize the unavailability of Wreck Cove generators and avoids possible damage to other substation equipment as a result of a failure.

CI Number : 41438 - 85S Cable Termination Replacement - Wreck Cove **Project Number**

Parent CI Number : -

Cost Centre : 800 - 800-Services - Admin. **Budget Version** 2012 ACE Plan

Capital Item Accounts

Acct	Actv	Account	Activity	Forecast Amount	Amount	Variance
092		092-Vehicle T&D Reg. Labour AO		13,463	0	13,463
094		094 - Interest Capitalized		7,051	0	7,051
095		095-COPS Regular Labour AO		20,510	0	20,510
001	043	001 - T&D Regular Labour	043 - DP - Substn Dev.	24,626	0	24,626
002	043	002 - T&D Overtime Labour	043 - DP - Substn Dev.	0	0	0
012	043	012 - Materials	043 - DP - Substn Dev.	[redacted]	0	[redacted]
066	043	066 - Other Goods & Services	043 - DP - Substn Dev.	[redacted]	0	[redacted]
001	085	001 - T&D Regular Labour	085 Design	1,945	0	1,945
001	085	001 - Regular Labour (No AO)	085 Design	3,600	0	3,600
002	085	002 - Overtime Labour (No AO)	085 Design	0	0	0
002	085	002 - T&D Overtime Labour	085 Design	0	0	0
			Total Cost:	291,194	0	291,194
			Original Cost:			

CI 41438 85S Cable Termination Replacement – Wreck Cove

The following is a breakdown of costs associated with the Street Light & Area Management:

Administrative Overhead and Interest	$ 41,024
Materials	$ [redacted]
COPS Labour	$ 30,171
Other	$ [redacted]
Total	$ 291,195

The materials portion of this estimate is for the purchase of 12 new termination kits – one for each end of the six cable runs. A boom truck will be required to lift the terminations into place for installation.

COPS labor will be required to assist the installer in the installation of the terminations. A contractor who specializes in the installation of these terminations will be brought in to install the terminations as NSPI does not have the expertise in HV oil filled cable terminations. These costs are included in the Other account.

NSPI engineering labor will be required in the procurement of the termination kits as well as project supervision.

CI Number: 41362

Title: **7H Beaufort Switchgear Retirement**

Start Date: 2012/05
Final Cost Date: 2012/07
Function: Transmission
Forecast Amount: $278,071

DESCRIPTION:

This project will cover the replacement of the 4 kV switchgear at 7H Beaufort substation with new reclosers and concrete pads to support them. In addition, new aerial feeder exit cables will be installed to replace the underground cables that are currently in place.

Summary of Related CI's +/- 2 years:
2012 CI 41388 7H Beaufort Conversion $174,253

JUSTIFICATION:

Justification Criteria: Transmission Plant

Sub Criteria: Equipment Replacement

Why do this project?

The 4 kV switchgear at Beaufort substation, along with the underground feeder exit cabling, is approaching the end of its useful life. Manufacturer support for maintenance or replacement components for the switchgear is no longer available. The switchgear and cabling is deteriorated due to its age and replacing it will reduce maintenance requirements at the substation as well as improve reliability.

Why do this project now?

The switchgear is over 50 years old and would be very difficult to repair and result in an extended outage, should it fail in-service, due to the lack of available parts and general condition of the equipment.

Replacing the equipment will:
A) Decrease the likelihood of an equipment failure.
B) Shorten the duration of any outages in the event of a failure, due to the availability of manufacturer support and parts for newer equipment.

Why do this project this way?

The condition and the age of the switchgear preclude any benefit from overhauling or refurbishment; replacement will provide greater benefit at equal or lesser cost.

The terrain surrounding the substation is composed of several sections of solid rock, which will make digging new conduits for underground feeder cables complex and expensive. Aerial cabling serves the same function while delivering a cost effective solution.

Replacing the retired switchgear will serve as an interim solution to keep the substation in operation until the 4 kV feeders can be converted to a higher voltage. After conversion, the new equipment will be removed and placed in stores for use in future projects.

CI Number : 41362 - 7H Beaufort Switchgear Retirement **Project Number**

Parent CI Number : -

Cost Centre : 800 - 800-Services - Admin. **Budget Version** 2012 ACE Plan

Capital Item Accounts

Acct	Actv	Account	Activity	Forecast Amount	Amount	Variance
092		092-Vehicle T&D Reg. Labour AO		13,591	0	13,591
094		094 - Interest Capitalized		533	0	533
095		095-COPS Contracts AO		[redacted]	0	[redacted]
095		095-COPS Regular Labour AO		20,704	0	20,704
095		095-Thermal Regular Labour AO		1,589	0	1,589
012	003	012 - Materials	003 - TP - Bldg.,Struct.Grnd.	1,500	0	1,500
013	003	013 - COPS Contracts	003 - TP - Bldg.,Struct.Grnd.	[redacted]	0	[redacted]
001	035	001 - T&D Regular Labour	035 - TP - Wood Poles	669	0	669
012	035	012 - Materials	035 - TP - Wood Poles	12,000	0	12,000
012	039	012 - Materials	039 - TP - O/H Cond.	50,000	0	50,000
001	043	001 - T&D Regular Labour	043 - TP - Substn Dev.	24,954	0	24,954
012	043	012 - Materials	043 - TP - Substn Dev.	71,000	0	71,000
012	043	012 - Materials	043 - DP - Substn Dev.	55,589	0	55,589
013	043	013 - COPS Contracts	043 - TP - Substn Dev.	[redacted]	0	[redacted]
001	085	001 - Regular Labour (No AO)	085 Design	2,690	0	2,690
001	085	001 - THERMAL Regular Labour	085 Design	6,620	0	6,620
001	086	001 - T&D Regular Labour	086 Commissioning	1,200	0	1,200
			Total Cost:	278,071	0	278,071
			Original Cost:	22,402		

CI 41362 7H Beaufort Switchgear Retirement

The following is a breakdown of costs associated with the 7H Beaufort Switchgear Replacement project:

Administrative Overhead and Interest	$39,350
Materials	$190,089
Contracts	$12,500
COPS Labour	$39,222
Total	$278,071

The labour associated with this project will be performed by NSPI personnel at a rate of approximately [redacted] per person day. The work for this project includes the installation, connection and commissioning of new reclosers. The material budgets include new reclosers, new cabling from low-side of 7H-T1 inside PVC conduit, poles and aerial conductor to tie into existing feeders, new concrete pads, and a tie installed between 7H-291 and 7H-292 to allow recloser maintenance without affecting customers' service. The contract forecast provides for a crane rental which is required to installing new poles. A contractor will also perform pouring of new concrete pads for reclosers.

CI Number: 41390

Title: **7V Methals Hydro Transformer Replacement**

Start Date: 2012/06
Final Cost Date: 2012/11
Function: Transmission
Forecast Amount: $258,506

DESCRIPTION:

This project will proactively replace 7V-GT1 which has exceeded its design life before it experiencing an in-service failure. A new transformer of the same rating will be ordered and installed in place of the current one, which will be permanently retired.

Summary of Related CI's +/- 2 years:
No projects for 2010, 2011, 2012, 2013 & 2014

JUSTIFICATION:

Justification Criteria: Transmission Plant

Sub Criteria: Equipment Replacement

Why do this project?

7V-GT1 is a 1949 vintage Westinghouse transformer. The most recent tests performed on its insulating oil show elevated and increasing levels of carbon monoxide and carbon dioxide. The presence of these two compounds in the oil indicates cellulose breakdown, which is a strong indicator that the paper insulation protecting the transformer windings is deteriorating. The oil itself is in such condition that it no longer complies with NSPI standards or IEEE standards for insulating oil.

Why do this project now?

The combination of the transformer's 60+ year age, and the evidence of paper insulation breakdown, suggest that this transformer is rapidly approaching the end of its useful life. If the paper is allowed to continue to deteriorate, it will lose its ability to withstand the turn-to-turn voltages inside the transformer and cause a flashover, likely resulting in a failure. Removing this equipment from the system will avoid an unplanned outage.

Why do this project this way?

Evidence suggests an insulating paper breakdown. Replacing, reclaiming, filtering, or otherwise treating the oil will not provide an effective means of extending the life of the transformer.

CI Number : 41390 - 7V Methals Hydro Transformer Replacement **Project Number**

Parent CI Number : -

Cost Centre : 800 - 800-Services - Admin. **Budget Version** 2012 ACE Plan

Capital Item Accounts

Acct	Actv	Account	Activity	Forecast Amount	Amount	Variance
092		092-Vehicle T&D Reg. Labour AO		6,258	0	6,258
094		094 - Interest Capitalized		825	0	825
095		095-COPS Regular Labour AO		9,533	0	9,533
095		095-COPS Contracts AO		[redacted]	0	[redacted]
095		095-Thermal Regular Labour AO		392	0	392
001	044	001 - T&D Regular Labour	044 - TP - Substn.Transf.	9,850	0	9,850
002	044	002 - T&D Overtime Labour	044 - TP - Substn.Transf.	0	0	0
012	044	012 - Materials	044 - TP - Substn.Transf.	[redacted]	0	[redacted]
013	044	013 - COPS Contracts	044 - TP - Substn.Transf.	[redacted]	0	[redacted]
001	085	001 - Regular Labour (No AO)	085 Design	4,340	0	4,340
001	085	001 - THERMAL Regular Labour	085 Design	1,635	0	1,635
001	086	001 - T&D Regular Labour	086 Commissioning	2,500	0	2,500
002	086	002 - T&D Overtime Labour	086 Commissioning	0	0	0
			Total Cost:	258,506	0	258,506
			Original Cost:	24,046		

CI 41390 7V Methals Hydro Transformer Replace

The following is a breakdown of costs associated with the 7V Methals Hydro Replacement Transformer project:

Administrative Overhead and Interest	[redacted]
Materials	
Contracts	
COPS Labour	$ 18,325
Total	$ 258,506

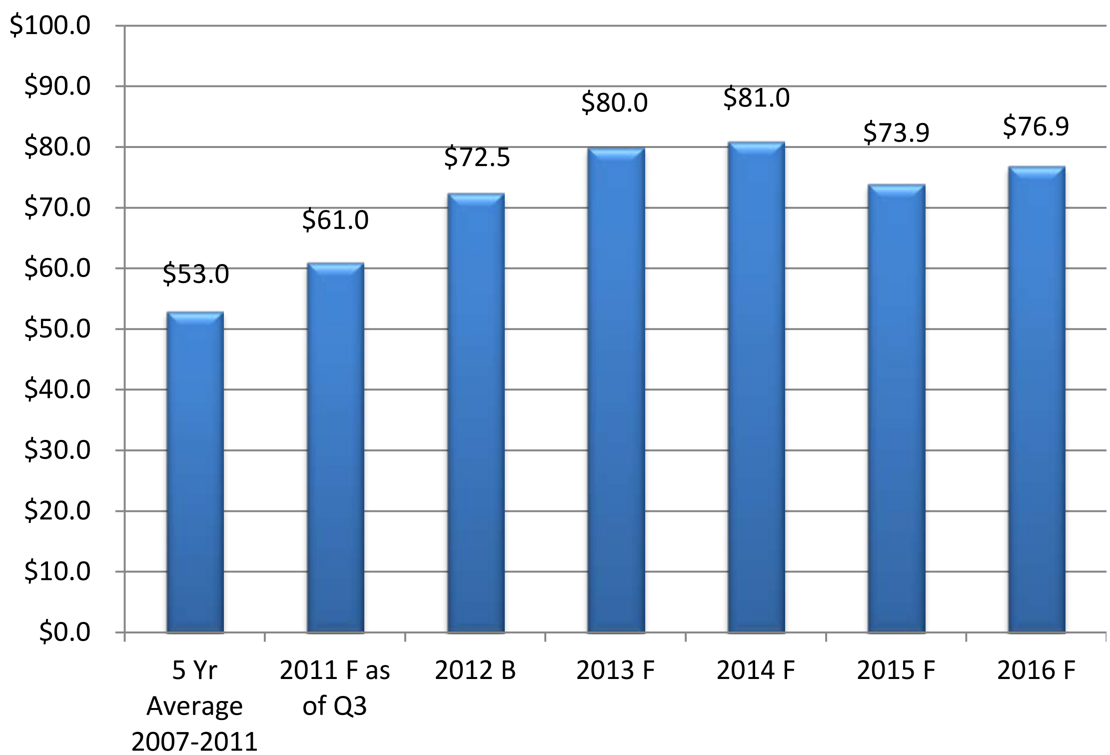
The labour associated with this project will be performed by NSPI personnel at a rate of approximately [redacted] per person day. The material budgets include the transformer along with oil, bushings, radiators, and other dressings necessary to prep the transformer for energization. The contract forecast provides for the crane rental to offload and place the transformer.

6 Distribution

(Millions of Dollars)

6.1 Distribution – Five-year Plan and Highlights

The focus for Distribution capital investments in 2012 continues to reflect growth in the customer base and customer reliability. The $72.5M Distribution capital investment plan for 2012 is comprised of the following:



i	New 2012 capital spending for projects with total estimated project spend greater than $250K and for which approval is sought	$11.9
ii	New 2012 capital spending for projects with total estimated project spend greater than $250K for subsequent approval	$10.7
iii	New capital spending for projects with total estimated spend less than $250K for which approval is not sought	$1.7
iv	Carry-over capital spending	$0.1
v	Routine capital spending	$48
vi	**Total 2012 Distribution capital investment plan**	**$72.5M**
vii	**Request for ACE approval (Items i + v)**	**$59.9M**

6.2 Distribution – Carry-over Capital spending Summary

Table 6.2 Distribution Carry-over Capital Spending

Project Number	CI#	Project Title	Start Date	Final Date	Previous Expenditure	2012 Budget	Subsequent Spending	Total Estimate
Distribution Plant								
D348	40211	2011 3H/6H Replacement Program	2011/06	2012/09	$231,508	$110,711	$0	$342,219
	Total Distribution Plant				**$231,508**	**$110,711**	**$0**	**$342,219**
Total Distribution Carry Over Spending					**$231,508**	**$110,711**	**$0**	**$342,219**

6.3 Distribution – New 2012 Capital Items for ACE Approval

Table 6.3 Distribution – New 2012 Capital items For ACE Approval

Tab #	CI#	Project Title	2012 Budget	Project Total
	Distribution Plant			
D01	41392	2012 Distribution Cutout Replacements	$2,596,796	$2,596,796
D02	41349	2012 Off Road To Roadside	884,869	884,869
D03	41398	2012 Padmount Transformer Replacements	827,340	827,340
D04	41359	79V-402 Feeder Load Reduction	797,378	797,378
D05	41383	2012 Halifax Underground Feeder Replacement	596,760	596,760
D06	41351	2012 Distribution Automation	553,965	553,965
D07	41353	2012 Downline Recloser Additions	543,284	543,284
D08	41355	2012 Remote Communication on Reclosers	536,258	536,258
D09	41339	2012 Distribution Feeder Ties	492,873	492,873
D10	41325	Replacement of 3H and 6H Reclosers	465,327	465,327
D11	41360	82V-423 Hardwood Lands Deteriorated Plant Replacement	437,192	437,192
D12	41389	8H Fairview Conversion	417,695	417,695
D13	41384	2012 Feeder Exit Cable Replacement	374,542	374,542
D14	41338	20H-301 Targeted Feeder Replacement	371,361	371,361
D15	41333	16N-301 Stewiacke Reconductor	353,467	353,467
D16	41327	103W-311 Gold River Reconductor Phase 2	310,296	310,296
D17	41393	2012 Automatic Sleeve Replacements	287,831	287,831
D18	41337	1N-405 Targeted Feeder Replacement	283,892	283,892
D19	41341	1H-Water Street New Feeder	280,657	280,657
D20	41363	88W New Feeder	269,616	269,616
D21	41356	35V-312 Windsor Causeway	252,137	252,137
		Total Distribution Plant	**$11,933,535**	**$11,933,535**
	Total Distribution New Spending		**$11,933,535**	**$11,933,535**

Distribution CIs 1 – 21

CI Number: 41392

Title:	**2012 Distribution Cutout Replacements**
Start Date:	2012/01
Final Cost Date:	2012/12
Function:	Distribution
Forecast Amount:	$2,596,796

DESCRIPTION:

This project provides for the replacement of porcelain cutouts on selected feeders. Feeder sections targeted for 2012 include:

103H-432G, 104H-423G, 18V-413, 3S-303, 82V-422, 103H-434, 113H-434G, 1H-427, 50W-412G, 87W-311, 103H-434G, 113H-443G

Summary of Related CI's +/- 2 years:
2010 38024 Distribution Cutout Replacements $2,000,606
2011 39270 Distribution Cutout Replacements $2,916,035
2013, 2014 CI TBD Distribution Cutout Replacements $TBD

JUSTIFICATION:

Justification Criteria: Distribution System

Sub Criteria: Equipment Replacement

Why do this project?

This work is being undertaken as part of the overall customer reliability improvement investment. The program entails cutout replacements on a prioritized feeder basis, as required, to improve customer reliability. Porcelain cutout insulators develop hairline cracks with age. Moisture present further expands the cracks during the freeze/thaw cycle, eventually causing device failures. Cut-out failures account for the majority of all device failure outages, accounting for an average of 64,000 customer interruptions and 130,000 customer hours of interruption annually.

Why do this project now?

Cut-out replacements performed to date have resulted in improved reliability and reduced failure rates, which can be further reduced by continued replacements. Approximately 28,500 customer hours of interruption are expected to be saved on an annual basis from the feeders targeted in 2012.

Why do this project this way?

It has been determined that the best approach to reduce outages, caused by cutout failures, is to prioritize feeders as opposed to targeting specific cutout replacements across a number of feeders.

A portion of the labour for this project is being sourced through NSPI's existing Power Line Technician (PLT) Service Agreement with EUS. This is aligned with NSPI's workforce planning model which is designed to optimize the allocation and execution of PLT resources among work requirements.

CI Number : 41392 - 2012 Distribution Cutout Replacements **Project Number**

Parent CI Number : -

Cost Centre : 800 - 800-Services - Admin. **Budget Version** 2012 ACE Plan

Capital Item Accounts

Acct	Actv	Account	Activity	Forecast Amount	Amount	Variance
092		092-Vehicle T&D Reg. Labour AO		53,966	0	53,966
094		094 - Interest Capitalized		56,245	0	56,245
095		095-COPS Regular Labour AO		82,212	0	82,212
095		095-COPS Contracts AO		363,266	0	363,266
001	040	001 - T&D Regular Labour	040 - DP - O/H Cond.Devices	36,435	0	36,435
002	040	002 - T&D Overtime Labour	040 - DP - O/H Cond.Devices	0	0	0
012	040	012 - Materials	040 - DP - O/H Cond.Devices	386,152	0	386,152
013	040	013 - COPS Contracts	040 - DP - O/H Cond.Devices	1,548,450	0	1,548,450
001	085	001 - T&D Regular Labour	085 Design	70,070	0	70,070
002	085	002 - T&D Overtime Labour	085 Design	0	0	0
			Total Cost:	2,596,796	0	2,596,796
			Original Cost:	835,570		

CI 41392 2012 Distribution Cutout Replacement

The following is a breakdown of costs associated with the 2012 Distribution Cutout Replacements project:

Administrative Overhead and Interest	$ 555,689
Materials	$ 386,152
Contracts	$ 1,548,450
COPS Labour	$ 106,505
Total	$ 2,596,796

The Materials forecast amounts are for polymer cutouts and fuses and were estimated based on similar projects. The majority of the work associated with this project is expected to be sourced through NSPI's existing Power Line Technician (PLT) contract with Emera Utility Services, at a rate of approximately [redacted] per compatible unit hour. The COPS Labour forecast provides for fuse coordination studies associated with the cutout replacements and internal power line technician labour budgeted at approximately [redacted] per person day.

2012 Distribution Cutout Replacements

Assumptions:

i **5.50%** Percent of customers affected by average cutout failure. Based on 2007 to 2010 cutout failure outages

ii **3.75** Average number of annual cutout failures per feeder. Based on 2007 to 2009 cutout failure outages

iii **2.83** Average duration of cutout failures outages. Based on 2007 to 2010 cutout failure outages

iv **75%** Percent improvement realised through cutout replacement

		a	b	c	d	e
Year	**Feeder Section**	**Down-Line Customers**	**Average CI (a x i)**	**Annual CI (b x ii)**	**Annual CHI (c x iii)**	**ACHI (d x iv)**
2012	103H-432G	2,016	111	416	1,177	883
2012	103H-434	3,421	188	706	1,997	1,498
2012	103H-434G	3,411	188	704	1,991	1,493
2012	104H-412	2,189	120	451	1,278	958
2012	104H-413G	2,272	125	469	1,326	995
2012	104H-421	2,885	159	595	1,684	1,263
2012	104H-423G	2,807	154	579	1,638	1,229
2012	113H-434G	2,997	165	618	1,749	1,312
2012	113H-443G	2,131	117	440	1,244	933
2012	113H-444	3,001	165	619	1,752	1,314
2012	137H-412	2,614	144	539	1,526	1,144
2012	16W-301	1,836	101	379	1,072	804
2012	18V-413	1,679	92	346	980	735
2012	1H-427	2,344	129	483	1,368	1,026
2012	22N-402G	2,344	129	483	1,368	1,026
2012	23H-302G	2,661	146	549	1,553	1,165
2012	2H-411	2,400	132	495	1,401	1,051
2012	3S-303	1,745	96	360	1,019	764
2012	50W-412G	2,916	160	601	1,702	1,277
2012	50W-412GA	2,016	111	416	1,177	883
2012	58C-405	1,495	82	308	873	654
2012	67C-412	1,431	79	295	835	626
2012	73W-411G	2,733	150	564	1,595	1,196
2012	82V-422	2,133	117	440	1,245	934
2012	87W-311	1,684	93	347	983	737
2012	88H-401	1,596	88	329	932	699
2012	88H-402	1,497	82	309	874	655
2012	88W-312	1,919	106	396	1,120	840
2012	93V-311	1,134	62	234	662	496
		65,307	**3,592**	**13,470**	**38,119**	**28,589**

CI Number: 41349

Title: **2012 Off Road To Roadside**

Start Date: 2012/04
Final Cost Date: 2012/12
Function: Distribution
Forecast Amount: $884,869

DESCRIPTION:

This project is planned to relocate approximately 25 km of distribution line from off road to the roadside in various locations throughout the province. The following locations are included in the scope for this project:

607N- 301 G Advocate Hospital - 750m
73W-41 1 Upper Branch Rd/Wagner Rd - 3.15 km
57C-426 Country Harbour Phase 3 - 1.5 km
58C-405 Margaree Forks - 4.5 km
100C- 21 Cape Porcupine Phase 2 - 3 km 590C-300 Route 4 - 5 km
57C-426 Goldboro Phase 4 - 5 km 4C-432 St. Andrews - 2 km

Summary of Related CI's +/- 2 years:
2010 Off Road to Roadside CI# 38062 - $1,000,119
2011 Off Road to Roadside CI# 40227 - $2,500,000
2013, 2014 CI TBD Off Road to Roadside $TBD

JUSTIFICATION:

Justification Criteria: Distribution System

Sub Criteria: Outage Performance

Why do this project?

This project will provide improved access to distribution circuits which are currently located in off road right of ways. Providing easier access to the distribution lines will reduce the time to identify the location of the fault during outage events improving the reliability of these feeder sections. Having the distribution line road side also makes the regular maintenance activities more cost effective.

Why do this project now?

Moving lines to the roadside will increase the reliability of the system.

Why do this project this way?

Relocating off road sections to the road side improves access to the distribution plant and reduces the restoration time during outage events.

The labour portion for this project is being sourced through NSPI's existing Power Line Technician (PLT) Service Agreement with EUS. This is aligned with NSPI's workforce planning model which is designed to optimize the allocation and execution of PLT resources among work requirements.

CI Number : 41349 - 2012 Off Road To Roadside **Project Number**

Parent CI Number : -

Cost Centre : 800 - 800-Services - Admin. **Budget Version** 2012 ACE Plan

Capital Item Accounts

Acct	Actv	Account	Activity	Forecast Amount	Amount	Variance
092		092-Vehicle T&D Reg. Labour AO		11,431	0	11,431
094		094 - Interest Capitalized		12,778	0	12,778
095		095-COPS Regular Labour AO		17,414	0	17,414
095		095-COPS Contracts AO		129,443	0	129,443
095		095-Thermal Regular Labour AO		565	0	565
013	002	013 - COPS Contracts	002 - DP - Land Rights	[redacted]	0	[redacted]
012	035	012 - Materials	035 - DP - Wood Poles	130,666	0	130,666
013	035	013 - COPS Contracts	035 - DP - Wood Poles	[redacted]	0	[redacted]
013	039	013 - COPS Contracts	039 - DP - O/H Cond.	[redacted]	0	[redacted]
012	040	012 - Materials	040 - DP - O/H Cond.Devices	3,221	0	3,221
013	040	013 - COPS Contracts	040 - DP - O/H Cond.Devices	[redacted]	0	[redacted]
001	085	001 - Regular Labour (No AO)	085 Design	2,678	0	2,678
001	085	001 - THERMAL Regular Labour	085 Design	2,352	0	2,352
001	087	001 - T&D Regular Labour	087 Field Super.& Ops.	22,560	0	22,560
			Total Cost:	884,869	0	884,869
			Original Cost:	93,123		

CI 41349 Off Road to Roadside

The following is a breakdown of costs associated with the Off Road to Roadside project:

Administrative Overhead and Interest	$ 171,631
Materials	$ 133,887
Contracts	$ 551,761
COPS Labour	$ 27,590
Total	$ 884,869

The work associated with this project is expected to be sourced through NSPI's existing Power Line Technician (PLT) contract with Emera Utility Services, at a rate of approximately [redacted] per compatible unit hour. Other contract costs include the use of backhoe and traffic control. Easements and tree trimming required for this project are obtained on a per site basis. Materials for this job are standard stock items with no special orders or long lead items required. NSPI resources will be required for site supervision.

CI Number: 41398

Title: **2012 Padmount Transformer Replacements**

Start Date: 2012/02
Final Cost Date: 2012/12
Function: Distribution
Forecast Amount: $827,340

DESCRIPTION:

This project is required to replace 37 to 40 padmounted transformers across the province. Regular inspections have identified padmounted transformers which are deteriorating such that they require replacement. These transformers will be replaced in a planned manner to avoid environmental incidents associated with transformer oil tank failure.

Summary of Related CI's +/- 2 years:
No projects in 2010, 2011, 2013 and 2014

JUSTIFICATION:

Justification Criteria: Environment

Sub Criteria: Equipment Replacement

Why do this project?

The failure of a padmounted transformer typically results in an environmental oil spill which can be very costly to clean up. Environmental regulations prohibit the release of mineral oil into the environment. Padmount transformer inspections have identified transformers that need to be replaced next year due to deterioration.

Why do this project now?

These transformers were identified and prioritized as part of the padmount inspection process. They will be replaced in a planned manner as part of NSPI's environmental due diligence.

Why do this project this way?

The replacement of these transformers will minimize customer outages and remove the environmental risk posed by these transformers. The removed transformers will be evaluated for refurbishment. Starting in 2012 all padmount units will be made of stainless steel which is estimated to increase their operating life from 25-30 to greater than 40 years.

CI Number : 41398 - 2012 Padmount Transformer Replacements **Project Number**

Parent CI Number : -

Cost Centre : 800 - 800-Services - Admin. **Budget Version** 2012 ACE Plan

Capital Item Accounts

Acct	Actv	Account	Activity	Forecast Amount	Amount	Variance
092		092-Vehicle T&D Reg. Labour AO		21,341	0	21,341
094		094 - Interest Capitalized		25,618	0	25,618
095		095-COPS Regular Labour AO		32,511	0	32,511
095		095-Thermal Regular Labour AO		4,017	0	4,017
095		095-COPS Contracts AO		5,478	0	5,478
013	039	013 - COPS Contracts	039 - DP - O/H Cond.	[redacted]	0	[redacted]
001	046	001 - T&D Regular Labour	046 - DP - U/G Conductor	3,343	0	3,343
012	046	012 - Materials	046 - DP - U/G Conductor	13,000	0	13,000
001	047	001 - T&D Regular Labour	047 - DP - U/G Conductor Devices	1,671	0	1,671
002	047	002 - T&D Overtime Labour	047 - DP - U/G Conductor Devices	0	0	0
012	047	012 - Materials	047 - DP - U/G Conductor Devices	5,000	0	5,000
001	048	001 - T&D Regular Labour	048 - DP - U/G Line Transf.	37,104	0	37,104
002	048	002 - T&D Overtime Labour	048 - DP - U/G Line Transf.	0	0	0
012	048	012 - Materials	048 - DP - U/G Line Transf.	638,176	0	638,176
013	048	013 - COPS Contracts	048 - DP - U/G Line Transf.	[redacted]	0	[redacted]
001	085	001 - THERMAL Regular Labour	085 Design	16,731	0	16,731
002	085	002 - T&D Overtime Labour	085 Design	0	0	0
			Total Cost:	827,340	0	827,340
			Original Cost:	417,246		

CI 41398 Padmount Transformer Replacement

The following is a breakdown of costs associated with the padmount transformer replacement project.

Administrative Overhead and Interest	$ 88,965
Materials	$ 656,176
Contracts	$ 23,350
COPS Labour	$ 58,849
Total	$ 827,340

The labour associated with this project will be performed by NSPI personnel at a rate of approximately [redacted] per person day. The material costs are budgeted based on estimated per-unit costs from previous projects. Traffic control and crane usage forecasted costs are reflected in the Contracts account.

CI Number: 41359

Title: **79V-402 Feeder Load Reduction**

Start Date: 2012/02
Final Cost Date: 2012/09
Function: Distribution
Forecast Amount: $797,378

DESCRIPTION:

This project provides for the addition of two phases of 336 ASC conductor for 1600 m on the Sangster Bridge Rd and the installation of three 500 kVA stepdown transformers at Sangster Bridge in order to offload 35V-312 and 79V-402. Also included is the double-circuiting of 800 m of three phase 25 kV distribution line along King St in Windsor in order to transfer additional load from 79V-402 to 79V-403 feeder.

Summary of Related CI's +/- 2 years:
No projects in 2010, 2011, 2013 and 2014

JUSTIFICATION:

Justification Criteria: Distribution System

Sub Criteria: Overloaded Equipment

Why do this project?

This project is required to relieve an existing overload condition on feeder 79V-402. The load on feeder 79V-402 exceeds NSPI's 325 amp feeder overload criteria. Load relief is required to maintain service voltage levels and to maintain reliability.

Why do this project now?

The load on 79V-402 exceeded NSPI's 325 amp feeder overload criteria in January 2011. There are no anticipated reductions in customer loads on feeder 79V-402 and currently there is no availability to transfer some load to another source, given the existing feeder configuration. Load relief is required as soon as practicable.

Why do this project this way?

Installation of a new stepdown transformer and construction of double circuit line on King St is the least cost alternative, as detailed in the attached Distribution Planning Study 280-0611-H47. The new configuration will also result in a reduction in distribution system losses of approximately170 kW.

The labour for this project will be sourced through NSPI's existing Power Line Technician (PLT) Service Agreement with EUS. This is aligned with NSPI's workforce planning model which is designed to optimize the allocation and execution of PLT resources among work requirements.

CI Number : 41359 - 79V-402 Feeder Load Reduction **Project Number**

Parent CI Number : -

Cost Centre : 800 - 800-Services - Admin. **Budget Version** 2012 ACE Plan

Capital Item Accounts

Acct	Actv	Account	Activity	Forecast Amount	Amount	Variance
092		092-Vehicle T&D Reg. Labour AO		24,041	0	24,041
094		094 - Interest Capitalized		4,749	0	4,749
095		095-COPS Contracts AO		104,081	0	104,081
095		095-COPS Regular Labour AO		36,624	0	36,624
012	035	012 - Materials	035 - DP - Wood Poles	69,000	0	69,000
013	035	013 - COPS Contracts	035 - DP - Wood Poles	[redacted]	0	[redacted]
012	039	012 - Materials	039 - DP - O/H Cond.	16,100	0	16,100
013	039	013 - COPS Contracts	039 - DP - O/H Cond.	[redacted]	0	[redacted]
012	040	012 - Materials	040 - DP - O/H Cond.Devices	4,000	0	4,000
013	040	013 - COPS Contracts	040 - DP - O/H Cond.Devices	[redacted]	0	[redacted]
013	041	013 - COPS Contracts	041 - DP - O/H Line Transf.	[redacted]	0	[redacted]
012	044	012 - Materials	044 - DP - Substn.Transf.	45,000	0	45,000
013	044	013 - COPS Contracts	044 - DP - Substn.Transf.	[redacted]	0	[redacted]
013	050	013 - COPS Contracts	050 - DP - Street Lights	[redacted]	0	[redacted]
013	052	013 - COPS Contracts	052 - DP - Services	[redacted]	0	[redacted]
001	085	001 - Regular Labour (No AO)	085 Design	2,682	0	2,682
001	087	001 - T&D Regular Labour	087 Field Super.& Ops.	47,446	0	47,446
			Total Cost:	797,378	0	797,378
			Original Cost:	98,257		

CI 41359 79V-402 Feeder Load Reduction

The following is a breakdown of costs associated with the 79V-402 Load Reduction project:

Administrative Overhead and Interest	$ 169,496
Materials	$ 134,100
Contracts	$ 443,654
COPS Labour	$ 50,128
Total	$ 797,378

The work associated with this project is expected to be sourced through NSPI's existing Power Line Technician (PLT) contract with Emera Utility Services, at a rate of approximately [redacted] per compatible unit hour. NSPI resources will be required for site supervision.

The materials forecast for this project include new stepdown transformers, poles, cutouts, switches conductor and insulators.

This item provides for the removal of 21 poles and the installation of 21 new double-circuit poles and 336 ASC conductor along King St in Windsor so that 79V-403 can pick up some of the load currently supplied by 79V-402. In addition, 25 spans of two-phase 336 ASC conductor will be installed along the Sangster Bridge Rd and a 3x500 kVA platform-mounted stepdown transformer will be installed at the Sangster Bridge in order to transfer load at the end of feeder 35V-312 to 79V-403, further offloading 79V-402.

CI Number: 41383

Title: **2012 Halifax Underground Feeder Replacement**

Start Date: 2012/02
Final Cost Date: 2012/11
Function: Distribution
Forecast Amount: $596,760

DESCRIPTION:

This project is required to replace 2.9 km of 3 phase, 25kV underground cable between 1 H Water Street Substation and Art Gallery Vault (feeder 1H-431) and a section of underground cable between Art Gallery Vault and Sheraton Hotel Vault (feeder 1H-419).

Summary of Related CI's +/- 2 years:
2010 38903 Halifax UG Cable Replacement 1H-403 & 405 - $473,599
2011 40220 Halifax Underground Cable Replacement - $418,861
2013 CI TBD Halifax Underground Cable Replacement $TBD

JUSTIFICATION:

Justification Criteria: Distribution System

Sub Criteria: Deteriorated Conductor

Why do this project?

This work is being undertaken as part of the overall customer reliability improvement investment. This is year three of a five year (2010-2014) plan to improve reliability to NSPI's customers. This project is required to replace deteriorated underground 25 kV cables and accessories in downtown Halifax.

Why do this project now?

This project is part of a plan to begin replacing cables installed 35 years ago, which have now reached the end of their useful life. The 1H-431 feeder services a number of large customers in the downtown core area of Halifax such as Maritime Center, Ralston Building, Summit Place, Radisson Hotel, Bedford Row, Public Works Canada, Bank of NS, Maritime Museum as well as a number of large residential buildings.

Why do this project this way?

Due to the age of the underground cables, a five year (2010-2014) replacement plan (Attachment 1) was developed and is being implemented. This is the most cost effective option to replace these assets.

CI Number : 41383 - 2012 Halifax Underground Feeder Replacement **Project Number**

Parent CI Number : -

Cost Centre : 800 - 800-Services - Admin. **Budget Version** 2012 ACE Plan

Capital Item Accounts

Acct	Actv	Account	Activity	Forecast Amount	Amount	Variance
092		092-Vehicle T&D Reg. Labour AO		76,262	0	76,262
094		094 - Interest Capitalized		10,731	0	10,731
095		095-COPS Regular Labour AO		116,177	0	116,177
095		095-Thermal Regular Labour AO		642	0	642
095		095-COPS Contracts AO		6,334	0	6,334
001	046	001 - T&D Regular Labour	046 - DP - U/G Conductor	132,037	0	132,037
002	046	002 - T&D Overtime Labour	046 - DP - U/G Conductor	0	0	0
012	046	012 - Materials	046 - DP - U/G Conductor	190,000	0	190,000
013	046	013 - COPS Contracts	046 - DP - U/G Conductor	27,000	0	27,000
001	047	001 - T&D Regular Labour	047 - DP - U/G Conductor Devices	1,671	0	1,671
012	047	012 - Materials	047 - DP - U/G Conductor Devices	12,383	0	12,383
001	085	001 - THERMAL Regular Labour	085 Design	2,674	0	2,674
001	085	001 - Regular Labour (No AO)	085 Design	4,048	0	4,048
002	085	002 - T&D Overtime Labour	085 Design	0	0	0
001	087	001 - T&D Regular Labour	087 Field Super.& Ops.	16,800	0	16,800
002	087	002 - T&D Overtime Labour	087 Field Super.& Ops.	0	0	0
			Total Cost:	596,760	0	596,760
			Original Cost:	118,260		

CI 41383 - 2012 Halifax UG Feeder Cable Replacement

The following is a breakdown of costs associated with the 2012 Halifax UG feeder cable Replacement project, year:

Administrative Overhead and Interest	$ 210,146
Labour	$ 157,230
Materials	$ 202,383
Contracts	$ 27,000
Total	$ 596,759

This project will be completed by NSPI personnel at a rate of approximately [redacted] per person day. The material costs are based on estimated per-unit costs of the previous year's projects. Contract costs include traffic control and crane usage.

PROJECT DESCRIPTION

Halifax Feeder Cable Replacement 2012

Year 3 of 5

[redacted]

June 14, 2011

Table of Contents

1.0 Summary

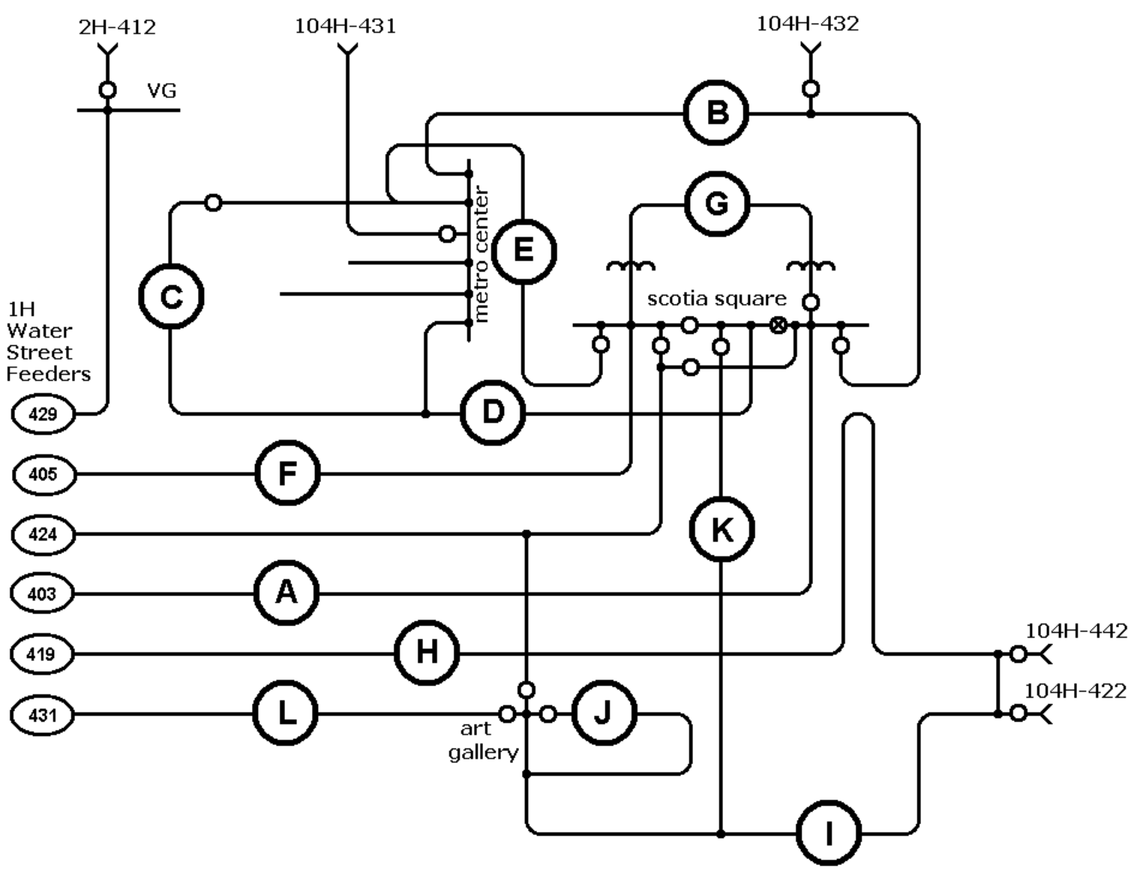
This project is a part of the five year plan to replace deteriorated underground 25kV cables and accessories in the Halifax Underground System. Cables installed in the early 1970's have now reached the end of their useful life estimated to be 35 years.

The Halifax underground system has been inventoried and studied in detail in the "Distribution Capital Investment Report Halifax 25 kV Underground System" by [redacted] This report recommends that the replacement project be carried out over the next 5 years and the required expenditures have been prioritized. This report has considered the age of plant, the loading of the system from PI data and the reliability to customers connected to the underground system. Consideration has been given to prolonging cable life by injection of chemicals into existing cables.

2.0 Overview of the Five Year Plan

Year 1, 2 and 3 – replace radial sections of the feeders 1H-403, 405, 419 and 431
Year 4 and 5 – replace loops and ties of the feeders 1H-403, 405 and 419

Fig.1 Feeder Sections for Replacement



2010

Section A: 1H-403 – radial section between 1H and 28H-416 Scotia Square (1,400 m)

Section F: 1H-405 – radial section between 1H and 28H-417 Scotia Square (1,440 m)

Old cable removals: Three out of service feeders 1H-243, 1H-246 and 1H-247 are to be removed between 1H and MH46 on Granville St (1000 m)

2011

Section H: 1H-419 - radial section between 1H and L431-401 Proctor St. (2,140 m)

Section I: 1H-419 – first half of the radial section between L431-404 and L431-211 Art Gallery Vault (645 m)

2012

Section L: 1H-431 – radial section between 1H and Art Gallery Vault (2,230 m)

Section I: 1H-419 – second half of the radial section between L431-404 and L431-211 Art Gallery Vault (645 m)

2013

Section B: 1H-403 – North Loop from 28H-410 to L431-229 Metro Center (2,240 m)

Section C: 1H-403 – Metro Center Loop from L431-230 to L431-232 (1,700 m)

2014

Section D: 1H-403 – Scotia Square 28H-415 to Grand Parade Vault (380 m)

Section E: 1H-403 – Scotia Square 28H-411 to Metro Center L431-230 (410 m)

Section G: 1H-405 – 23kV loop (1,900 m)

Section K: 1H-419 – Tie to Scotia Square (240 m)

3.0 2012 Plan

Step 1 – Replace feeder 1H-431 between 1H and Art Gallery Vault (Section L) – 2,230 meters.

This feeder section will include the following route:
1H, MH2, MH3, MH60, Riser on Hollis/Morris St
Riser on Hollis St (btw Morris&Bishop), MH59, MH58, MH57, MH148, Ralston vault, MH57, MH7, Keith's Brewery vault, MH7, Harbour Walk vault, MH7, MH8, Summit Place vault, MH89, MH49, MH51, Founder's Square vault, MH51, MH52, Bedford Row vault, MH52, MH53, Public Works Canada building vault, MH53, MH12, MH88, Maritime Museum vault, MH88, MH12, MH13, MH56, Art Gallery Vault.

Step 2 – 1H-419 – second half (645m) of the radial section between Proctor Street and Art Gallery Vault (Section I) - 1,290m.

The feeder will be replaced between switches L431-258 and L431-211 Art Gallery Vault
The route will include:
Sheraton vault, MH19, MH18, MH22, MH18, MH16, MH14, 1801 Hollis St vault, MH14, MH13, MH56, Art Gallery vault.

4.0 Labor

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

5.0 Materials

Table 5.1
Per unit cost of materials:

#	Description	NSPI Code	$$
1	Primary cable 750 kcmil Al, 28 kV	113418	$20/m
2	Basic Shielded Elbow 25 kV	114627	$76.87/ea
3	Cable Adapter #750, Compact	137137	$15.84/ea
4	Connecting Plug 25 kV	116390	$79.26/ea
5	Basic Insulating Plug	122317	$46.29/ea
6	Conductor Contact, #750 Compact	156260	$33.17/ea
7	Constant Force Spring	114624	$13.56/ea
8	Braid Flexible Tinned	124141	$7.98 /ft
9	Arm, Cable support 10"	157934	$23/ea
10	Arm, Cable support 14"	157935	$26/ea
11	Termination Kit. (above items 2, 3, 5, 6)	N/A	$132/ea
12	Grounding Kit for LC shield cable	N/A	$46/ea

Table 5.2
Schedule of materials for one three phase separable deadfront cable-to-cable connection:

#	Description	NSPI Code	QTY
1	Termination Kit (see Table 5.1 for details)	N/A	6
2	Connecting Plug 25 kV	116390	3
3	Grounding Kit for LC shield cable	N/A	6

Table 5.3
Schedule of materials for one three phase deadfront switch-to-cable connection:

#	Description	NSPI Code	QTY
1	Termination Kit (see Table 5.1 for details)	N/A	3
2	Grounding Kit for LC shield cable	N/A	3

The materials for this project will be ordered based on the following considerations:

a. Ten percent is added to known cable length for making terminations and waste.
b. Sixteen (16) three phase cable-to-cable splices are required
c. Fourteen (14) three phase cable-to-equipment connections are required
d. Each underground manhole or vault will require two cable support brackets per feeder. There are two bracket sizes: 10 inches and 14 inches. A 10 inch bracket will hold 3 cables; 14 inch bracket will hold either three cables or three T-splices.

Table 5.4
Materials to be ordered in October - November 2011

#	Description	NSPI Code	QTY
1	Cable XLPE, LC shield, #750, aluminum	113418	9,500 m
2	Termination Kit (see Table 5.1 for details)	N/A	138
3	Connecting Plug 25 kV	116390	48
4	Grounding Kit for LC shield cable	N/A	138
5	Multi-mount cable support bracket, Underground Devices Inc, 14 inch, MM14	157935	56

DISTRIBUTION CAPITAL INVESTMENT REPORT
HALIFAX 25 kV UNDERGROUND SYSTEM

Draft
October 05, 2009

TABLE OF CONTENTS

1.0 SUMMARY

Objective
The purpose of this report is to identify the requirements necessary to perform the cable replacement program in Downtown Halifax.

Scope
The scope of the report is limited to 25 kV feeders interconnected around the pole-free area of Downtown Halifax. The main components of the report are: overview of the present system configuration, review of the historic load check, cable inventory and categorization, review of manhole configurations and availability of spare ducts, basic feeder contingency assessment, system improvement proposals, budgeting and timelines. The existing 4 kV underground distribution system, substation contingencies and justifications for new feeder(s) are not covered in the report.

Recommendations
This report recommends that the replacement project be carried out over the next 5 years. The required expenditures have been prioritized. This report has considered the age of plant, the loading of the system from PI data and the reliability to customers connected to the underground system. Consideration has been given to prolonging cable life by injection of chemicals into existing cables.

Also, the report recommends two system improvement options that are necessary to improve the existing switching flexibility by establishing two new tie links. These changes should be made prior to the cable replacement program.

2.0 PRESENT SYSTEM CONFIGURATION

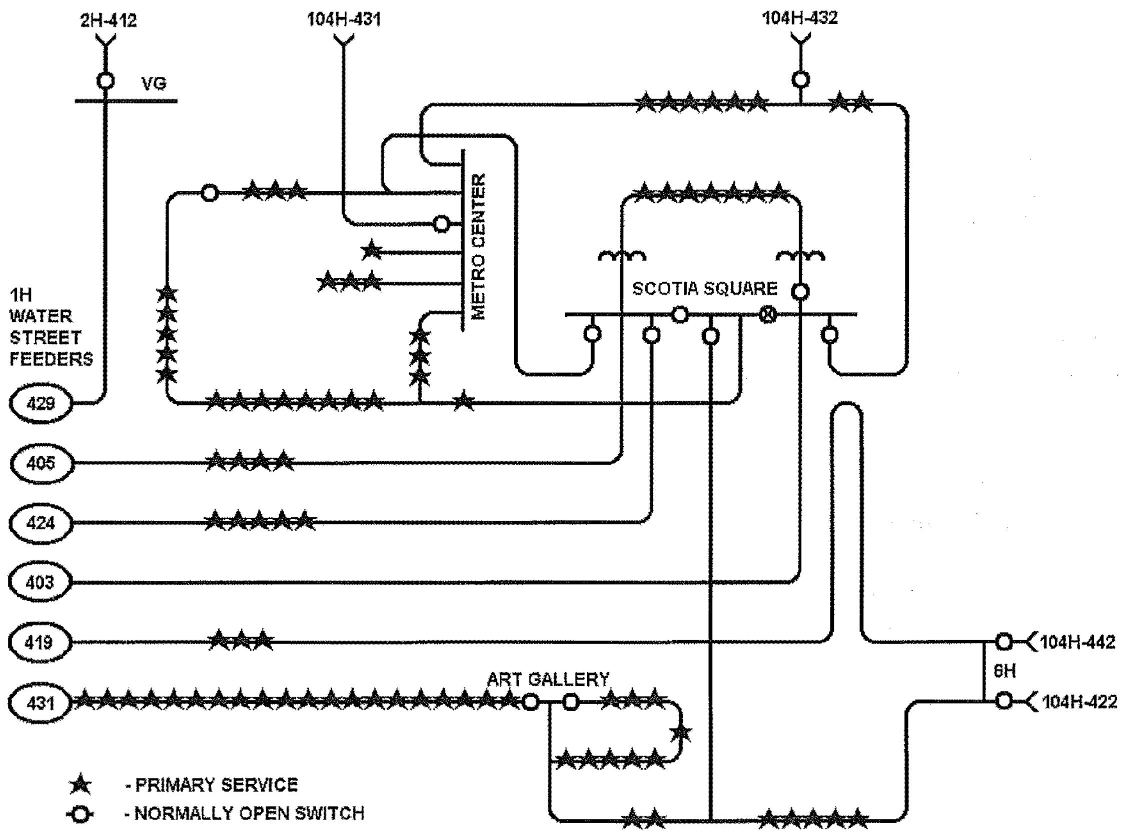


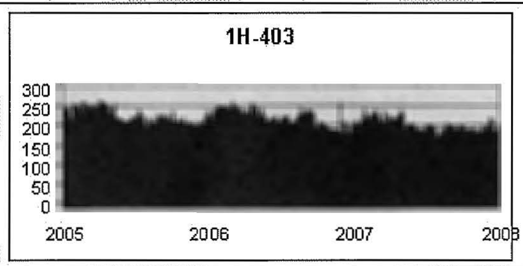
Fig. 2.1 Simplified Feeder Diagram

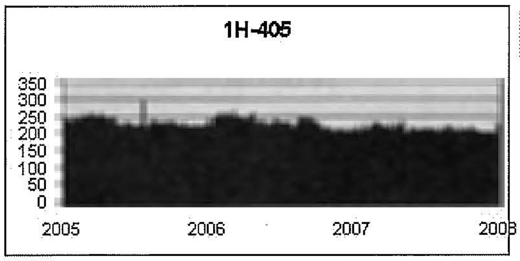
The diagram on Fig. 2.1 is a simplified combination of an electrical single line diagram and a geographical layout of the Halifax UD system. For simplicity, only open points are shown (except for the one at Scotia Square).

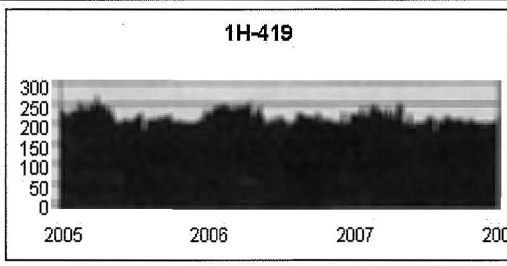
2.1 UNDERGROUND FEEDER PROFILES

The feeder profiles below describe each of the six underground feeders in a uniform format that will allow for easy comparison and quick reference further in the report. The underground feeders are: 1H-403, 1H-405, 1H-419, 1H-424, 1H-429 and 1H-431

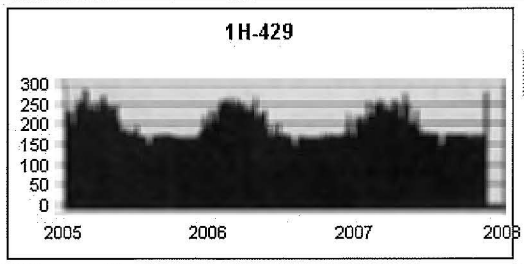
1 of 6

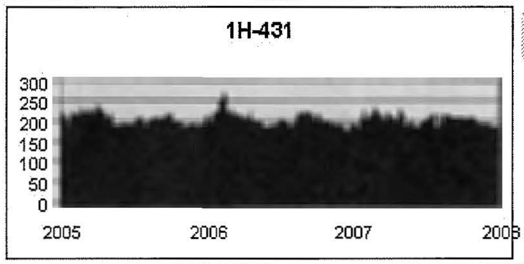
<table>
<tr><th colspan="4">1H-403 FEEDER PROFILE</th></tr>
<tr><th colspan="4">Scotia Square / Metro Center</th></tr>
<tr><td>Total feeder length (including services)</td><td colspan="3">7.8 km</td></tr>
<tr><td>Built</td><td colspan="3">1970's</td></tr>
<tr><td>Route</td><td colspan="3">Water, Sackville, Granville, Duke, 28H, Barrington, Agryle, Grafton, Market, Brunswick, Cogswell.</td></tr>
<tr><td>Installed MVA</td><td colspan="3">23</td></tr>
<tr><td>Interties with feeders</td><td colspan="3">1H-405, 1H-419, 104H-432, 104H-431</td></tr>
<tr><td>Loops</td><td colspan="3">Two</td></tr>
<tr><td>Stepdowns</td><td colspan="3">689H</td></tr>
<tr><td>Primary services</td><td colspan="3">CS431-048, 170, 139, 197, 184, 185, 198, 487, 510, 428, 036, 429, 637, 531, 430, 150, 227, 211, 162, 154, 001, 182, 270, 426, 046, 144, 143, 265, 216, 244, 573, 402</td></tr>
<tr><td>Load profile for the last 3 years ending June 1, 2008.</td><td colspan="3">
</td></tr>
<tr><td></td><td colspan="3"></td></tr>
<tr><td rowspan="12">Underground Cable</td><td>Part of feeder</td><td>Conductor size [kcmil],[AWG]</td><td>Length, 3ph [m]</td></tr>
<tr><td>Main radial</td><td>750</td><td>1780</td></tr>
<tr><td rowspan="3">Loops</td><td>750</td><td>2240</td></tr>
<tr><td>500</td><td>180</td></tr>
<tr><td>350</td><td>1550</td></tr>
<tr><td rowspan="2">Ties</td><td>750</td><td>230</td></tr>
<tr><td>500</td><td>180</td></tr>
<tr><td rowspan="5">Primary services</td><td>750</td><td>90</td></tr>
<tr><td>350</td><td>100</td></tr>
<tr><td>3/0</td><td>1110</td></tr>
<tr><td>1/0</td><td>470</td></tr>
<tr><td>#1</td><td>100</td></tr>
</table>

1H-405 FEEDER PROFILE			
Scotia Square			
Total feeder length (including services)	3.8 km		
Built	1970's		
Route	Water, Sackville, Granville, Duke, Scotia Square, Market, Cogswell		
Installed MVA	14 (approx.)		
Interties with feeders	1H-403, 1H-424		
Loops	One		
Stepdowns	28H-T26		
Primary services	CS431-007, 427, 005, 012, 507, 508, 481, 506		
Load profile for the last 3 years ending June 1, 2008.			
Underground Cable	Part of feeder	Conductor size [kcmil],[AWG]	Length, 3ph [m]
	Main radial	750	1470
	23 kV loop	750	160
		350	1380
		4/0	180
		#1	340
	Primary services	3/0	170
		#1	10

1H-419 FEEDER PROFILE			
Joseph Howe Bldg./ Proctor Street			
Total feeder length (including services)	5.4 km		
Built	1970's		
Route	Water, Sackville, Granville, Duke, 28H, Hollis, 6H, Upper Water		
Installed MVA	14		
Interties with feeders	1H-403, 1H-431, 104H-422, 104H-442		
Loops	One		
Stepdowns	622H		
Primary services	CS431-351, 138, 196, 053, 268, 183, 272, 140, 004, 142, 047, 279, 011, 141, 169		
Load profile for the last 3 years ending June 1, 2008.			
Underground Cable	Part of feeder	Conductor size [kcmil],[AWG]	Length, 3ph [m]
	Main radial	750	2140
	Loop	750	1290
		4/0	490
		3/0	640
	Tie	750	240
	Primary services	750	30
		3/0	100
		#1	50

1H-424 FEEDER PROFILE			
Water Street/Scotia Square			
Total feeder length (including services)	2.0 km		
Built	2003		
Route	Water, Granville, Duke, 28H		
Installed MVA	3.9		
Interties with feeders	1H-405		
Loops	N/A		
Stepdowns	N/A		
Primary services	CS431-516, 493, 247, 485, 566, 567		
Load profile	No Load Profile Available		
Underground Cable	Part of feeder	Conductor size [kcmil],[AWG]	Length, 3ph [m]
	Main radial	750	1600
	Primary services	350	270
		3/0	350
		#1	150

1H-429 FEEDER PROFILE			
V.G. Hospital			
Total feeder length (including services)	2.2 km		
Built	1990's		
Route	Water, Morris, 10H		
Installed MVA	11.2		
Interties with feeders	2H-412		
Loops	N/A		
Stepdowns	10H-T1 VG - North Bus		
Primary services	N/A		
Load profile for the last 3 years ending June 1, 2008.			
Underground Cable	Part of feeder	Conductor size [kcmil],[AWG]	Length, 3ph [m]
	Main radial	750	2200

<table>
<tr><th colspan="4">1H-431 FEEDER PROFILE</th></tr>
<tr><th colspan="4">Downtown U/G</th></tr>
<tr><td>Total feeder length (including services)</td><td colspan="3">3.9 km</td></tr>
<tr><td>Built</td><td colspan="3">1970’s</td></tr>
<tr><td>Route</td><td colspan="3">Morris, Hollis, Salter, Water, Bedford Row, Prince</td></tr>
<tr><td>Installed MVA</td><td colspan="3">17.5</td></tr>
<tr><td>Interties with feeders</td><td colspan="3">1H-419, 1H-415(o/h), 1H-427(o/h)</td></tr>
<tr><td>Loops</td><td colspan="3">N/A</td></tr>
<tr><td>Stepdowns</td><td colspan="3">610H Bedford Row</td></tr>
<tr><td>Primary services</td><td colspan="3">CS431-205, 345, 554, 002, 497, 498, 148, 580, 674, 165, 049, 261, 217, 220, 271, 401, 608, 450, 054</td></tr>
<tr><td>Load profile for the last 3 years ending June 1, 2008.</td><td colspan="3">
</td></tr>
<tr><td></td><td colspan="3"></td></tr>
<tr><td rowspan="4">Underground Cable</td><td>Part of feeder</td><td>Conductor size [kcmil],[AWG]</td><td>Length, 3ph [m]</td></tr>
<tr><td>Main radial</td><td>750</td><td>2130</td></tr>
<tr><td rowspan="2">Primary services</td><td>3/0</td><td>280</td></tr>
<tr><td>350</td><td>270</td></tr>
</table>

2.2 LOAD CHECK SUMMARY

FEEDER PEAK LOAD HISTORY 2004 - 2008

Halifax peninsular feeders of interest		2008*		2007		2006		2005		2004	
		PI	Load Check	PI	Load Check	PI	Load Check	PI	Load Check	PI	Load Check
Underground	1H- 431	230	213	250	223	270	298	240	286	240	303
feeders	1H-419	220	-	250	196	260	230	260	240	290	258
	1H-403	220	203	240	222	260	273	270	227	270	250
	1H-405	220	210	250	220	270	275	270	283	255	230
	1H-424**	-	60	-	70	-	70	-	70	-	80
	1H-429	180	-	270	184	270	257	280	261	260	247
Overhead	1H-415	360	-	375	283	340	326	390	320	350	240
Feeders	1H-427	230	230	260	238	260	267	260	220	250	220
intertied with	104H-413	250	253	250	330	280	330	250	360	340	350
u/g feeders	104H-431	350	350	260	243	270	271	280	250	340	330
	104H-432	280	343	275	365	280	288	350	351	160	271
	104H-422	230	206	300	253	275	277	275	280	230	267
	104-442	280	284	290	309	240	287	270	253	310	309
	2H-412	350	331	350	345	350	334	350	357	330	332
	2H-413	300	295	300	336	290	242	260	379	300	255

* - Period ending June 1, 2008
** - Evaluated based on installed kVA

3.0 FEEDER CONTINGENCIES

The purpose of this contingency categorization is to help identify feeders with switching limitations and to help draw the line between "Possible" and "Practical" as applied to a planned power outage to a part of the system. In other words even if the power can be restored after a system failure, the same technique may not always be justifiable for a planned outage.

3.1 CONTINGENCY DEFINITIONS

Contingency A – Transferring open point(s) in the loop of the same feeder. This is the preferred way of managing planned and unplanned outages.

Contingency B – Simple switching by transferring open point between two adjacent feeders of the same source (substation). Backup feeder loading is a possible limiting factor.

Contingency C – Transferring open point between two feeders from two independent substations. Limiting factors: feeder loading, substation capacity, temporary abnormal configuration of the backup feeder, possible issues with paralleling, more complicated switching procedures.

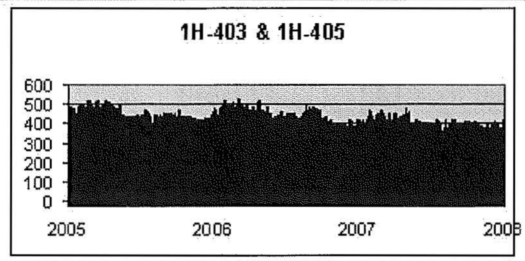
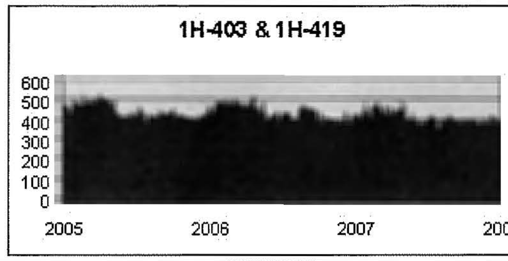
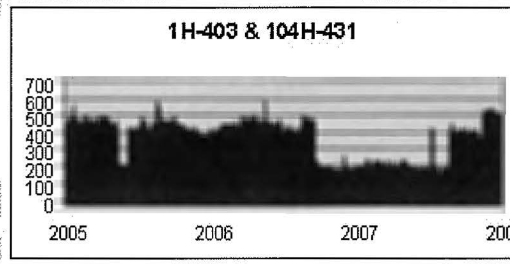
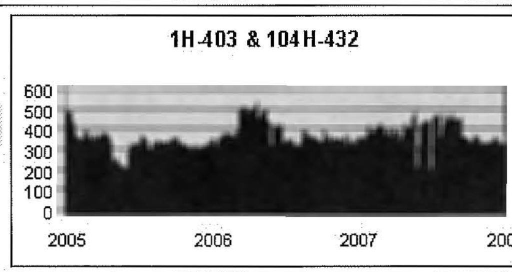
Contingency D – Cascade offloading. (a) Same as Contingency B or C but the backup feeder needs to be offloaded first to a third feeder. (b) Splitting load between two adjacent feeders.

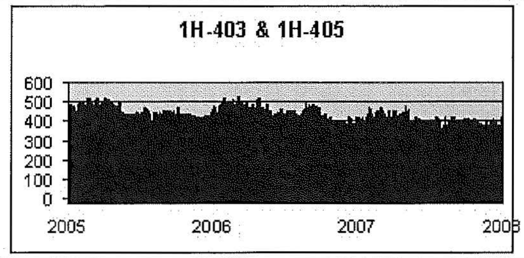
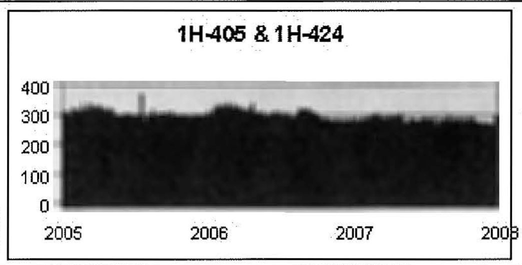
3.2 CONTINGENCY OPTIONS

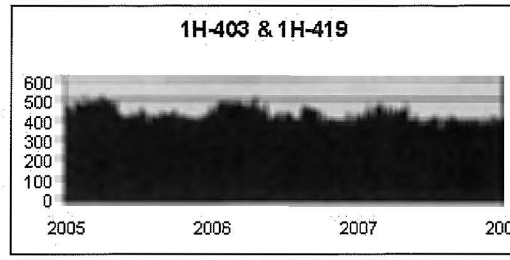
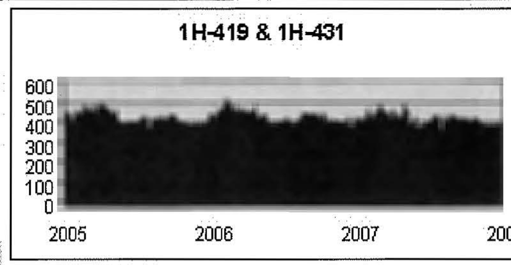
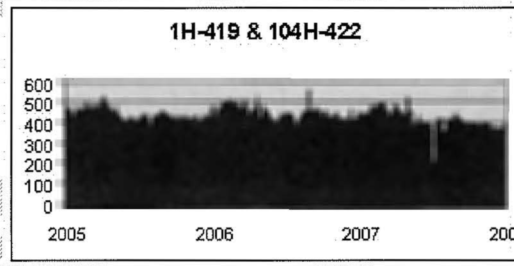
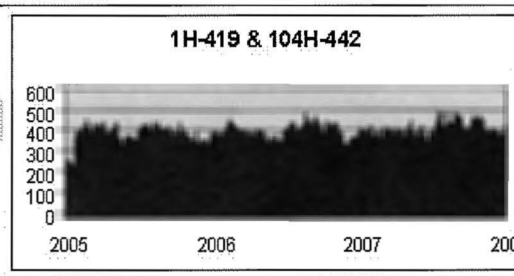
The following summaries are to give an overview of the available switching options. Contingency A options are only available for feeders with loops and only for the loop part of the feeder. This option is not shown in the summaries.

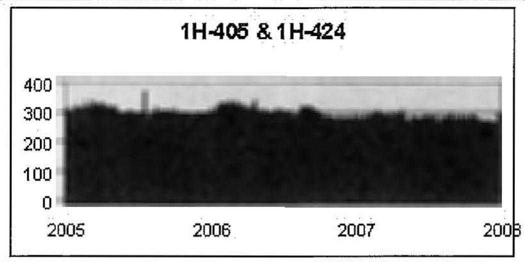
Contingency D options are only shown for the feeders with limited switching options B and C.

Not all of the D- options can be shown due to a high number of open/closed switch combinations.

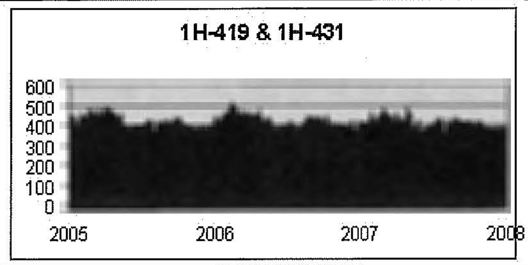
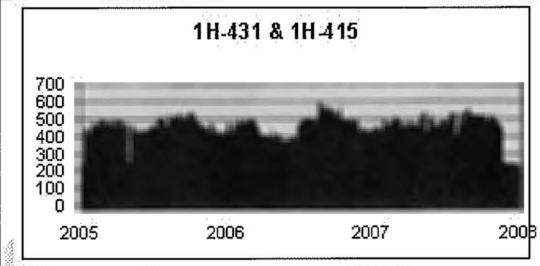
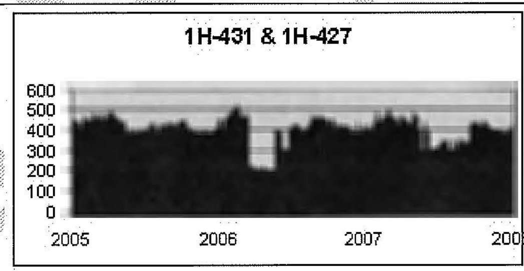
1H-403 CONTINGENCY OPTIONS		
Backup feeder	**1H-405**	
Total load [A]	490/440	
Switching device	L431-412	
Contingency type	B	
Comment	This option can be marginal during summer peaks	
Backup feeder	**1H-419**	
Total load [A]	490/420	
Switching device	28H-413	
Contingency type	B	
Comment	Very similar to 1H-405	
Backup feeder	**104H-431**	
Total load [A]	500/465	
Switching device	L431-233 Metro Center	
Contingency type	C	
Comment	Combined load can be close to 500 A -load check is recommended	
Backup feeder	**104H-432**	
Total load [A]	575/570	
Switching device	D4A15364	
Contingency type	C	
Comment	Available but load check is recommended	
Backup feeder	**1H-419** offloaded to 1H-431 sw# L431-177	No Profile Available
Total load [A]	310/350 estimated	
Switching device	28H-413	
Contingency type	D	
Comment	Limiting factor: 1H-431 peaks at 430/380	
Backup feeder	Split between **104H-431 & 104H-432**	No Profile Available
Total load [A]	TBD as required	
Switching device	TBD as required	
Contingency type	D	
Comment	Available	

1H-405 CONTINGENCY OPTIONS		
Backup feeder	**1H-403**	
Total load [A]	490/440	
Switching device	L431-412	
Contingency type	B	
Comment	This option can be marginal during summer time	
Backup feeder	**1H-424**	
Total load [A]	290/320	
Switching device	28H-447	
Contingency type	B	
Comment	Available. 1H-424 load is estimated to be 70 A.	

1H-419 CONTINGENCY OPTIONS		
Backup feeder	**1H-403**	
Total load [A]	490/320	
Switching device	28H-413	
Contingency type	B	
Comment	Possible but load check is recommended before switching	
Backup feeder	**1H-431**	
Total load [A]	510/440	
Switching device	L431-210 Art Gallery	
Contingency type	B	
Comment	Load check is recommended before switching	
Backup feeder	**104H-422**	
Total load [A]	600/500	
Switching device	6H-410	
Contingency type	C	
Comment	Most of the time >400 A. Marginal	
Backup feeder	**104H-442**	
Total load [A]	560/490	
Switching device	6H-430	
Contingency type	C	
Comment	Available, but load check is recommended before switching	
Backup feeder	Split between 1H-431 & one the above	No Profile Available
Total load [A]	TBD as required	
Switching device	TBD as required	
Contingency type	D	
Comment	Available	

1H-424 CONTINGENCY OPTIONS		
Backup feeder	**1H-405**	
Total load [A]	290/320	
Switching device	28H-447	
Contingency type	B	
Comment	1H-424 load is estimated to be 70 A.	

1H-429 CONTINGENCY OPTIONS		
Backup feeder	Split between 2H-412 and 104H-413	1H-429 is an express feeder to the stepdown 10H-T1 North Bus of VG Hospital. At full capacity the load is 260A.
Total load [A]	TBD as required	
Switching device	TBD as required	
Contingency type	D	
Comment	This backup option can be marginal during summer peaks.	

1H-431 CONTINGENCY OPTIONS		
Backup feeder	**1H-419**	
Total load [A]	510/440	
Switching device	L431-210 Art Gallery	
Contingency type	B	
Comment	Load check is recommended before switching	
Backup feeder	**1H-415**	
Total load [A]		
Switching device	D431-184 Hollis/Morris	
Contingency type	B	
Comment	The intertie switch is close to the substation. Very limited backup options for 1H-431	
Backup feeder	**1H-427**	
Total load [A]		
Switching device	D431-266 Hollis/Morris	
Contingency type	B	
Comment	The intertie switch is close to the substation. Very limited backup options for 1H-431	

3.3 OBSERVATIONS

1H-403
There are several switching options but none of them are straightforward. All of the options can be marginal during summer peaks.

1H-405
Feeder 1H-424 is a reliable backup for 1H-405.

1H-419
There are several options. During summer time the simple options become questionable. Splitting the load between 1H-431 and 1H-403 or 104H-422 would be the next option.

1H-424
Feeder 1H-405 is a reliable backup for 1H-424. New feeder.

1H-429
Complicated switching to offload the 10H-T1 transformer between 2H-412 and 104H-413. The load situation at 4 kV is expected to improve and therefore the above offloading should become more reliable. There is a suspicion of a collapsed ductbank on Morris St. The work to clarify on this issue is in progress (Summer 2008). This feeder is relatively new.

1H-431
The only simple backup option for this feeder is 1H-419. This option becomes questionable during summer months. For improved switching flexibility this feeder may require additional intertie. See 4.1 for details. This may be especially important considering the overhead section of the feeder that is exposed at the intersection of Hollis and Morris St.

To summarize the above:
- Feeders 1H-405 and 1H-424 have reliable backup.
- Feeders 1H-403, 1H-419 and 1H-429 have conditional backup options. An effort should be made to improve it.
- Feeder 1H-431 has a questionable backup option. There is a risk of extended outage. Additional backup alternative(s) need to be developed.

4.0 SYSTEM IMPROVEMENTS

4.1 ART GALLERY TIE

To improve the backup options for feeders 1H-431 and 1H-419 a new tie connection is recommended between the Art Gallery vault and feeder 1H-424 in manhole #13 on Lower Water Street. This will create a simple and reliable contingency option for the above two feeders which can also be used for a cable replacement/injection or cable treatment program.

The new feeder configuration will require extending nine 100 mm ducts (3-in, 3-out, 3-spare) from MH56 to the Art Gallery vault. See Fig. 4.2 and Appendix 4 for more details. There are ducts available in the existing ductbank between MH13 and MH56 to install six 750 kcmil cables. The total length of the new cable extension is approximately 60 meters.

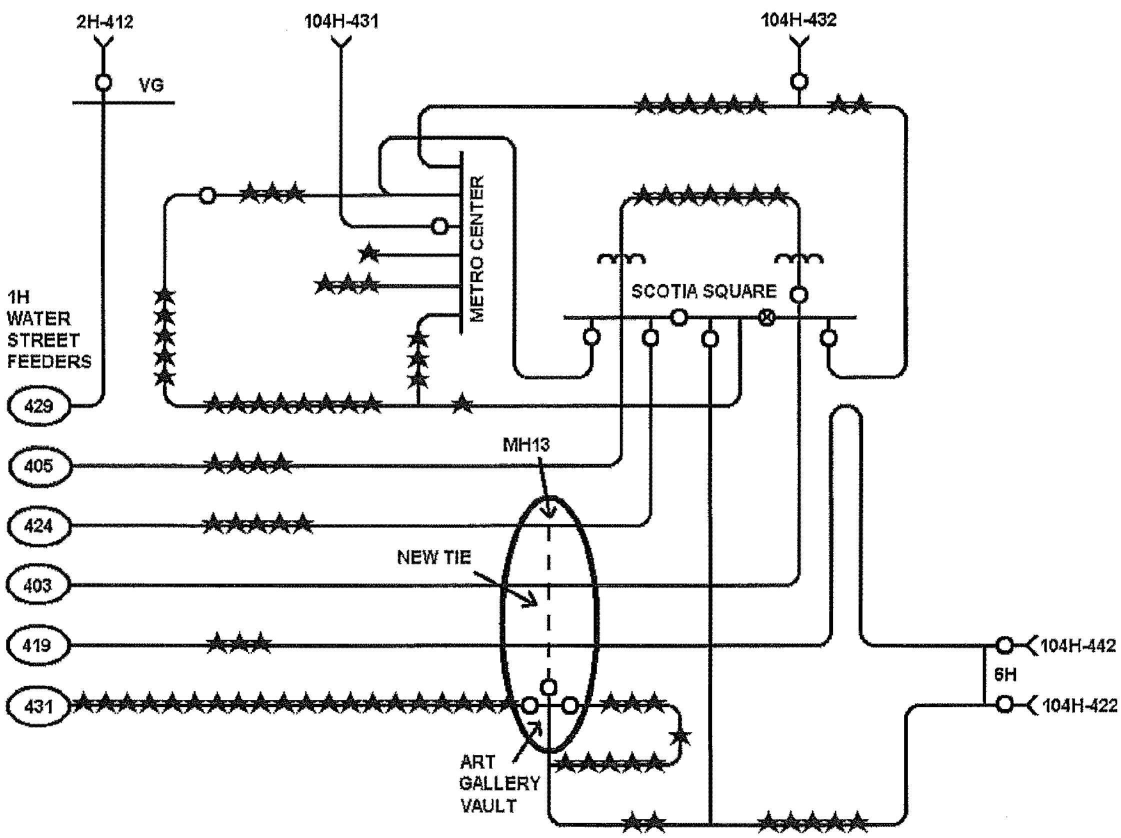


Fig. 4.1 New intertie between Art Gallery vault and MH13

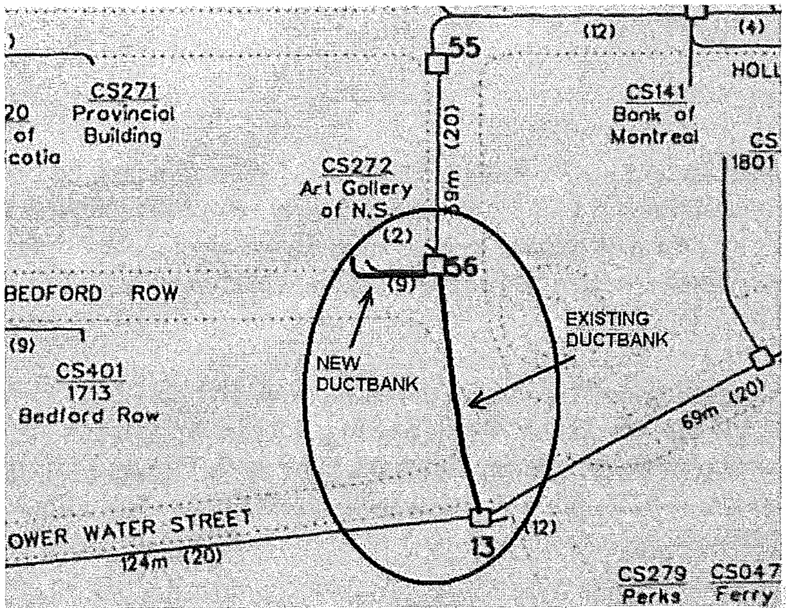


Fig. 4.2 Ductbank Layout

4.2 SCOTIA SQUARE TIE

The main purpose of this proposal is to improve the backup options of the feeder 1H-403. The idea is to use the existing 3-way Vista switch at the Scotia Square vault as a universal tie for 1H-403, 1H-405 and 1H-424 feeders that will allow paralleling them in any combination. At the moment the switch is underutilized and is serving as a connection point between 1H-405 and 1H-424.

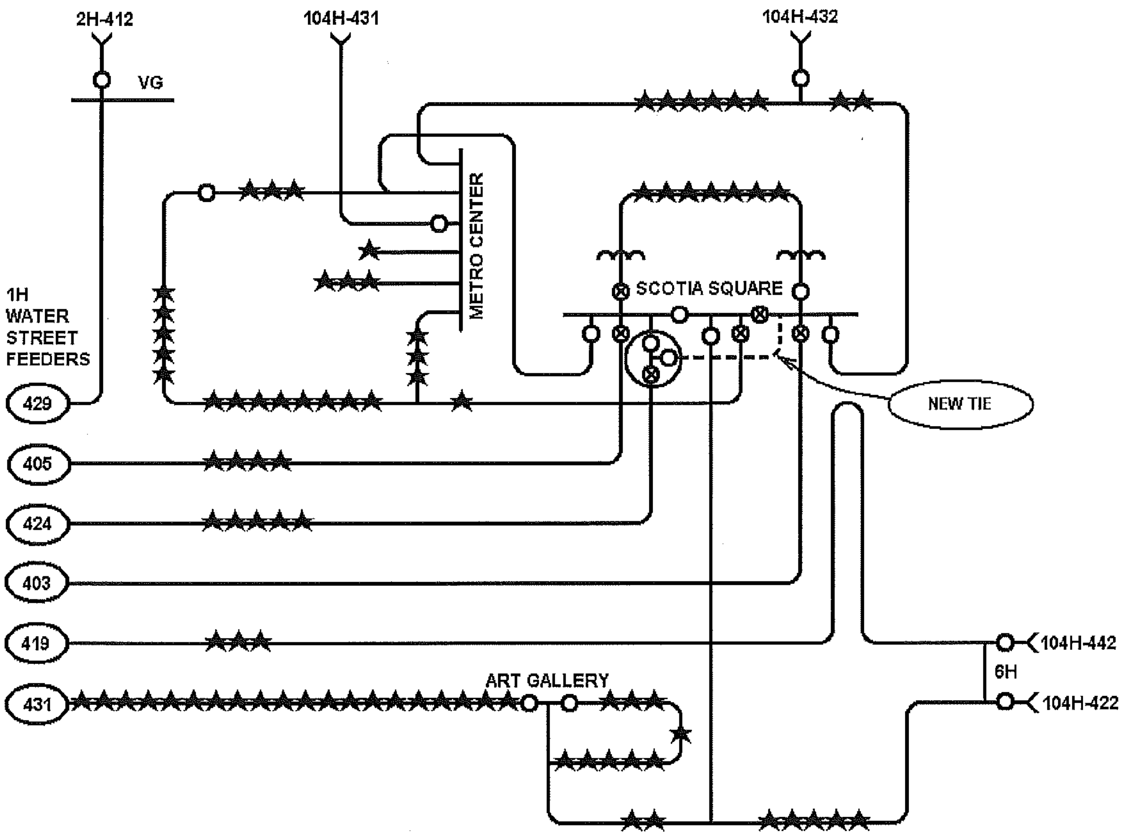


Fig. 4.7 New Connection in the Scotia Square vault

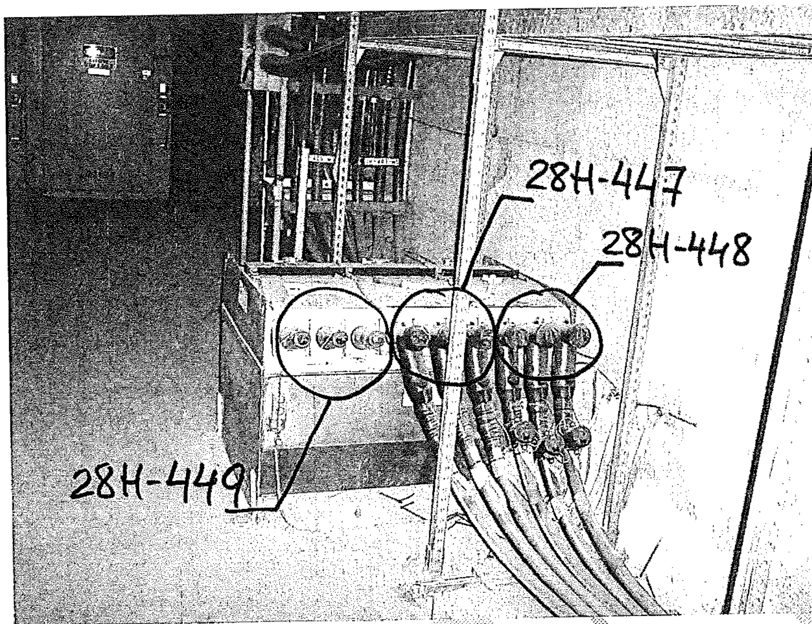


Fig. 4.8

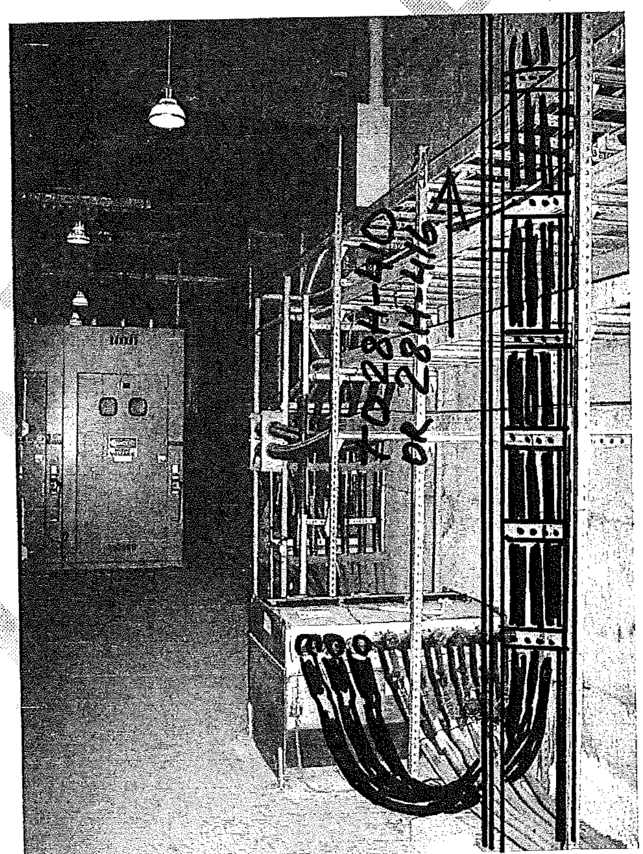


Fig. 4.9

The switch 28H-449 can be connected to one of the following devices that are on the same bus of the 28H substation: 28H-410, 28H-416, 28H-414 or 28H-445
The exact point of connection needs to be determined.

4.3 OTHER SYSTEM IMPROVEMENT OPTIONS

4.3.1 Configuration Improvements of 1H-431

Converting the o/h portion of the feeder 1H-431 would benefit the reliability of the Halifax underground system. There are six riser poles around the intersection of Hollis and Morris Streets that are exposed to traffic and weather. Also, there is a number of flying taps (two sets), quick sleeves, inline switches, communication loops and 4 kV lines sharing the same poles. The top circuits on each of the three poles on Fig. 4.10 are the feeder 1H-431.

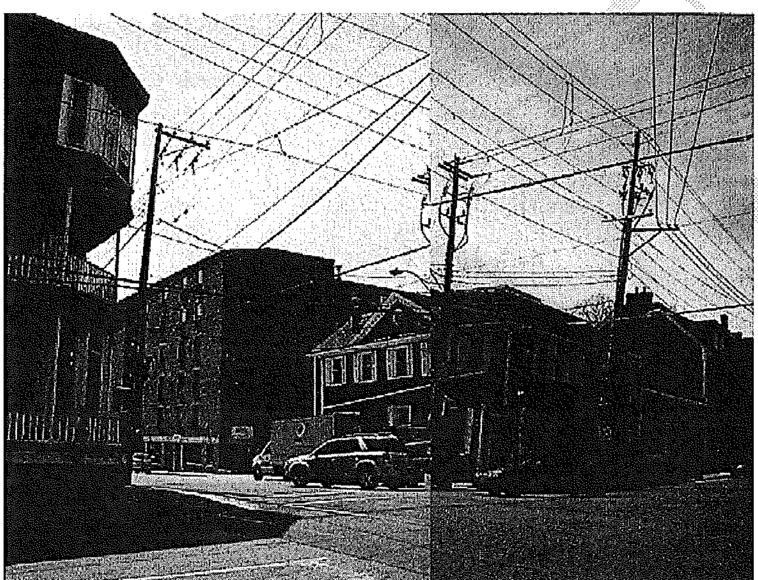


Fig. 4.10 Intersection of Hollis and Morris St.

This project would mostly involve extending the ductbank on Hollis Street from manhole #59 (Bushop/Hollis) to #60 (Morris/Hollis) which are approximately 120 meters apart and a new manhole in the middle of the block with a submersible switch in it. The switch is required for two primary services: Waterford Apartments CS431-554 and Prince Matthew's Apartments CS431-480 and also to replace the functionality of the existing set of inline switches D431-394. Two or three overhead services would have to be converted as well.

This part of the feeder is situated within the boundaries of the existing pole-free area. This conversion would have to be supported by the HRM as a continued commitment of the current cost sharing agreement with NSPI. A new development in the area may help to trigger this process.

4.3.2 Cable Upgrades

There are two potential bottlenecks in the existing system that may be considered for an upgrade. The purpose is to increase the conductor size to the full size feeder (750 kcmil) between the Metro Center and Scotia Square and between the riser pole on Cogswell St (feeder 104H-432) and Scotia Square.

See paragraphs 5.3.1 (B) and 5.3.1 (E) further in the text for details. With the existing ductbank configuration only one of the two can be implemented.

5.0 CABLE REPLACEMENT

5.1 Cable Lengths

Table 5.1

Total Feeder Section Lengths [m]							
Part of Feeder	Cable Size	1H Underground Feeders					
		403	405	419	424	429	431
Radial	750	1780	1440	3430	1600	2200	2130
	500	-	-	-	-	-	-
Loop	750	2240	160	-	-	-	-
	500	180	-	-	-	-	-
	350	1550	1380	-	-	-	-
	4/0	-	180	490	-	-	-
	3/0	-	-	640	-	-	-
	#1	-	170	-	-	-	-
Tie	750	230	-	240	-	-	-
	500	-	180	-	-	-	-
Primary Service	350	100	-	-	-	-	-
	3/0	1260	130	100	350	-	270
	#1	-	10	50	-	-	280
Total without/with services		5980/ 7340	3510/ 3650	4800/ 4950	1600/ 1950	2200	2130/ 2680

Note:
1. The above numbers are 3 phase lines, not individual conductors
2. For detailed summary on feeder sections see Appendix A
3. For detailed summary on primary service cables see Appendix B

Summary:
The total length underground feeders including primary services (6 feeders): 22770 m
Same for the feeders over 30 years old (4 feeders) – 18620 m
This includes the feeder sections:

a) Radial – 8780 m
b) Loops – 6990 m
c) Ties – 650 m
d) Primary services – 2200 m

5.2 Cable Accessories

The following cable accessories will be referenced to in tables 5.2, 5.3 and Appendix C:
S – Splice, general.
T – 600 A deadbreak termination
LF – Life front termination
L – 200 A loadbreak elbow
SA – Support arm, 14" multi-mount, Underground Devices Inc, MM14,

Table 5.2

Accessories per Feeder								
Cable Accessory	1H-403		1H-405		1H-419		1H-431	
	Feeder	Service	Feeder	Service	Feeder	Service	Feeder	Service
S	9	-	9	-	9	-	2	-
T	31	27	24	9	20	13	21	14
LF	31	7	36	-	15	4	2	4
L	0	33	-	9	-	11	-	14
SA*	60	-	34	-	60	-	26	-

* - the number of support arms is estimated based on the approximate number of passes through manholes for feeder cables only.

Table 5.3

Total Accessories		
Cable Accessory	Feeder	Service
S	25	-
T	96	67
LF	84	15
L	0	67
SA	180	-
Total	385	149

Note that the accessories are shown here as three phase devices, therefore for the actual number of single phase units needs to be tripled.

5.3 Feeder Sections

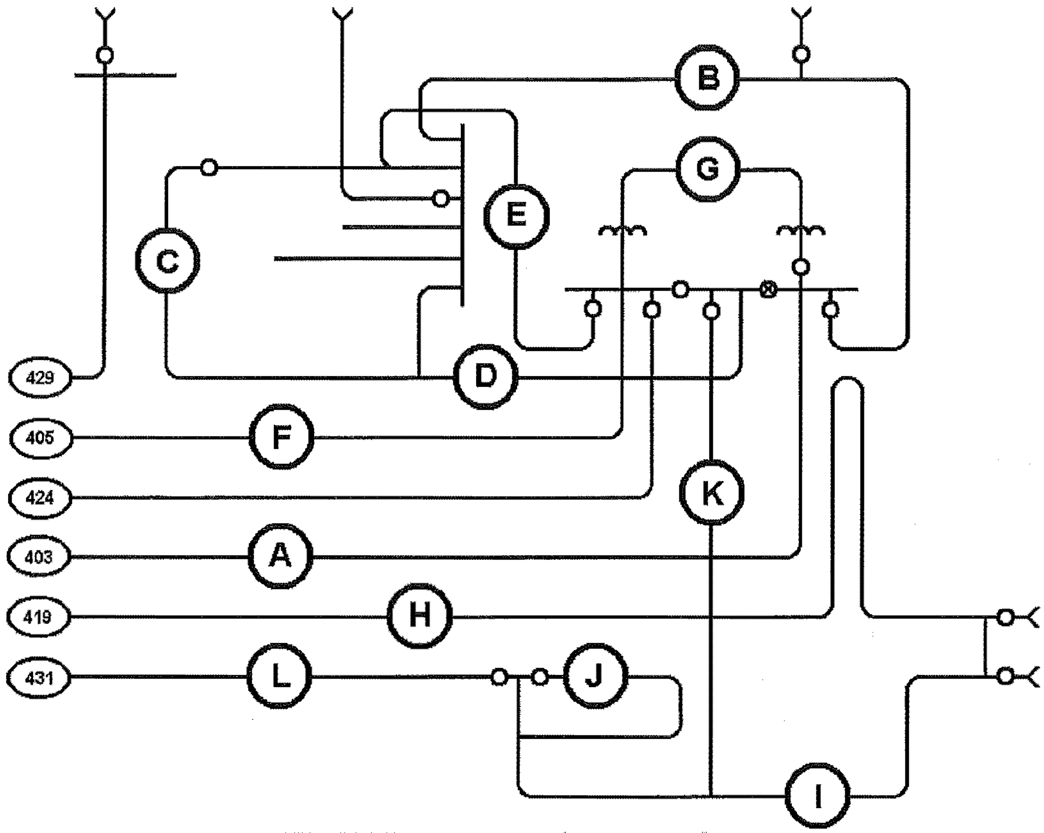


Fig. 5.3 Feeder Sections for Replacement

5.3.1 FEEDER 1H-403 (A, B, C, D, E)

(A) 1H-403 – Main Radial from 1H to 28H-416

The replacement of this part of the feeder can be approached in two ways:

Option 1
Use an alternative supply for 1H-403 (See 3.2 Contingency Options). Deenergize the radial part of the feeder between 1H and 28H-416 (approx. 1.4 km) and replace it.

Option 2
Remove the old 4 kV cables 1H-243, 1H-246 and 1H-247 (#500, 3 phase PILC) along the Lower Water, Sackville and Granville Streets between 1H and MH46 (1 km). Install new cables in the freed-up ducts while the existing feeder cables are still in service. Then extend the new cables from MH46 to MH47 and further to MH125 and MH26. This is approximately 90 % of the radial section of the feeder. The remaining short run from MH26 – MH28 – MH32 to 28H does not have enough free ducts. Therefore, one of the alternative supplies will be used for the duration of the cable replacement.

Advantages of this option: a) minimizes the use of alternative supply b) one kilometer of ducts becomes available for cascade replacement of two more feeders c) old equipment is removed and salvaged.

This cable may contain PCB. Federal and provincial legislation and regulations regulate the management of PCBs. Refer to the Environmental Management Strategy for Oil-Filled Equipment ENV-2.05 (Environmental Binder) for proper procedures.

(B) 1H-403 – North Loop from 28H-410 to L431-229 Metro Center
There are three sizes of conductors in the loop: 350, 500 and 750 kcmil. It may be beneficial to upgrade a part of the loop between MH102 on Cogswell St and 28H to 750 kcmil to create a full size tie between feeder 104H-422 (SW# D4A15363) and 28H-410 in Scotia Square. There are two conditions for this upgrade:
1) Some cables would have to be swapped in MH43 to make this tie "service free". This will transfer the cs431-265 service to another shoulder of the same loop that has multiple primary services and will remain 350 kcmil.
2) There are only two free ducts available between 28H and MH32. The upgrade is still possible but this option needs to be further investigated.

(C) 1H-403 –Metro Center Loop from L431-230 to L431-232
This part of the feeder has enough spare ducts to pre-install the new switch-to-switch sections while the old cable remains in service. The switching between the old and new cable can be done without taking outages to the customers.

(D) 1H-403 – 28H-415 to Grand Parade Vault
This is a normal feed for the Metro Center loop. There are not enough spare ducts to install the replacement cable ahead of time. One of the two available backup options has to be used for the duration of the cable replacement or injection.

(E) 1H-403 – 28H-411 to L431-230 Metro Center – Tie with 1H-405
There are two sizes of conductors (500 and 750 kcmil) used in this tie. The 500 kcmil section should be upgraded to the standard 750 kcmil size. There are only two free ducts available between 28H and MH32 to exit the Scotia Square vault. The cable upgrade is possible but this option needs to be further investigated.

With the existing ductbank configuration, the two cable upgrades (B) and (E) are mutually exclusive therefore:
a) Only one of the two may be selected
b) Possibility of adding more ducts between 28H vault and MH32 to be explored

5.3.2 FEEDER 1H-405 (F, G)

(F) 1H-405 – Main Radial from 1H to 28H-417
This part of the feeder is very similar to 1H-403 (A) and can be approached in the same way. See section (A) options for details. The removal of the old 4 kV feeder cables will also benefit the 1H-405 feeder replacement.

(G) 1H-405 – 23 kV Loop
The old multi-loop configuration was recently changed. The exact configuration of the present system may need to be updated on the single line diagrams. The upcoming cable replacement may also be used as an opportunity to further optimize the existing 23 kV loop system.

5.3.3 FEEDER 1H-419 (H, I, J)

(H) 1H-419 – to L431-401 Proctor Street
The replacement of this section can be combined with the removal of the old 4 kV cables (See 5.1 Option 2). This section can be backfeed from 104H-422 or 104H-442.

(I) 1H-419 – L431-404 Proctor Street to L431-211 Art Gallery Vault
The layouts of manholes MH90, MH91 and MH92 need to be verified and completed.

(J) 1H-419 Loop from L431-211 to L431-209 Art Gallery Vault
This is a normal underground loop. There is no foreseeable reason for cable size upgrades or configuration change.

(K) 1H-419 MH22 to 28H-413
This is a normally open tie with the feeder 1H-403. There are no primary services on this feeder section. The replacement should be straightforward.

5.3.4 FEEDER 1H-431 (L)
(L) 1H-431 to Art Gallery Vault
The records on the available spare ducts are inconsistent. A detailed scoping is required. The system improvement option 4.1 is recommended for better contingency arrangements.

5.4 Budgeting for Cable Replacement

5.4.1 Estimates and Assumptions

Labour:
- One underground crew includes 3 technicians.
- A basic length of 3 phase cable would normally consist of 1, 2 or 3 runs between two electrically adjacent cable accessories. The cable runs can be: manhole-to-manhole, manhole-to-vault, vault-to-vault and in some cases riser pole to manhole.
- One crew can install in one normal day:
  a) one basic length of three 750 kcmil cables, no terminations.
  b) 2 basic lengths of triplexed cable, no terminations.
  c) 1 basic length of triplexed cable and terminate one end.
  d) 6 cable terminations
  e) one primary service loop (one basic length), terminate both ends reconnect.
- One crew can remove in one normal day:
  a) three old PILC cables from three manhole-to-manhole lengths. Four manholes to be entered. This is mostly applicable to the three old feeders between 1H and MH46.
  b) switch from old to new pre-installed and pre-terminated length of cable, remove the old cable. Phase the cable.
- For simplicity the above installation steps can be further combined into mandays per basic length of cable (installation + termination + switching + removal):
  a) 750 kcmil three 1 phase cables: [redacted]
  b) <750 kcmil 3 phase cable installation: [redacted]

- One eight hour manday (2010) with overhead is calculated as follows:
[redacted]

- One eight hour overtime manday is calculated:
[redacted]

- Unless specified, no overtime rates have been used for calculations.

Materials:

- Primary cable:	750 kcmil Al, 28 kV	- $25/m
	350 kcmil Al, 28 kV, 3 phase	- $40/m
	3/0 Al, 28 kV, 3 phase	- $35/m
	#1 Al, 28 kV, 3 phase	- $30/m
- Splice	750/750	- $200 each
- T-Connector 600 A	(See Appendix E for details)	- $239 each
- Loadbreak elbow 200 A		- $55 each
- Synthetic terminator	-	$170 each
- Support arm 14" complete with masonry fasteners and tie wraps for cable		- $50 each

5.4.2 Feeder Replacement Estimates

Table 5.4

Materials and Labour for Cable Replacement Option Excluding Primary Services			
Feeder	Cable (refer to feeder profiles 2.2)	Accessories (refer to 5.2)	Labour (refer to 5.4.1)
1H-403	750 kcmil: 4250 x 1.1* x 25 x 3 = $325,625 350 kcmil: 1550 x 1.1 x 40 = $68,200 Other sizes: 360 x 1.1 x 35 = $13,860 **Total: $407,685**	S: 9 x 6**x 239 = $12,906 T: 31 x 3 x 239 = $22,227 LF: 31 x 3 x 170 = $15,810 SA: 60 x 50 = $3,000 **Total: $53,943**	750 kcmil: [redacted] <750 kcmil***: [redacted] [redacted]
1H-405	750 kcmil: 1630 x 1.1 x 25 x 3 = $134,475 350 kcmil: 1380 x 1.1 x 40 = $60,720 Other sizes: 520 x 1.1 x 35 = $20,020 **Total: $215,215**	S: 9 x 6 x 239 = $12,906 T: 24 x 3 x 239 = $17,208 LF: 36 x 3 x 170 = $18,360 SA: 34 x 50 = $1,700 **Total: $50,174**	750 kcmil: 7 runs =[redacted] <750 kcmil: 6 runs =[redacted] [redacted]
1H-419	750 kcmil: 3430 x 1.1 x 25 x 3 = $302,775 Other sizes: 1130 x 1.1 x 35 = $43,505 **Total: $346,280**	S: 9 x 6 x 239 = $12,906 T: 20 x 3 x 239 = $14,340 LF: 15 x 3 x 170 = $7,650 SA: 60 x 50 = $3,000 **Total: $37,896**	750 kcmil: 17 runs = [redacted] <750 kcmil: 8 runs = [redacted] [redacted]
1H-431	750 kcmil: 2130 x 1.1 x 25 x 3 = $175,725 **Total : $175,725**	S: 2 x 6 x 239 = $2,868 T: 21 x 3 x 239 = $15,057 LF: 2 x 3 x 170 = $1,020 SA: 26 x 50 = $1,300 **Total: $20,245**	750 kcmil cable: 14 runs =[redacted] [redacted]

* - 10% of length is added for splicing loops and waste.

** - 600 A deadbreak elbows are used for splicing cables.

*** - In this context: 3 phase cable size between #1 and 350 kcmil

Total: [redacted]

Note that the system improvement items (4.0), old 4 kV cable removals (5.3.1 A) and proposed conductor upgrades for 1H-403 (5.3.1 B, E) are not included in the above estimate.

5.4.3 Service Replacement Estimates

Table 5.5

Materials and Labour for Replacing Primary Service Cables			
Feeder	Cable (refer to feeder profiles 2.2)	Accessories (refer to 5.2)	Labour (refer to 5.4.1)
1H-403	750 kcmil: 100 x 1.1* x 25 x 3 = $8,250 350 kcmil: 100 x 1.1 x 40 = $4,400 Other sizes: 1680 x 1.1 x 35 = $64,680 **Total: 72,930**	T: 27 x 3 x 239 = $19,359 LF: 7 x 3 x 170 = $3,570 L: 33 x 3 x 55 = $5,445 **Total: $28,374**	32 services = [redacted] [redacted]
1H-405	3/0: 170 x 1.1 x 35 = **$6,545**	T: 9 x 3 x 239 = $6,453 L: 9 x 3 x 55 = $1,485 **Total: $7,938**	8 services = [redacted] [redacted]
1H-419	750 kcmil: 30 x 1.1 x 25 x 3 = $2,475 3/0 & #1: 140 x 1.1 x 35 = $5,390 **Total: $7,865**	T: 13 x 3 x 239 = $9,321 LF: 4 x 3 x 170 = $2,040 L: 11 x 3 x 55 = $1,815 **Total: $13,176**	15 services = [redacted] [redacted]
1H-431	350 kcmil: 270 x 1.1 x 40 = $11,880 3/0 & #1: 480 x 1.1 x 35 = $18,480 **Total: $30,360**	T: 14 x 3 x 239 = $10,038 LF: 4 x 3 x 170 = $2,040 L: 14 x 3 x 55 = $2,310 **Total: $14,388**	19 services = [redacted] [redacted]

* - 10% of length is added for splicing loops and waste.

[redacted]

Table 5.6

Materials and Labour for Replacing Primary Service Cables 50% Overtime			
Feeder	Cable (refer to feeder profiles 2.2)	Accessories (refer to 5.2)	Labour (refer to 5.4.1)
1H-403	750 kcmil: 100 x 1.1* x 25 x 3 = $8,250 350 kcmil: 100 x 1.1 x 40 = $4,400 Other sizes: 1680 x 1.1 x 35 = $64,680 **Total: 72,930**	T: 27 x 3 x 239 = $19,359 LF: 7 x 3 x 170 = $3,570 L: 33 x 3 x 55 = $5,445 **Total: $28,374**	32 services = [redacted] [redacted]
1H-405	3/0: 170 x 1.1 x 35 = **$6,545**	T: 9 x 3 x 239 = $6,453 L: 9 x 3 x 55 = $1,485 **Total: $7,938**	8 services = [redacted] [redacted]
1H-419	750 kcmil: 30 x 1.1 x 25 x 3 = $2,475 3/0 & #1: 140 x 1.1 x 35 = $5,390 **Total: $7,865**	T: 13 x 3 x 239 = $9,321 LF: 4 x 3 x 170 = $2,040 L: 11 x 3 x 55 = $1,815 **Total: $13,176**	15 services = [redacted] [redacted]
1H-431	350 kcmil: 270 x 1.1 x 40 = $11,880 3/0 & #1: 480 x 1.1 x 35 = $18,480 **Total: $30,360**	T: 14 x 3 x 239 = $10,038 LF: 4 x 3 x 170 = $2,040 L: 14 x 3 x 55 = $2,310 **Total: $14,388**	19 services = [redacted] [redacted]

* - 10% of length is added for splicing loops and waste.

[redacted]

5.5 Salvage

Aluminum

Table 5.7

Theoretical Weight of Aluminum Wire			
Wire size	Diameter [mm]	Cross-section [mm2]	Weight [kg/km]
750	22	380	1026
500	18	253	683
350	15	177	478
4/0	11.7	107	289
3/0	10.4	85	230
#1	7.4	42	113

Table 5.8

Aluminum Salvage Weight by Feeder [kg]					
	Cable Size	1H-403	1H-405	1H-419	1H-431
Feeder	750	13,080	4,926	11,295	6,555
	500	369	369	-	-
	350	2,223	1,977	-	-
	4/0	-	156	426	-
	3/0	-	-	441	-
	#1	-	57	-	-
Service	350	144	-	-	-
	3/0	849	90	69	186
	#1	-	-	18	96

Note: concentric neutral material is not accounted for

Salvage value of aluminum: $1.5/kg:

a) Feeder cables 750 kcmil = $54,000
b) Feeder cables <750 kcmil = $9,000
c) Services, all sizes = $2,200

Copper

The salvage value of copper: $5.00/kg. The removal of 3 km of 3 ph 500 kcmil PILC cable (5.3.1 Option 2) should produce 10 tons of salvageable copper, which is approximately $50,000.

The total salvage value of the cables proposed for removal under this project is expected to be $110,000.

6.0 CABLE INJECTION

6.1 Description

The cable injection option will be calculated for 750 kcmil cable only. The smaller conductor sizes for both feeder and services are considered for replacement. See Table 6.1 for summaries.

Table 6.1

Three phase line to be injected/replaced [m]			
	Feeder Injection 750 kcmil	Feeder Replacement <750 kcmil	Service Cable Replacement
1H-403	4,250	1,730	1,360
1H-405	1,680	1,910	140
1H-419	3,650	1,130	150
1H-431	2,130	0	550
Total	**11,710**	**4,770**	**2,200**

For feeder cables the injection will have to be done with de-energized cables. The injection and material installation crew would normally include 3 technicians. Time to inject will be dependent on the characteristics of the cable and type of conductors. The first draft work schedule implies up to 10 hours/day and 7 days/week. Labour fees for cable testing (TDR and pressure test) and cable injection are included in the injection price. The actual cable length is to be confirmed with TDR. Once injected the cables are protected by a 20 year warranty.

6.2 Scope

Following is a planned scope of injection work grouped by feeder# and section# (see Fig. 5.3). The sections will be (a) terminated at switching devices using livefront or deadfront terminations and (b) spliced using 600A deadbreak T-body, therefore each section will require 6 terminations. All terminations are in manholes and vaults. Some of the basic section lengths below are assumed to be equal for simplicity, but the total lengths should be fairly accurate.

Feeder 1H-403 (4250 m)
Section A: 230+230+230+230+230+230=1400 m
Section B: 160+150+230=540 m
Section C: 210+220+160+220+140+80+280+120+120+150=1700 m
Section D: 190+190=380 m
Section E: 230 m
Three phase cable sections: **22**
Terminations: 22 x 6 = **132**

Feeder 1H-405 (1680 m)
Section F: 230+230+230+230+230+270=1440
Section G: 240

Three phase cable sections: **7**
Terminations: **42**

Feeder 1H-419 (3670 m)
Section H: 228+228+228+228+228+200+200+200+200+200=1140 m
Section I: 156+156+156+110+190+240+190=1290 m
Section K: 240 m
Three phase cable sections: **18**
Terminations: **108**

Feeder 1H-431 (2130 m)
Section L: 190+190+150+90+100+160+170+170+190+110+100+180+160+160=2130 m
Three phase cable sections: **14**
Terminations: **84**

Summary:
Three phase cable sections: **61** (183 1ph 750 kcmil cables)
Total 3 ph. length: **11,710 m**
Terminations: **366** (306 T-bodies + 60 misc. live front terminations)

6.3 Cable Replacement Part of the Cable Injection Option

The cables other than 750 kcmil will be replaced as follows

Table 6.2

Materials and Labour for Cable Replacement Excluding 750 kcmil Feeder Cables and Primary Services			
Feeder	Cable (refer to feeder profiles 2.2)	Accessories (refer to 5.2)	Labour (refer to 5.4.1)
1H-403	350 kcmil: 1550 x 1.1* x 40 = $68,200 Other sizes: 360 x 1.1 x 35 = $13,860 **Total: $82,060**	T: 13 x 3 x 239 = $9,321 LF: 23 x 3 x 170 = $11,730 SA: 60 x 50 = $3,000 **Total: $24,051**	<750 kcmil**: 13 runs [redacted] [redacted]
1H-405	350 kcmil: 1380 x 1.1 x 40 = $60,720 Other sizes: 520 x 1.1 x 35 = $20,020 **Total: $80,740**	T: 32 x 3 x 239 = $22,944 LF: 32 x 3 x 170 = $16,320 SA: 34 x 50 = $1,700 **Total: $40,964**	<750 kcmil: 6 runs = [redacted] [redacted]
1H-419	Other than 750 kcmil sizes: 1130 x 1.1 x 35 = **$43,505**	T: 7 x 3 x 239 = $5,019 LF: 10 x 3 x 170 = $5,100 SA: 60 x 50 = $3,000 **Total: $13,119**	<750 kcmil: 8 runs = [redacted] [redacted]
1H-431	N/A	N/A	N/A

* - 10% of length is added for splicing loops and waste.

** - In this context: 3 phase cable size from #1 to 350 kcmil

[redacted] 203 [redacted]

6.4 Injection Estimates

[redacted]

The Total price with 24.46% of contractor's overhead: [redacted]

One of the NSPI underground crews will be involved with the contractor for the duration of the project which is estimated to be 8 weeks.

[redacted]

The Total contractor's price: [redacted]
Same with 24.42% of contractor's overhead: [redacted]

7.0 Cable Replacement vs. Cable Injection

Table 7.1

Replacement of 750 kcmil Cable Only			
Feeder	Cable (Table 5.4)	Accessoties	Labour
1H-403	**$325,625**	Splices:19x1,432=$27,208 Brackets:19x50=$950 Total: **$28,158**	[redacted]
1H-405	**$130,475**	Splices:7x1,432=$10,024 Brackets: 7x50=$350 Total: **$10,374**	[redacted]
1H-419	**$302,775**	Splices: 17x1,432=$24,344 Brackets: 17x50=$850 Total: **$25,194**	[redacted]
1H-431	**$175,725**	Splices: 14x1,432=$20,048 Brackets: 14x50=$700 Total: **$20,748**	[redacted]
Total:	**$934,600**	**$84,474**	**$325,242**

Table 7.2

Cable Replacement vs. Cable Injection Budget Summaries 750 kcmil only						
	Cable Replacement (Table 7.1)		CableCure [redacted]		Cable Injection [redacted]	
	$	Comment	$	Comment	$	Comment
NSPI Labour	325,242	replace radial feeder cables	114,120	working with [redacted]	114,120*	working with [redacted]
Materials	1,019,074	750 kcmil cables	N/A	N/A	N/A	N/A
Cable Injection with OH 25%	N/A	N/A	927,582	Injecting cables, 3x12km	709,194	Injecting cables, 3x12km
Salvage	+60,000	Al	N/A		N/A	
	+50,000	Cu	N/A		N/A	
Total:	**$1,234,316**		**$1,041,702**		**$823,314**	

* -3 technicians, [redacted], regular time[redacted]

Calculating net present values for projects with different life spans can lead to incorrect decisions unless adjustments are made. One of the accepted techniques for dealing with this problem is the Replacement Chain Method which transforms the decision variable (NPV) into a common metric for projects of different life spans. NPV in itself does not accomplish this.

Table 7.3

Cable Replacement vs. Cable Injection – Compare the Options of Different Life 750 kcmil only			
	Cable Replacement	CableCure [redacted]	Cable Injection [redacted]
Expected Life, years	40	20	40**
NPV	$1,238,000	$1,041,702	$823,314
Replacement Chain Method * (i = 8%)	$1,238,000	$1,265,197	$823,314

* Method: Determine the lowest common denominator of all the "project lives". Calculate the Net Present Value for the project repeated "n" times. Compare the projects; choose that project with highest NPV or less negative in our case.
** [redacted]

Risks associated with cable injection:

a. A variety of first generation polyethylene insulation cable will remain in service.
b. After removing of the old terminations and splices some of the cables may be too short for a quality splice.
c. Some of the cable sections may not be injectable due to physical (loss of pressure) or electrical parameters and therefore will have to be replaced.
d. Need to trace another parameter of the injected cable section and having to manage the cable injection records for warranty purposes.
e. The cable injection warranty will only cover the cost of injection for the affected section. The cost of associated NSPI labour and cost of restoration will not be covered.
f. Introduction of non-standard hardware to the system. All of the new terminations have features for cable injection (e.g. reticular flash preventer)
g. Working with contractor will require additional coordination effort.
h. Unforeseeable cost plus items

[redacted]

The cost of cable injection per basic length of three phase section (typ. Switch-to-switch) today is:
$823,314 / 57 (Table 7.2) = $14,444

When one of the three cables of the injected section fails in 20 years, NSPI will be reimbursed with:
$570,000 / (57x3) = $3,333

The present value of the future warranty payment is:
PV=3,333(P/F,8%,20)= $715

8.0 BUDGETARY TIMELINES

Year 1, 2 and 3 – replace radial sections of the feeders 1H-403, 405, 419 and 431
Year 4 and 5 – replace loops and ties of the feeders 1H-403, 405 and 419

2010: a) 1H-403 – radial section between 1H and 28H-416 Scotia Square (1,400m)
b) 1H-405 – radial section between 1H and 28H-417 Scotia Square (1,440m)
c) PILC cable removal between 1H and MH46 on Granville St (1,000m)

2011: a) 1H-419 – radial section between 1H and L431-401 Proctor Street (2,140m)
b) 1H-419 – half of the radial section between L431-404 and L431-211 Art Gallery Vault (645m)

2012: a) 1H-431 – radial section between 1H and Art Gallery Vault (2,230m)
b) 1H-419 – second half of the radial section between L431-404 and L431-211 Art Gallery Vault (645m)

2013: a) 1H-403 – North Loop from 28H-410 to L431-229 Metro Center (2,240m)
b) 1H-403 – Metro Center Loop from L431-230 to L431-232 (1,700m)

2014: a) 1H-403 – Scotia Square 28H-415 to Grand Parade Vault (380m)
b) 1H-403 – Scotia Square 28H-411 to Metro Center L431-230 (410m)
c) 1H-405 – 23kV loop (1,900m)
d) 1H-419 – Tie to Scotia Square (240m)

Budgetary Item for 2010

The underground work units and cost of materials are described in Section 5.4.1 of the Report. The RT labour is calculated as: [redacted]

1. Cable NSPI# 6548-0400
   (1400 + 1440) x 1.1 x $25 x 3 = **$234,300**
2. Accessories
   Separable cable connectors as per Appendix E: 28 x $1,432 = **$40,095**
   Support arms – 28 x $50 = **$1,400**
3. Labour
   Cable installation (28 basic runs) 28 x 9 = [redacted]: **$161,532**
   PILC cable remova[redacted] days: **$9,615**
4. Contracting
   Traffic control -[redacted]/day: 28 x 500 x 1.2442 = **$17,419**
5. Salvage
   3 x 3 x 1 km of copper PILC 500 kcmil cable = 10,000 kg of salvageable copper
   Assume salvage value is $5.00/kg, the total value is **$50,000**
   3 x 2.84 km of 750 kcmil al cable = 8,740 kg of salvageable aluminum
   Assume the salvage value is $1.5/kg the total value is **$13,000**

Total: $401,419

APPENDIX A – Cable Lengths and Available Ducts

(A) 1H-403 – Main Radial 1H to 28H-416 – 1400 m of 750 kcmil		
From	To	Available Ducts
1H Substation	MH2	9A (A- available), Remove: 243, 246, 247
MH2	MH4	1A* Removals: 243, 246, 247
MH4	MH5	
MH5	MH6	
MH6	MH9	
MH9	MH10	2A* Removals: 243, 246, 247
MH10	MH48	
MH48	MH46	
MH46	MH26	0A, 1 cemented over,
MH26	MH28	0A
MH28	MH32	3A
MH32	28H-416 Scotia Square	2A*

(B) 1H-403 – North Loop from 28H-410 to L431-229 Metro Center			
From	To	Cable	Available Ducts
28H-410	MH32	500, 180 m	2A
MH32	MH39		5A
MH39	MH41	350, 530 m	4A*
MH41	MH42		4A*
MH42	MH43		5A
MH43	MH126		2A
	MH102	350, 400 m	3A*
MH102	MH103		0A
MH103	Police Station Vault		0A
Police Station Vault	Citadel Inn Vault	350, 70 m	0A
Citadel Inn Vault	MH103	350, 550 m	0A
MH103	MH102		0A
MH102	MH43		3A*
MH43	MH42		5A
MH42	MH41		4A*
MH41	MH39		4A*
MH39	MH38	750, 160 m	3A*
MH38	MH40		5A
MH40	MH38	750, 150 m	5A
MH38	MH116		5A
MH116	MH38	750, 230 m	5A
MH38	MH37		9A
MH37	MH36		9A
MH36	L431-229 MetroCtr		8A

(C) 1H-403 –Metro Center Loop from L431-230 to L431-232			
From	To	Cable	Available Ducts
Metro Venter Vault	MH36	750, 210 m	11A
MH36	MH110		4A
MH110	MH114		
MH114	Prince George Vault		
Prince George Vault	MH114	750, 220 m	
MH114	MH124		
MH124	Cambridge Vault		
Cambridge Vault	MH124	750, 160 m	
MH124	MH87		
MH87	MH131		
MH131	MH132	750, 220 m	
MH132	MH117	750, 140 m	
MH117	MH115	750, 80 m	
MH115	MH109	750, 280 m	
MH109	Grand Parade Vault		
Grand Parade Vault	MH33	750, 120 m	
MH33	MH34		
MH34	MH35	750, 120 m	
MH35	MH123		
MH123	MH35	750, 150 m	
MH35	MH36		
MH36	L431-232 Metro Ctr		

(D) 1H-403 – 28H-415 to Grand Parade Vault			
From	To	Cable	Available Ducts
28H-415	MH30	750, 190 m	2A
MH30	MH31		2A
MH31	L431-187 Barrington Place		0A
L431-186	MH31	750, 190 m	0A
MH31	MH30		2A
MH30	MH33		12A
MH33	L431-227 Grand Parade Vault		9A

(E) 1H-403 – 28H-411 to L431-230 Metro Center – Tie with 1H-405			
From	To	Cable	Available Ducts
28H-411	MH32	500, 180 m	A2, Upgrade?
MH32	MH39		A5, Upgrade?
MH39	MH38	750, 230 m	A3*
MH38	MH37		A9
MH37	MH36		A9

MH36	L431-230 Metro Center		A11

(F) 1H-405 – Main Radial 1H to 28H-417			
From	To	Cable	Available Ducts
1H-405	MH2	750, 1050 m	9A
MH2	MH4		1A
MH4	MH5		1A
MH5	NH6		1A
MH6	MH9		1A
MH9	MH10		2A
MH10	MH48		2A
MH48	MH46		2A
MH46	MH47		3A
MH47	MH133		13A
MH133	MH47	750, 390 m	13A
MH47	MH46		3A
MH46	MH26		0A
MH26	MH28		1A
MH28	MH32		3A
MH32	28H-417		2A, may be used for 1H-403 upgrades

(G) 1H-405 – 23 kV Loop			
From	To	Cable	Available Ducts
28H-408	MH32	350, 390 m	2A
MH32	MH39		5A
MH39	MH41		4A
28H-409	MH32	350, 390 m	2A
MH32	MH39		5A
MH39	MH41		4A
28H-408	28H-424 Center Pad	350, 110 m	
28H-409	28H-423 Center Pad	350, 110 m	
MH41	28H-419 Scotia Tower	350, 20 m	
MH41	28H-418 Scotia Tower	350, 20 m	
MH41	MH42	350, 120 m	4A
MH41	MH42	350, 120 m	4A
MH42	28H-427 North Pad	4/0, 90 m	1A
MH42	28H-428 North Pad	4/0, 90 m	1A
MH42	28H-433 MacKeen Tower	350, 50 m	0A
MH42	28H-432 MacKeen Tower	350, 50 m	0A

28H-433	MH43	#1, 170 m	
MH43	28H-442		
28H-432	MH43	#1, 170 m	
MH43	28H-441		

(H) 1H-419 – to L431-401 Proctor Street			
From	To	Cable	Available Ducts
1H-405	MH2	750, 1140 m	9A
MH2	MH4		1A
MH4	MH5		1A
MH5	MH6		1A
MH6	MH9		1A
MH9	MH10		2A
MH10	MH48		2A
MH48	MH46		2A
MH46	MH47		3A
MH47	MH125		3A
MH125	MH26	750, 1000 m	1A
MH26	MH28		1A
MH28	MH32		3A
MH32	28H		2A*
28H	MH30		2A
MH30	MH23		6A
MH23	MH22		7A
MH22	MH21		9A
MH21	MH90		0A
MH90	MH91		0A
MH91	MH92		
MH92	6H-401 Proctor St		

(I) 1H-419 – L431-404 Proctor Street to L431-211 Art Gallery Vault			
From	To	Cable	Available Ducts
L431-404	MH92	750, 560 m	
MH92	MH91		
MH91	MH90		0A
MH90	MH21		0A
MH21	MH20		5A
MH20	MH19		7A
MH19	L431-257 Xerox Building		4A
L431-256	MH19	750, 110 m	4A
MH19	L431-259 Sheraton Vault		5A
L431-258 Sheraton Vault	MH19	750, 190 m	5A

MH19	MH18		15A
MH18	MH22		9A
MH22	MH18	750, 240 m	9A
MH18	MH16		14A
MH16	MH14		14A
MH14	1801 Hollis St		4A
1801 Hollis St	MH14	750, 190 m	4A
MH14	MH13		14A
MJH13	MH56		12A
MH56	L431-211 Art Gallery Vault		0A

(J) 1H-419 Loop from L431-211 to L431-209 Art Gallery Vault			
From	To	Cable	Available Ducts
L431-211 Art Gallery Vault	MH56	3/0, 140 m	0A
MH56	MH55		13A
NH55	MH25		1A
MH25	L431-236 Royal Bank Vault		4A
L431-237 Royal Bank Vault	MH25	3/0, 210 m	4A
MH25	MH24		4A
MH24	MH15		
MH15	MH17		2A
MH17	L431-238 Historic Properties Vault		0A
L431-239 Historic Properties Vault	MH7	4/0, 160 m	
MH7	MH15		
MH15	L431-240 Law Courts Vault		
Law Courts Vault	MH111	3/0, 50 m, NB radial	
MH111	Ferry Term. Vault		
Ferry Term. Vault	MH13		
MH13	Riser Pole		
L431-241 Law Courts Vault	MH15	4/0, 140 m	
MH15	MH24		4A
MH24	L431-242 Hist. Prop. Prom. Vault		
L431-243 Hist. Prop. Prom. Vault	MH24	4/0, 190 m	
MH24	MH25		4A
MH25	Royal Bank Vault		4A

Royal Bank Vault	MH25		4A
MH25	L431-244 Bank of Montreal		2A
L431-245 Bank of Montreal	MH25	3/0, 70 m	2A
MH25	MH105		0A
MH105	MH25	3/0, 170 m	0A
MH25	MH55		1A
MH55	MH56		12A
MH56	L431-209 Art Gallery Vault		0A

(K) 1H-419 MH22 to 28H-413			
From	To	Cable	Available Ducts
L431-176 MH22	MH23	750, 240 m	
MH23	MH30		6A
MH30	28H-413 Scotia Square		2A

(L) 1H-431 to Art Gallery Vault			
From	To	Cable	Available Ducts
1H-431	MH2	750, 380 m	12A
MH2	MH3		2A
MH3	MH60		2A
MH60	Riser D431-001		0A
Riser D431-354	MH59	750, 150 m	0A
MH59	MH58		9A
MH58	MH57	750, 90 m	9A
MH57	MH148		
MH148	Ralston Vault	750, 100 m	
Ralston Vault	MH57	750, 160 m	
MH57	MH7		8A
MH7	Keith's Brewery Vault		1A
Keith's Brewery	MH7	750, 170 m	1A
MH7	Harbour Walk Vault		5A
Harbour Walk Vault	MH7	750, 180 m	5A
MH7	MH8		15A
MH8	Summit Place Vault		
Summit Place Vault	MH89	750, 190 m	
MH89	MH49		5A
MH49	MH51		9A
MH51	Founder's Square Vault		0A
Founder's Square	MH51	750, 110 m	0A

Vault			
MH51	MH52		5A
MH52	Bedford Row Vault		
Bedford Row Vault	MH52	750, 100 m	3A
MH52	MH53		12A
MH53	Public Works Vault		
Public Works Vault	MH53	750, 180 m	
MH53	MH12		
MH12	MH88		
MH88	Maritime Museum Vault		
Maritime Museum Vault	MH88	750, 320 m	
MH88	MH12		
MH12	MH13		
MH13	MH56		
MH56	Art Gallery Vault		

APPENDIX B – Primary Service Cables

Note: Due to short cable length, the primary services located in the same with the switch vault or manhole may not be shown in the list.

1 of 4

1H-403 Primary Service Cables		
CS Number	Cable Size [AWG], [kcmil]	Cable Length [m]
CS431-139	3/0	70
CS431-170-T2	#1	160
CS431-150	750	10
CS431-221	3/0	10
CS431-227	3/0	40
CS431-265	350	60
CS431-426	350	40
CS431-046	3/0	50
CS431-182	3/0	150
CS431-270	750	80
CS431-001	3/0	50
CS431-211	3/0	80
CS431-162	3/0	100
CS431-154	3/0	40
CS431-402	3/0	50
CS431-430	3/0	150
CS431- 531	#1	100
CS431-036	3/0	50
CS231-012	1/0	200
CS231-038	1/0	270
CS431-428	3/0	10
CS431-197	3/0	130
CS431-137	3/0	100
CS431-185	3/0	20
CS431-184	3/0	10

2 of 4

1H-405 Primary Service Cables		
CS Number	Cable Size [AWG], [kcmil]	Cable Length [m]
CS431-007	3/0	50
CS431-012	3/0	70
CS431-005	3/0	50
CS431-504	-	-
CS431-505	-	-
CS431-506	-	-
CS431-507	-	-
CS431-508	-	-

3 of 4

1H-419 Primary Service Cables		
CS Number	Cable Size [AWG], [kcmil]	Cable Length [m]
CS431-351	3/0	10
CS431-138	3/0	70
CS431-196-T2	750	30
CS431-268	#1	50
CS431-279	3/0	10

4 of 4

1H-431 Primary Service Cables		
CS Number	Cable Size [AWG], [kcmil]	Cable Length [m]
CS431-205	#1	55
CS431-002	3/0	50
CS431-345	#1	50
CS431-247	#1	30
CS431-049	#1	10
CS431-217	3/0	10
CS431-220	3/0	220
CS431-271	3/0	50
CS431-450	350	270

APPENDIX C – Splices and Terminations

The allocation of the cable accessories below is assumed based on single line diagrams and may not be an exact representation of the actual type or quantity. For accessory legend see 5.2.

Splices and Terminations									
MH# /Vault	Equip. in MH	1H-403		1H-405		1H-419		1H-431	
		Feeder	Service	Feeder	Service	Feeder	Service	Feeder	Service
001									
002									
003								s	
004		s		s		s			
005									
006		s		s		s			
007									
008									
009									
010		s		s		s			
011									
012								s	
013									
014									
015									
016									
017									
018									
019									
020						s			
021									
022	TX+SW					3T	2T+2L		
023						s			
024									
025									
026				s					
027									
028		s							
029									
030									
031									
032						s			
033									
034	SW	2T	T+L						
035									
036		T							
037									
038									
039		2s							
040	SW	2T	T+L						
041				2s					
042		s		2s					
043		s							

044									
045									
046		s				s			
047				s					
048									
049									
050									
051									
052	TX+SW								
053									
054									
055									
056									
057									
058								T	
059									
060									
061									
062									
063									
064									
065									
066									
067									
068									
069									
070									
071									
072									
073									
074									
075									
076									
077									
078									
079									
080									
081									
082									
083									
084									
085									
086									
087									
088									
089									
090						2s			
091A									
091B									
092									
093									
094									
095									

096									
097									
098									
099									
100									
101									
102		s							
103									
104									
105	TX+SW					2T	T+L		
106									
107									
108	TX		L						
109									
110									
111									
112									
113									
114									
115	TX+SW	2T	4T+4L						
116		2T	2T+2L						
117	TX+SW	2T	T+L						
118									
119									
120	SW								
121									
122	TX								
123	TX+SW	2T	2T+2L						
124	TX								
125	TX+SW					2T	2T+2L		
126	Adj Sw	2LF	2LF+2 L						
127									
128									
129									
130									
131	TX+SW	5T	5T+5L						
132	TX+SW	2T	2T+L						
133	TX+SW			4T	4T+4L				
134									
135									
136									
137									
138									
139									
140									
141									
142									
143									
144									
145									
146									
147									
148	TX+SW							2T	2T+2L

149									
150									
151									
152									
153									
154	SW								
155									
156									
157									
158									
159	TX	2T	2T+2L						
160									
161									
162									
163									
164									
165									
166									
167									
168									
169									
170									
171									
200									
B01	TX+SW								
B02	TX+SW								
D01									
D02	TX								
D03	SW								
D04									
D05									
D06									
D07									
D08									
D09									
D10	SW								
D11	SW								
D12									
D13	TX+SW								
D14	TX+SW								
D15									
D16	TX+SW								
D17									
D18	TX+SW								
D19									
D2	TX								
D20	TX								
D21	TX+SW								
D22									
D23	TX+SW								
D24									
D25									
D26									

D27									
D28									
D29									
D30									
D31									
D32									
D33									
D34									
D35									
D36A									
D36B									
D37									
D38									
D39									
D40									
D41									
D42									
D43									
D44A									
D44B									
D44C									
D44D									
D44E									
D44F									
D44G									
D44H									
D44I									
D44J									
D6									
Police Station		4LF	LF						
Citadel Hotel		4LF	LF						
Plaza 1881									
Blue Cross									
Metro Center		11LF	3LF						
Prince George		2T	T+L						
Cambridge Suites		2T	2T+2L						
Canada Trust									
City Hall									
Grand Parade		3T	3T+3L						
Proctor Street									
Xerox Bldg						2T	2T+2L		
Sherato						2T	T+L		

n									
Hollis 1801						2T	T+L		
Art Gallery						3T	T+L	T	
Royal Bank						2LF	LF		
Historic Prop. Warerfront						2LF	LF		
Ferry Terminal						2LF			
Law Courts						2T	2T+3LF		
Hist Prop. Promenade						2T	T+L		
Bank of Montreal						2LF	LF		
Ralston Building								2T	T+L
Summit Place								2T	T+L
Founder's Square								3T	T+L
Bedford Row								2T	2T+2L
Public Works Canada								2T	2T+2L
Barrington Place		2T	T+L						
Market St 1770			4L						
6H Proctor Street						6LF			
O/H section								2LF	4LF
Keith's Brewery								2T	2T+2L
Harbour Walk								2T	T+L
Maritime Museum								2T	2T+2L
28H South Pad Vault		10LF		36LF+ 2T		LF			
Center Pad Vault				4T	T+L				

Scotia Tower Vault				4T	T+L				
North Pad Vault				4T	T+L				
MacKeen Pad Vault				4T	T+L				
Trade Mart Vault				2T	T+L				

APPENDIX D – Art Gallery Tie (Details)

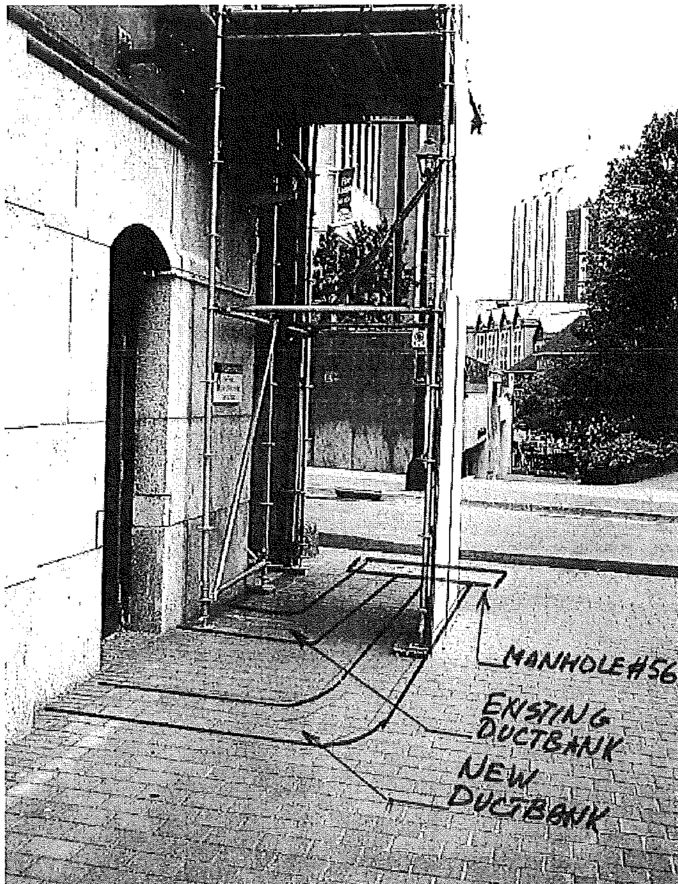


Fig. 4.3 Art Gallery Ductbank Extension

The inlaid brick manhole cover should be replaced with a different type of cover that can be quickly removed and reinstalled as required.

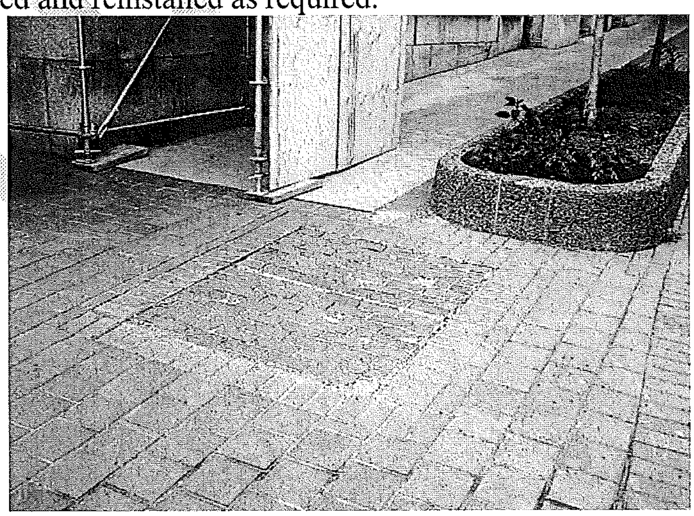


Fig. 4.4 Manhole MH56

The electrical connections in the vault will have to be modified to allow for a new switch. One of the options would be to install a new two-way 200 A VacPac switch and relocate the CS431-272 primary service from the existing four-way VacPac switch to the new switch. The source side of the new switch will be piggybacked at L431-209. See Fig. 4.5 and 4.6 for details. This will free up one of the 600 A switches on the existing VacPac which will be used to tie-in the feeder 1H-424.

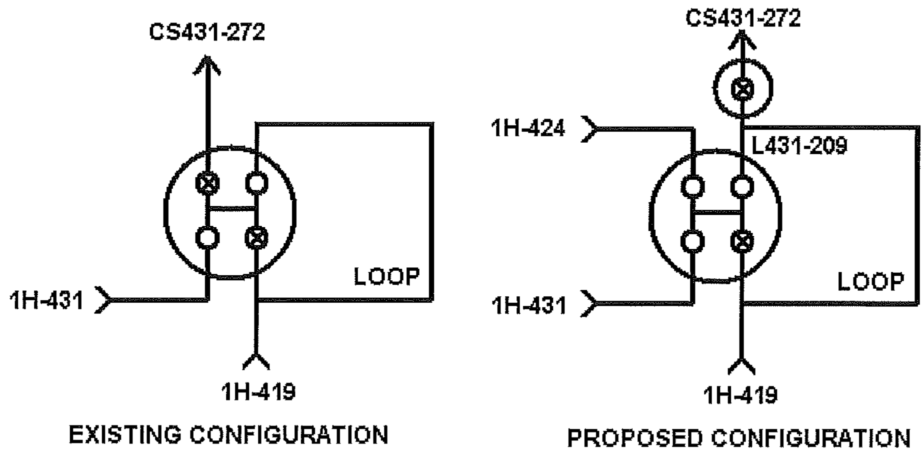


Fig. 4.5 Electrical Connections Before and After

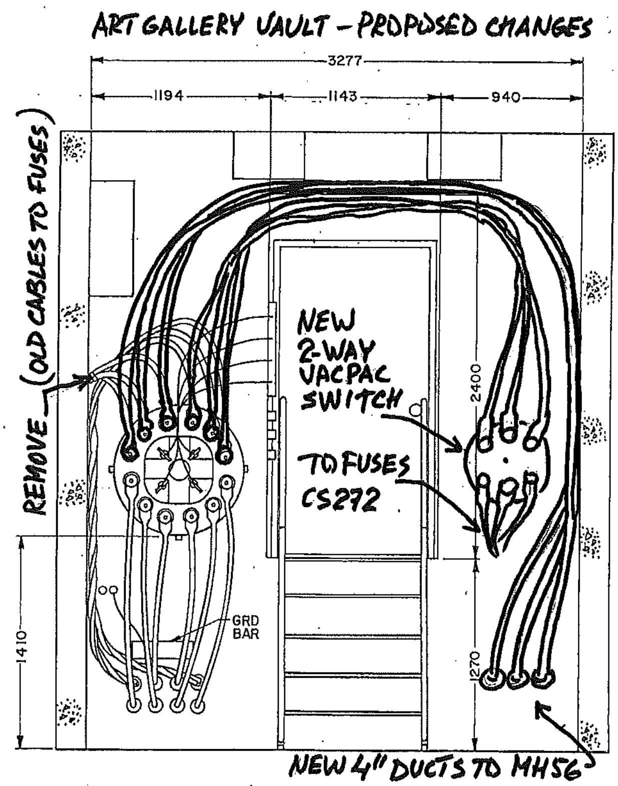


Fig. 4.6 New Two-Way Switch in the Vault

The following is the list of basic jobs for the project:

1. Install nine 100 mm ducts (3 spare) between the Art Gallery vault and MH56 (approx. 8 m).
2. Repair or replace manhole cover MH56
3. Install six 750 kcmil Al cables from MH13 through MH56 to Art Gallery vault (60 – 70 m)
4. Install new 2-way 200 A VacPac switch in the vault. Cooper model # 21VP125-22. The SMD-20 fuse mounts in the vault may need to be slightly moved to allow for proper clearance.
5. Transfer cs431-272 from four-way to two-way VacPac switch. The source side of the new switch connects to L431-209.
6. Terminate and connect the new cables to L431-212 -the freed-up switch.
7. Splice-in the other end of the cable to the feeder 1H-424 in MH13 using 600A deadbreak terminations.
8. Consider installing barriers in front of the fuses in the vault.

APPENDIX E – Deadfront Splice Specifications for 750 kcmil Cable

One three phase separable deadfront splice on the full size feeder cable will require the following materials:

#	Description	NSPI Code	QTY	Price
1	Basic Shielded Elbow 25 kV	5465-2370	6	$76.87/ea
2	Cable Adapter #750, Compact	5465-0189	6	$15.84/ea
3	Connecting Plug 25 kV	5465-7400	3	$79.26/ea
4	Basic Insulating Plug	5465-7350	6	$46.29/ea
5	Conductor Contact, #750 Compact	5465-1320	6	$33.17/ea
6	Constant Force Spring	5465-0655	6	$13.56/ea
7	Braid Flexible Tinned	5465-0650	3 m	$7.98 per ft

CI Number: 41351

Title: **2012 Distribution Automation**

Start Date: 2012/02
Final Cost Date: 2012/12
Function: Distribution
Forecast Amount: $553,965

DESCRIPTION:

This project provides for the installation of additional recloser devices to provide sectionalizing points on specified feeders. In 2012 it is planned to add or change out reclosers associated with 12 distribution circuits. Feeder selection is based on Customer Interruptions (CI) x Customer Hours (CH) weighting for full feeder outages that were not caused by loss of transmission.

Summary of Related CI's +/- 2 years:
2011 39269 Recloser Additions - $444,765

JUSTIFICATION:

Justification Criteria: Distribution System

Sub Criteria: Outage Performance

Why do this project?

This project is designed to improve distribution reliability on feeders. By installing loop sectionalizing transfer schemes, NSPI will be able to significantly reduce the number of customer interruptions and customer hours of interruption each year through improved feeder sectionalizing and automatic restoration of unfaulted feeder segments.

Why do this project now?

This project consists of installing 7 new loop sectionalizing transfer schemes between a total of 12 distribution circuits. Feeders were selected based on a ranking that included only full feeder outages that were not the result of a loss of transmission supply. The loop sectionalizing schemes resulted in the following $/ACHI (Avoided Customer Hour Interruptions) analysis:

(1) Transfer scheme between 2H-413 & 1H-415 to transfer load in both directions provides a $/ACHI of 20.7.

(2) Transfer scheme to transfer portion of 104H-413 onto 1H-427 provides a $/ACHI of 41.1.

(3) Transfer scheme between 104H-431 & 1H-415 (new feeder) to transfer load in both directions provides a $/ACHI of 93.4.

(4) Transfer scheme between 20H-301 & 20H-303 to transfer load in both directions & upgrade of midpoint recloser on 20H-303 provides a $/ACHI of 76.1.

(5) Transfer scheme between 104H-431 & 104H-432 to transfer load in both directions provides a $/ACHI of 91.5.

(6) Transfer scheme between 113H-432 & 58H-421 to transfer load in both directions provides a $/ACHI of 18.1.

(7) Transfer scheme between 113H-434 & 58H-431 to transfer load in both directions

provides a $/ACHI of 83.3.

These projects are advanced based on the $/ACHI analysis and favourable results.

Why do this project this way?

This project targets NSPI's poor performing feeders for the purpose of improving reliability.

CI Number : 41351 - 2012 Distribution Automation **Project Number**

Parent CI Number : -

Cost Centre : 800 - 800-Services - Admin. **Budget Version** 2012 ACE Plan

Capital Item Accounts

Acct	Actv	Account	Activity	Forecast Amount	Amount	Variance
092		092-Vehicle T&D Reg. Labour AO		33,107	0	33,107
094		094 - Interest Capitalized		22,327	0	22,327
095		095-Thermal Regular Labour AO		4,538	0	4,538
095		095-COPS Contracts AO		[redacted]	0	[redacted]
095		095-COPS Regular Labour AO		50,434	0	50,434
001	035	001 - T&D Regular Labour	035 - DP - Wood Poles	6,017	0	6,017
012	035	012 - Materials	035 - DP - Wood Poles	27,570	0	27,570
013	035	013 - COPS Contracts	035 - DP - Wood Poles	[redacted]	0	[redacted]
001	039	001 - T&D Regular Labour	039 - DP - O/H Cond.	5,683	0	5,683
012	039	012 - Materials	039 - DP - O/H Cond.	8,400	0	8,400
001	040	001 - T&D Regular Labour	040 - DP - O/H Cond.Devices	46,798	0	46,798
012	040	012 - Materials	040 - DP - O/H Cond.Devices	306,066	0	306,066
001	085	001 - T&D Regular Labour	085 Design	6,841	0	6,841
001	087	001 - THERMAL Regular Labour	087 Field Super.& Ops.	18,900	0	18,900
			Total Cost:	553,965	0	553,965
			Original Cost:	91,652		

CI 41351 2012 Distribution Automation

The following is a breakdown of costs associated with the 2012 Distribution Automation project:

Administrative Overhead and Interest	[redacted]
Materials	$ 342,036
Contracts	[redacted]
COPS Labour	$ 84,238
Total	$ 553,964

This project will be completed by NSPI personnel at a rate of approximately [redacted] per person day. The material costs are based on estimated per-unit costs for a similar project executed in 2011. The forecast for contracts includes traffic control services.

Feeder	Cust Count	CI/y	CH/y	Comments	ACI	ACHI	Cost	$/ACI	$/ACHI
2H-413	2828	4,275.2	6108.1	Tie recloser between 2H-413 & 1H-415 to transfer load in both directions	1332.7	1904.0	$62,282	32.3	20.7
1H-415	2224	1,779.2	3336.0		592.7	1111.4			
104H-413	4100	6,630.0	4427.2	Tie recloser to transfer portion of 104H-413 onto 1H-427	2245.3	1499.3	$61,567	27.4	41.1
104H-431	2275	3,491.6	4127.0	Tie recloser between 104H-431 & 1H-415 (new feeder) to transfer load in both directions	195.3	230.8	$61,567	145.3	93.4
1H-415 (new feeder)	1250	1,000.0	1875.0		228.6	428.6			
20H-301	2141	2,701.4	2042.7	Tie recloser between 20H-301 & 20H-303 to transfer load in both directions & new midpoint recloser on 20H-303	448.1	338.8	$117,783	151.2	76.1
20H-303	1282	1,762.2	6437.1		330.9	1208.8			
104H-431	2275	3,491.6	4127.0	Tie recloser between 104H-431 & 104H-432 to transfer load in both directions	195.3	230.8	$61,567	85.3	91.5
104H-432	1831	2,819.8	2368.2		526.5	442.2			
113H-432	2262	1,809.6	3393.0	Transfer scheme on existing tie recloser to transfer load in both directions. Portion of double circuit is also required	638.4	1196.9	$125,070	42.5	18.1
58H-421	1246	5,599.6	11238.4		2302.0	4620.1			
113H-434	3610	2,888.0	5415.0	Tie recloser between 113H-434 & 58H-431 to transfer load in both directions. Portion of double circuit is also required	373.5	700.2	$140,470	122.6	83.3
58H-431	2064	2,913.0	3723.0		771.9	986.5			

CI Number: 41353

Title: **2012 Downline Recloser Additions**

Start Date: 2012/02
Final Cost Date: 2012/11
Function: Distribution
Forecast Amount: $543,284

DESCRIPTION:

This project provides for the installation of additional midpoint (downline) reclosers to provide sectionalizing points on specific feeders. In 2012, it is planned to add midpoint reclosers to 11 distribution circuits. Feeder selection is based on Customer Interruptions (CI) x Customer Hours (CH) weighting for full feeder outages that were not caused by loss of transmission.

Summary of Related CI's +/- 2 years:
2010 - 38022 2010 Recloser Additions $1,400,271
2011 - 39269 2011 Recloser Additions $444,765
2013 CI TBD Downline Recloser Additions $TBD

JUSTIFICATION:

Justification Criteria: Distribution System

Sub Criteria: Outage Performance

Why do this project?

This project is designed to improve distribution reliability on selected feeders. An estimated 4,100 customer interruptions and 6,000 customer hours of interruption will be avoided through improved feeder sectionalizing and automatic restoration of unfaulted feeder segments. These numbers are based on the 11 new additional downline reclosers proposed for 2012

Why do this project now?

This project will provide improved reliability through avoided customer interruptions.

Why do this project this way?

The installation of a midpoint (downline) recloser is a utility standard approach to improving distribution reliability. Appropriate sectionalizing of a feeder will improve outage statistics. For instance, installing a recloser at 50% of the length of a feeder with 50% of the customer count before and after the recloser will result in a 25% (on average) improvement in both the System Average Interruption Frequency Index (SAIFI) and the System Average Interruption Duration Index (SAIDI) statistics. The reduction in customer outages will improve customer service. If the new downline feeder section can be transferred automatically to an alternate feeder when the source feeder section has tripped, the improvement in predicted reliability becomes 50%. Given the predicted improvement in CI and CH, the $/ACI (Avoided Customer Interruptions) was evaluated to be $128.44 /ACI and the $/ACHI (Avoided Customer Hour Interruptions) was evaluated to be $87.24mn /ACHI.

CI Number : 41353 - 2012 Downline Recloser Additions **Project Number**

Parent CI Number : -

Cost Centre : 800 - 800-Services - Admin. **Budget Version** 2012 ACE Plan

Capital Item Accounts

Acct	Actv	Account	Activity	Forecast Amount	Amount	Variance
092		092-Vehicle T&D Reg. Labour AO		33,442	0	33,442
094		094 - Interest Capitalized		25,883	0	25,883
095		095-COPS Regular Labour AO		50,945	0	50,945
095		095-COPS Contracts AO		[redacted]	0	[redacted]
013	045	013 - COPS Contracts	045 - DP - U/G Conduit	[redacted]	0	[redacted]
001	046	001 - T&D Regular Labour	046 - DP - U/G Conductor	66,000	0	66,000
012	046	012 - Materials	046 - DP - U/G Conductor	348,000	0	348,000
013	046	013 - COPS Contracts	046 - DP - U/G Conductor	[redacted]	0	[redacted]
			Total Cost:	543,284	0	543,284
			Original Cost:			

CI 41353 - Downline Recloser Additions

The following is a breakdown of costs associated with the Downline Recloser Additions project:

Administrative Overhead and Interest	$ 113,884
Materials	$ 348,000
Contracts	$ 15,400
COPS Labour	$ 66,000
Total	$ 543,284

This project will be completed by NSPI personnel at a rate of approximately [redacted] per person day.

The forecast for materials is based on estimated per-unit costs based on NSPI's recent experience in purchasing and installing these types of reclosers.

The forecast for contracts is for traffic control services.

Feeder	Cust Count	CI/y	CH/y	Comments	ACI	ACHI	Units	Avg $/ACI $/ACI	Avg $/ACHI $/ACHI	Cost
1H-415	2,224.0	1,779.2	3,336.0	Midpoint recloser near D4A11644	28.8	54.0	1	1,804.51	962.41	$ 51,970
1H-415 new	1,250.0	1,000.0	1,875.0	Midpoint recloser at Morris and Queen	175.5	329.1	1	296.08	157.91	$ 51,970
2H-412	1,207.0	3,278.4	3,229.4	Midpoint recloser at Qunipool and Vernon	402.9	396.9	1	129.00	130.95	$ 51,970
104H-432	1,831.0	2,819.8	2,368.2	Midpoint recloser at D431-400	693.8	582.7	1	74.91	89.19	$ 51,970
20H-301	2,141.0	2,701.4	2,042.7	Midpoint recloser at E331-011	590.0	446.2	1	67.74	89.59	$ 39,970
50N-415	715.0	2,868.4	3,209.0	Midpoint recloser after Boat Harbour Tap	425.8	476.3	1	93.88	83.91	$ 39,970
84W-301	1,496.0	762.8	2,298.2	Midpoint recloser at D314-045	372.1	1,121.2	1	107.41	35.65	$ 39,970
58H-421	1,246.0	5,599.6	11,238.4	Midpoint recloser at D432-054	444.2	891.5	1	117.00	58.30	$ 51,970
58H-431	2,064.0	2,913.0	3,723.0	Midpoint recloser at old 39H stepdown site	520.2	664.9	1	99.90	78.16	$ 51,970
113H-432	2,262.0	1,809.6	3,393.0	Midpoint recloser at D4A21138	204.0	382.4	1	254.79	135.89	$ 51,970
87H-313	1,767.0	2,116.0	6,327.9	Midpoint recloser after takeoffs to R332-013 and R332-022	219.8	657.4	1	181.82	60.80	$ 39,970
Totals	45,851.2	70,689.0	43,040.8		4,077.1	6,002.5	11.0			$ 523,670
Averages								$ 128.44	$ 87.24	

CI Number: 41355

Title: **2012 Remote Communication on Reclosers**

Start Date: 2012/01
Final Cost Date: 2012/12
Function: Distribution
Forecast Amount: $536,258

DESCRIPTION:

This project provides for the installation of remote communication (modems, speednets, repeaters, RTU's, etc.) on existing substation and downline reclosers. In 2012 it is proposed to add communications to 29 substation reclosers and 11 downline reclosers and install 1 new control system for an existing sectionalizer.

Summary of Related CI's +/- 2 years:
No projects in 2010, 2011, 2012, 2013 and 2014

JUSTIFICATION:

Justification Criteria: Distribution System

Sub Criteria: Outage Performance

Why do this project?

This project is required to improve restoration time on distribution feeders. By installing remote communications on existing substation and downline reclosers NSPI can improve the restoration time on feeder outages as well as provide useful information in determining the exact fault locations.

Why do this project now?

The existing downline sectionalizer is on Henry Street in Halifax. The existing plant is deteriorated and remote communications are not installed.

Substation reclosers were selected based on the type of unit that was previously installed which has the ability to accept remote communications. Increased operating costs on the substation based units would be avoided due to the ability to remotely gather fault information, install hold-offs, and block ground trips.

Downline reclosers were selected based on a ranking that included only full feeder outages that were not the result of a loss of transmission supply. The addition of remote communications would save on average 15 min in restoration time which results in a $/ACHI (Avoided Customer Hour Interruptions) of 100.6.

Why do this project this way?

This item targets existing electronic reclosers with high customer counts and the ability to handle the remote communications.

CI Number : 41355 - 2012 Remote Communication on Reclosers **Project Number**

Parent CI Number : -

Cost Centre : 800 - 800-Services - Admin. **Budget Version** 2012 ACE Plan

Capital Item Accounts

Acct	Actv	Account	Activity	Forecast Amount	Amount	Variance
092		092-Vehicle T&D Reg. Labour AO		33,442	0	33,442
094		094 - Interest Capitalized		18,858	0	18,858
095		095-COPS Contracts AO		3,613	0	3,613
095		095-COPS Regular Labour AO		50,945	0	50,945
013	045	013 - COPS Contracts	045 - DP - U/G Conduit	[redacted]	0	[redacted]
001	046	001 - T&D Regular Labour	046 - DP - U/G Conductor	66,000	0	66,000
002	046	002 - T&D Overtime Labour	046 - DP - U/G Conductor	0	0	0
012	046	012 - Materials	046 - DP - U/G Conductor	348,000	0	348,000
013	046	013 - COPS Contracts	046 - DP - U/G Conductor	[redacted]	0	[redacted]
			Total Cost:	536,258	0	536,258
			Original Cost:			

CI 41355 Remote Communications on Reclosers

The following is a breakdown of costs associated with the Remote Communications on Existing Reclosers project:

Administrative Overhead and Interest	$106,858
Materials	$348,000
Contracts	$15,400
COPS Labour	$66,000
Total	$536,258

This project will be completed by NSPI personnel at a rate of approximately [redacted] per person day. The material costs are based on estimated per-unit costs for a similar project executed in 2011. The forecast for contracts includes traffic control services.

Feeder	Device	Customers Downstream	Avg Trip to Lockout Per Year	Response Time Saved	ACHI
3S-403	R471-032	1111	2.4	0.25	666.6
50N-410	R451-025	1564	1.2	0.25	469.2
37N-412	607N-301	498	2.4	0.25	298.8
73W-411	R412-001	2782	0.8	0.25	556.4
73W-411	R412-002	1917	0.8	0.25	383.4
62N-414	R451-018	880	1.4	0.25	308
87H-313	R332-012	761	1.4	0.25	266.35
91W-411	91W-411	978	1.4	0.25	342.3
57C-426	R456-121	560	2.2	0.25	308
7N-301	7N-301	1376	0.6	0.25	206.4
7N-302	7N-302	431	1.4	0.25	150.85
				Avg ACHI:	**359.7**

CI Number: 41339

Title:	**2012 Distribution Feeder Ties**
Start Date:	2012/02
Final Cost Date:	2012/12
Function:	Distribution
Forecast Amount:	$492,873

DESCRIPTION:

This project provides for the costs associated with building spans of line, reconductoring and installing transfer switches in order to tie distribution lines together to allow for load transfer between circuits. This scope of this project will focus on four different feeder ties in 2012:

(1) 101H-421 to 101H-422 – Duke St. – Construct 9 spans of line and install a gang switch. This is expected to realize an annual average savings of 11,689 Customer Hours.

(2) 1H-427 to 1H-429 – University Ave – Install an underground switch. This is expected to realize an annual average savings of 366 Customer Hours.

(3) 63V-311 to 64V-302 – Bridge St. – Re-conductor 1km of line to 336. This is expected to realize an annual average savings of 4943 Customer Hours.

(4) 65V-302 to 64V-301 – Torbrook Rd. – Re-conductor 3km of line to 336 This is expected to realize an annual average savings of 4832 Customer Hours.

Summary of Related CI's +/- 2 years:
2010 CI 38847 2010 Distribution Feeder Ties - $531,609
2011 CI 39272 2011 Distribution Feeder Ties - $500,000
2013 CI TBD 2013 Distribution Feeder Ties - $ TBD

JUSTIFICATION:

Justification Criteria: Distribution System

Sub Criteria: Outage Performance

Why do this project?

This work is being undertaken as part of the overall customer reliability improvement investment. This is year three of a five year (2010-2014) plan to improve reliability to NSPI's customers. This project is required in order to improve reliability by enabling the transfer of customers between feeders during outages.

Why do this project now?

This project will improve system reliability by providing alternate supply during outage situations.

Why do this project this way?

This is the most cost effective and efficient way to create a feeder interconnection between the circuits.

The labour for this project will be sourced through NSPI's existing Power Line Technician (PLT) Service Agreement with EUS. This is aligned with NSPI's workforce planning model which is designed to optimize the allocation and execution of PLT resources among work requirements.

CI Number : 41339 - 2012 Distributin Feeder Ties **Project Number**

Parent CI Number : -

Cost Centre : 800 - 800-Services - Admin. **Budget Version** 2012 ACE Plan

Capital Item Accounts

Acct	Actv	Account	Activity	Forecast Amount	Amount	Variance
094		094 - Interest Capitalized		11,672	0	11,672
095		095-COPS Contracts AO		74,003	0	74,003
013	002	013 - COPS Contracts	002 - DP - Land Rights	[redacted]	0	[redacted]
012	035	012 - Materials	035 - DP - Wood Poles	10,299	0	10,299
013	035	013 - COPS Contracts	035 - DP - Wood Poles	[redacted]	0	[redacted]
012	039	012 - Materials	039 - DP - O/H Cond.	43,971	0	43,971
013	039	013 - COPS Contracts	039 - DP - O/H Cond.	[redacted]	0	[redacted]
012	040	012 - Materials	040 - DP - O/H Cond.Devices	4,512	0	4,512
013	040	013 - COPS Contracts	040 - DP - O/H Cond.Devices	[redacted]	0	[redacted]
012	041	012 - Materials	041 - DP - O/H Line Transf.	3,863	0	3,863
013	041	013 - COPS Contracts	041 - DP - O/H Line Transf.	[redacted]	0	[redacted]
012	050	012 - Materials	050 - DP - Street Lights	29,000	0	29,000
013	050	013 - COPS Contracts	050 - DP - Street Lights	[redacted]	0	[redacted]
012	052	012 - Materials	052 - DP - Services	109	0	109
013	052	013 - COPS Contracts	052 - DP - Services	[redacted]	0	[redacted]
			Total Cost:	492,873	0	492,873
			Original Cost:	39,024		

CI 41339 2012 Distribution Feeder Ties

The following is a breakdown of costs associated with the 2012 Distribution Feeder Ties project:

Administrative Overhead and Interest	$ 85,675
Materials	$ 91,753
Contracts	$ 315,444
Total	$492,872

Material – The material forecast for this project is based on similar projects which were submitted in the 2011 and 2010 Annual Capital Expenditure Plans (CI 39272 2011 Distribution Feeder Ties and CI 38847 Distribution Feeder Ties). Additionally, one Vac-Pak switch will be required.

The work associated with this project is expected to be sourced through NSPI's existing Power Line Technician (PLT) contract with Emera Utility Services (EUS), at a rate of approximately [redacted] per compatible unit hour. Trimming, Traffic Control, Backhoe and Easements will also be funded through the Contract forecast.

Calculated $/ACHI

Feeder	SAIDI 5 YR AVG	-1/2hr connect	customers (#)	Hours saved	Est Cost For Tie	$/ACHI
1H-427	1.37	0.87	2348.00	244.79	$34,128	$93.23
1H-429	0.60	0.10	16.00	121.27		
101H-421	8.08	7.58	1362.00	9,181.85	$37,546	$3.21
101H-422	7.24	6.74	372.00	2,507.82		
63V-311	4.97	4.47	910.00	4,066.93	$260,155	$52.62
64V-302	5.02	4.52	194.00	876.64		
64V-301	9.07	8.57	200.00	1,714.65	$91,670	$18.97
65V-302	16.09	15.59	200.00	3,117.34		

$/ACHI = Est Cost / ((SAIDI-.5)x(# of Cust))for both feeders

CI Number: 41325

Title: **Replacement of 3H and 6H Reclosers**

Start Date: 2012/02
Final Cost Date: 2013/02
Function: Distribution
Forecast Amount: $465,327

DESCRIPTION:

This project provides for the replacement of the remaining 13 model 3H and 6H hydraulic reclosers. There were 35 of these reclosers in the Nova Scotia Power distribution system.

Summary of Related CI's +/- 2 years:
2010 CI 38867 Replacement of 3H and 6H Reclosers – 253,331
2011 CI 40211 2011 3H/6H Replacement Program – 306,895

JUSTIFICATION:

Justification Criteria: Distribution System

Sub Criteria: System Protection

Why do this project?

This work is being undertaken as part of the overall customer reliability improvement investment. This is part of the five year (2010-2014) plan to improve reliability to NSPI's customers. This project is required to replace deteriorated equipment, which is having an adverse effect on distribution system reliability.

Why do this project now?

These reclosers are approximately 40 years old and are at the end of their expected product life. Deterioration of these reclosers has a negative impact on customer service reliability. Replacement of these devices in 2012 will prevent failures, thereby averting customer hours of interruption. This is the final year of the planned 3 year replacement project.

Why do this project this way?

Replacing the identified reclosers over a 3 year timeframe provides Nova Scotia Power with the flexibility needed to manage the resources to complete this work. This final year will see the replacement of 13 reclosers to complete the project.

CI Number : 41325 - Replacement of 3H and 6H Reclosers **Project Number**

Parent CI Number : -

Cost Centre : 800 - 800-Services - Admin. **Budget Version** 2012 ACE Plan

Capital Item Accounts

Acct	Actv	Account	Activity	Forecast Amount	Amount	Variance
092		092-Vehicle T&D Reg. Labour AO		40,554	0	40,554
094		094 - Interest Capitalized		14,607	0	14,607
095		095-Thermal Regular Labour AO		320	0	320
095		095-COPS Regular Labour AO		61,779	0	61,779
001	040	001 - T&D Regular Labour	040 - DP - O/H Cond.Devices	52,230	0	52,230
002	040	002 - T&D Overtime Labour	040 - DP - O/H Cond.Devices	0	0	0
011	040	011 - Travel Expense	040 - DP - O/H Cond.Devices	375	0	375
012	040	012 - Materials	040 - DP - O/H Cond.Devices	260,000	0	260,000
013	040	013 - COPS Contracts	040 - DP - O/H Cond.Devices	0	0	0
014	040	014 - Overtime Meals	040 - DP - O/H Cond.Devices	0	0	0
041	040	041 - Meals & Entertainment	040 - DP - O/H Cond.Devices	750	0	750
001	043	001 - T&D Regular Labour	043 - DP - Substn Dev.	14,365	0	14,365
002	043	002 - T&D Overtime Labour	043 - DP - Substn Dev.	0	0	0
011	043	011 - Travel Expense	043 - DP - Substn Dev.	125	0	125
014	043	014 - Overtime Meals	043 - DP - Substn Dev.	0	0	0
041	043	041 - Meals & Entertainment	043 - DP - Substn Dev.	250	0	250
001	085	001 - Regular Labour (No AO)	085 Design	5,200	0	5,200
001	085	001 - THERMAL Regular Labour	085 Design	1,332	0	1,332
001	085	001 - T&D Regular Labour	085 Design	13,440	0	13,440
002	085	002 - Overtime Labour (No AO)	085 Design	0	0	0
002	085	002 - THERMAL Overtime Labour	085 Design	0	0	0
002	085	002 - T&D Overtime Labour	085 Design	0	0	0
011	085	011 - Travel Expense	085 Design	0	0	0
041	085	041 - Meals & Entertainment	085 Design	0	0	0
			Total Cost:	465,327	0	465,327
			Original Cost:	61,609		

CI 41325 Replacement of 3H and 6H Reclosers

The following is a breakdown of costs associated with the 3H and 6H recloser project:

Administrative Overhead and Interest	$117,260
Materials	$260,000
COPS Labour	$86,567
Other	$1,500
Total	$465,327

The labour associated with this project will be performed by NSPI personnel at a rate of approximately [redacted] per person day. The material budget includes the cost of the reclosers (approximately [redacted] each). Other forecast amounts include travel and meal costs.

CI Number: 41360

Title: **82V-423 Hardwood Lands Deteriorated Plant Replacement**

Start Date: 2012/06
Final Cost Date: 2012/11
Function: Distribution
Forecast Amount: $437,192

DESCRIPTION:

This project provides for the reconductoring of a section of deteriorated plant in Hardwood Lands. The conductor and several poles are reaching the end of their life and need to be replaced. This project will include the replacement of some porcelain equipment in the area.

Summary of Related CI's +/- 2 years:
No projects in 2010, 2011, 2012, 2013 and 2014

JUSTIFICATION:

Justification Criteria: Distribution System

Sub Criteria: Outage Performance

Why do this project?

NSPI's inspection program has identified a section of deteriorated plant which requires replacement. The area experiences outages during storm events and the equipment has come to the end of its service life.

Why do this project now?

The plant has reached the end of its serviceable life and is a risk to the reliability of the system.

Why do this project this way?

Replacement of the deteriorated plant is the most cost effective way to improve reliability on this section of feeder.

CI Number : 41360 - 82V-423 Hardwood Lands Deteriorated Plant Replacement **Project Number**

Parent CI Number : -

Cost Centre : 800 - 800-Services - Admin. **Budget Version** 2012 ACE Plan

Capital Item Accounts

Acct	Actv	Account	Activity	Forecast Amount	Amount	Variance
092		092-Vehicle T&D Reg. Labour AO		49,769	0	49,769
094		094 - Interest Capitalized		2,603	0	2,603
095		095-COPS Regular Labour AO		75,817	0	75,817
095		095-COPS Contracts AO		22,281	0	22,281
013	002	013 - COPS Contracts	002 - DP - Land Rights	[redacted]	0	[redacted]
020	002	020 - Royalties, Easements, App	002 - DP - Land Rights	[redacted]	0	[redacted]
001	035	001 - T&D Regular Labour	035 - DP - Wood Poles	43,562	0	43,562
012	035	012 - Materials	035 - DP - Wood Poles	46,201	0	46,201
013	035	013 - COPS Contracts	035 - DP - Wood Poles	[redacted]	0	[redacted]
001	038	001 - T&D Regular Labour	038 - DP - Insulators	235	0	235
012	038	012 - Materials	038 - DP - Insulators	64	0	64
001	039	001 - T&D Regular Labour	039 - DP - O/H Cond.	38,741	0	38,741
012	039	012 - Materials	039 - DP - O/H Cond.	18,657	0	18,657
001	040	001 - T&D Regular Labour	040 - DP - O/H Cond.Devices	1,097	0	1,097
012	040	012 - Materials	040 - DP - O/H Cond.Devices	1,116	0	1,116
001	041	001 - T&D Regular Labour	041 - DP - O/H Line Transf.	6,999	0	6,999
012	041	012 - Materials	041 - DP - O/H Line Transf.	19,080	0	19,080
001	046	001 - T&D Regular Labour	046 - DP - U/G Conductor	418	0	418
012	046	012 - Materials	046 - DP - U/G Conductor	386	0	386
001	050	001 - T&D Regular Labour	050 - DP - Street Lights	1,149	0	1,149
012	050	012 - Materials	050 - DP - Street Lights	802	0	802
001	052	001 - T&D Regular Labour	052 - DP - Services	4,004	0	4,004
012	052	012 - Materials	052 - DP - Services	483	0	483
001	085	001 - Regular Labour (No AO)	085 Design	1,736	0	1,736
001	087	001 - T&D Regular Labour	087 Field Super.& Ops.	2,016	0	2,016
			Total Cost:	437,192	0	437,192
			Original Cost:	11,489		

CI 41360 82V-423 Hardwood Lands Deteriorated Plant

The following is a breakdown of costs associated with the 82V-423 Hardwood Lands Deteriorated Plant project:

Administrative Overhead and Interest	$150,470
Materials	$86,789
Contracts & Easements	$99,977
COPS Labour	$99,957
Total	$437,193

The labour associated with this project will be performed by NSPI personnel at a rate of approximately [redacted] per person day. The material budget includes standard structures, wire and devices for which special orders and long lead times are not required. The contracts and other forecast includes amounts for flagging, trimming and backhoe work, easements for new poles and anchors.

CI Number: 41389

Title: **8H Fairview Conversion**

Start Date: 2012/06
Final Cost Date: 2012/12
Function: Distribution
Forecast Amount: $417,695

DESCRIPTION:

This project provides for the retirement of the Fairview Substation Transformer, 8H-T1. The transformer is approximately 60 years old and is approaching its end of life. This project will require that the two feeders currently fed from 8H-T1 be converted from 4kV to 25kV. The load will continue to be serviced from 104H-433.

Summary of Related CI's +/- 2 years:
2012 CI 41395 8H Fairview Switchgear Retirement $213,288

JUSTIFICATION:

Justification Criteria: Distribution System

Sub Criteria: Equipment Replacement

Why do this project?

This project will increase the reliability to the 8H service area through this conversion. The 8H service area is an electrical island served at 4kV surrounded by the remaining 25kV distribution system. This conversion will allow for load switching to adjacent 25kV feeders, thereby providing an alternative to reduce outages that does not exist today. This project responds to a portion of the recommendations included in the Halifax 4kV planning study, 257-11 07-H43.

Why do this project now?

The operating equipment is approaching its end of life and the conversion will reduce potential extended unplanned outages.

Why do this project this way?

Replacement of the deteriorated equipment is the most cost effective option.

A portion of the labour associated with this project is being sourced through NSPI's existing Power Line Technician (PLT) Service Agreement with EUS. This is aligned with NSPI's workforce planning model which is designed to optimize the allocation and execution of PLT resources among work requirements.

CI Number : 41389 - 8H Fairview Conversion **Project Number**

Parent CI Number : -

Cost Centre : 800 - 800-Services - Admin. **Budget Version** 2012 ACE Plan

Capital Item Accounts

Acct	Actv	Account	Activity	Forecast Amount	Amount	Variance
092		092-Vehicle T&D Reg. Labour AO		36,075	0	36,075
094		094 - Interest Capitalized		2,102	0	2,102
095		095-COPS Contracts AO		16,429	0	16,429
095		095-COPS Regular Labour AO		54,957	0	54,957
013	002	013 - COPS Contracts	002 - DP - Land Rights	[redacted]	0	[redacted]
020	002	020 - Royalties, Easements, App	002 - DP - Land Rights	[redacted]	0	[redacted]
001	035	001 - T&D Regular Labour	035 - DP - Wood Poles	11,451	0	11,451
002	035	002 - CUST. SERV. Overtime Labour	035 - DP - Wood Poles	0	0	0
002	035	002 - T&D Overtime Labour	035 - DP - Wood Poles	0	0	0
012	035	012 - Materials	035 - DP - Wood Poles	15,949	0	15,949
013	035	013 - COPS Contracts	035 - DP - Wood Poles	[redacted]	0	[redacted]
001	038	001 - T&D Regular Labour	038 - DP - Insulators	248	0	248
012	038	012 - Materials	038 - DP - Insulators	145	0	145
001	039	001 - T&D Regular Labour	039 - DP - O/H Cond.	35,574	0	35,574
012	039	012 - Materials	039 - DP - O/H Cond.	14,802	0	14,802
001	040	001 - T&D Regular Labour	040 - DP - O/H Cond.Devices	1,456	0	1,456
012	040	012 - Materials	040 - DP - O/H Cond.Devices	2,191	0	2,191
001	041	001 - T&D Regular Labour	041 - DP - O/H Line Transf.	11,245	0	11,245
002	041	002 - T&D Overtime Labour	041 - DP - O/H Line Transf.	0	0	0
012	041	012 - Materials	041 - DP - O/H Line Transf.	125,327	0	125,327
001	046	001 - T&D Regular Labour	046 - DP - U/G Conductor	90	0	90
001	052	001 - T&D Regular Labour	052 - DP - Services	7,036	0	7,036
012	052	012 - Materials	052 - DP - Services	316	0	316
001	085	001 - Regular Labour (No AO)	085 Design	3,175	0	3,175
001	087	001 - T&D Regular Labour	087 Field Super.& Ops.	4,097	0	4,097
			Total Cost:	417,695	0	417,695
			Original Cost:	29,005		

CI 41389 - 8H Fairview Conversion

The following is a breakdown of costs associated with the 8H Conversion project:

Administrative Overhead and Interest	$ 109,563
Materials	$ 158,730
Contracts	[redacted]
COPS Labour	$ 74,371
Other	[redacted]
Total	$ 417,695

The Material forecast amounts are for standard wire and devices. A portion of the work associated with this project is expected to be sourced through NSPI's existing Power Line Technician (PLT) contract with Emera Utility Services, at a rate of approximately [redacted] per compatible unit hour. Traffic control and backhoe services are also included in the contract forecast. A portion of work is planned to be completed by NSPI resources at a rate of [redacted] per person day. The other account provides a forecast for potential easements.

CI Number: 41395

Title: **8H Fairview Switchgear Retirement**

Start Date: 2012/05
Final Cost Date: 2012/07
Function: Transmission
Forecast Amount: $213,293

DESCRIPTION:

This project will cover the retirement of the metal-clad 4 kV switchgear at 8H Fairview substation. New reclosers and concrete pads will be installed to cover the load currently being supported by the metal-clad switchgear. In addition, new aerial feeder exit cables will be installed to replace the underground cable that is currently in place.

JUSTIFICATION:

Justification Criteria:

Transmission Plant

Sub-Criteria:

Equipment Replacement

Why do this project?

The 4 kV switchgear at the Fairview substation and underground feeder exit cabling is approaching the end of its useful life. Manufacturer support for maintenance or replacement components for the switchgear is no longer available. The switchgear and cabling has experienced expected age-related deterioration and replacing it will reduce maintenance requirements at the substation as well as improve reliability.

Why do this project now?

The switchgear is over 50 years old and would be difficult to repair should it fail in-service due unavailability of spare parts.

Replacing the equipment now will decrease the likelihood of an unplanned equipment failure. Availability of manufacturer support and spare parts will also ensure the duration of future potential outages is minimized.

Why do this project this way?

The condition and the age of the switchgear preclude any benefit from overhauling or refurbishment. The cost of replacement is the same or less than the cost of refurbishment.

CI Number: 41384

Title: **2012 Feeder Exit Cable Replacement**

Start Date: 2012/02
Final Cost Date: 2012/12
Function: Distribution
Forecast Amount: $374,542

DESCRIPTION:

This project provides for the costs associated with replacing deteriorated feeder exit cables at the 50N Trenton, 3S Gannon Rd, 22V New Minas and the 70W Bridgewater substations.

Summary of Related CI's +/- 2 years:
2011 CI 40328 Feeder Exit Cable Replacements $317,587
2013 CI TBD Feeder Exit Replacement $TBD

JUSTIFICATION:

Justification Criteria: Distribution System

Sub Criteria: Deteriorated Conductor

Why do this project?

This work is being undertaken as part of the overall customer reliability improvement investment. This is year three of a five year (2010-2014) plan to improve reliability to NSPI's customers. Deteriorated feeder exit cables have the potential to affect the reliability of their associated feeders. Cable failures will generally result in lengthy customer outages, especially when the cables are not installed in a duct system, which is the case in three of the four locations identified for replacement.

Why do this project now?

These cables are at the end of their normal service life. Typical cables of this vintage (1970's) have an average service life of 25-30 years. Three of the installations (50N, 3S & 22V) are directly buried cables which cannot be easily replaced or repaired. The purpose of this project is to replace such cables in a proactive manner.

Why do this project this way?

The planned replacement of feeder exit cables allows for controlled upgrade of deteriorated plant focusing on those that are the greatest risk to reliability based on the age of the cables and the regular inspection data.

CI Number : 41384 - 2012 Feeder Exit Cable Replacement **Project Number**

Parent CI Number : -

Cost Centre : 800 - 800-Services - Admin. **Budget Version** 2012 ACE Plan

Capital Item Accounts

Acct	Actv	Account	Activity	Forecast Amount	Amount	Variance
092		092-Vehicle T&D Reg. Labour AO		17,819	0	17,819
094		094 - Interest Capitalized		7,619	0	7,619
095		095-Thermal Regular Labour AO		739	0	739
095		095-COPS Contracts AO		36,715	0	36,715
095		095-COPS Regular Labour AO		27,146	0	27,146
013	045	013 - COPS Contracts	045 - DP - U/G Conduit	[redacted]	0	[redacted]
001	046	001 - T&D Regular Labour	046 - DP - U/G Conductor	20,056	0	20,056
002	046	002 - T&D Overtime Labour	046 - DP - U/G Conductor	0	0	0
012	046	012 - Materials	046 - DP - U/G Conductor	40,000	0	40,000
013	046	013 - COPS Contracts	046 - DP - U/G Conductor	[redacted]	0	[redacted]
001	047	001 - T&D Regular Labour	047 - DP - U/G Conductor Devices	1,671	0	1,671
012	047	012 - Materials	047 - DP - U/G Conductor Devices	48,000	0	48,000
013	048	013 - COPS Contracts	048 - DP - U/G Line Transf.	[redacted]	0	[redacted]
001	085	001 - THERMAL Regular Labour	085 Design	3,077	0	3,077
001	085	001 - Regular Labour (No AO)	085 Design	1,760	0	1,760
002	085	002 - T&D Overtime Labour	085 Design	0	0	0
001	087	001 - T&D Regular Labour	087 Field Super.& Ops.	13,440	0	13,440
002	087	002 - T&D Overtime Labour	087 Field Super.& Ops.	0	0	0
			Total Cost:	374,542	0	374,542
			Original Cost:	37,156		

CI 41384 2012 Feeder Exit Cable Replacement

The following is a breakdown of costs associated with the 50N Trenton, 3S Gannon Rd, 22V New Minas and the 70W Bridgewater substations 2012 Feeder Exit Cable Replacement project:

Administrative Overhead and Interest	$ 90,038
Materials	$ 88,000
Contracts	$ 156,500
COPS Labour	$ 40,004
Total	$ 374,542

The labour associated with this project will be performed by NSPI personnel at a rate of approximately [redacted] per person day. The material budgets are based on previous estimated per-unit costs on similar projects. The contract forecasts include amounts for traffic control, crane usage and civil work for duct bank installation.

CI Number: 41338

Title: **20H-301 Targeted Feeder Replacement**

Start Date: 2012/01
Final Cost Date: 2012/10
Function: Distribution
Forecast Amount: $371,361

DESCRIPTION:

This project is part of a program to improve customer service and reliability, as measured by System Average Interruption Duration Index (SAIDI), System Average Interruption Frequency Index (SAIFI) performance and deteriorated plant incidents on select feeders throughout the Province. Specifically, deteriorated poles and conductor, porcelain arrestors, cutouts, rusty transformers and guys will be replaced.

Summary of Related CI's +/- 2 years:
No projects in 2010, 2011, 2012, 2013 and 2014

JUSTIFICATION:

Justification Criteria: Distribution System

Sub Criteria: Outage Performance

Why do this project?

This work is being undertaken as part of the overall customer reliability improvement investment. This is year three of a five year (2010-2014) plan to improve reliability to NSPI's customers. Distribution equipment (e.g. poles, conductor, cutouts, and transformers) failures are a primary driver of customer outages. This project will address distribution equipment issues on feeder 20H-301, out of the Spryfield Substation. This feeder, which is 62.6km in length, was selected due to past performance, customer density and feeder length.

Why do this project now?

This feeder is included in the 2012 Reliability Investment Plan based on past performance, customer density and feeder length. It is expected that targeted replacements on 20H-301 will result in annual savings of approximately 1570 customer hours of interruption.

Why do this project this way?

This project will address the distribution equipment weaknesses on this feeder.

A portion of the labour associated with this project is being sourced through NSPI's existing Power Line Technician (PLT) Service Agreement with EUS. This is aligned with NSPI's workforce planning model which is designed to optimize the allocation and execution of PLT resources among work requirements.

CI Number : 41338 - 20H-301 Targeted Feeder Replacement **Project Number**

Parent CI Number : -

Cost Centre : 800 - 800-Services - Admin. **Budget Version** 2012 ACE Plan

Capital Item Accounts

Acct	Actv	Account	Activity	Forecast Amount	Amount	Variance
092		092-Vehicle T&D Reg. Labour AO		53,862	0	53,862
094		094 - Interest Capitalized		10,807	0	10,807
095		095-COPS Contracts AO		11,730	0	11,730
095		095-COPS Regular Labour AO		82,053	0	82,053
001	035	001 - T&D Regular Labour	035 - DP - Wood Poles	470	0	470
012	035	012 - Materials	035 - DP - Wood Poles	404	0	404
013	035	013 - COPS Contracts	035 - DP - Wood Poles	50,000	0	50,000
001	038	001 - T&D Regular Labour	038 - DP - Insulators	9,636	0	9,636
012	038	012 - Materials	038 - DP - Insulators	3,247	0	3,247
001	039	001 - T&D Regular Labour	039 - DP - O/H Cond.	39,917	0	39,917
012	039	012 - Materials	039 - DP - O/H Cond.	1,736	0	1,736
001	040	001 - T&D Regular Labour	040 - DP - O/H Cond.Devices	9,715	0	9,715
012	040	012 - Materials	040 - DP - O/H Cond.Devices	8,010	0	8,010
001	041	001 - T&D Regular Labour	041 - DP - O/H Line Transf.	46,302	0	46,302
012	041	012 - Materials	041 - DP - O/H Line Transf.	42,099	0	42,099
001	042	001 - T&D Regular Labour	042 - DP - O/H Ln.Transf.Dev.	209	0	209
001	052	001 - T&D Regular Labour	052 - DP - Services	52	0	52
001	085	001 - Regular Labour (No AO)	085 Design	1,110	0	1,110
			Total Cost:	371,361	0	371,361
			Original Cost:	122,394		

CI 41338 20H-301 Targeted Feeder Replacements

The following is a breakdown of costs associated with the 20H-301 Targeted Feeder Replacements project:

Administrative Overhead and Interest	$ 158,452
Materials	$ 55,497
Contracts	$ 50,000
COPS Labour	$ 107,411
Total	$ 371,361

The Materials forecast amounts are for standard cutouts, insulators, arrestors and framing structures. A portion of the work associated with this project is expected to be sourced through NSPI's existing Power Line Technician (PLT) contract with Emera Utility Services, at a rate of approximately [redacted] per compatible unit hour. Traffic control services are also included in the contract forecast. A portion of work is planned to be completed by NSPI resources at a rate of [redacted] per person day.

CI Number: 41333

Title: **16N-301 Stewiacke Re-conductor**

Start Date: 2012/04
Final Cost Date: 2012/12
Function: Distribution
Forecast Amount: $353,467

DESCRIPTION:

This project provides for upgrading deteriorated plant within the town of Stewiacke. This replacement will include deteriorated conductor, poles and pole top equipment that are approaching its end of life.

Summary of Related CI's +/- 2 years:
No projects in 2010, 2011, 2012, 2013 and 2014

JUSTIFICATION:

Justification Criteria: Distribution System

Sub Criteria: Deteriorated Conductor

Why do this project?

The conductor is roughly 50 years old and is approaching its end of life. Replacing this equipment will increase the reliability in the area, through a reduction of equipment failures.

Why do this project now?

The conductor is reaching its end of life. Re-conductoring now will reduce outages due to conductor failure, increasing reliability in the area.

Why do this project this way?

This is the most effective method for increasing reliability in the area. Re-conductoring nearest to the existing source also provides the capability for load transfers.

The labour for this project will be sourced through NSPI's existing Power Line Technician (PLT) Service Agreement with EUS. This is aligned with NSPI's workforce planning model which is designed to optimize the allocation and execution of PLT resources among work requirements.

CI Number : 41333 - 16N-301 Stewiacke Reconductor **Project Number**

Parent CI Number : -

Cost Centre : 800 - 800-Services - Admin. **Budget Version** 2012 ACE Plan

Capital Item Accounts

Acct	Actv	Account	Activity	Forecast Amount	Amount	Variance
094		094 - Interest Capitalized		6,033	0	6,033
095		095-COPS Contracts AO		53,225	0	53,225
013	002	013 - COPS Contracts	002 - DP - Land Rights	[redacted]	0	[redacted]
012	035	012 - Materials	035 - DP - Wood Poles	34,028	0	34,028
013	035	013 - COPS Contracts	035 - DP - Wood Poles	[redacted]	0	[redacted]
012	039	012 - Materials	039 - DP - O/H Cond.	17,440	0	17,440
013	039	013 - COPS Contracts	039 - DP - O/H Cond.	[redacted]	0	[redacted]
012	041	012 - Materials	041 - DP - O/H Line Transf.	15,865	0	15,865
013	041	013 - COPS Contracts	041 - DP - O/H Line Transf.	[redacted]	0	[redacted]
			Total Cost:	353,467	0	353,467
			Original Cost:	37,953		

CI 41333 16N-301 Stewiacke Reconductor

The following is a breakdown of costs associated with the 16N-301 Stewiacke Reconductor project:

Administrative Overhead and Interest	$59,258
Materials	$67,333
Contracts	$226,876
Total	$353,467

This project provides for the costs associated with upgrading deteriorated plant within the town of Stewiacke. This replacement will include deteriorated conductor, poles and pole top equipment that is approaching its end of life. The work associated with this project is expected to be sourced through NSPI's existing Power Line Technician (PLT) contract with Emera Utility Services (EUS) at a rate of approximately [redacted] per compatible unit hour.

CI Number: 41327

Title: **103W-311 Gold River Re-conductor Phase 2**
Start Date: 2012/04
Final Cost Date: 2012/09
Function: Distribution
Forecast Amount: $310,296

DESCRIPTION:

This project entails the reconductoring of approximately 7 km of feeder. The project will be spread over multiple years. The current conductor size will be increased to enable a contingency for load transferring. The first phase was completed in 2011 and covered from the Delbury Road along Highway 3 south for approximately 174 spans. This second phase planned for 2012 will begin at Civic # 6736 Highway 3, and continue for approximately 210 spans to the corner of Pine Drive and Highway 3.

Summary of Related CI's +/- 2 years:
2011 CI 40203 103W-311 Gold River Phase 1 - $434,415
2013 CI TBD 103W-311 Gold River Phase 3 $TBD
2014 CI TBD 103W-311 Gold River Phase 4 $TBD

JUSTIFICATION:

Justification Criteria: Distribution System

Sub Criteria: Requirement to Serve

Why do this project?

The existing conductor is a combination of #6 CU and #4 AL which are physically small, have large cumulative operating hours and have limited capacity for incremental load increase.

Why do this project now?

Re-conductoring with a larger wire will improve reliability and provide contingency at all times of year.

Why do this project this way?

This is the most effective method for increasing contingency loading in the area. Reconductoring the small wire closest to the existing source provides the required capacity for load transfers.

CI Number : 41327 - 103W-311 Gold River Reconductor Phase 2 **Project Number**

Parent CI Number : -

Cost Centre : 800 - 800-Services - Admin. **Budget Version** 2012 ACE Plan

Capital Item Accounts

Acct	Actv	Account	Activity	Forecast Amount	Amount	Variance
092		092-Vehicle T&D Reg. Labour AO		26,596	0	26,596
094		094 - Interest Capitalized		1,932	0	1,932
095		095-COPS Contracts AO		16,051	0	16,051
095		095-COPS Regular Labour AO		40,517	0	40,517
013	002	013 - COPS Contracts	002 - DP - Land Rights	[redacted]	0	[redacted]
001	035	001 - T&D Regular Labour	035 - DP - Wood Poles	7,109	0	7,109
012	035	012 - Materials	035 - DP - Wood Poles	6,138	0	6,138
013	035	013 - COPS Contracts	035 - DP - Wood Poles	[redacted]	0	[redacted]
098	035	098 - Salvage	035 - DP - Wood Poles	(35)	0	(35)
001	039	001 - T&D Regular Labour	039 - DP - O/H Cond.	39,634	0	39,634
012	039	012 - Materials	039 - DP - O/H Cond.	96,157	0	96,157
098	039	098 - Salvage	039 - DP - O/H Cond.	(4,128)	0	(4,128)
001	040	001 - T&D Regular Labour	040 - DP - O/H Cond.Devices	2,657	0	2,657
012	040	012 - Materials	040 - DP - O/H Cond.Devices	1,836	0	1,836
098	040	098 - Salvage	040 - DP - O/H Cond.Devices	(111)	0	(111)
001	041	001 - T&D Regular Labour	041 - DP - O/H Line Transf.	1,095	0	1,095
012	041	012 - Materials	041 - DP - O/H Line Transf.	3,981	0	3,981
098	041	098 - Salvage	041 - DP - O/H Line Transf.	(1,463)	0	(1,463)
001	050	001 - T&D Regular Labour	050 - DP - Street Lights	121	0	121
001	052	001 - T&D Regular Labour	052 - DP - Services	1,874	0	1,874
012	052	012 - Materials	052 - DP - Services	1,914	0	1,914
			Total Cost:	310,296	0	310,296
			Original Cost:	21,165		

CI 41327 103W-311 Gold River Reconductor Ph 2

The following is a breakdown of costs associated with the Gold River Reconductor Ph 2 project:

Administrative Overhead and Interest	$85,096
Materials	$110,026
Contracts	$68,420
COPS Labour	$52,490
Salvage	($5,737)
Total	$310,295

The labour associated with this project will be performed by NSPI personnel at a rate of approximately [redacted] per person day. The material budgets include standard distribution equipment such as 336 conductors, spot replacement of poles and framing structures. The contract forecast includes tree trimming which will be completed by a contractor and easements as required.

CI Number: 41393

Title: **2012 Automatic Sleeve Replacements**

Start Date: 2012/03
Final Cost Date: 2012/09
Function: Distribution
Forecast Amount: $287,831

DESCRIPTION:

This project provides for the replacement of automatic sleeves on distribution feeders with compression connectors. An emerging failure mode has been encountered for automatic sleeves located close to substations with high operating and fault currents. The failure of these sleeves results in customer outages, and often affects entire feeders or substations. In some circumstances, failures have and can result in fallen conductor. All feeders from the following substations are targeted for automatic sleeve replacement in 2012:

Substation/ Region/ Customers
23H/ Central/ 9,568
15N/Central/9,672
48H /Central/5,038
1N/Central/7,852
62N/Central/7,400 54H/ Central/5,067 62H/Central/5,045 11S/ East /9,579
81S/ East/ 10,070
3S /East / 9,423
4S / East/ 7,501
22V/West/ 6,862 70W /West/ 6,148

Summary of Related CI's +/- 2 years:
No projects in 2010, 2011, 2012, 2013 and 2014

JUSTIFICATION:

Justification Criteria: Distribution System

Sub Criteria: Equipment Replacement

Why do this project?

Failure of automatic sleeves results in outages with high number of customer interruptions and customer hours of interruption. Failure of those located close to substations in urban areas can pose a risk to substation transformers due to high current faults. Automatic sleeve replacements in the targeted areas are expected to result in over 50,000 avoided customer hours of interruption (ACHI), with a unit cost of $4.72/ACHI.

Why do this project now?

Automatic sleeve failures were recognized to be accelerating in 2010 and are expected to continue with continued operation and deterioration.

This work is being undertaken as part of the overall customer reliability improvement investment. This is year three of a five year (2010-2014) plan to improve reliability to NSPI's customers.

Why do this project this way?

Proactive replacement of automatic sleeves is the ideal way to minimize potential customer interruptions, potential safety hazards and potential damage to substation transformers. Proactive replacement will not require planned interruptions.

CI Number : 41393 - 2012 Automatic Sleeve Replacements **Project Number**

Parent CI Number : -

Cost Centre : 800 - 800-Services - Admin. **Budget Version** 2012 ACE Plan

Capital Item Accounts

Acct	Actv	Account	Activity	Forecast Amount	Amount	Variance
092		092-Vehicle T&D Reg. Labour AO		49,627	0	49,627
095		095-COPS Contracts AO		[redacted]	0	[redacted]
095		095-COPS Regular Labour AO		75,600	0	75,600
001	040	001 - T&D Regular Labour	040 - DP - O/H Cond.Devices	97,437	0	97,437
002	040	002 - T&D Overtime Labour	040 - DP - O/H Cond.Devices	0	0	0
012	040	012 - Materials	040 - DP - O/H Cond.Devices	23,500	0	23,500
013	040	013 - COPS Contracts	040 - DP - O/H Cond.Devices	[redacted]	0	[redacted]
001	085	001 - T&D Regular Labour	085 Design	504	0	504
001	085	001 - Regular Labour (No AO)	085 Design	470	0	470
011	085	011 - Travel Expense	085 Design	800	0	800
041	087	041 - Meals & Entertainment	087 Field Super.& Ops.	0	0	0
			Total Cost:	287,831	0	287,831
			Original Cost:	143,212		

CI 41393 - 2012 Automatic Sleeve Replacements

The following is a breakdown of costs associated with the 2012 Automatic Sleeve Replacement project:

Administrative Overhead and Interest	$ [redacted]
Materials	$ 23,500
Contracts	$ [redacted]
COPS Labour	$ 98,411
Other	$ 800
Total	$ 287,832

The materials amount in this project is comprised of compression sleeves. The contract amount is for traffic control. There is COPS labour at a rate of [redacted] per person day, some GIS data collection and assessment along with some engineering.

CI Number: 41337

Title: **1N-405 Targeted Feeder Replacement**

Start Date: 2012/01
Final Cost Date: 2012/10
Function: Distribution
Forecast Amount: $283,892

DESCRIPTION:

This project is part of a program to improve customer service and reliability, as measured by System Average Interruption Duration Index (SAIDI), System Average Interruption Frequency Index (SAIFI) performance and deteriorated plant incidents on selected feeders throughout the Province. Specifically, deteriorated poles and conductor, porcelain arrestors, cutouts, rusty transformers and guys will be replaced.

Summary of Related CI's +/- 2 years:
No projects in 2010, 2011, 2012, 2013 and 2014

JUSTIFICATION:

Justification Criteria: Distribution System

Sub Criteria: Outage Performance

Why do this project?

This work is being undertaken as part of the overall customer reliability improvement investment. This is year three of a five year (2010-2014) plan to improve reliability to NSPI's customers. Distribution equipment (e.g. poles, conductor, cutouts, and transformers) failures are a primary driver of customer outages. This project will address distribution equipment issues on feeder 1N-405, out of the Onslow Substation. This feeder, which is 108km in length, was selected due to past performance, customer density and feeder length.

Why do this project now?

This feeder is included in the 2012 Reliability Investment Plan based on past performance, customer density and feeder length. It is expected that targeted replacements on 1N-405 will result in annual savings of approximately 2485 customer hours of interruption.

Why do this project this way?

This project will address the distribution equipment issues on this feeder.

CI Number : 41337 - 1N-405 Targeted Feeder Replacement **Project Number**

Parent CI Number : -

Cost Centre : 800 - 800-Services - Admin. **Budget Version** 2012 ACE Plan

Capital Item Accounts

Acct	Actv	Account	Activity	Forecast Amount	Amount	Variance
092		092-Vehicle T&D Reg. Labour AO		31,602	0	31,602
094		094 - Interest Capitalized		8,165	0	8,165
095		095-COPS Contracts AO		[redacted]	0	[redacted]
095		095-COPS Regular Labour AO		48,143	0	48,143
013	035	013 - COPS Contracts	035 - DP - Wood Poles	[redacted]	0	[redacted]
001	038	001 - T&D Regular Labour	038 - DP - Insulators	274	0	274
012	038	012 - Materials	038 - DP - Insulators	92	0	92
001	039	001 - T&D Regular Labour	039 - DP - O/H Cond.	6,424	0	6,424
012	039	012 - Materials	039 - DP - O/H Cond.	759	0	759
001	040	001 - T&D Regular Labour	040 - DP - O/H Cond.Devices	8,135	0	8,135
012	040	012 - Materials	040 - DP - O/H Cond.Devices	6,338	0	6,338
001	041	001 - T&D Regular Labour	041 - DP - O/H Line Transf.	46,484	0	46,484
012	041	012 - Materials	041 - DP - O/H Line Transf.	99,182	0	99,182
001	046	001 - T&D Regular Labour	046 - DP - U/G Conductor	52	0	52
001	085	001 - T&D Regular Labour	085 Design	999	0	999
			Total Cost:	283,892	0	283,892
			Original Cost:	62,976		

CI 41337 1N-405 Targeted Feeder Replacements

The following is a breakdown of costs associated with the 1N-405 Targeted Feeder Replacements project:

Administrative Overhead and Interest	[redacted]
Materials	$ 106,372
Contracts	[redacted]
COPS Labour	$ 62,369
Total	$ 283,892

The labour associated with this project will be performed by NSPI personnel at a rate of approximately [redacted] per person day. The material budgets include standard distribution equipment such as cutouts, insulators, arrestors and framing structures. The contract forecast includes traffic control services.

CI Number: 41341

Title: **1H-Water Street New Feeder**

Start Date: 2012/03
Final Cost Date: 2012/11
Function: Distribution
Forecast Amount: $280,657

DESCRIPTION:

This project includes:

- Establishing a new feeder out of substation 1H-Water St via Morris St.
- Removing de-energized cables from existing ducts on Morris St.
- Pulling in new 750kcmil cable to Manhole 65 at Morris St. and Queen St.
- Transitioning to overhead to split the existing 1H-415 into approximately equal halves

Summary of Related CI's +/- 2 years:
No projects in 2010, 2011, 2012, 2013 and 2014

JUSTIFICATION:

Justification Criteria: Distribution System

Sub Criteria: Equipment Replacement

Why do this project?

In its nominal configuration, feeder 1H-415 has exceeded NSPI's feeder overload criterion of 325A (14MVA at 25kV) with a peak load of 349 amps in late 2010/ early 2011. Load relief is required to reduce this feeder's peak loading.

Why do this project now?

Although the load can be shared between 2H-413 and 1H-415, the peak load experienced in winter 2011 placed both at NSPI's loading limits. A large industrial customer in the area is currently increasing its capacity and is expected to increase load by 1MVA. Combined with annual area growth, the two feeders can no longer meet the area's demand without overload.

Why do this project this way?

Planning Report 278-0611-H46 evaluated alternatives to solve the overload issues at 1H-415. In addition to the preferred alternative, the possibility of investing in feeder ties to allow load to be transferred to other distribution circuits was also investigated. This project provides the most effective solution with the addition of a new distribution circuit on the Halifax Peninsula and provides for greater switching flexibility and improved reliability.

A portion of the labour associated with this project will be sourced through NSPI's existing Power Line Technician (PLT) Service Agreement with EUS. This is aligned with NSPI's workforce planning model which is designed to optimize the allocation and execution of PLT resources among work requirements.

CI Number : 41341 - 1H-Water Street New Feeder **Project Number**

Parent CI Number : -

Cost Centre : 800 - 800-Services - Admin. **Budget Version** 2012 ACE Plan

Capital Item Accounts

Acct	Actv	Account	Activity	Forecast Amount	Amount	Variance
092		092-Vehicle T&D Reg. Labour AO		16,136	0	16,136
094		094 - Interest Capitalized		5,245	0	5,245
095		095-COPS Regular Labour AO		24,582	0	24,582
095		095-COPS Contracts AO		7,554	0	7,554
001	040	001 - T&D Regular Labour	040 - DP - O/H Cond.Devices	669	0	669
012	040	012 - Materials	040 - DP - O/H Cond.Devices	[redacted]	0	[redacted]
001	043	001 - T&D Regular Labour	043 - DP - Substn Dev.	1,970	0	1,970
012	043	012 - Materials	043 - DP - Substn Dev.	[redacted]	0	[redacted]
013	045	013 - COPS Contracts	045 - DP - U/G Conduit	[redacted]	0	[redacted]
001	046	001 - T&D Regular Labour	046 - DP - U/G Conductor	16,045	0	16,045
012	046	012 - Materials	046 - DP - U/G Conductor	[redacted]	0	[redacted]
013	046	013 - COPS Contracts	046 - DP - U/G Conductor	[redacted]	0	[redacted]
001	085	001 - T&D Regular Labour	085 Design	2,842	0	2,842
001	087	001 - T&D Regular Labour	087 Field Super.& Ops.	10,320	0	10,320
			Total Cost:	280,657	0	280,657
			Original Cost:	29,728		

CI 41341 1H-Water Street New Feeder

The following is a breakdown of costs associated with the 1H-Water St New Feeder project:

Administrative Overhead and Interest	$ 53,517
Materials	$ 163,095
Contracts	$ 32,200
COPS Labour	$ 31,846
Total	$ 280,657

A portion of the work associated with this project is expected to be sourced through NSPI's existing Power Line Technician (PLT) contract with Emera Utility Services (EUS), at a rate of approximately [redacted] per compatible unit hour. A portion of the work is planned to be performed by NSPI personnel at a rate of approximately [redacted] per person day. The material budgets include cable, terminators and overhead materials at the transition point from underground to overhead. For the NSPI portion of this work contracts also includes flagging.

CI Number: 41363

Title: **88W New Feeder**

Start Date: 2012/05
Final Cost Date: 2012/11
Function: Distribution
Forecast Amount: $269,616

DESCRIPTION:

This project provides for the distribution line work associated with the installation of a new feeder to reduce loading on 88W-312 at Parade St. in Yarmouth. The distribution line will be underbuilt for 250 m on L-5536 from 88W to Pleasant St, and then a double-circuit line will be constructed for 300 m along Pleasant St to Parade St.

Summary of Related CI's +/- 2 years:
2012 CI 41592 - 88W New Recloser and Relocate 88W-322 $111,171
2012 CI 41329 - 11W-202 Voltage Conversion to 12kV $98,382

JUSTIFICATION:

Justification Criteria: Distribution System

Sub Criteria: Overloaded Equipment

Why do this project?

This project is required to relieve an existing overload condition on feeder 88W-312. The load on feeder 88W-312 exceeds NSPI's 325 amp feeder overload criteria. Load relief is required to maintain service voltage levels and to maintain reliability. It is also required to balance the load between the two transformers at 88W since 88W-T52 is approaching its winter overload capability limit. Additionally, 12 kV feeder capacity is required in order to accommodate the conversion of some 4kV load normally supplied from the 11W substation.

Why do this project now?

The load on 88W-312 exceeded NSPI's 325 amp feeder overload criteria in January 2011. There are no anticipated reductions in customer loads on feeder 88W-312 and no availability to transfer some load to another source, given the existing feeder configuration. Load relief is required as soon as practicable.

Why do this project this way?

The proposed solution is the least cost alternative, as detailed in Distribution Planning Study 242-0608-W64R (Attachment 1).

The labour for this project will be sourced through NSPI's existing Power Line Technician (PLT) Service Agreement with EUS. This is aligned with NSPI's workforce planning model which is designed to optimize the allocation and execution of PLT resources among work requirements.

CI Number : 41363 - 88W New Feeder **Project Number**

Parent CI Number : -

Cost Centre : 800 - 800-Services - Admin. **Budget Version** 2012 ACE Plan

Capital Item Accounts

Acct	Actv	Account	Activity	Forecast Amount	Amount	Variance
094		094 - Interest Capitalized		1,652	0	1,652
095		095-COPS Contracts AO		46,209	0	46,209
013	002	013 - COPS Contracts	002 - DP - Land Rights	[redacted]	0	[redacted]
012	035	012 - Materials	035 - DP - Wood Poles	18,500	0	18,500
013	035	013 - COPS Contracts	035 - DP - Wood Poles	[redacted]	0	[redacted]
012	039	012 - Materials	039 - DP - O/H Cond.	5,800	0	5,800
013	039	013 - COPS Contracts	039 - DP - O/H Cond.	[redacted]	0	[redacted]
013	041	013 - COPS Contracts	041 - DP - O/H Line Transf.	[redacted]	0	[redacted]
013	050	013 - COPS Contracts	050 - DP - Street Lights	[redacted]	0	[redacted]
013	052	013 - COPS Contracts	052 - DP - Services	[redacted]	0	[redacted]
001	085	001 - Regular Labour (No AO)	085 Design	486	0	486
			Total Cost:	269,616	0	269,616
			Original Cost:	41,897		

CI 41363 - 88W New Feeder

The following is a breakdown of costs associated with the 88W New Feeder project:

Administrative Overhead and Interest	$ 47,861
Materials	$ 24,300
Contracts	$ 196,969
COPS Labour	$ 486
Total	$ 269,616

The work associated with this project is expected to be sourced through NSPI's existing Power Line Technician (PLT) contract with Emera Utility Services (EUS) at a rate of approximately [redacted] per compatible unit hour. The material forecasts include the costs for poles, framing, conductor and standard hardware.

CI Number: 41592

Title: **88W New Recloser and Relocate 88W-322**

Start Date: 2012/02
Final Cost Date: 2012/12
Function: Transmission
Forecast Amount: $111,171

DESCRIPTION:

This project provides for two new recloser bays on the 88W substation. One is for a new recloser to supply a new feeder required to offload 88W-312 and the second is required to allow the recloser currently in the 88W-322 bay to be relocated to bus 88W-B31.

Related CI's +/- 2 years:

2012 CI 41363 - 88W New Feeder $98,669
2012 CI 41329 - 11W-202 Voltage Conversion to 12 kV $269,616

JUSTIFICATION:

Justification Criteria:

Transmission Plant

Sub-Criteria:

Overloaded Equipment

Why do this project?

The load on feeder 88W-312 exceeds NSPI's 325 amp feeder overload criteria. Load relief is required to maintain service voltage levels and to maintain reliability. In addition, the load on 88W-T52 is approaching its maximum winter overload capability while 88W-T51, although a larger transformer, is lightly loaded. Relocating the 88W-322 recloser to a new recloser bay supplied from 88W-T51 will avoid an overload condition on 88W-T52.

Why do this project now?

There are no anticipated reductions in customer loads on feeder 88W-312 and no availability to transfer some load to another source, given the existing feeder configuration. While 88W-T51 has not yet reached its winter overload rating, this is projected to occur within a few years and building both recloser bays now is more cost effective than building them separately.

Why do this project this way?

The proposed solution is the least cost alternative in accordance with Distribution Planning Study 242-0608-W64.

CI Number: 41329

Title: **88W New Recloser and Relocate 88W-322**

Start Date: 2012/06
Final Cost Date: 2012/12
Function: Distribution
Forecast Amount: $98,382

DESCRIPTION:

This project provides for the conversion of the 4.16 kV load on feeder 11W-202 to the 12 kV supply from 88W-Pleasant St. Nine transformers and 8 poles will be replaced in order to facilitate the voltage conversion.

Related CI's:

2012 - CI 41592 - 88W New Recloser and Relocate 88W-322 $111,171
2012 - CI 41363 - 88W New Feeder $269,616

JUSTIFICATION:

Justification Criteria:

Distribution System

Sub-Criteria:

Equipment Replacement

Why do this project?

This project is required as part of a staged process to convert the load supplied by the 11W substation to 12 kV.

Why do this project now?

The substation transformer 11W-T51 will be 53 years old in 2012 and is nearing the end of its useful life.

Why do this project this way?

The proposed solution is the least cost alternative in accordance with Distribution Planning Study 242-0608-W64. Voltage conversion results in lower distribution system losses and avoids a large future cost to replace the substation transformer 11W-T51.

CI Number: 41356

Title: **35V-312 Windsor Causeway**

Start Date: 2012/03
Final Cost Date: 2012/10
Function: Distribution
Forecast Amount: $252,137

DESCRIPTION:

This project provides for the removal of the lower circuit along the Windsor Causeway, through the conversion of the load on the eastern side of the causeway from 12kV to 25kV. This section of distribution line has been experiencing outages during storm events and removal of the distribution line will improve reliability to the area. This conversion will also reduce load on 35V-312 which is fed from a 25 kV feeder 79V-402.

Summary of Related CI's +/- 2 years:
No projects in 2010, 2011, 2012, 2013 and 2014

JUSTIFICATION:

Justification Criteria: Distribution System

Sub Criteria: Overloaded Equipment

Why do this project?

Currently 25kV feeder, 79V-402, is overloaded and this project allows for the reduction of load on that system. The part of the 12kV system which crosses the Windsor Causeway has been experiencing outages during storm events and converting this area will allow this part of the distribution circuit to be removed and improves reliability to the area.

Why do this project now?

The load on the 25kV feeder 79V-402, needs to be reduced and this conversion achieves that goal. Removal of the line on the causeway will also improve reliability to the area.

Why do this project this way?

This conversion is a cost effective way to address two areas of concern on the existing system in the Windsor area.

The labour for this project will be sourced through NSPI's existing Power Line Technician (PLT) Service Agreement with EUS. This is aligned with NSPI's workforce planning model which is designed to optimize the allocation and execution of PLT resources among work requirements.

CI Number : 41356 - 35V-312 Windsor Causeway **Project Number**

Parent CI Number : -

Cost Centre : 800 - 800-Services - Admin. **Budget Version** 2012 ACE Plan

Capital Item Accounts

Acct	Actv	Account	Activity	Forecast Amount	Amount	Variance
094		094 - Interest Capitalized		4,867	0	4,867
095		095-COPS Contracts AO		34,259	0	34,259
013	002	013 - COPS Contracts	002 - DP - Land Rights	[redacted]	0	[redacted]
020	002	020 - Royalties, Easements, App	002 - DP - Land Rights	2,000	0	2,000
012	035	012 - Materials	035 - DP - Wood Poles	9,142	0	9,142
013	035	013 - COPS Contracts	035 - DP - Wood Poles	[redacted]	0	[redacted]
012	038	012 - Materials	038 - DP - Insulators	324	0	324
013	038	013 - COPS Contracts	038 - DP - Insulators	[redacted]	0	[redacted]
012	039	012 - Materials	039 - DP - O/H Cond.	2,222	0	2,222
013	039	013 - COPS Contracts	039 - DP - O/H Cond.	[redacted]	0	[redacted]
012	040	012 - Materials	040 - DP - O/H Cond.Devices	291	0	291
013	040	013 - COPS Contracts	040 - DP - O/H Cond.Devices	[redacted]	0	[redacted]
012	041	012 - Materials	041 - DP - O/H Line Transf.	51,726	0	51,726
013	041	013 - COPS Contracts	041 - DP - O/H Line Transf.	[redacted]	0	[redacted]
013	050	013 - COPS Contracts	050 - DP - Street Lights	[redacted]	0	[redacted]
013	052	013 - COPS Contracts	052 - DP - Services	[redacted]	0	[redacted]
001	085	001 - Regular Labour (No AO)	085 Design	1,274	0	1,274
			Total Cost:	252,137	0	252,137
			Original Cost:	31,839		

CI 41356 35V-312 Windsor Causeway

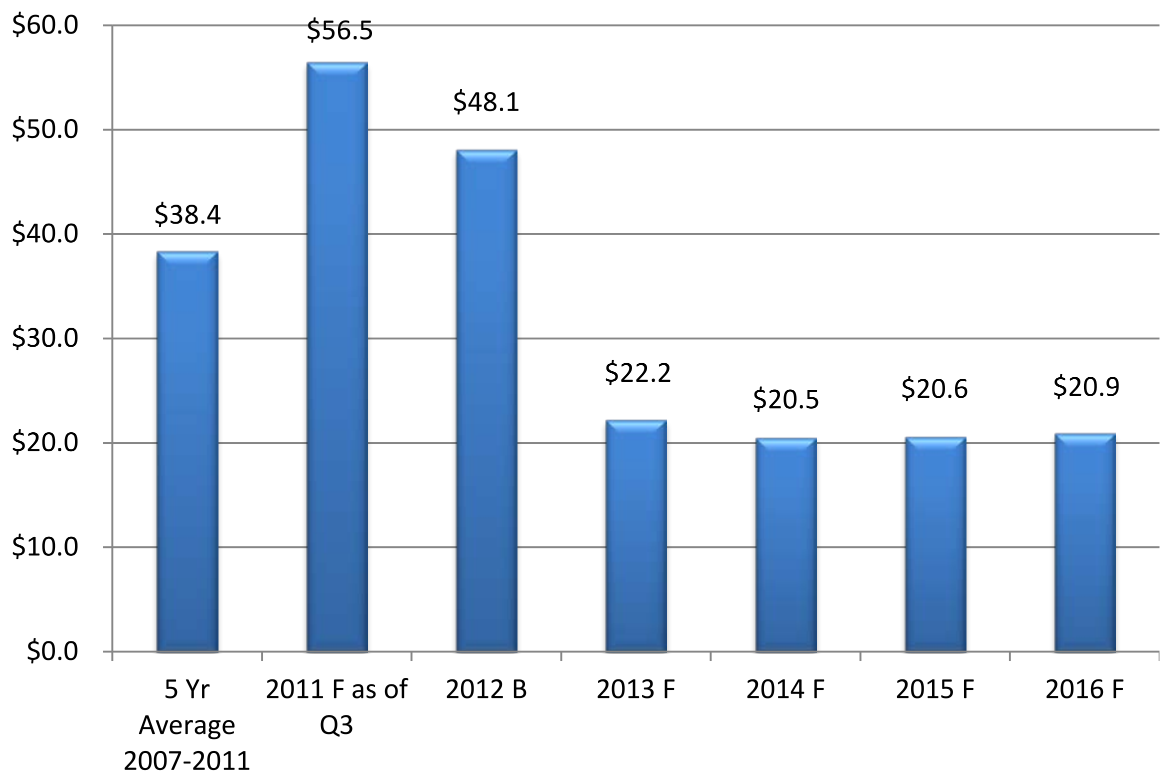
The following is a breakdown of costs associated with the 35V-312 Windsor Causeway project:

Administrative Overhead and Interest	$39,126
Materials	$63,705
Contracts	$146,033
COPS Labour	$1,274
Other	$2,000
Total	$252,138

The materials portion of this project includes standard distribution line items. Emera Utility Services (EUS) will be engaged to perform the majority of the work associated with this project at a rate of [redacted] per compatible unit hour. The other account includes a forecast for traffic control.

7 General Plant

(Millions of Dollars)



7.1 General Plant – Five-year Plan and Highlights

General Plant capital investment in 2012 focuses largely on information technology related projects and vehicle purchases:

i	New 2012 capital spending for projects with total estimated project spend greater than $250K and for which approval is sought	$3.5
ii	New 2012 capital spending for projects with total estimated project spend greater than $250K for subsequent approval	$18.4
iii	New capital spending for projects with total estimated spend less than $250K for which approval is not sought	$0.7
iv	Carry-over capital spending	$9.3
v	Routine capital spending	$16.2
vi	**Total 2012 General Plant capital investment plan**	**$48.1M**
vii	**Request for ACE approval (Items i + v)**	**$19.7M**

7.2 General Plant Carry-over Capital Spending Summary

Table 7.2 General Plant Carry-over Capital Spending

Project Number	CI#	Project Title	Start Date	Final Date	Previous Expenditure	2012 Budget	Subsequent Spending	Total Estimate
Buildings								
P863	38182	2010 Backup Control Centre	2010/11	2012/07	$1,933,881	$1,237,619	$0	$3,171,500
	Total Buildings				**$1,933,881**	**$1,237,619**	**$0**	**$3,171,500**
Computers								
P819	34782	Oracle Financials Upgrade	2010/05	2012/12	$224,955	$518,884	$0	$743,839
P789	35742	Connectivity Upgrade	2009/05	2012/05	3,013,798	293,309	0	3,307,107
	40298	SAN and Backup Replacement	2011/07	2012/04	752,715	184,990	0	937,705
	Total Computers				**$3,991,467**	**$997,183**	**$0**	**$4,988,651**
Equipment Replacement								
P860	40229	Protective Equip Test Center Upgrade	2011/04	2012/07	$305,973	$604,369	$0	$910,342
	Total Equipment Replacement				**$305,973**	**$604,369**	**$0**	**$910,342**
Overloaded Equipment								
	38849	Harbour East Land Purchase and Right of Way	2011/06	2012/12	$84,686	$94,994	$0	$179,680
	Total Overloaded Equipment				**$84,686**	**$94,994**	**$0**	**$179,680**
Other General Property								
	40403	Work & Asset Management	2011/07	2013/03	$2,240,679	$3,359,065	$216,369	$5,816,113
P833	29009	Right of Way Purchase Northern NS	2010/09	2013/05	2,408,263	1,379,319	0	3,787,582
P834	40103	U&U Load Control Demo	2010/10	2014/03	539,033	1,290,353	2,233,866	4,063,252
	33562	FAC Land Registration Act	2010/10	2014/12	105,144	332,152	750,833	1,188,129
	Total Other General Property				**$5,293,120**	**$6,360,889**	**$3,201,068**	**$14,855,077**
Total General Plant Carry Over Spending					**$11,609,126**	**$9,295,055**	**$3,201,068**	**$24,105,249**

7.3 General Plant – New 2012 Capital Items for ACE Approval

Tab #	CI#	Project Title	2012 Budget	Project Total
General Plant				
GP02	40649	PeopleSoft (Human Resource Management)	$403,131	$633,487
GP03	41424	PeopleSoft Self Service Module	413,859	413,859
GP04	41425	Cognos Upgrade	186,933	254,413
Total New Computers Spending			**$1,003,923**	**$1,301,759**
Outage Performance				
GP05	41433	2012 New RTU Deployment	$1,062,700	$1,062,700
GP06	41428	2012 RTU Capital Replacement	314,026	314,026
Total Outage Performance			**$1,376,725**	**$1,376,725**
Furniture & Fixtures				
GP07	41763	Warehouse Racking System	$262,402	$262,402
Total Furniture & Fixtures			**$262,402**	**$262,402**
Telecommunications				
GP08	41419	2012 Replace Microwave Radio System	$601,339	$601,339
GP09	41420	Upgrade Multiplexer Network Manager	294,571	294,571
Total New Telecommunications Spending			**$895,910**	**$895,910**
Total New General Plant Spending			**$3,538,960**	**$3,836,796**

General Plant CIs 1 - 8

CI Number: 40649

Title: **PeopleSoft (Human Resource Management)**

Start Date: 2012/07
Final Cost Date: 2013/05
Function: General Plant
Forecast Amount: $633,487

DESCRIPTION:

NSPI uses five PeopleSoft application modules to support and undertake Human Resource management. These include: Human Resource Management, Payroll, Time and Labour, Benefits and Training. Not all functionality has been activated within these existing modules. This project will enable functionality to define and centrally manage all positions within the organization.

Summary of Related CI's +/- 2 years:
2011 CI 40294 People Soft HRMS License $94,190
2011 CI 40293 People Soft Workflow $276,578
2012 CI 41424 PeopleSoft Self Service Module $413,859

JUSTIFICATION:

Justification Criteria: Work Support Facilities

Sub Criteria: Computers

Why do this project?

This project will provide the capability to track and report on budgeted vs non-budgeted positions, determine the location of positions and keep track of position history to ensure the accuracy and consistency of department headcount and complement. Position management will be utilized across various business processes such as recruiting, employee transfers, leave of absence management, succession planning, job evaluations, re-organizations, etc.

Why do this project now?

Position Management functionality previously would have required a separate technology investment. The licensing associated with this project will enable NSPI's current investment to deliver this functionality and provides an opportunity for NSPI to plan, monitor and control positions across the company.

Why do this project this way?

This project will allow NSPI to leverage existing investments while utilizing the same technology architecture . It also makes the transition for employees smoother based on existing proficiency in the existing PeopleSoft environment.

CI Number : 40649 - PeopleSoft (Human Resource Mgt) **Project Number**

Parent CI Number : -

Cost Centre : 027 - 027-Administration **Budget Version** 2012 ACE Plan

Capital Item Accounts

Acct	Actv	Account	Activity	Forecast Amount	Amount	Variance
094		094 - Interest Capitalized		15,835	0	15,835
095		095-IT Regular Labour AO		58,652	0	58,652
001	072	001 - IT Regular Labour	072 - GP - Computer Equipment	110,000	0	110,000
001	072	001 - Regular Labour (No AO)	072 - GP - Computer Equipment	[redacted]	0	[redacted]
011	072	011 - Travel Expense	072 - GP - Computer Equipment	12,000	0	12,000
028	072	028 - Consulting	072 - GP - Computer Equipment	[redacted]	0	[redacted]
041	072	041 - Meals & Entertainment	072 - GP - Computer Equipment	7,000	0	7,000
056	072	056 - Training & Development	072 - GP - Computer Equipment	30,000	0	30,000
			Total Cost:	633,487	0	633,487
			Original Cost:			

Nova Scotia Power
Information Technology Capital Support Information

Project #	**CI 40649**
Project Name	**PeopleSoft Position Management**

Key Capital Expense Components

Expense Type	Key Driver	Comments
IT Regular Labour	**Project Manager – 92 days at $[redacted]/day**	**Project Management support for the duration of the project.**
	IT Technical Resources – 90 Days at $[redacted]/day	**Technical support for the duration of the project (Data Base Administration, Security, performing application changes, trouble shooting, interface management)**
Consulting	**Technical 100 days at $[redacted]/day**	**Peoplesoft technical support to the project team and train HR and IT employees on technical management of the application.**
	Functional Consulting – 120 days $[redacted]/day	**Position Management functional expertise. This resource(s) will be working closely with HR for the duration of the product.**
Regular Labour No AO	**110 days at $[redacted]/day**	**Nova Scotia Power Peoplesoft functional experts for testing, documentation and training design and development.**

Nova Scotia Power
PeopleSoft Investment Plan
2009-2013

A number of related investments are planned for the Human Resource application PeopleSoft. PeopleSoft is a best in category computer application consistent with NSPI's information technology strategy. It enables major human resource processes supporting all employees of Nova Scotia Power. The table below summarizes the related planned investments providing an overall view of the investment, benefits and timing.

Capital Item #	Year	Project Name	Benefits
40294	**2011**	HRMS Software Licenses	The current PeopleSoft software license requires NSPI to maintain active licenses for the full number of employees. This investment was to purchase enough licenses to maintain compliancy with the software contract.
40293	**2011**	WorkFlow	The scope of this project is to introduce a PeopleSoft automation tool called **Workflow.** This will enable NSPI to automate the flow of HR related information throughout the enterprise. Time consuming business processes that are currently run manually can be automated and setup to deliver the right information to the right people at the right time. By introducing Workflow, NSPI will be able to take advantage of the following features. 1. Automate approval process for various HR business processes. (New Hires, Termination) 2. Enable workflow triggers from other applications 3. Automated notifications. 4. Batch Workflow processing (Monitoring for a specific criteria to initiate a Workflow trigger – e.g Employee years of service or days absent) 5. Activity Guides – An on-line support or help feature used to lead employees through a multi-step task in PeopleSoft. This will be especially useful for new HR employees and for guiding untrained employees through future self-service options.
40649	**2012-2013**	Position Management	NSPI uses 5 PeopleSoft application modules to assist in the management of Human Resources. These include (1) Human Resource Management, (2) Payroll, (3) Time and Labour, (4) Benefits and (5) Training. These applications enable some components of key human resource processes. Not all functionality has been activated within these modules. This project is to enable the functionality that will define and

			centrally manage all positions within the organization. Today all human resource processes are employee based. From this centrally managed data, various stakeholders distributed throughout the organization will have the capability to track and report on budgeted vs non-budgeted positions, determine the location of positions and keep track of position history thus ensuring that accuracy of department headcount and complement. Position Management can be integrated with various internal business processes such as recruiting, employee transfers, leave of absence management, succession planning, job evaluations, re-organizations, etc. This module will allow for tighter integration to other applications such as organizational charts and other administrative functions such as the Personal Action notices (PANs) used by HR. This functionality will help to: •Ensure the right person is being paid from the right funds for the right position •Ability to manage Nova Scotia Power's workforce by position in addition to tracking by employee •Streamline processes for recruiting and hiring employees and consultants •Provides a clear view of the organizational structure and staffing needs •Real-time, consistent and reliable workforce information •Provides committed funding (budget) and salary expenses by position, both vacant and filled •Improved reporting and analysis capabilities. i.e Org Charts
41424	**2012**	Self-Serve	This project will enable employee self-service functionality for all Nova Scotia Power employees. It allows employees to enter, update and review personal and job information that they would now have to contact an HR employee to complete. It provides employees with more control over their information and easier and more timely access to information for key planning events such as retirement, joining the company, changing benefits with marriages, births or other critical events. This will allow HR staff to focus their activities towards more pressing matters such as recruitment, training, performance management, orientations, labour relations and resolving employee issues with leaders. The PeopleSoft employee self-service feature reduces the amount of time and manual paperwork necessary to complete transactional HR tasks as it will provide employees with direct access to the system to complete transactions at any time.

			Implementing employee self-service will allow Nova Scotia Power to further leverage the investment that has been made in PeopleSoft over the last number of years including a recent upgrade in 2010 to PeopleSoft 9.1.

CI Number: 41424

Title:	**PeopleSoft Self Service Module**
Start Date:	2012/07
Final Cost Date:	2012/12
Function:	General Plant
Forecast Amount:	$413,859

DESCRIPTION:

NSPI utilizes Oracle PeopleSoft for Human Resource (HR) Management. PeopleSoft delivers a set of standard employee self-service functions that must be licensed in order to be used across the organization. The HR Department currently manages employee changes and updates for approximately 2,000 employees resulting in a large amount of time being consumed by HR on administrative tasks; preventing staff from focusing on more value add tasks and initiatives. The addition of employee self-service will allow employees to manage a subset of their information within the PeopleSoft system and enhance efficiencies. These changes include but are not limited to: address changes; marital status changes; time entry; beneficiary/depending changes; benefit program enrolment; and electronic paystubs.

Summary of Related CI's +/- 2 years:
2011 CI 40294 People Soft HRMS License $94,190
2011 CI 40293 People Soft Workflow $276,578
2012 CI 40649 PeopleSoft (Human Resource Management) $633,487

JUSTIFICATION:

Justification Criteria: Work Support Facilities

Sub Criteria: Computers

Why do this project?

This project will enable employee self-service functionality for NSPI employees, allowing employees to enter, update and review personal and job information that they currently contact a Human Resources (HR) employee to complete for them. This will allow HR staff to focus their activities towards more value added tasks such as recruitment, training, performance management, orientations, labour relations and resolving employee issues with leaders. The PeopleSoft employee self-service feature reduces the amount of time and manual paperwork necessary to complete transactional HR tasks through employee direct access to the system to complete transactions themselves.

Implementing employee self-service will allow NSPI to further leverage the investment that has been made in PeopleSoft over the last number of years including a recent 2010 upgrade to PeopleSoft 9.1.

Why do this project now?

NSPI's PeopleSoft system was upgraded to the most recent release in November of 2010 and the addition of the self service module now enables the latest functionality for end-users and to leverage the recent investment that has been made in PeopleSoft. Leveraging technology to do manual transactional work allows for increased efficiencies.

Why do this project this way?

The implementation of this module is an extension of the core PeopleSoft application and will best integrate with the current environment as well as providing the opportunity to further leverage existing assets.

CI Number : 41424 - PeopleSoft Self Service Module **Project Number**

Parent CI Number : -

Cost Centre : 027 - 027-Administration **Budget Version** 2012 ACE Plan

Capital Item Accounts

Acct	Actv	Account	Activity	Forecast Amount	Amount	Variance
094		094 - Interest Capitalized		6,699	0	6,699
095		095-IT Regular Labour AO		26,660	0	26,660
001	072	001 - Regular Labour (No AO)	072 - GP - Computer Equipment	62,000	0	62,000
001	072	001 - IT Regular Labour	072 - GP - Computer Equipment	76,000	0	76,000
028	072	028 - Consulting	072 - GP - Computer Equipment	[redacted]	0	[redacted]
034	072	034 - Appl. Software	072 - GP - Computer Equipment	[redacted]	0	[redacted]
041	072	041 - Meals & Entertainment	072 - GP - Computer Equipment	2,500	0	2,500
056	072	056 - Training & Development	072 - GP - Computer Equipment	30,000	0	30,000
			Total Cost:	413,859	0	413,859
			Original Cost:			

Nova Scotia Power
Information Technology Capital Support Information

Project #	**CI 41424**
Project Name	**PeopleSoft Self Service**

Key Capital Expense Components

Expense Type	Key Driver	Comments
IT Regular Labour	Project Manager – 50 days at $[redacted]/day	Project Management support for the duration of the project through project start-up, design, configuration, testing, training, implementation and support.
	IT Technical Analyst 75 Days at $[redacted]/day	Peoplesoft technical support for the duration of the project.
Consulting	Technical 35 days at $[redacted]/day	Peoplesoft technical support to the project team and transfer Peoplesoft technical self-service knowledge to NSPI
	Functional 100 days at $[redacted]/day	To provide and transfer Peoplesoft self- functional expertise.
HR Regular Labour	[redacted] days at $[redacted]/day (Two resources)	
Training	Training on the new functionality employees using Universal Productivity Kit online tutorials	
Comp. Hardware and Opr. Software	Upgrades to current servers to support increased load on server.	

Nova Scotia Power
PeopleSoft Investment Plan
2009-2013

A number of related investments are planned for the Human Resource application PeopleSoft. PeopleSoft is a best in category computer application consistent with NSPI's information technology strategy. It enables major human resource processes supporting all employees of Nova Scotia Power. The table below summarizes the related planned investments providing an overall view of the investment, benefits and timing.

Capital Item #	Year	Project Name	Benefits
40294	**2011**	HRMS Software Licenses	The current PeopleSoft software license requires NSPI to maintain active licenses for the full number of employees. This investment was to purchase enough licenses to maintain compliancy with the software contract.
40293	**2011**	WorkFlow	The scope of this project is to introduce a PeopleSoft automation tool called **Workflow.** This will enable NSPI to automate the flow of HR related information throughout the enterprise. Time consuming business processes that are currently run manually can be automated and setup to deliver the right information to the right people at the right time. By introducing Workflow, NSPI will be able to take advantage of the following features. 1. Automate approval process for various HR business processes. (New Hires, Termination) 2. Enable workflow triggers from other applications 3. Automated notifications. 4. Batch Workflow processing (Monitoring for a specific criteria to initiate a Workflow trigger – e.g Employee years of service or days absent) 5. Activity Guides – An on-line support or help feature used to lead employees through a multi-step task in PeopleSoft. This will be especially useful for new HR employees and for guiding untrained employees through future self-service options.
40649	**2012-2013**	Position Management	NSPI uses 5 PeopleSoft application modules to assist in the management of Human Resources. These include (1) Human Resource Management, (2) Payroll, (3) Time and Labour, (4) Benefits and (5) Training. These applications enable some components of key human resource processes. Not all functionality has been activated within these modules. This project is to enable the functionality that will define and

			centrally manage all positions within the organization. Today all human resource processes are employee based. From this centrally managed data, various stakeholders distributed throughout the organization will have the capability to track and report on budgeted vs non-budgeted positions, determine the location of positions and keep track of position history thus ensuring that accuracy of department headcount and complement. Position Management can be integrated with various internal business processes such as recruiting, employee transfers, leave of absence management, succession planning, job evaluations, re-organizations, etc. This module will allow for tighter integration to other applications such as organizational charts and other administrative functions such as the Personal Action notices (PANs) used by HR. This functionality will help to: •Ensure the right person is being paid from the right funds for the right position •Ability to manage Nova Scotia Power's workforce by position in addition to tracking by employee •Streamline processes for recruiting and hiring employees and consultants •Provides a clear view of the organizational structure and staffing needs •Real-time, consistent and reliable workforce information •Provides committed funding (budget) and salary expenses by position, both vacant and filled •Improved reporting and analysis capabilities. i.e Org Charts
41424	**2012**	Self-Serve	This project will enable employee self-service functionality for all Nova Scotia Power employees. It allows employees to enter, update and review personal and job information that they would now have to contact an HR employee to complete. It provides employees with more control over their information and easier and more timely access to information for key planning events such as retirement, joining the company, changing benefits with marriages, births or other critical events. This will allow HR staff to focus their activities towards more pressing matters such as recruitment, training, performance management, orientations, labour relations and resolving employee issues with leaders. The PeopleSoft employee self-service feature reduces the amount of time and manual paperwork necessary to complete transactional HR tasks as it will provide employees with direct access to the system to complete transactions at any time.

			Implementing employee self-service will allow Nova Scotia Power to further leverage the investment that has been made in PeopleSoft over the last number of years including a recent upgrade in 2010 to PeopleSoft 9.1.

CI Number: 41425

Title:	**Cognos Upgrade**
Start Date:	2012/09
Final Cost Date:	2013/04
Function:	General Plant
Forecast Amount:	$254,413

DESCRIPTION:

The Company utilizes Cognos reporting for a large portion of the financial reports produced within the organization. The purpose of this project is to upgrade the existing Cognos platform from version 7.4 to version 10 and to increase the number of licenses available to the organization. Increasing the license count will allow Cognos to be offered to departments in the Company currently not using the application.

Summary of Related CI's +/- 2 years:
No projects in 2010, 2011, 2013 and 2014

JUSTIFICATION:

Justification Criteria: Work Support Facilities

Sub Criteria: Computers

Why do this project?

Cognos is used throughout the organization to provide secure access to financial information from the Oracle Financials General Ledger, Accounts Payable and Procurement modules. It is also used to provide historical labour information from the Human Resources PeopleSoft platform.

An increasing number of users are requesting access to Cognos reporting functionality. Due to a licensing limitation, the application cannot be rolled out to additional users. Users of the application are also requesting functionality that does not exist in the current version such as the ability to create and customize their own reports.

Why do this project now?

Support for Cognos Impromptu 7.4 and Cognos PowerPlay 7.4 will be unavailable after September 30th, 2012. Issues encountered with the software after September 30th, 2012 will no longer be investigated by the vendor.

Why do this project this way?

This project will be executed with a combination of internal and external resources. This approach will allow the Company to ramp up the resource complement with contractor resources and then return the resource complement to normal operating levels when the project is concluded. This approach also ensures that knowledge and skills are developed internally and sustained beyond the life of the project.

The project will employ industry standard approaches, processes, and tools that have been proven successful by Cognos contractors and endorsed by IBM (the Cognos vendor).

CI Number : 41425 - Cognos Upgrade **Project Number**

Parent CI Number : -

Cost Centre : 027 - 027-Administration **Budget Version** 2012 ACE Plan

Capital Item Accounts

Acct	Actv	Account	Activity	Forecast Amount	Amount	Variance
094		094 - Interest Capitalized		4,186	0	4,186
095		095-IT Regular Labour AO		27,726	0	27,726
001	072	001 - IT Regular Labour	072 - GP - Computer Equipment	52,000	0	52,000
011	072	011 - Travel Expense	072 - GP - Computer Equipment	9,000	0	9,000
028	072	028 - Consulting	072 - GP - Computer Equipment	[redacted]	0	[redacted]
034	072	034 - Appl. Software	072 - GP - Computer Equipment	[redacted]	0	[redacted]
035	072	035 - Comp.Hrdwr & Op.Sftwr	072 - GP - Computer Equipment	[redacted]	0	[redacted]
041	072	041 - Meals & Entertainment	072 - GP - Computer Equipment	1,500	0	1,500
056	072	056 - Training & Development	072 - GP - Computer Equipment	15,000	0	15,000
			Total Cost:	254,413	0	254,413
			Original Cost:			

Nova Scotia Power
Information Technology Capital Support Information

Project #	CI 41425
Project Name	Cognos Upgrade

Key Capital Expense Components

Expense Type	Key Driver	Comments
IT Regular Labour	Project Manager – [redacted] days at $[redacted]/day	To provide Project Management support for the duration of the project.
	IT Technical Analyst [redacted] Days at $[redacted]/day	To provide technical support to the project team.
Consulting	Technical [redacted] days at $[redacted]/day	To provide assistance with setting up new environment, upgrading software and rewriting reports as required.
Training	Development of training material for end users.	Training will be delivered using online tutorials.
Comp. Hardware and Opr. Software	Server upgrade to support increased load on server.	
Appl. Software (Licenses)	Cognos license purchase. [redacted] licenses at $[redacted]/license.	

CI Number: 41433

Title: **2012 New RTU Deployment**

Start Date: 2012/03
Final Cost Date: 2012/12
Function: General Plant
Forecast Amount: $1,062,700

DESCRIPTION:

This project provides for the installation of Remote Terminal Units (RTUs) at 6 substations to provide remote monitoring and control of selected substations and provides for the upgrade of some exiting RTUs to further enhance their communication capabilities. The sites planned for installation in 2012 are as follows:

22V NEW MINAS
62N BRIDGE AVE 79V 3 MILE PLN
70W HIGH ST
73W AUBURNDALE 75W WESTHAVERS

Summary of Related CI's +/- 2 years:
2010 38142 RTU Replacement Program $780,137
2011 40274 New RTU Deployment $509,706
2013, 2014 CI TBD New RTU Deployment $TBD

JUSTIFICATION:

Justification Criteria: Work Support Facilities

Sub Criteria: Equipment Replacement

Why do this project?

Completion of these new RTU installations and communication upgrades will provide remote monitoring and control capacity to System Operators at the Energy Control Centre which will improve outage prediction, and improve reliability through reduction of power outage duration. A total of more than 35,651 customers are served by these four stations

Why do this project now?

Increasing operational visibility of distribution substations by the addition of RTU'S and enhancing the operator's ability to perform remote switching will provide a subsequent reduction in customer interruption hours.

Why do this project this way?

The technology that will be used in this project aligns with the communication methods employed in the over 120 other RTU's across the province.

CI Number : 41433 - 2012 New RTU Deployment **Project Number**

Parent CI Number : -

Cost Centre : 800 - 800-Services - Admin. **Budget Version** 2012 ACE Plan

Capital Item Accounts

Acct	Actv	Account	Activity	Forecast Amount	Amount	Variance
092		092-Vehicle T&D Reg. Labour AO		91,206	0	91,206
094		094 - Interest Capitalized		28,284	0	28,284
095		095-COPS Regular Labour AO		138,942	0	138,942
001	064	001 - T&D Regular Labour	064 - DP - Sup. Control and DA	180,000	0	180,000
002	064	002 - T&D Overtime Labour	064 - DP - Sup. Control and DA	0	0	0
011	064	011 - Travel Expense	064 - DP - Sup. Control and DA	50,000	0	50,000
012	064	012 - Materials	064 - DP - Sup. Control and DA	551,768	0	551,768
041	064	041 - Meals & Entertainment	064 - DP - Sup. Control and DA	15,000	0	15,000
066	064	066 - Other Goods & Services	064 - DP - Sup. Control and DA	7,500	0	7,500
			Total Cost:	1,062,700	0	1,062,700
			Original Cost:			

CI 41433 2012 New RTU Deployment

The following is a breakdown of costs associated with the 2012 New RTU Deployment project:

Administrative Overhead and Interest	$ 258,432
Materials	$ 551,768
COPS Labour	$ 180,000
Other	$ 72,500
Total	$ 1,062,700

The material costs associated with this item are for the purchase of RTUs and associated accessories and are based on similar units purchased in 2011. The labour costs associated with this project are for engineering design, as well as for the installation of the RTUs.

CI Number: 41428

Title:	**2012 RTU Capital Replacement**
Start Date:	2012/03
Final Cost Date:	2012/12
Function:	General Plant
Forecast Amount:	$314,026

DESCRIPTION:

The 2012 Remote Terminal Unit (RTU) capital replacement program will replace select RTUs, enabling NSPI to redeploy spare parts for other RTUs. In 2012 this project provides for the replacement of the 6V Weymouth and 5W Deep Brook RTU sites.

Summary of Related CI's +/- 2 years:
2010 CI 38142 RTU Replacement Program $780,137
2011CI 40245 2011 RTU Replacement Program $459,517
This is a multi-year project that will continue beyond 2012. Future CIs TBD

JUSTIFICATION:

Justification Criteria: Work Support Facilities

Sub Criteria: Equipment Replacement

Why do this project?

Due to evolving industry standards, technology, and product lifespan, approximately 90 of the RTU's that are currently in service have been deemed as obsolete by the original equipment manufacturers. These unreliable RTU operations will have impacts on both generation and customer reliability. The commercial availability of spare parts is becoming increasingly difficult to manage effectively.

Replacement of part of the operating inventory creates spares for use as necessary.

Why do this project now?

The inventory of RTU spare parts has become sparse. Most of the existing RTUs have reached the end of their useful life. RTU installations require extensive time and effort to complete and having an effective RTU management plan is critical for the orderly replacement of units that are experiencing reliability issues and to gradually modernize the fleet.

Why do this project this way?

Most of NSPI's RTUs have reached the end of their useful life and through a measured replacement plan it is possible to supplement the spares in inventory.

CI Number : 41428 - 2012 RTU Capital Replacement **Project Number**

Parent CI Number : -

Cost Centre : 620 - 620-Control Centre Operations **Budget Version** 2012 ACE Plan

Capital Item Accounts

Acct	Actv	Account	Activity	Forecast Amount	Amount	Variance
092		092-Vehicle T&D Reg. Labour AO		38,003	0	38,003
094		094 - Interest Capitalized		5,637	0	5,637
095		095-COPS Regular Labour AO		57,893	0	57,893
001	064	001 - T&D Regular Labour	064 - GP - Sup. Control and DA	75,000	0	75,000
011	064	011 - Travel Expense	064 - GP - Sup. Control and DA	10,000	0	10,000
012	064	012 - Materials	064 - DP - Sup. Control and DA	62,494	0	62,494
012	064	012 - Materials	064 - GP - Sup. Control and DA	60,000	0	60,000
041	064	041 - Meals & Entertainment	064 - GP - Sup. Control and DA	5,000	0	5,000
			Total Cost:	314,026	0	314,026
			Original Cost:	103,390		

CI 41428 2012 RTU Capital Replacement

The following is a breakdown of costs associated with the 2012 RTU Capital Replacement project:

Administrative Overhead and Interest	$ 101,533
Materials	$ 122,494
COPS Labour	$ 75,000
Other	$ 15,000
Total	$ 314,027

The material forecast associated with this project is for the purchase of RTUs. The labour cost associated with this project is for engineering design, as well as for the installation of the RTU's. Other expenses include travel and meals.

CI Number: 41763

Title: **Warehouse Racking System**

Start Date: 2012/02
Final Cost Date: 2012/04
Function: General Plant
Forecast Amount: $262,402

DESCRIPTION:

This project serves to replace an existing warehouse racking system at the Central Stores location in Lakeside to optimize and increase the storage capacity and manage the safety risks to warehouse storekeepers.

Summary of Related CI's +/- 2 years:
No projects in 2010, 2011, 2013 and 2014

JUSTIFICATION:

Justification Criteria: Work Support Facilities

Sub Criteria: Furniture and Fixtures

Why do this project?

The existing racking system does not accommodate the current pallet storage configuration.

Why do this project now?

The racking does not technically support the current pallet storage configuration and presents a safety risk to the employees working in the storeroom.

Why do this project this way?

Replacing the existing warehouse racking system is the most effective approach to allow for proper storage and minimize safety risks for employees.

CI Number : 41763 - Warehouse Racking System **Project Number**

Parent CI Number : -

Cost Centre : 032 - 032-Facilities **Budget Version** 2012 ACE Plan

Capital Item Accounts

Acct	Actv	Account	Activity	Forecast Amount	Amount	Variance
094		094 - Interest Capitalized		3,061	0	3,061
001	003	001 - Regular Labour (No AO)	003 - GP - Bldg.,Struct.Grnd.	26,000	0	26,000
012	003	012 - Materials	003 - GP - Bldg.,Struct.Grnd.	233,341	0	233,341
			Total Cost:	262,402	0	262,402
			Original Cost:			

CI Number: 41419

Title: **2012 Replace Microwave Radio System**

Start Date: 2012/02
Final Cost Date: 2012/12
Function: General Plant
Forecast Amount: $601,339

DESCRIPTION:

This project provides for the replacement of existing microwave radio equipment on two radio hops in the South Shore: Shelburne to Granite Village and Granite Village to Great Hill. This equipment and systems allow for transfer of critical Supervisory Control and Data Acquisition (SCADA), teleprotection, voice and data traffic on NSPI telecommunication network infrastructure. This project allows for the planned completion of a microwave radio ring around the South Shore and the Valley providing a redundant system to improve reliability and flexibility.

The project involves the installation of a new telecommunications tower at Shelburne as well as the upgrade of towers at the Great Hill.

In 2013, a similar project will install new radios on the remaining two South Shore hops, Tusket Falls to French Lake and French Lake to Shelburne, completing the microwave ring around the South Shore and Valley.

Summary of Related CI's +/- 2 years:
2010 - 38244 P812 Replace Microwave Radio Systems $410,068
2011 - 40521 P849 Replace Microwave Radio Systems $351,658
2011 - 40249 P848 New Chester Microwave Radio Link $407,925
2011 - 40247 P847 Radio Tower Upgrades $324,686
2013 – CI TBD Replace Microwave Radio System $TBD

JUSTIFICATION:

Justification Criteria: Work Support Facilities

Sub Criteria: Telecommunication

Why do this project?

Replacement of the equipment for two radio hops is required to provide reliability and the required system capacity of the telecom network infrastructure.

Why do this project now?

The project will improve the reliability of these critical radio links. The existing radios on these two links are unlicensed spread spectrum radios with poor reliability that do not meet NSPI's standards for critical traffic such as SCADA and teleprotection.

It is necessary to upgrade these radio links now due to the need for redundancy and disaster scenario planning recovery. The new Backup Control Centre is scheduled to be operational in 2012 to meet NERC's requirements. This project allows for circuits to be easily re-routed to the Backup Control Centre if required because of the loss of the primary Control Centre.

With the recent additions of new generation and the associated transmission system expansion, it is necessary to upgrade these communication links to be able to handle the additional telecom circuit requirements.

CI Number : 41419 - 2012 Replace Microwave Radio System **Project Number**

Parent CI Number : -

Cost Centre : 625 - 625-Control Centre Operations - Tel **Budget Version** 2012 ACE Plan

Capital Item Accounts

Acct	Actv	Account	Activity	Forecast Amount	Amount	Variance
092		092-Vehicle T&D Reg. Labour AO		2,662	0	2,662
092		092-Vehicle T&D OT Labour AO		2,594	0	2,594
094		094 - Interest Capitalized		19,083	0	19,083
095		095-Thermal Regular Labour AO		1,585	0	1,585
095		095-COPS Regular Labour AO		4,055	0	4,055
095		095-COPS Overtime Labour AO		3,952	0	3,952
095		095-COPS Contracts AO		[redacted]	0	[redacted]
012	054	012 - Materials	054 - GP - Remote Monitoring	[redacted]	0	[redacted]
001	060	001 - T&D Regular Labour	060 - GP - Broadband Radio	5,253	0	5,253
002	060	002 - T&D Overtime Labour	060 - GP - Broadband Radio	10,240	0	10,240
011	060	011 - Travel Expense	060 - GP - Broadband Radio	3,000	0	3,000
012	060	012 - Materials	060 - GP - Broadband Radio	[redacted]	0	[redacted]
013	060	013 - COPS Contracts	060 - GP - Broadband Radio	[redacted]	0	[redacted]
028	060	028 - Consulting	060 - GP - Broadband Radio	[redacted]	0	[redacted]
041	060	041 - Meals & Entertainment	060 - GP - Broadband Radio	3,000	0	3,000
012	061	012 - Materials	061 - GP - Switched Telecomm. Sys	[redacted]	0	[redacted]
012	063	012 - Materials	063 - GP - Mobile Radio Infrastru	[redacted]	0	[redacted]
001	085	001 - THERMAL Regular Labour	085 Design	6,600	0	6,600
002	085	002 - THERMAL Overtime Labour	085 Design	0	0	0
			Total Cost:	601,339	0	601,339
			Original Cost:	377,787		

CI 41419 Replace Microwave Radio System

The following is a breakdown of costs associated with the Replace Microwave Radio System project:

Administrative Overhead and Interest	[redacted]
Materials	
Contracts	
COPS Labour	$ 22,093
Other	$ 26,000
Total	$ 601,338

The materials forecast provides for the purchase of 2 Alcatel Microwave radios, as well as the supply of a new tower for Shelburne.

The contracts forecast provides for the engineering and installation of a new tower in Shelburne. It also allows for the installation of new microwave dishes as well as microwave waveguides and other accessories. A portion of this forecast also provides for a consultant to carry out tower analyses to determine recommended modifications ensuring the towers meet safety standards.

NSPI personnel will complete the work associated with this project at a rate of approximately $[redacted] per person day.

CI Number: 41420

Title: **Upgrade Multiplexer Network Manager**

Start Date: 2012/02
Final Cost Date: 2012/12
Function: General Plant
Forecast Amount: $294,571

DESCRIPTION:

This project provides an upgrade to the Multiplexer Network Manager to provide for future expansion capabilities.

Summary of Related CI's +/- 2 years:
2012 C I 41404 Multiplexer Group Replacement $146,131
2013, 2014 CI TBDF Replace Multiplexer and Teleprotection Equipment $TBD

JUSTIFICATION:

Justification Criteria: Work Support Facilities

Sub Criteria: Telecommunication

Why do this project?

Nova Scotia Power's existing Newbridge Multiplexer network supports communication between substations and plants for the majority of the teleprotection circuits, SCADA circuits, System Ops Voice circuits, four-digit dial circuits, mobile radio circuits and corporate network access. This system is monitored and controlled by a Network Manager located in the Telecom Point of Contact (POC) area at the Ragged Lake Control Center.

The existing Newbridge Multiplexer network and Network Manager has been discontinued by the manufacturer, Alcatel-Lucent, and will only be supported until 2015. NSPI requires a new Network Management system to support future installations and new technologies.

Why do this project now?

Though the manufacturer's discontinuation of the currently installed Multiplexers was expected and spares are in place for failures, expansion for new sites, such as new windfarms and other renewable energy projects will not be possible within the existing Newbridge Multiplexer network and Network Management system. To allow for future growth and the incorporation of new generation sources, a new Network Management system is required that can integrate with the existing system as well as provide the same level of maintenance and control for the new model of multiplexer that will be purchased for future sites.

Why do this project this way?

The proposed system, the Alcatel 5620SAM, will allow integration with the existing Network Manager and grooming of circuits on the existing 3600 and 3630 model multiplexers as well as the 7705 model which will be installed in future sites. This will save time for new installations by allowing more of the process to be completed from Ragged Lake by provisioning the circuits remotely from the new Network Manager. A different type of multiplexer would be required for new installations at future sites that would not be compatible with the existing multiplexers or Network Manager would result in a more complicated and expensive installations to facilitate new sites.

CI Number : 41420 - Upgrade Multiplexer Network Manager **Project Number**

Parent CI Number : -

Cost Centre : 625 - 625-Control Centre Operations - Tel **Budget Version** 2012 ACE Plan

Capital Item Accounts

Acct	Actv	Account	Activity	Forecast Amount	Amount	Variance
092		092-Vehicle T&D Reg. Labour AO		3,324	0	3,324
092		092-Vehicle T&D OT Labour AO		334	0	334
094		094 - Interest Capitalized		7,762	0	7,762
095		095-COPS Overtime Labour AO		509	0	509
095		095-Thermal Regular Labour AO		1,268	0	1,268
095		095-COPS Regular Labour AO		5,064	0	5,064
001	059	001 - T&D Regular Labour	059 - GP - Multiplex	6,560	0	6,560
002	059	002 - T&D Overtime Labour	059 - GP - Multiplex	1,320	0	1,320
012	059	012 - Materials	059 - GP - Multiplex	[redacted]	0	[redacted]
028	059	028 - Consulting	059 - GP - Multiplex	[redacted]	0	[redacted]
066	059	066 - Other Goods & Services	059 - GP - Multiplex	86,000	0	86,000
001	085	001 - THERMAL Regular Labour	085 Design	5,280	0	5,280
002	085	002 - THERMAL Overtime Labour	085 Design	0	0	0
			Total Cost:	294,571	0	294,571
			Original Cost:			

CI 41420 Upgrade Multiplexer Network Manager

The following is a breakdown of costs associated with the 2012 Multiplexer Network Manager Upgrade.

Administrative Overhead and Interest	$ 18,261
Materials	[redacted]
Consulting	[redacted]
Other	$ 86,000
COPS Labor	$ 13,160
Total	$ 294,571

The materials forecast provides for the multiplexer upgrade equipment. NSPI personnel will perform the installation at a rate of [redacted] per person day.

The consulting and other forecasts were developed to allow for training of NSPI personnel associated with the new system.

CI Number: 41404

Title:	**Multiplexer Group Replacement**
Start Date:	2012/03
Final Cost Date:	2012/12
Function:	General Plant
Forecast Amount:	$146,131

DESCRIPTION:

This project provides for the costs to remove several obsolete multiplexer groups and associated teleprotection equipment for the following sites:

DM102 – 138kV Teleprotection and 230kV ‘A’ SPS
1) 2C-Port Hastings Sub
2) 5S-Glentosh Substation
3) 85S-Wreck Cove Sub
4) 88S-Lingan 230kV Sub

DM22 – 230kV ‘B’ Teleprotection and 345 ‘A’ SPS
1) 88S-Lingan Sub
2) 101S-Woodbine Sub
3) 89S1-Point Aconi Sub
4) 79N-Hopewell Sub
5) 67N2-Onslow Sub

DM16 – 230kV ‘A’ Teleprotection and SCADA data circuits
1) 101S-Woodbine Sub
2) 88S-Lingan Sub
3) 89S-Point Aconi Sub
4) 415H-Ragged Lake
5) Various SCADA RTUs

The ‘B’ side Teleprotection circuits in group DM22 will be replaced with new RFL multiplex and teleprotection equipment at 88S-Lingan, 101S-Woodbine and 89S1-Point Aconi. All of the ‘A’ side protection circuits, as well as any other functions will be moved to the existing Newbridge ‘A’ side multiplexers at each of the above mentioned sites.

JUSTIFICATION:

Justification Criteria: Work Support Facilities

Sub-Criteria: Telecommunication

Why do this project?

Nova Scotia Power’s existing Multiplexer groups DM102, DM22 and DM16 support teleprotection and other functions for the sites and systems listed above. The existing equipment in these groups is now obsolete and the inventory of spare parts has been depleted. New spare parts are no longer available and replacement is required to mitigate the risk of unplanned extended outages.

Why do this project now?

As spare parts are no longer available for the existing multiplexer and teleprotection equipment, this equipment must be replaced to mitigate the risk of unplanned failures and potential for extended outages.

Why do this project this way?

The addition of ‘A’ circuits and data circuits is the most economical solution. The RFL equipment proposed for the ‘B’ side protection circuits is the same design as equipment installed in other parts of the system. NSPI technicians are trained on this equipment and an inventory of spare parts exists. In addition, the existing RFL equipment installations have been performing very well.

8 Glossary of Terms

Capacitor	A device used by electrical utilities to maintain voltage on a distribution or a transmission line.
Capacity	The load for which a generating unit, generating station, or other electrical apparatus is rated. Several capacity values may be identified as follows:
Maximum:	the maximum output that can be achieved.
Nameplate:	the maximum output specified by the manufacturer.
Dependable:	the maximum output that can be reliably supplied during peak load months (December, January, and February).
Firm:	based on dependable capacity, unit availability and system characteristics.
Cogeneration	The generation of electricity in conjunction with the production of useful heat, usually steam.
Conductor	One or more wires, usually aluminum or copper, connected together and designed to carry an electrical current. These wires may be bare or insulated.
Demand	The rate at which electric energy is delivered at a given instant or averaged over some designated period of time, expressed in kilowatts, megawatts, and other larger units. Also called “load” or “power.”
Distribution System	The facilities (i.e. lines, transformers, switches and sub-stations) used to distribute electricity over short distances from the transmission system to the customer, generally at voltages below 69 kV.
Energy Terms	A kWh is a measure of energy equal to 1000 watts, over a period of one hour. A MWh is a measure of energy equal to 1000 kilowatt hours. A GWh is a measure of energy equal to 1000 megawatt hours.
Electrical Generation	The process of transforming other forms of energy into electrical energy. At Nova Scotia Power, this means using coal, oil, natural gas, diesel fuel, water or wind as fuel for the process to create electrical energy.
Feeder	An electric line for supplying electrical energy within an electric service

	area or subarea.
Heat Rate	A measure of the thermal efficiency of a generation station, generally expressed as Btu per net kWh. The lower the heat rate (the fewer Btu's required to produce a kilowatt hour of electricity), the more efficient the generating unit.
Line	A term used to describe a section of either distribution or transmission conductor, and its supporting hardware towers and insulators.
Load	See Demand.
Load Factor	The ratio of energy supplied during a given period to the maximum that could have been supplied had the peak load in that period been maintained in all hours.
Recloser	A heavy duty power switch capable of detecting abnormal power flows, then automatically opening and closing according to preset instructions.
Relay	A piece of equipment used to monitor quantities such as current, pressure, liquid levels, voltage or temperature and take action when these quantities are outside prescribed limits.
Substation	A facility for switching circuits and/or transforming electrical energy from one voltage to another.
Three Phase	Three separate conductors, each at the same nominal voltage, used to supply power primarily to large customers.
Transformer	An electromagnetic device for changing voltage from one level to another.
Transmission System	The facilities (i.e. lines, transformers, switches and substations) used to transmit electrical energy from the generating stations throughout the province and NB Power/NSPI interconnection to various parts of the transmission system, generally at voltages of 69 kV and higher.

9 NSPI 2012 Quick Reference Sheet

2012 AFUDC Rate 7.97%

2012 O/H Rates

Generation		**Customer Operations**		**Shared Services**	
PP Regular	24.0%	Regular	77.2%	Regular	53.3%
Hydro	18.5%	Contract	23.5%		
Contractor	5.0%	Vehicle	50.7%		

10. 2012 Depreciation Rates

2012 Deprecation Rates

	2012
Steam Production Plant	
Lingan	
Lingan 1-2	4.12%
Lingan 3-4	2.28%
Lingan - Common	4.48%
Total Lingan	3.35%
Point Aconi 1	2.27%
Point Tupper	
Point Tupper 1	3.97%
Point Tupper 2	2.82%
Total Point Tupper	2.89%
Trenton	
Trenton 5	3.10%
Trenton 6	2.34%
Trenton - Common	0.47%
Total Trenton	2.47%
Tufts Cove	
Tufts Cove 1	4.24%
Tufts Cove 2	3.68%
Tufts Cove 3	2.33%
Tufts Cove - Common	3.44%
Total Tufts Cove	3.27%
Point Tupper Marine Terminal	4.06%
General	2.82%
Total Steam Production Plant	2.82%

	2012
Hydraulic Production Plant	
Avon	3.02%
Bear River	1.80%
Black River	2.04%
Dickie Brook	3.16%
Fall River	1.82%
Harmony	4.55%
Lequille System	2.33%
Roseway	2.29%
St. Margaret's	2.85%
Sheet Harbour	3.38%
Tusket	2.64%
Wreck Cove System	1.67%
Annapolis Tidal	2.32%
General	2.10%
Total Hydraulic Production	**2.10%**
Other Production - Gas Turbines	
Burnside	2.40%
Tusket	6.42%
Victoria Junction	3.17%
Tufts Cove Unit 4	2.55%
Tufts Cove Unit 5	2.77%
Total Other Production - Gas Turbines	**2.81%**
Wind Turbines	
Pre 2009 Wind	5.52%
Post 2009 Wind	4.0%
Total Wind Turbines	**5.52%**
Transmission Plant	
Land Rights - Easements	1.26%
Station Equipment	2.14%
Towers & Fixtures	1.26%
Poles & Fixtures	4.32%
Overhead Conductors & Devices	1.96%
Underground Conduit	1.53%
Underground Conductors & Devices	2.61%
Roads, Trails & Bridges	1.74%
Total Transmission Plant	**2.35%**

	2012
Distribution Plant	
Land Rights - Easements, Surveys & Clearing	1.56%
Structures & Improvements	5.31%
Station Equipment	1.28%
SCADA Equipment	9.68%
Remote Monitoring Equipment	10.32%
Station Equipment - Miscellaneous	12.49%
Poles, Towers & Fixtures	3.79%
Overhead Conductors & Devices	3.33%
Underground Conduit	1.51%
Underground Conductors & Devices	3.17%
Line Transformers	4.09%
Services	5.33%
Meters	6.87%
Street Lighting & Signal Systems	5.33%
Total Distribution Plant	**3.89%**
General Plant	
Land Rights - General Plant	1.93%
Structures & improvements	2.85%
Office Furniture & Equipment	9.26%
Office Furniture & Equip - Comp Hardware	20.00%
Office Furniture & Equip - Comp Software	10.00%
Transportation Equipment	9.55%
Stores Equipment	14.97%
Communication Equipment	4.38%
Communication Equipment - SCADA Eq	1.33%
Remote Monitoring Equipment	10.27%
Miscellaneous Equipment	5.02%
Roads, Bridges & Traps (Kelly Rock)	2.58%
Mining Equipment (Kelly Rock)	2.92%
Total General Plant	**8.16%**