Request IR-1:

Please provide the current status of projects listed in Schedule "A" of the 2015 ACE Plan Decision, and the current status and a cost update for each of the projects listed in Schedules "B", and "C" of the Decision.

Response IR-1:

Please refer to the following attachments, also provided electronically:

- Schedule A – Attachment 1
- Schedule B – Attachment 2
- Schedule C – Attachment 3

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CI#	Project Title	2014 Budget	Project Total	Status
	Generation			
44248	HYD - MacMillan Dam D-7 Refurbishment	$4,795,607	$5,279,936	APPROVED
43067	HYD - Cheticamp Dam D-1 Refurbishment	$694,750	$4,313,991	APPROVED
41142	HYD - St. Margaret's Fish Passage	$296,958	$3,163,840	APPROVED
44978	HYD-Wreck Cove Automation	$381,782	$805,604	APPROVED
44669	HYD - Wreck Cove Fire Suppression Upgrades	$333,589	$333,589	APPROVED
33142	CT- Burnside #4 Unit Restoration	$767,439	$3,704,398	Submitted
29065	CTS BGT Replace Halon Fire Protection System	$356,702	$356,702	Now less than $250k
43155	CT - BGT2 Air Intake Structure Refurbishment	$306,586	$306,586	Deferred to 2017
30162	POT - Bunker C tank refurbishment	$2,125,931	$2,239,835	APPROVED
44730	TRE5 Turbine Main and Control Valves Refurbishments	$306,807	$731,359	APPROVED
42728	Unit Lay-up Program	$79,893	$330,650	Now less than $250k
45180	ICP - Rail Line Bridge Work	$308,108	$308,108	Cancelled
45392	TRE Bunker C System Refurbishments	$288,886	$288,886	APPROVED
45178	ICP - Rail Centre Shop Roof	$265,725	$265,725	Now less than $250k
45326	LIN1 PAC System Improvements	$227,641	$262,986	
45327	LIN2 PAC System Improvements	$227,641	$262,986	
45328	LIN3 PAC System Improvements	$227,641	$262,986	
45329	LIN4 PAC System Improvements	$227,641	$262,986	
	Transmission			
43324	L6513 Rebuild / Upgrade Line Terminals	$8,456,500	$16,141,774	Submitted
43678	Separate L8004/L7005 on Conso Crossing Double Circuit Tower	$2,241,664	$10,818,967	Deferred to 2016
45066	Upgrade L6511 and L7019 Thermal Rating	$3,775,982	$7,707,849	Submitted
44987	L7003 Upgrades	$971,776	$6,859,667	Submitted
45306	Prime Brook Substation Addition	$362,477	$3,771,492	APPROVED
45067	67N Onslow 345 KV Node Swap	$2,150,875	$3,006,487	Submitted
43291	Protection Risk Reduction 67N-Onslow 230KV	$2,486,992	$2,486,992	APPROVED
44984	9C Aberdeen Transmission Line Installation	$846,755	$846,755	APPROVED
44970	2014 Steel Tower Refurbishments	$492,271	$492,271	Cancelled
	Distribution			
45027	535N - Powell Road Partial Conversion Phase 1	$357,418	$357,418	Now less than $250k
	General Plant			
44671	IT-Oracle Financials Upgrade	$1,491,343	$6,633,731	Deferred to 2016
45106	IT - Printer Fleet Refresh	$500,000	$500,000	APPROVED
44713	IT - Safety Health and Wellness Tracking System	$358,924	$358,924	Cancelled
45036	ArcMap Design Software	$344,459	$344,459	Pending Submission

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Schedule "B" - 2015 ACE Plan Approved Projects

			ACE 2015		Updated		
Tab #	CI#	Project Title	2015 Budget ($)	Project Total ($)	2015 Budget ($)	Project Total ($)	Status
G01	41139	HYD - Annapolis Sluiceway Superstructure Refurbishment	1,615,767	3,410,322	319,855	2,857,876	on-going
G02	43066	HYD - Little Indian Dam / Mill Lake Upgrade	1,188,480	1,409,587	1,137,000	1,304,548	in service
G03	43607	HYD - Malay Falls #5 Unit Overhaul	780,932	1,077,255	621,787	1,026,687	in service
G04	46594	HYD Sissiboo Falls Overhaul	817,153	817,153	1,007,738	1,007,738	in service
G05	45370	HYD - WRC Unit 1 Excitation System	578,113	578,113	502,794	502,794	in service
G06	44667	HYD Upper Lake Falls Unit #1 Overhaul	477,533	477,533	547,220	547,220	in service
G07	44267	TRE Ash Lagoon Site Closure	4,571,161	7,994,849	1,714,794	7,337,322	on-going
G08	44188	TRE Ash Site Phase 1 Capping	2,093,285	4,538,289	3,590,832	4,859,217	on-going
G09	46299	TRE6 Boiler Refurbishments	873,652	873,652	980,610	980,610	in service
G10	46256	POT - Boiler Refurbishment 2015	780,097	780,097	1,075,644	1,075,644	in service
G11	46451	PHB Boiler Refurbishment 2015	673,602	673,602	733,624	733,624	in service
G12	46302	TRE5 Boiler Refurbishments	647,845	647,845	664,299	664,299	in service
G13	46467	LIN3 - Division Wall Replacement	635,747	635,747	735,356	735,356	in service
G14	46352	TRE5 Air Heater Refurbishments	527,994	527,994	-	530,310	deferred
G15	46469	LIN4 - Boiler Refurbishment 2015	501,938	501,938	600,873	600,873	in service
G16	46470	LIN1 - Boiler Refurbishment 2015	496,369	496,369	549,064	549,064	in service
G17	46463	LIN3 - Air Heater Refurbishment	477,566	477,566	566,275	566,275	in service
G18	44191	POT Coal Nozzle and Bucket Replacement	409,515	570,309	593,118	753,912	in service
G19	46472	LIN3 - Boiler Chemical Treatment	387,649	387,649	465,400	465,400	in service
G20	46394	POT - Air Heater Steam Coil Replacement -North Side	361,514	361,514	273,591	273,591	in service
G21	46482	LIN3 Burner Front Refurbishment	299,261	299,261	364,076	364,076	in service
G22	46508	LIN2 Boiler Refurbishment	289,345	289,345	349,412	349,412	in service
G23	41645	TRE6 Bottom Ash Seal Replacement	214,383	307,499	303,741	396,857	in service
G24	42806	LIN3 L-0 Turbine Blade Replacements	3,881,826	4,157,741	3,981,505	4,357,255	in service
G25	43094	LIN3 HT Fastener Replacement	868,348	868,348	931,309	931,309	in service
G26	44730	TRE5 Turbine Valves Refurbishment	752,160	752,160	635,713	635,713	in service
G27	46336	POT Turbine Valve Refurbishment	616,865	616,865	643,767	643,767	in service
G28	46473	TUC3 - Turbine Valve Refurbishment	609,870	609,870	615,201	615,201	in service
G29	46464	TUC1 - Turbine Valve Refurbishment	541,162	541,162	572,009	572,009	in service
G30	43088	LIN3 Generator Rotor Rewind	1,901,480	1,901,480	2,146,821	2,146,821	in service
G31	40363	LIN3 High Voltage Bushing Refurbishment	628,531	628,531	727,854	727,854	in service
G32	46484	TUC - Unit 1&2 Analytical Panel Replacement	386,607	386,607	262,723	421,743	on-going
G33	46496	LIN3 Analytical Panel Replacement	276,756	276,756	344,186	344,935	in service
G34	41227	LIN3 Condenser Large Bore Pipe and Valve Refurbishment	1,299,329	1,299,329	1,527,141	1,527,141	in service
G35	28288	POT Turbine Supervisory Equipment Upgrade	822,535	822,535	796,678	796,678	in service
G36	43031	POT - #5 HP Feedwater Heater Replacement	811,277	812,644	825,750	860,466	in service
G37	46055	LIN - Coal Mill Refurbishment 2015	736,546	736,546	704,035	704,035	in service
G38	46301	TRE6 6A 6B Mills Refurbishment	665,045	665,045	738,091	738,091	in service
G39	46392	POT - Plant Siding Replacement	547,659	547,659	450,758	450,758	on-going
G40	46058	LIN Coal Plant Structural Refurbishment - Phase 1	516,818	516,818	556,995	556,995	in service
G41	46395	TRE5 Baghouse Filter Replacements 2015	489,517	489,517	589,842	589,842	in service
G42	46070	LIN3 Bottom Ash Replacement	475,908	475,908	570,687	570,687	in service
G43	46372	POT - Coal Mill Overhauls	418,292	418,292	448,268	448,268	in service
G44	45851	POT - Stack Repairs	349,165	381,316	379,928	413,239	in service
G45	45246	LIN Cooling Water MCC Refurbishment	295,667	327,633	132,880	239,693	in service
G46	46057	LIN - CW Screen Refurbishment 2015	292,634	292,634	350,915	350,915	in service
G47	46293	LIN Coal Bunker Chute Refurbishment	291,730	291,730	117,042	169,069	in service
G48	45116	CT - BGT1 GG4C-1D Engine Refurbishment	1,168,167	1,168,167	-	1,185,648	deferred
G49	20511	CT - Victoria Junction Replace Halon Fire Protection System	268,467	268,467	4,028	275,128	on-going
Transmission							
T01	46339	120H Brushy Hill - SVC Controls Replacement	3,689,176	9,959,330	2,776,695	10,026,230	on-going
T02	46513	3C Port Hastings BPS Upgrade	2,795,730	3,684,823	2,355,828	3,113,665	on-going
T03	46340	2015 Transmission Switch & Breaker Replacements	1,581,599	1,581,599	1,269,307	1,269,307	in service
T04	43490	2015 Steel Tower Life Extension	641,709	1,441,709	173,448	1,005,033	on-going
T05	43267	13V Gulch Hydro Replace 13V-GT1 and 13V-VR1	1,061,902	1,061,902	354,144	836,006	on-going
T06	44976	10H 25kV Breaker Replacement	953,521	953,521	102,599	866,015	on-going
T07	46583	L6511 Replacements	905,745	905,745	388,655	788,958	in service
T08	46331	L7001 Replacements - Phase 2	888,192	888,192	749,283	749,283	on-going
T09	46335	L5511 Replacements	722,934	722,934	568,118	568,118	in service
T10	44979	L5527 Structure Replacements	721,068	721,068	623,508	669,214	on-going
T11	46362	L5560 Transmission Line Reconductor	626,895	626,895	552,667	559,327	on-going
T12	46353	2015 Substation Recloser Replacements	596,893	596,893	414,099	414,099	on-going
T13	43261	6V-GT1 Hollow Bridge Hydro Transformer Replacement	550,938	550,938	334,254	555,549	on-going
T14	46337	L6535/L6551 Insulator Replacements	459,422	459,422	416,286	416,286	on-going
T15	46354	2015 Reactor Breaker Replacements	460,691	460,691	166,697	280,185	on-going
T16	46582	L5569 Upgrade	369,032	369,032	318,892	318,892	on-going
T17	46356	2015 Sacrificial Anode Installation Program	304,612	304,612	1,543,496	1,543,496	in service
Distribution							
D01	46292	2015 Padmount Transformer Replacement Program	1,536,110	1,536,110	1,360,717	1,360,717	in service
D02	46458	16N-302 Stewiacke Reconductor	592,084	965,830	749,916	813,638	on-going
D03	43234	104S-313 Baddeck Rebuild	778,470	778,470	851,243	851,243	in service
D04	46576	2015 PCB Phase-out for Pole Top Transformers	733,503	733,503	828,433	828,433	in service
D05	45031	3N Oxford Conversion Phase 1	716,167	716,167	3,505	539,146	on-going
D06	46457	79V-401 Cameron Lake Voltage Conversion	282,166	637,939	555,018	555,018	in service
D07	46456	11W Yarmouth 4kV Conversion	295,167	545,514	380,710	626,456	on-going
D08	46304	20W-311 Argyle Sound Reconductor	430,435	430,435	570,141	570,141	on-going
D09	46251	36V-303 Saxon Double Circuit	425,838	425,838	460,381	460,381	on-going
D10	43203	58C-405 / 11C Belle Cote Phase 1	339,419	339,419	320,133	320,133	in service
D11	45003	2015 Hydraulic Recloser Replacements	260,524	260,524	150,891	254,336	on-going
General Plant							
GP01	46307	2015 Multiplexer Network Upgrades	446,538	446,538	241,668	563,836	on-going
GP02	46308	2015 Microwave System Capacity Upgrade	316,142	316,142	150,906	385,271	on-going
GP03	46306	2015 Telecom Building Replacement	251,727	251,727	-	240,504	on-going
GP04	46365	Maximo Enhancements for Substation Field Mobility	315,242	315,242	72,310	287,077	on-going
GP05	46364	Maximo Enhancements for Telecom & Relays	170,598	272,539	76,567	263,211	on-going
GP06	46050	Operator Training Simulator	358,284	531,119	277,007	395,229	on-going
GP07	46657	Wire Inspection Services - Analyzer Replacement	448,300	448,300	449,549	449,549	on-going
Total New Capital Spending			**$65,638,037**	**$83,627,912**	**57,358,301**	**83,499,948**	

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Schedule C

		ACE 2015		Updated		
CI#	**Project Title**	**2015 Budget ($)**	**Project Total ($)**	**2015 Forecast ($)**	**Project Total ($)**	**Status**
			Generation			
41142	HYD - St. Margaret's Fish Passage	2,900,021	3,433,314	3,492,977	3,926,079	Approved
44978	HYD-Wreck Cove Automation	874,891	2,379,999	846,452	3,802,446	Approved
40283	HYD - Wrights Lake Dam Refurbishment	1,967,723	2,242,751	1,324,782	1,600,449	Approved
41130	HYD - Avon #2 Generator Stator Rewind	620,353	694,096	561,291	633,484	Approved
45171	HYD-Avon 1 Pipeline Replacement	467,755	547,780	1,005,324	1,012,419	Approved
46232	HYD - WHR Pipeline Replacement	458,493	538,454	685,770	685,805	Approved
33142	CT- Burnside #4 Unit Restoration	3,094,420	3,469,160	489,265	8,320,984	Submitted
44775	CT - TUC#4 LM6000 Generator Rotor Re-wedge	691,046	803,594	136,124	1,722,180	ACE 2016 Subsequent Submittal
46506	LM6000 - Noise Mitigation	707,491	707,491	102,707	102,707	Now less than $250k
46483	CT - Tusket Control System Upgrade	441,816	441,816	-	436,301	Deferred to 2017
44752	BGT1 - Generator Rotor Retaining Ring Replacement	357,869	357,869	-	357,869	Deferred to 2017
29065	CT - BGT Replace Halon Fire Protection System	234,780	356,682	-	229,422	ACE 2016 Less than $250k
46507	LM6000 - Fuel Nozzle Rotable Kit	295,772	295,772	293,315	293,315	Approved
45117	BGT1 - PLC and Field Device Control Upgrade	253,768	253,768	-	255,768	Deferred to 2017
46068	LIN CW Debris Removal System	1,575,866	1,575,866	102,097	1,746,988	Approved
46300	TRE6 Air Heater Refurbishment	752,215	752,215	2,040,366	2,040,366	Approved
44536	LIN3 HP Rows 1&2 Replacement	706,791	706,791	-	-	Cancelled
46466	TUC2 - Rotary Airheater Refurbishment	439,946	439,946	-	-	Cancelled
46655	ICP Mile 10.1 Bridge Repairs	377,279	377,279	-	377,279	Deferred to 2018
			Transmission			
46591	88S Lingan Replace 230kV GIS	3,274,637	23,510,262	145,852	14,249,882	ACE 2016 Seek Approval
43324	L6513 Rebuild/upgrade line terminals	12,735,850	23,429,902	10,481,516	22,067,148	Submitted
43678	Separate L8004/L7005 on Conso Crossing Double Circuit Tower(DCT)	1,367,669	10,797,354	1,263,504	10,767,280	ACE 2016 Subsequent Submittal
41519	Harbour East 138 kV Transmission Line	497,838	8,793,272	203,774	11,672,021	ACE 2016 Subsequent Submittal
44987	L7003 Lidar Upgrades	2,871,847	6,885,817	2,867,672	11,032,275	Submitted
45053	69Kv Structure Replacements West	290,836	4,495,729	66,000	4,495,729	Deferred to 2017
45306	Prime Brook Substation Addition	2,431,743	4,300,627	1,148,348	3,442,582	Approved
45066	Upgrade L6511 and L7019 Thermal Rating	3,219,774	3,693,033	3,372,430	3,957,530	Submitted
46587	Metro Voltage Support Add Capacitor	1,499,915	2,522,277	157,516	3,373,511	ACE 2016 Seek Approval
46586	2015 PCB Removal - Substation	1,262,087	1,262,087	1,236,351	1,236,351	Approved
46333	L6538 Replacements	500,375	1,019,443	522,274	1,008,356	Approved
45795	L6503 Upgrade	780,641	780,641	870,870	870,870	Approved
46332	L6539 Replacements	736,393	736,393	723,796	723,796	Approved
41438	85S Cable Termination Replacement Wreck Cove	616,959	616,959	418,763	418,763	Submission no longer required *
			Distribution			
40320	LED Street Light Conversion	7,280,062	40,609,354	2,797,339	36,041,594	Approved
44749	Tiverton Tower Refurbishment	935,802	1,281,771	276,818	1,157,069	ACE 2016 Subsequent Submittal
44836	Halifax 4kV Conversion Part 2	581,405	842,670	359,007	678,393	Submitted
46651	23H-303G Rockingham Conversion Part 1	266,008	572,750	516,777	566,694	Approved
46398	20H Spryfield Voltage Conversion	329,169	444,970	384,819	480,510	Approved
43218	88W-323HA Tusket Islands Phase 3	286,911	286,911	-	273,205	Deferred to 2017
			General Plant			
46552	Backbone Communications System Upgrade	1,189,999	12,525,792	1,648,665	8,913,092	Approved
46075	IT - Maximo Upgrade & GIS Integration	1,198,973	1,198,973	887,461	7,937,644	ACE 2016 Subsequent Submittal
46739	IT - Outage Map Technology Upgrades	982,880	1,023,269	2,544,507	2,895,724	Submitted
41425	IT - Cognos Upgrade	323,498	526,740	803,613	1,431,257	ACE 2016 Subsequent Submittal
46411	AMO Hydro Asset Management PE	205,643	376,637	444,143	590,884	Approved
46073	IT - Lotus Notes Applications Replacement	308,782	308,782	329,690	744,698	ACE 2016 Subsequent Submittal
46671	CIP v5 Cyber System Systems	730,200	730,200	976,265	1,528,492	ACE 2016 Subsequent Submittal
		63,924,189	**173,947,254**			

* Pursuant to NS Power's letter to the UARB of December 8, 2015 and the UARB's subsequent acknolwedgement, this project was approved as part of the 2012 ACE Plan.

Request IR-2:

Please identify all 2016 ACE Plan projects that were in a previous ACE Plan, but have not been activated.

Response IR-2:

Please refer to Attachment 1.

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CI#	Project Long Title
	Generation
42944	TUC3 - Boiler Drum North PSV Replacement
46495	TUC3 - DCS Upgrade
28249	POT Structural Steel Refurbishment on South ID fan and Precipitator ductwork steel
22410	TRE5 5-1 Condensate Extraction Pump Refurbishment
43257	POA - Main Oil Tank Refurbishment
45176	ICP - Pier Belting
29065	CT - BGT Replace Halon Fire Protection System
46352	TRE5 Air Heater Refurbishments
44775	TUC#4 LM6000 Generator Stator Re-wedge
45029	POA - Auxiliary Boiler Replacement
46461	POA - Ash Cell Capping 2015
41664	TRE5 Precip Refurbishment
43407	TRE5 Cable Rooms Fire Protection
43429	TRE5 Lube Oil Cooler Retube
43144	POA - Plant Access Improvements
43170	LIN4 AVR Replacement
43239	LIN4 BFP Proportional Recirculation Line Control
43386	POT - LP dosing automation
	Transmission
41519	Harbour East 138 kV Transmission Line
44749	Tiverton Tower Refurbishment
43678	Separate L8004/L7005 on Canso Crossing Double Circuit Tower(DCT)
46587	Metro Voltage Support Add Capacitor
46591	88S Lingan Replace 230kV GIS
43268	9W-B53 Tusket Replace Supporting Structure
	General Plant
46073	IT - Lotus Notes Applications Replacement
41425	IT - Cognos Upgrade
46671	NERC CIP Version 5 Implementation
46075	IT - Maximo Upgrade & GIS Integration
44671	IT - Oracle Financials Upgrade

Request IR-3:

In its 2015 ACE Plan submission, NSPI included 84 projects with an estimated costs of less than $250,000 each. Has the cost for any of the above projects exceeded, or is it expected to exceed, the $250,000 limit? If so, please identify these projects and their revised cost estimates.

Response IR-3:

The following table lists the projects included in ACE 2015 as less than $250,000 that have exceeded or are expected to exceed the $250,000 limit.

CI	Project Long Title	ACE 2015	Revised Estimate	Status / Expected Filing Date
46593	70V Bridgetown Voltage Conversion	237,679	534,887	UARB Approved – September 9, 2015
38108	POT - AVR Replacement	245,617	346,970	Filed on October 30, 2015
43389	LIN3 Bentley Nevada Upgrade - System 1	242,907	298,363	February 2016
46422	POT - Automatic Trash Rack Cleaning System	233,741	329,720	UARB Approved – July 31, 2015
43027	POT - Refurbish Dust Collection Area Explosion System	239,355	289,357	January 2016
46673	LIN - Plant Noise Mitigation	247,024	256,854	February 2016

Capital items 43389, 43027 and 46673 are currently being reviewed and will be filed, if necessary, in early 2016.

Request IR-4:

With reference to page 3 of the 2016 ACE Plan submission letter, please identify the discrepancy between the Q3 Reports submitted to the Board on October 30, 2015, and the updated document.

Response IR-4:

There is no discrepancy. The numbers in the 2015 Q3F (Forecast) listed on Page 4 of the 2016 ACE Plan ($258.3 million) and the numbers in the 2015 Potential Capital Spend shown in the Q3 Reports ($287.3 million) represent different things.

The 2015 Q3F amount in the ACE Plan is the updated level of investment that NS Power forecasted in 2015. The 2015 Potential Capital Spend shown in the quarterly capital reports is the original 2015 ACE Plan total, adjusted to include ATOs, U&Us and P&As, less deferred and cancelled projects. Potential Capital Spend does not include subsequently updated capital project spend forecasts from the 2015 ACE Plan amount.

Request IR-5:

With reference to the Q3 Report, NS Power Capital Item Status Update, for all projects with a status "Not Approved at this time", please clarify their status, as well as their accounting treatment.

Response IR-5:

The status for each of the projects included in the "Not Approved at this time" category is as follows:

43324 – L6513 Rebuild/upgrade line terminals: Some preliminary engineering and land clearing work has been completed; however, no construction has been started.

45066 – Upgrade L6511 and L7019 Thermal Rating – This project has been completed.

45067 – 67N Onslow 345 KV Node Swap – This project has been completed.

In accordance with the Board's direction in connection with each of the above CIs, costs related to each, including AFUDC, will not be included in the rate base unless specifically approved by the Board during the Maritime Link tariff hearing or a GRA hearing.

Request IR-6:

Descriptions of new capital items for which NSPI seeks Board approval include a "Summary of Related CIs +/- 2 years". Please describe the criteria NSPI uses to determine which capital items are related.

Response IR-6:

The criteria NS Power uses to determine which capital items are related differs depending on the type of capital project.

Steam/Gas Turbine – Work completed on the same asset (turbine, boiler, etc.) and on the same unit (Lingan Unit #3, for example).

Hydro – Work completed on the same generating unit and dam structures, but not necessarily the same asset.

Transmission & Distribution – Work completed on the same asset class (Padmount transformers, Breakers, etc.) or in the same location (feeder).

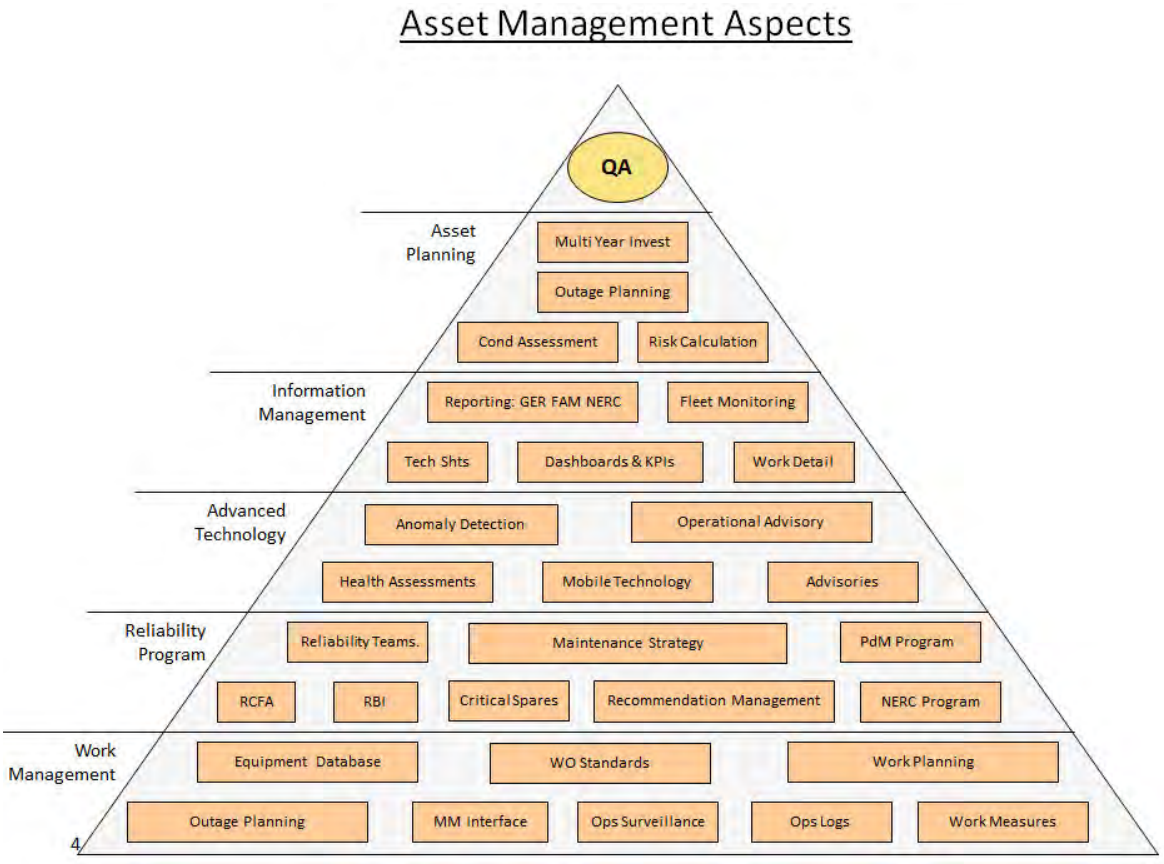
General Plant – Work completed on the same asset (application, building, etc.).

Request IR-7:

With reference to page 4 of the submission, it is noticed that Uptime Magazine had selected NSPI for the "Best Asset Management" award. Please describe NSPI's asset management program, and explain reasons that make it so distinctive.

Response IR-7:

NS Power has deployed a comprehensive asset management program to its thermal generation fleet. The program includes dozens of aspects organized within layers: work management, reliability programs, advanced technologies, information management and asset planning. These layers and their aspects are represented in NS Power's asset management pyramid (below).



NS Power's approach is distinctive in that the numerous aspects within the pyramid are highly integrated, resulting in a high degree of data synthesis, supporting quality risk profiling and decision making. While many industries are able to achieve excellence in some aspects or layers of asset management, few have been able to achieve the degree of business penetration and integration that has been realised at NS Power. For example:

- Work management processes are identical across the fleet.

- Maintenance strategies are deployed for like equipment across the fleet, enabled by common work management processes and systems.

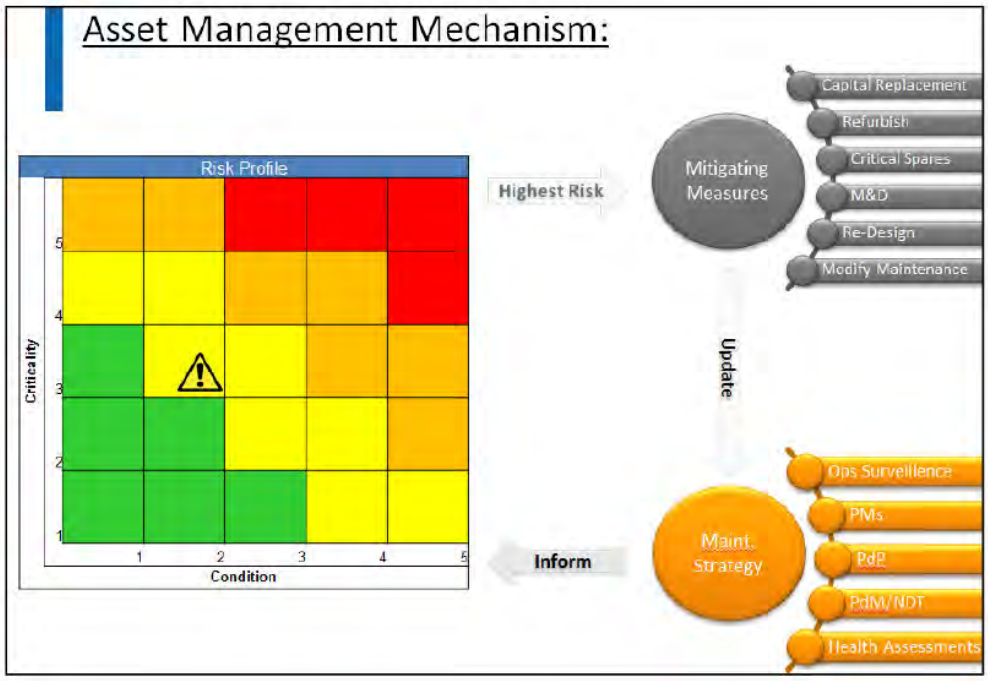
- Reliability programs (Predictive Maintenance and Risk Based Inspection Programs) are deployed and managed centrally for the fleet.

- Data management, reporting and scorecards are highly automated and provisioned for the Plants.

- Risk profiles are generated for like equipment, across the fleet, to develop a detained understanding of health and support decision making on investment and maintenance strategy.

- Multiyear outage and investment planning is enabled by the detailed risk information.

The following graphic illustrates how many aspects of NS Power's asset management approach are related, integrated and result in actionable risk profiling.



These asset management aspects include:

- Maintenance strategies are designed and deployed across the fleet for like asset classes.
- Output from maintenance strategies enable risk calculation.
- Criticality is determined by fleet reliability teams.
- Risk is calculated in a standardized approach.
- Risk profiles deliver an understanding of which equipment requires mitigating measures.
- Mitigating measures are applied to manage risk. Anticipated unit utilization is considered as mitigating measures are applied.

- The process repeats annually.

The combination of process design, operational excellence, deployment of latest tools and technology and organization commitment has resulted in the recognition of NS Power's asset management program.

Request IR-8:

With respect to the table on page 8, Metro Transmission Upgrades, please provide an overview of this project and its forecasted costs.

Response IR-8:

The 'Metro Transmission Upgrades' listed in the table on page 8 includes the following capital items and forecasted costs:

CI	Description	Forecasted Costs ($M)		
		2016	2017	Total
48022	Spider Lake Substation Addition	1.1	5.3	6.3
48023	103H-Lakeside: Capacitor Bank Addition and L-6033 Breaker Upgrade	0.8	2.4	3.2
48024	90H-Sackville: Capacitor Bank Addition and L-6010/L-6005 Breaker Upgrades	0.8	3.1	3.9
48025	L-7018 Upgrade to 345kV and Capacitor Bank Addition	2.0	19.5	21.5
48026	1H-Water St.: CT Ratio Changes on L-6033 and L-6035	0.05	-	0.05
	Total	**4.7**	**30.3**	**35.0**

Note: Amounts above may be off by $0.1M due to rounding

The purpose of these projects is to reduce the need for out of merit dispatch of the Tuft's Cove Generating Station for system stability purposes. CIs 48022, 48023, 48024, and 48025 are included in the 2016 ACE Plan Capital Items Forecast for Subsequent Approval list, and are anticipated to be submitted for approval in the first half of 2016. CI 48026 is under $250,000 and is included in the 2016 ACE Plan Capital Items with Estimated Total Project Cost of Less Than $250,000.

Request IR-9:

Please explain how the cost estimates provided in the table on page 8 are consistent with the assumptions in the recent IRP?

Response IR-9:

The sustaining capital investment provided in the table on page 8 is a five-year forecast of the capital spending to sustain all of the generation, transmission and distribution assets of NS Power.

Within the 2014 Integrated Resource Plan (IRP), NS Power developed a 25-year sustaining capital forecast for thermal generating assets necessary to maintain the operational capability of these assets for the various utilization and retirement strategies modeled within the Candidate Resource Plans of the IRP.

The ACE Plan five-year forecast and the long-term forecasts of the IRP are developed from consistent asset management methodologies considering forecasted unit utilization, asset health and major maintenance intervals.

Request IR-10:

On page 8, NSPI notes that the Sustaining Capital portion of the annual forecast is more certain than the large scale strategic capital profile. Please explain increases in the forecasted spending on Sustaining Capital for years 2016 to 2018, when compared with the related 2015 ACE Plan cost estimates.

Response IR-10:

2016 – The increase in the forecasted spending on Sustaining Capital of $19 million ($170 million to $189 million) in 2016 is due largely to a number of significant IT and Telecommunication investments in 2016. These include $4.6 million in the Backbone Communication Network, $7.4 million in IT application upgrades and $2.8 million in customer experience improvements. Additionally, a $5 million increase in Transmission and Distribution (T&D) sustaining capital is a result of the continued advancement of the asset management program, which identifies required capital investment that was previously unknown.

2017 – The increase in the forecasted spending on Sustaining Capital of $34 million ($166 million to $200 million) in 2017 is due to an increase of $12 million in General Plant sustaining investment in order to properly reflect the required investment to sustain the IT, Vehicle and Telecommunication systems. The increased level of spending in 2017 is similar in nature to the IT investment in 2016 which is part of an effort to update an aging IT applications. The remaining increase is largely due to an increase in T&D capital investment that reflects the expected investment levels to sustain the T&D assets based on the quantity of assets we currently have in operation. This new level of investment is based on the continued advancement of the asset management strategy being developed in T&D. Additionally, a $3 million increase in gas turbine investment expected over the 2017 and 2018 time period is included.

2018 – The increase in the forecasted spending on Sustaining Capital of $27 million ($173 million to $200 million) in 2018 is largely due to the similar increase in T&D investment as in

2016 and 2017 as well as a $3 million increase in gas turbine investment expected over the 2017 and 2018 time period.

Request IR-11:

Recent ACE Plan submissions made references to forecasted capital expenditures in fast acting generation, but none in the 2016 ACE Plan submission:

(a) Please confirm that NSPI currently does not foresee any capital investment in fast acting generation for the 2016 - 2020 period. If not confirmed, please elaborate.

(b) Has the refurbishment of Light Fuel Oil ("LFO") combustion units had any effect on the timing and size of capital expenditures in fast acting generation? Please elaborate.

Response IR-11:

(a) Confirmed. NS Power does not foresee any capital investment in new fast acting generation for the 2016-2020 period.

(b) No, the refurbishment in the combustion turbine units is still well aligned with the long term strategy of those seven units and has not had an effect on NS Power's expectations on new fast acting generation. The refurbishment of the gas turbine units is still the most cost effective option ($277/kW for Burnside Unit #4 vs $1,500/kW for new fast acting generation).

Request IR-12:

With respect to pages 8 to 15, 2015 Stakeholder Engagement, and NSPI's Capital Expenditure Justification Criteria ("CEJC") document, as approved by the Board on November 17, 2015:

Does the 2015 ACE Plan submission comply with criteria contained in the recently approved CEJC document? If not, please elaborate.

Response IR-12:

NS Power confirms that the 2016 ACE Plan is compliant with the criteria contained in the recently approved CEJC document.

Request IR-13:

With respect to page 10 and the exclusion of Administration Overhead ("AO") costs from the Economic Analysis Model ("EAM"):

(a) Please provide the rational for the exclusion of AO costs from the EAM.

(b) Specifically, one would assume this implies that there is no increase to the fixed costs associated with the capital work being completed. Please confirm or clarify this assumption.

(c) Under the assumptions that a project could be completed by replacing and refurbishing an asset, and by internal or external labour, could the omission of the AO alter the result of an economic analysis, and prefer certain types of projects, for example those that are heavily weighted towards labour costs? Please elaborate.

Response IR-13:

(a) Administrative Overhead (AO) costs are included in the analysis of a project's revenue requirement in NS Power's Economic Analysis Model (EAM). The forecasted amount of the AO associated with the project is entered in the capital investment section (row 34) of the 'Data' tabs. This amount can also be seen in the calculation of the revenue requirement, displayed under the "Operating Expense" line item (row 153) of the "Alt" tabs.

(b) NS Power assumes that the support costs required to execute its capital program do not vary when the capital program stays within the normal range for the Company. The portion of these support costs that would be capitalized as administrative overhead (AO) vs. expensed as Operating, Maintenance and General (OM&G) costs would vary depending upon the ratio of capital and operating work that is undertaken in the year.

NS Power assumes that the support costs remain constant as staffing and other OM&G costs do not vary significantly as a result of a year-to-year variance in the expected capital spending. If there were a large increase in capital spending in a given year, NS Power may contract an increased amount of this work out to external vendors or hire additional term employees. All of these costs would be directly charged to the capital projects they were associated with and would not be included in the support costs that are allocated between AO and OM&G.

If there was a year with a significantly lower capital spend, the assumption is that NS Power's support costs would not vary significantly provided spend was expected to return to the normal range in the following year. The reduction in capital spend would result in less work contracted to external vendors and a lower number of term employees, these decreased charges would be related to direct capital costs and not the support costs used to calculate AO.

(c) AO results in an allocation of OM&G costs to capital. OM&G is credited in the current year, reducing the revenue requirement. These costs are then recovered over the life of the asset through depreciation expense. Financing costs of the additional capital are also recovered over the life of the asset through interest and other expenses. These costs will not result in a material change to the revenue requirement of a capital item on a net present value basis.

All else equal, an increase in AO in a project results in a decrease in the revenue requirement of a project as a portion of the AO can be deducted for tax purposes, resulting in a favourable reduction in the income tax portion of the project's revenue requirement.

Request IR-14:

NSPI's CEJC Detailed document states:

> **In Administrative Overhead (AO) - Project capital cost and the revenue requirement analysis include Administrative Overhead (AO). While it is understood that costs included in NS Power's eligible expenses used to determine the AO rate are largely fixed, NS Power will examine further those projects where elimination of the AO credit from the revenue requirement analysis could affect the recommended alternative for economically justified projects. Where this occurs, NS Power will examine the effect of the AO amount more closely to determine the level of reduction to the AO credit which would change the recommended project, and based on this, provide appropriate comment on this in the Capital Item justification.**

(a) Please identify those projects in the 2016 ACE Plan where the above noted examination was performed.

(b) Please comment on one of those projects.

Response IR-14:

(a-b) There are no projects included in the 2016 ACE Plan where the removal of AO would change the recommended approach, and therefore the examination was not performed.

Please also refer to CA IR-17.

Request IR-15:

With respect to the EAM model, the economic analysis spreadsheet includes "Total Revenue", "Operating Costs", "Avoided Expenses", and "Capital" columns. Please describe these terms, and rationale used to populate these fields.

Response IR-15:

Total Revenue: This column represents revenues expected to be generated on an annual basis as a result of implementing the corresponding project.

Operating Costs: This column represents annual incremental operating costs that would be incurred as a result of implementing the corresponding project. For clarification, these costs are not associated with activities already being performed and would otherwise not be incurred if the project was not adopted. Examples are: materials, repairs and maintenance costs directly attributable to the project.

Avoided Expenses: These are the annual savings related to executing the corresponding project. These are costs that would be incurred if not for the completion of the project, typically expressed as avoided replacement energy and unplanned repair costs; these costs are therefore avoided as compared to the status quo. The calculation of the avoided expenses can be seen in the Avoided Cost Calculator tab in the EAM.

Capital: This is the dollar value that the assets associated with the project will cost. The cost of a capital asset includes all expenditures necessary (excluding AO) to place the asset in service and includes such items as: labour, materials, freight and installation costs.

Request IR-16:

With respect to the EAM model and a comparison of two alternatives, for example, refurbishment versus replacement of an asset:

(a) Please describe the criteria NSPI uses in including, and estimating annual estimated costs, under the "Capital" column.

(b) Does NSPI include estimated future capital or operating expenses that are expected to occur during the entire life expectancy of a capital asset? If not, please elaborate.

(c) Does NSPI use any probability based cost estimate of future capital costs in order to include them in the EAM spreadsheet? Please elaborate.

(d) Does NSPI account for a difference in the life expectancy of two different alternatives? Please elaborate.

Response IR-16:

(a) The criteria used in including annual capital costs within the EAM Cash Summary tab is based on NS Power's Accounting Policy 6000 – Capitalization of Cost. These include all costs necessary for NS Power to put an asset into service. The criteria used in estimating capital costs varies from project to project but typically includes internal expense estimates (labour, travel, etc), vendor quotes, RFPs, similar work completed in the past, discussion with third parties or NS Power engineering experience.

(b) Yes, if those costs are known, all future capital or operating expenses related to that asset are included in the EAM. However, this is rare occurrence. Please refer to part (c).

(c) No, NS Power only includes future capital costs that are reasonably known at the time of submission. In the majority of capital projects, no capital investment is expected on that specific asset throughout its expected useful life.

(d) Yes. When entering a capital option into an EAM, the expected life of the asset must be included. All costs, both incurred and avoided, are only included within the timeframe that the asset is expected to remain in-service, therefore not including costs or benefits beyond the useful life of the asset.

Request IR-17:

With respect to the table on page 16, please reconcile the differences in the forecasted expenditures in years 2017 and 2018, with the related forecast amounts provided on page 20 of the 2015 ACE Plan submission.

Response IR-17:

Please refer to NSUARB IR-10.

2017 – The increase of $36 million is primarily due to the $34 million increase in sustaining capital spending.

2018 – The increase of $15 million is due to a $27 million increase in sustaining capital spending. However, this increase is partially offset by a lower level of spending in Hydro Infrastructure Investment related to the Mersey Hydro Re-development initiative.

Request IR-18:

With respect to Section 1.5, starting from page 17, it appears that the list of deferred or cancelled 2015 ACE Plan capital items includes a large number of projects related to LFO combustion units. For example, four out of five LFO projects NSPI intended to submit later are now on this list. Please explain these deferrals.

Response IR-18:

The deferred/cancelled list in the 2016 ACE Plan includes 10 projects related to the combustion turbine generating units. Nine of these projects are 2016 ACE Plan subsequent submittal items or items less than $250,000.

Four of the ten projects are related to Burnside Unit #1. Burnside Unit #1 was scheduled to have its engine refurbished in 2015; however, further scoping showed that investment could be postponed until 2017. Deferring that outage led to the deferral of the three other Burnside Unit #1 capital projects.

The remaining six projects were deferred after further scoping showed the investment could be safely deferred to 2016 or beyond for various reasons, which are detailed within the deferred/cancelled list.

Request IR-19:

With reference to page 18, in an attempt to gain some comfort over the avoided cost estimates used in the EAM, please provide the following information in relation to CI #46352 TRE5 Air Heater Refurbishments, that was approved as part of the 2015 ACE plan but deferred:

(a) Were there any unplanned outages during 2015 due to the refurbishment of the air heater not being completed?

(b) If so, what are the total repair costs and replacement energy costs incurred during 2015 in comparison to the estimate per the EAM of $121,592?

Response IR-19:

(a-b) There were no unplanned outages during 2015 due to the refurbishment of the air heater not being completed. Further evaluation completed in 2015 indicated that this project could be reliably deferred to 2016.

Request IR-20:

There are various projects for the Trenton Five Generating Plant (e.g. pg. 24, 25, 94, 232, 233). The Board understands that upon the completion of the Maritime Link this is one of the first plants to be retired. Please justify why these projects should be done when the whole plant may have a very short life span before retirement.

Response IR-20:

Trenton Unit #5 is not expected to be retired in the near future after the Maritime Link project is completed. This unit is estimated to be operated well into the future as identified in the 2014 Integrated Resource Plan (IRP) and recent 10 Year System Outlook reports where it has an estimated retirement date of 2035. Investment plans for Trenton Unit #5 are consistent with this planning forecast.

Request IR-21:

With respect to page 26, Section 2.3, 2016 ACE Plan Capital Items Forecast for Subsequent Approval, please provide NSPI's tentative schedule showing when each of these projects is expected to be filed with the Board.

Response IR-21:

Please refer to Attachment 1, also provided electronically.

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ACE Capital Items to be Submitted for Approval Later in 2016

CI#	Project Title	2016 Budget ($)	Project Total ($)	Expected Filing Date
Hydro				
29807	HYD - Tusket Falls Main Dam	257,292	6,534,233	November
44595	HYD - Hollow Bridge Canal and Intake Refurbishment	2,907,602	3,137,002	February
46254	HYD - Mill Lake Surge Tank Refurbishment	1,380,899	1,421,366	February
47167	HYD - Sandy Lake Surge Tank Refurbishment	1,316,587	1,358,796	February
47551	HYD - SHH Controls Upgrade	524,406	1,092,851	January
48020	HYD - RUT3 Generator Refurbishment	774,422	1,030,940	January
47163	HYD - Tusket Controls Upgrade	472,153	880,570	January
	Total New Hydro Spending for Subsequent Approval	**7,633,361**	**15,455,757**	
Gas Turbine				
44775	TUC#4 LM6000 Generator Stator Re-wedge	1,586,056	1,722,180	April
46191	Tusket Fuel System Upgrade	606,082	892,178	April
44788	BGT1 Vibration Monitoring & Protection System Upgrade	252,674	252,674	August
	Total New Gas Turbine Spending for Subsequent Approval	**2,444,812**	**$2,867,031**	
Steam				
48157	TUC Auxiliary Boiler Purchase	2,822,565	2,822,565	February
47870	LIN Cofferdam Outer Cell Refurbishment	850,609	850,609	August
47871	LIN Stack Re-Coating	707,696	707,696	July
47953	LIN Rail Car Positioner Upgrade	507,812	507,812	June
47687	POT Boiler Chemical Recondition	855,348	855,348	April
47893	TUC3 Generator Hydrogen Panel Upgrade	301,806	301,806	March
	Total New Steam Spending for Subsequent Approval	**$6,045,836**	**$6,045,836**	
	Total New Generation Spending for Subsequent Approval	**$16,124,009**	**$24,368,625**	
Transmission				
48025	L7018 Upgrade to 345kV & Capacitor Bank Addition	1,982,135	21,495,059	March
41519	Harbour East 138 kV Transmission Line	2,120,250	11,672,021	February
43678	Separate L8004/L7005 on Canso Crossing Double Circuit Tower(DCT)	270,900	10,767,280	February
48022	Spider Lake Substation Addition	1,093,651	6,348,981	March
48154	L5527 Reconductor	297,828	497,606	May
48024	90H - Sackville: Capacitor Bank Addition & L-6010/L6005 Breaker Upgrades	794,131	3,852,989	Project Cancelled
48023	103H - Lakeside: Capacitor Bank Additions & L-6003 Breaker Upgrades	794,131	3,231,190	March
43268	9W-B53 Tusket Replace Supporting Structure	354,151	354,151	April
	Total New Transmission Spending for Subsequent Approval	**$7,707,178**	**$58,219,276**	
Distribution				
47124	Automated Metering Infrastructure	6,997,996	100,000,000	October
47760	85S-402 Re-Insulate	387,024	1,855,988	April
47776	111S Prime Brook Feeder Exits & Feeders	1,474,738	1,560,144	September
47787	2H Armdale New Feeder	451,838	1,272,415	May
44749	Tiverton Tower Refurbishment	880,250	1,157,069	July
47753	24C-442GB Highway 16 Reconductor Phase 2	669,565	1,154,302	February
47784	103H-Lakeside Feeder Reconfiguration	579,868	579,868	February
47792	Distribution Automation Remote Communications	378,666	415,762	April
48152	20H-Spryfield Voltage Conversion Phase II	375,848	375,848	March
47403	Load Research Sample Update	286,872	322,387	May
47786	129H Kearney Lake New Feeder	311,817	311,817	April
48195	Halifax 4kV Conversion Ph 3	250,336	250,336	May
	Total New Distribution Plant Spending for Subsequent Approval	**$13,044,818**	**$109,255,935**	
General Plant				
44671	IT-Oracle Financials Upgrade	3,768,231	9,891,170	May
46075	IT - Maximo Upgrade & GIS Integration	3,042,932	7,937,644	August
48232	T&D Scheduling & Dispatch	2,012,050	5,306,971	July
48251	T&D Field Design	2,012,050	4,022,082	June
47477	IT - Security Enhancements	2,280,000	2,536,182	February
48236	Customer Experience Self Serve Development Phase 1	1,802,719	1,802,719	September
46671	NERC CIP Version 5 Implementation	552,227	1,528,492	January
48254	IT - Outage Communication system Hardening and Enhanced DR	1,500,000	1,500,000	February
41425	IT - Cognos Upgrade	190,000	1,431,257	Filed December 17, 2015
46073	IT - Lotus Notes Applications Replacement	415,008	744,698	April
47751	Dynamic Transmission Limits	414,748	552,560	June
48234	Customer Support System Enhancements	515,063	515,063	September
48238	Customer Billing Experience Improvements	515,063	515,063	July
48155	2016 SCADA Application Upgrade	426,355	426,355	May
	Total New General Plant Spending for Subsequent Approval	**$19,446,445**	**$38,710,255**	
	Total Capital Items for Subsequent Approval	**$56,322,449**	**$230,554,091**	

Request IR-22:

On page 27 there are projects for St. Margaret's Bay system; it appears that there have been many projects over the years related to this complete system. Are the number of projects for this system coming to an end or is more refurbishment necessary over the coming years?

Response IR-22:

The projects included in the 2016 ACE Plan represent the last of the major capital planned for the St. Margaret's Bay system at this time.

Request IR-23:

With respect to pages 28 and 29, please provide a short description and justification for the Onslow South projects.

Response IR-23:

Please refer to NSUARB IR-8.

Under specific load conditions, Tuft's Cove generation must be dispatched to maintain system voltage levels in the Metro Halifax area. The Onslow South (or Metro Transmission Upgrade) projects provide additional reactive power, address thermal line limitations with increased Onslow South flows, and address contingency reliability issues for when Tuft's Cove generation is not running. The result of these transmission investments is the reduced requirement to dispatch Tuft's Cove generation for system planning. Full justifications will be provided when these items are submitted for subsequent approval.

Request IR-24:

Page 30 notes large sums for IT upgrades. The analysis does not indicate a true cost/benefit of doing these upgrades. Has there been any attempt to determine cost savings and/or potential revenue generation by doing these upgrades? If so, what are the cost savings or potential revenues?

Response IR-24:

These projects are listed on the Subsequent Submittal list due to the fact that adequate scoping and development of these projects has not yet been completed. Any applicable analysis on these projects will be presented at the time of project submission.

Request IR-25:

With reference to page 31, the total new General Plant budget for subsequent approval of $38.7 million is approximately twice the size of the related 2015 ACE Plan budget. Please explain this significant increase in the General Plant spending.

Response IR-25:

This increase in General Plant subsequent submittal items is largely due to a significant Information Technology (IT) investment around application upgrades (Oracle, Maximo & GIS, Cognos, etc.) and security improvements. While the level of investment forecasted to be submitted is higher, NS Power will justify each of these projects on their own merits at the time of project submission.

Request IR-26:

With reference to Section 2.4, starting from page 32, in comparison with the 2015 ACE Plan there is approximately 40% increase in the number of projects of less than $250,000, as well as in the total amount budgeted for these projects. Please explain these increases.

Response IR-26:

Projects of less than $250,000 increased from 85 in the 2015 ACE Plan to 112 in the 2016 ACE Plan (the total value increased from $12.3 million to $15.5 million) These projects are determined through NS Power's asset management practices in the generation and the transmission and distribution functions based on each project's individual ranking. NS Power does not consider the quantity of projects less than $250,000 when evaluating whether a project should proceed or not.

Request IR-27:

With reference to Sections 3.2, 4.2, 5.2, and 6.2, starting from page 41:

(a) Please file revised tables that include the original Board approval date, and the budget approved.

(b) Identify those projects that have not been approved by the Board, and projects with forecasted overspending that exceeds the Board approved amount by more than $250,000.

(c) For each of the projects from b), please explain why the Board approval has not been requested, and advise on expected filing dates.

(d) Please provide a status report for the each of projects listed in the above Sections, with a total project cost estimate of $250,000 or over.

Response IR-27:

(a) Please refer to the following attachments, also provided electronically:

3.2 Generation – Attachment 1
4.2 Transmission – Attachment 2
5.2 Distribution – Attachment 3
6.2 General Plant – Attachment 4

(b-c) Please refer to Attachment 5 for a listing of these projects and a status update stating whether the project is in-service or has construction still on-going.

(d) Please refer to Attachments 1-5 for a status update on each of these projects.

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Generation - Carry Over Spending Summary

Project Number	CI#	Project Title	Start Date	Final Date	Previous Expenditure ($)	2016 Budget ($)	Subsequent Spending ($)	Total Estimate ($)	UARB Approval Date	UARB Approved Budget	Status
Hydro Generation Plant											
H517	16374	HYD Gaspereau Dam Safety Remedial Works	2007/05	2016/12	6,270,317	6,112,131	-	12,382,448	2007/05	4,354,889	on-going
H715	44978	HYD-Wreck Cove Controls Upgrade	2014/01	2018/06	489,984	1,819,803	1,511,000	3,820,787	2015/12	3,802,446	on-going
H655	41139	HYD - Annapolis Sluiceway Superstructure Refurbishment	2012/07	2016/12	803,329	1,786,459	-	2,589,788	ACE 2015	3,410,322	on-going
H630	41142	HYD St. Margaret's Bay - Sandy Lake Fish Passage	2011/11	2016/12	2,369,442	19,289	-	2,388,731	2015/04	3,926,079	in service
H629	12079	HYD - SHH - RUF 1&2 Runner Replacement	2011/10	2016/12	1,011,884	403,245	-	1,415,129	2014/08	1,304,966	in service
H714	44669	HYD Wreck Cove Fire Suppression Upgrades	2013/06	2016/10	390,579	559,845	-	950,424	2015/09	1,034,915	on-going
H660	17581	HYD - Weymouth Electrical Replacement	2012/07	2016/12	576,219	350,875	-	927,094	ACE 2013	1,641,359	on-going
H674	43136	HYD - Weymouth Unit #1 Headcover Replacement	2012/11	2016/12	372,552	415,740	-	788,293	ACE 2013	438,158	on-going
H685	43128	HYD - Gisborne Gearbox and Bearing Replacement	2015/08	2016/12	100,064	274,526	-	374,590	ACE 2013	360,731	on-going
H688	20571	HYD - Weymouth Falls Tailrace Deck Refurbishment	2013/03	2016/12	52,033	202,525	-	254,558	ACE 2013	371,469	on-going
H737	45330	HYD-WRC C3 Culvert Replacement	2014/01	2016/12	18,181	207,039	-	225,219			on-going
					$12,454,585	**$12,151,477**	**$1,511,000**	**$26,117,062**			
Steam Generation Plant											
SB90	44267	TRE Ash Lagoon Site Closure	2013/05	2017/04	2,506,639	5,474,564	-	7,981,203	ACE 2015	7,994,849	on-going
SB67	44188	TRE Ash Site Phase 1 Capping	2013/04	2017/03	3,715,886	1,116,812	-	4,832,698	ACE 2015	4,538,289	on-going
SE70	46068	LIN CW Debris Removal System	2015/02	2016/12	100,376	1,651,071	-	1,751,447	2015/09	1,746,988	on-going
S901	35083	LIN 2011 Ash Site Sealing and Capping	2011/11	2016/12	742,117	259,308	-	1,001,425	ACE 2011	1,112,451	in service
SD76	46484	TUC - Unit 1&2 Analytical Panel Replacement	2015/03	2016/12	262,723	159,020	-	421,743	ACE 2015	386,607	on-going
S795	28645	TRE6 - Turbine Controls Power Supplies Replacement	2012/03	2016/11	241,310	162,230	-	403,539	ACE 2012	321,691	on-going
SC74	42943	TUC2 - Turbine-Generator (T-G) Area Fire Protection	2014/05	2016/06	225,832	46,161	-	271,993	ACE 2014	292,621	on-going
	42973	TUC - #1, 2 and 4 WTP DCS upgrade	2015/08	2016/12	58,002	162,882	-	220,884			on-going
SA40	30163	POT - Control room and permit room upgrade	2012/04	2017/01	29,755	172,201	-	201,956			on-going
	44727	TUC3 - DCS Upgrade Phase 3	2015/07	2016/07	107,824	86,161	-	193,986			on-going
SB17	41229	LIN - Cable Spreading Rooms Fire Protection	2013/09	2016/12	113,650	53,453	-	167,103			on-going
SD31	43038	POT - FeS04 Dosing Control System	2014/09	2016/12	3,175	138,276	0	141,452			on-going
SB05	41226	LIN - Boiler Feed Pump Proportional Valve Replacements - Unit #1	2012/09	2016/12	-	140,098	-	140,098			on-going
SE54	46493	TUC2 - Polisher Upgrade	2015/07	2016/12	79,957	47,036	-	126,993			on-going
SE50	47493	POT - Turbine Dehumidifier	2015/04	2016/12	98,318	13,449	-	111,767			in service
SE39	46375	POT - Condenser Level Control Upgrade	2015/02	2016/07	12,415	30,151	-	42,566			on-going
	Total Steam Generation Plant				**$8,297,981**	**$9,712,872**	**$0**	**$18,010,853**			
Gas Turbine Generation Plant											
G180	33142	CT- Burnside #4 Unit Restoration	2014/03	2017/04	1,950,985	6,140,403	282,768	8,374,156	Filed - Awaiting Approval		on-going
G173	45733	CT Burnside Unit#3 Generator Refurbishment U&U	2014/01	2016/12	2,386,563	138,865	-	2,525,428	2015/04	2,567,808	in service
	Total Gas Turbine Generation Plant				**$4,337,549**	**$6,279,267**	**$282,768**	**$10,899,584**			
Total Generation Carry Over Spending					**$25,090,114**	**$28,143,616**	**$1,793,769**	**$55,027,499**			

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Transmission - Carry Over Spending Summary

Project Number	CI#	Project Title	Start Date	Final Date	Previous Expenditure	2016 Budget	Subsequent Spending	Total Estimate	UARB Approval Date	UARB Approved Budget	Status
Transmission Plant											
T782	43324	L6513 Rebuild / Upgrade Line Terminals	2013/08	2017/12	2,203,128	99,126	16,202,656	18,504,910	Filed - Not approved at this time		on-going
T820	44987	L7003 Lidar Upgrades	2014/09	2017/01	5,026,209	2,982,685	2,101,254	10,110,148	Filed - Awaiting Approval		on-going
T825	46339	120H Brushy Hill - SVC Controls Replacement	2014/11	2017/06	2,772,724	3,280,080	3,969,035	10,021,839	ACE 2015	9,959,330	on-going
T822	45306	Prime Brook Substation Addition	2014/12	2017/01	998,744	2,375,945	270,714	3,645,403	2015/08	3,442,582	on-going
T827	46513	3C Port Hastings BPS Upgrade	2014/12	2016/09	2,922,937	468,251	-	3,391,187	ACE 2015	3,684,823	on-going
T786	43291	Protection Risk Reduction 67N-Onslow 230KV	2013/01	2016/05	3,041,136	293,342	-	3,334,478	2015/10	3,448,979	on-going
T802	45066	Upgrade L6511 and L7019 Thermal Rating	2014/02	2017/12	2,662,110	222,948	176,199	3,061,258	Filed - Not approved at this time		on-going
T801	45067	67N Onslow 345 KV Node Swap	2014/03	2017/12	2,534,952	186,590	183,334	2,904,876	Filed - Not approved at this time		on-going
T808	43205	L5510 Insulator Replacements	2014/03	2016/02	2,434,904	448,468	-	2,883,371	ACE 2014	3,191,398	in service
T860	43490	Steel Tower Life Extension - Halifax Harbour	2015/07	2017/01	180,570	750,431	81,154	1,012,154	ACE 2015	1,441,709	on-going
	43266	89S-ST2 Point Aconi Replace Station Service Transformer	2015/09	2017/01	280,283	1,180,263	-	1,460,546	Approval not Required - Pt. Aconi		on-going
T858	47131	L8001 Structure 58 Replacement	2015/04	2016/06	505,003	443,139	-	948,142	2015/07	928,377	on-going
T835	43267	13V Gulch Hydro Replace 13V-GT1 and 13V-VR1	2014/12	2017/01	436,098	363,606	119,737	919,441	ACE 2013	954,407	on-going
T832	44976	10H 25kV Breaker Replacement	2015/02	2016/06	121,974	763,416	-	885,390	ACE 2015	953,521	on-going
T864	46333	L6538 Replacements	2015/07	2016/03	481,502	389,084	-	870,586	2015/12	1,008,356	on-going
T831	43261	6V-GT1 Hollow Bridge Hydro Transformer Replacement	2015/02	2016/09	408,636	222,639	-	631,275	ACE 2013	435,537	on-going
T712	41439	Mobile Refurbishments 5P & 6P	2012/02	2016/03	382,305	32,562	-	414,867	ACE 2012	367,409	on-going
T839	46354	2015 Reactor Breaker Replacements	2015/02	2016/12	158,555	113,390	-	271,945	ACE 2015	460,691	on-going
T854	46366	65V Middleton Substation RTU Addition	2016/05	2017/06	-	123,628	123,432	247,060			on-going
T855	46397	Substa ion Telemetry	2015/06	2016/10	70,356	92,204	-	162,560			on-going
	Total Transmission Plant				**$27,622,126**	**$14,831,796**	**$23,227,515**	**$65,681,437**			
Total Transmission Carry Over Spending					**$27,622,126**	**$14,831,796**	**$23,227,515**	**$65,681,437**			

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Distribution - Carry Over Spending Summary

Project Number	CI#	Project Title	Start Date	Final Date	Previous Expenditure	2016 Budget	Subsequent Spending	Total Estimate	UARB Approval Date	UARB Approved Budget	Status
Distribution Plant											
D454	40320	LED Street Light Conversion	2012/07	2019/09	17,877,023	4,681,027	12,519,375	35,077,425	2016/01	36,041,594	in service
D675	47471	131H-422G-East Uniacke Rd Load Growth P&A	2015/07	2016/12	885,443	41,338	-	926,781	2015/11	904,331	on-going
D418	41383	2012 Halifax Underground Feeder Replacement	2012/03	2016/12	532,136	134,399	-	666,535	ACE 2012	596,760	on-going
D592	46456	11W Yarmouth 4kV Conversion	2014/09	2016/02	604,392	45,273	-	649,665	ACE 2015	545,514	on-going
D562	44826	2014 Build-to-Roadside	2014/03	2016/10	490,468	137,939	-	628,407	ACE 2014	791,268	on-going
D674	47773	3N Oxford Conversion Phase 2	2015/08	2016/08	547,164	84,552	-	631,715	2015/12	631,686	on-going
D664	46593	70V-311 Bridgetown Voltage Conversion	2015/05	2016/06	388,562	164,815	-	553,377	2015/09	534,887	on-going
D630	45031	3N Oxford Conversion Phase 1	2015/03	2016/12	3,505	535,641	(0)	539,146	ACE 2015	721,068	on-going
	44836	Halifax 4kV Conversion Part 2	2015/08	2016/12	260,574	273,599	-	534,173	Filed - Awaiting Approval		on-going
D570	43177	103W-311 Gold River Reconductor Phase 3	2014/03	2016/12	315,353	21,713	-	337,066	ACE 2014	377,721	on-going
D652	45003	2015 Hydraulic Recloser Replacements	2015/03	2016/10	101,339	103,445	-	204,784			on-going
	Total Distribution Plant				**$22,005,958**	**$6,223,742**	**$12,519,375**	**$40,749,075**			
Total Distribution Carry Over Spending					**$22,005,958**	**$6,223,742**	**$12,519,375**	**$40,749,075**			

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General Plant - Carry Over Spending Summary

Project Number	CI#	Project Title	Start Date	Final Date	Previous Expenditure	2016 Budget	Subsequent Spending	Total Estimate	UARB Approval Date	UARB Approved Budget	Status
Telecommunications											
P960	46552	Backbone Communications System Upgrade	2015/02	2018/02	1,647,049	4,606,489	2,650,921	8,904,459	2015/12	8,913,092	on-going
P943	43227	2014 RTU Replacements	2014/06	2016/06	422,939	308,065	-	731,005	ACE 2014	687,839	on-going
P954	46307	2015 Multiplexer Network Upgrades	2015/02	2016/12	100,490	316,183	-	416,673	ACE 2015	446,538	on-going
P955	46308	2015 Microwave System Capacity Upgrade	2015/01	2016/12	58,006	231,567	-	289,572	ACE 2015	316,142	on-going
	46309	2015 Multiplexer & Teleprotection Equipment	2016/05	2016/11	-	158,158	-	158,158			on-going
P956	46310	2015 Telecom 48VDC Battery & Charger Rep	2015/01	2016/07	13,208	131,751	-	144,959			on-going
P929	44969	Replace Multiplexer and Teleprotec ion Equip	2015/04	2016/07	50,289	76,641	-	126,930			on-going
P913	43173	2013 Upgrade Multiplexer Group	2013/07	2016/06	92,076	31,068	-	123,143			on-going
	Total Telecommunications				**$2,384,057**	**$5,859,921**	**$2,650,921**	**$10,894,899**			
Computers											
P958	46739	IT - Outage Map Technology Upgrades	2015/02	2016/03	2,536,070	291,949	-	2,828,018	Filed - Awaiting Approval		in service
	46365	Maximo Enhancements for Substa ion Field M	2015/03	2016/09	72,310	214,767	-	287,077	ACE 2015	315,242	on-going
P945	46364	Maximo Enhancements for Telecom & Relays	2014/08	2016/06	208,601	54,342	-	262,943	ACE 2015	272,539	on-going
	46078	IT - SharePoint Upgrade	2015/06	2016/05	118,051	95,232	-	213,283			on-going
	Total Computers				**$2,935,032**	**$656,290**	**$0**	**$3,591,322**			
Other General Plant											
P833	29009	Right of Way Purchase Northern NS	2010/09	2016/05	3,319,775	288,000	-	3,607,775	2010/07	4,462,493	in service
P946	46411	Hydro Asset Management Implementation	2014/08	2016/12	283,001	275,459	-	558,460	2015/05	590,884	on-going
P969	46306	2015 Telecom Building Replacement	2016/05	2017/01	-	240,504	-	240,504			on-going
	46590	T&D Asset Management Project	2015/04	2016/10	65,978	173,134	-	239,112			on-going
	Total Equipment Replacement				**$3,668,755**	**$977,098**	**$0**	**$4,645,852**			
Total General Plant Carry Over Spending					**$8,987,843**	**$7,493,309**	**$2,650,921**	**$19,132,073**			

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Projects that have not received UARB Approval		
CI #	**Project Title**	**Status**
33142	CT- Burnside #4 Unit Restoration	Filed on October 30, 2015
43324	L6513 Rebuild / Upgrade Line Terminals	Filed on January 13, 2015
44987	L7003 Lidar Upgrades	Filed on August 31, 2015
45066	Upgrade L6511 and L7019 Thermal Rating	Filed on April 24, 2015
45067	67N Onslow 345 KV Node Swap	Filed on November 14, 2014
43266	89S-ST2 Point Aconi Replace Station Service Transformer	Approval not Required - Pt. Aconi
44836	Halifax 4kV Conversion Part 2	Filed on December 17, 2015
46739	IT - Outage Map Technology Upgrades	Filed on September 30, 2015

Projects that Exceeds the UARB Approval by $250,000		
CI #	**Project Title**	**Status**
16374	HYD Gaspereau Dam Safety Remedial Works	Work ongoing to finalize design. Will be filed when this design work is complete.
43136	HYD - Weymouth Unit #1 Headcover Replacement	ATO Filed on December 17, 2015
44188	TRE Ash Site Phase 1 Capping	Work continuing into 2016. Will file an ATO application if required.

Request IR-28:

Page 44 refers to transmission lines of 69 kV or higher. Are the design parameters for those transmission lines over 100 kV any different than those between 69 kV and 100 kV and if so, is there cost avoidance by using different standards for the lines below 100 kV?

Response IR-28:

The design requirements for transmission lines over 100 kV are different than those between 69 kV and 100 kV in compliance with the CSA 22.3 Overhead Systems. The primary difference between these voltage levels is the spacing between the phases and the spacing between the phases and the ground.

Although the construction and maintenance of a 69kV line is typically less cost than an over 100kV line, the decision to build a 69kV line or an over 100kV line is determined first and foremost on the system configuration and load requirements.

Request IR-29:

With respect to the tables on pages 80, 81, 82, 84, and 86:

(a) Please show the derivation of the $4.15M annual multiple used to estimate OM&G in the model (page 81), and explain any relevant rationale or assumptions required in the derivation.

(b) Does the income tax treatment in the model assume that NSPI will be successful in appealing the current reassessment of expensed items the CRA deemed to be capital in nature?

(c) If so, please provide a second version of the model assuming the appeal is unsuccessful.

(d) Please confirm the $1,270.9M used in the calculation of "Rate Impact of five-year capital plan" is the 2016 expected revenue requirement prior to any capital investment, or explain the calculation if this is not correct.

(e) The underlying assumption by including a reduction in fixed costs in the model (attributable to a higher customer base) is that the fixed costs will not increase with the additional customers. Is this in fact the case, and what is the basis for the assumed customer growth? Please provide the total OM&G costs per the financial statements for the preceding 5 years.

Response IR-29:

(a) Additional fixed cost recovery received from customer growth achieved through capital investment required to provide service to these customers is included in the Operating, Maintenance & General expense (OM&G) line. The amount of fixed cost recovery is

based on NS Power's projections of new residential customer growth and the portion of these electric sales that will contribute to fixed cost recovery. NS Power does not forecast commercial customer growth. The fixed cost recovery is forecasted to increase by $4,150,000 annually and was calculated as detailed below. This figure is consistent with the amount included in the revenue requirement table in the 2015 ACE Plan.

Annual Residential Growth
Forecasted New Customers – 3,250
Forecasted New Load – 45GWh
Residential Amount per kWh contribution to fixed costs – $0.09283

45GWh = 45,000,000kWh
45,000,000kWh x $0.09283 = $4,177,350
Rounded down to $4,150,000

(b-c) For purposes of the revenue requirement model, all capital spending excluding AFUDC and 70 percent of AO was considered capital for tax purposes. This is a conservative approach. The inclusion of an estimated repairs and maintenance deduction for 2016-2020 would result in a decrease to the calculated revenue requirement.

(d) The $1,270.9 million used in the calculation of "Rate Impact of five-year capital plan" is NS Power's total revenue requirement in the 2014 test year as filed in the compliance filing of the 2013-2014 General Rate Application.

(e) Please refer to part (a) for the basis of assumed customer growth. The purpose of including the reduction in fixed costs in the model is to demonstrate the decrease in revenue requirement for current customers related to having more customers connected and sharing the fixed costs. The assumption in this model is that fixed costs should not vary significantly with the addition of more customers. Please refer to the table below for

NS Power's Operating, Maintenance and General Expenses for the previous five years as reported in the regulated financial statements:

Operating, Maintenance and General Expenses	
Year	**$M**
2014	264.4
2013	264.6
2012	252.6
2011	262.6
2010	237.8*

*As adjusted for US GAAP

Request IR-30:

On page 88, the bar chart shows the 2016 sustaining capital to be approximately $73 million, while the amount shown under the IRP is approximately $51 million:

(a) The category for environmental costs shows a forecast of about $13 million while the IRP amount is about $6 million. NSPI noted that this can be attributed to ash site investment. Please explain why this increase is needed in 2016.

(b) The second reason given for higher sustainable costs in 2016 was attributed to investment in the Burnside Unit #4 CT. Please elaborate on why this must be done in 2016.

(c) The third reason given for increased sustainable capital is the purchase of an auxiliary boiler for Tuft's Cove. Please explain when NSPI undertook its analysis regarding this addition and why this deviates from the IRP analysis just recently completed.

(d) The chart also indicates that fuel systems expenditures are forecast to increase by about $6 million over the IRP amount. Please elaborate on this projection.

Response IR-30:

(a) The ash site investment, along with much of the capital investment, was allocated in a levelized manner during the development of assumptions for the IRP, which is a long-term planning activity. NS Power completes its ash site investment based on environmental approvals issued by Nova Scotia Environment. The investment increase in 2016 is required to meet these requirements or, in the case of CI 47846 POA Ash Cell 4 Stage 3, to meet requirements for ash site storage at the generating facility as previously constructed ash cells become fully utilized.

(b) Please refer to CI 33142 CT – Burnside Unit #4 Restoration filed with the Board October 30, 2015. The return to service of Burnside #4 brings the system in-line with the modeled assumptions for fast-acting generation in the Nova Scotia Renewable Energy Integration Study. In this study, General Electric suggested that additional fast-acting generation will be called upon. Completion of the project by winter 2016-17 brings additional peaking capacity to the system which is required to handle the additional wind generation anticipated to be on the NS Power system at that time.

(c) Consistent with part (a), the sustaining capital assumption in the IRP was a levelized forecasting activity with the exception of some large scale investment events (major outages, for example) and would have forecasted a fairly levelized investment for boilers over the future years. The need for the purchase of the auxiliary boiler was not well known at the time of IRP preparations. The justification of this purchase will be presented when CI 48157 TUC Auxiliary Boiler Purchase is filed in early 2016.

(d) Please refer to part (a). The increase within the fuel system asset class is approximately $4 million. The investment in fuel systems was a levelized forecast within the IRP, and 2016 contains a large level of investment at the Lingan Generating Station related to the coal system.

Request IR-31:

With reference to the chart on page 89, please explain what is contained in the categories labelled as "Lingan Common", "Trenton Common", and "Tuft's Cove Common", and why those ACE Plan costs totalling about $20 million have no corresponding IRP costs.

Response IR-31:

These costs were included in the IRP and were included in the levelized sustaining capital forecasts of the associated units. As part of that levelized forecast, all costs were allocated to each generating unit to be applied within the model. However, as part of the ACE Plan these costs are labelled as Common, as they apply to multiple units within the plant.

The investments in the categories labeled as "Common" are investments that cannot be attributed to a specific generating unit. These are largely made up of ash site investment, but also include capital work at the generating stations that is applicable to all units.

Request IR-32:

On page 91, the ranking methodology is defined as multiplying the "Criticality" and "Condition" for each asset. What was the rationale for multiplying the two factors rather than a straight addition?

Response IR-32:

The risk matrix has 25 cells (5 x 5). Multiplying Criticality by Condition results in a product between 1 and 25. This provides a clear approach that can be easily described and understood throughout the organization. This methodology is covered in Section 6.2 of the Capital Expenditure Justification Criteria approved by the UARB on November 17, 2015.

Request IR-33:

On page 117, the T&D assets are broken down between "high band" and "low band" replacements. What is the difference between the two? Also, how are the target annual replacement numbers calculated?

Response IR-33:

The difference between the high and low replacement bands is the estimated useful life for the asset classification. A 10 year range was applied to estimated useful lives of all asset classifications to provide a range of targeted annual replacements. This can be seen in the "Estimated Useful Life" column just under the High Band Replacements and Low Band Replacements columns.

The target annual replacement is calculated as follows:

Target Annual Replacements = Quantity on Grid[1] / Estimated Useful Life

[1] Quantity of Distribution structures on Grid is scaled by 60% to reflect pole ownership distribution between NS Power and Bell Aliant.

Request IR-34:

Please explain the variance in the 2016 ACE Plan budget amount to the 2015 projected actual amount for the following routines:

(a) T004 – Replacements

(b) T011 – Provincial – Planned Trans Line Replacements

(c) D051 – System Performance Improvement Routine

(d) D055 – Planned Replacement of Dist. Equip.

(e) D062 – New Customers – Commercial

(f) P062 – Work Vehicle Replacements

(g) P031 – NSPI Non-CGI Infrastructure

(h) P001/P030 – Property Improvement and Furniture

Response IR-34:

(a) T004 – Provincial - Substation Additions & Replacements – The reason for the increase in the 2016 ACE Plan budget amount from the 2015 projected annual amount is due to a decrease in the 2015 Forecast, due to no unknown additions occurring in 2015, which accounted for $374,001 in the 2015 ACE Plan Budget. The 2016 ACE Plan budget still has a provision for unknown additions. The remaining decrease is due to delays in the substation online monitoring program which was deferred to the 2016 ACE Plan.

(b) T011 – Provincial – Planned Trans Line Replacements – The reason for the increase in the 2016 ACE Plan budget amount from the 2015 projected annual amount is due to an increase in the 1-6 month inspection driven work of approximately $1 million, which is driven by the results of ongoing inspections of the transmission line assets.

(c) D051 – System Performance Improvement Routine – The reason for the decrease in the 2016 ACE Plan budget amount from the 2015 projected annual amount is associated with three "part of" projects being required within D051 that were not included in the 2015 ACE Plan. Longspell Rd Add 2 Phases, 1N-404 81N-411 Plains Rd Line Upgrade and 613V-211 Bear River Voltage Conversion. These three part of projects resulted in an increase of $550k in 2015 that is not expected to be required in 2016.

(d) D055 – Planned Replacement of Dist. Equip – The reason for the increase in the 2016 ACE Plan budget amount from the 2015 projected annual amount is a large portion of this routine is driven by the inspection program, which throughout 2015 indicated a greater need for distribution equipment replacement in 2016.

(e) D062 – New Customers – Commercial – The reason for the decrease in the 2016 ACE Plan budget amount from the 2015 projected annual amount is driven by the quantity of new commercial customers being installed onto NS Power's system. 2015 had a higher volume of new commercial customers than previously expected. This number is forecasted to slightly lower levels in 2016.

(f) P062 – Work Vehicle Replacements – The reason for the increase in the 2016 ACE Plan budget amount from the 2015 projected annual amount is due to the inclusion of two additional vehicles in 2016 which require replacement.

(g) P031 – NSPI Non-CGI Infrastructure – The reason for the increase in the 2016 ACE Plan budget amount from the 2015 projected annual amount is because the 2015 Forecast for the IT Infrastructure routine decreased due to investment related to mobility

infrastructure, IT Service management tools and VoIP expansion being deferred to future years.

(h) P001/P030 – Property Improvement and Furniture – The reason for the decrease in the 2016 ACE Plan budget amount from the 2015 projected annual amount is primarily because the generator installations at Lakeside and other facilities, for use in storm response and emergency situations, occurred in 2015, but are not required in 2016.

Request IR-35:

With respect to routines T010 (Transmission Right-of-Way Widening), and D010 (Distribution Right-of-Way Widening):

It was noted in NSPI's Letter to the Board of July 31, 2015 (as part of matter M06321), that the right-of-way widening work of a routine nature that is done annually consists of the trimming or removal of hazard trees. A project to widen the right-of-way currently undertaken consists of the trimming or removal of all trees, including healthy ones, to widen the space from 20m to 30m or 40m. This is a project with a finite time-period to completion.

(a) Considering these transmission and distribution right-of-way widening projects are abnormal in nature and not expected to continue indefinitely, why are they being treated as routines?

(b) How were the cost estimates of $12,800/km and $11,070/km for transmission (as provided in the 'Proposed 69kV Transmission Right-of-Way Widening Plan – Excel Spreadsheet' provided to the Board as part of M06321), and $18,000/km for distribution (from page 71) derived? Is there a contract in place or is this work being done internally by NSPI?

(c) Please provide supporting contract documentation or the build-up of the cost estimates per kilometer if the work is being done internally.

(d) How was the easement estimate of $1,534 per property derived?

(e) Please provide cost build-up or supporting documentation for the easement estimate.

Response IR-35:

(a) These additional vegetation management projects for distribution and transmission rights-of-way are being submitted as routines because the widening work involved is the same work that has been done under the D010 and T010 routines historically. NS Power is only increasing the amount of vegetation work that is being done under these routines, not the type of work that is being performed. Once the finite time period for the investments has been reached (an eight-year period for transmission rights-of-way), the spending in the routines will reduce. The specific details with respect to the work to be completed under routines T010 and D010, not unlike what would be found in a separate capital item, is set out on pages 63 to 65 and 70 to 72 of the ACE Plan respectively. Routines are submitted for approval in the ACE Plan submissions and therefore subject to the same rigor of review as separate capital items.

(b) The cost estimates for transmission were derived from contractor costs associated with previous work carried out in T010 right-of-way widening projects during the last 5 years. There are contracts in place with vegetation management companies to complete this type of work. No vegetation management work will be performed by internal NS Power crews.

The average historical contractor costs for 5-metre transmission widening projects has been [redacted]. Historical vegetation work has been focused on higher risk areas and has not been consistent on a linear basis. It is estimated that the costs for the new widening projects could be reduced slightly with continuous work in the same area. It is anticipated that with greater linear consistency, that 5-metre widening projects could be carried out at [redacted] and 10-metre widening projects could be carried out at [redacted] due to the greater volume and consistency.

The contractor cost estimate of $18,000/km for distribution right-of-way widening is based upon historical unit costs averaging $1,000/span, as there are approximately 18 spans per kilometre.

(c) No vegetation management work will be done internally, other than the planning, scheduling and project management of contractor crews. All cost estimates are based upon completing the work with contractors. Please refer to Confidential Attachments 1 and 2.

(d) The easement estimate of $1,534 per property was derived by examining the historical right-of-way widening project costs associated with:

(i) the cost to purchase the easement,

(ii) the total cost of property valuation across the total number of properties affected, and

(iii) the estimated Land Agent cost per property owner.

(e) The cost build-up for the easement estimate is as follows:

(i) Cost to Purchase the Easement – The table below provides the compensation costs associated with 7 properties that accommodated power line rights-of-way. Widening activities will impact less than one acre of land on the vast majority of properties.

Property Compensation

Property	Total Area (acres)	Compensation ($)
1	0.33	500
2	5.00	5,000
3	1.07	1,100
4	3.18	3,000
5	2.38	2,400
6	0.85	1,000
7	1.60	1,600
Total	**14.41**	**14,600**

Therefore, the total cost per acre is $14,600/14.41 = $1,013.19

(ii) Cost of Property Valuation per Property Owner – the total cost for property valuation is estimated at $250,000. This total divided by 7,252 (estimated number of property owners affected by the right-of-way widening plan) is $34.47 per property owner.

(iii) Estimated Land Agent Cost - this is based upon one to two visits per property, for a total of 6 hours at $80/hour, which in total is approximately $500 per property.

Therefore, the total easement estimate per property owner is approximated as: $1,000 (cost to purchase easement) + $34.47 (property valuation) + $500 (Land Agent fee) = $1,534 per property.

NSUARB IR-35 Attachments 1 & 2 have been removed due to confidentiality.

Request IR-36:

With respect to D004 New Customer Upgrades, D061 New Customers – Residential, and D062 New Customers – Commercial:

(a) Please provide a calculation of the variance of budget to actual for 2015 (forecast), 2014, and 2013.

(b) Please provide a breakdown of the total variance in each year into the portion of the variance which is attributable to a difference in the number of new customers budgeted versus actual, and the portion of the variance attributable to a difference in the cost per new customer budgeted versus actual.

(c) Please provide a listing of GL accounts making up the total of each routine, and their corresponding year-end (or closest month available) GL balance.

(d) Please provide the total number of residential customers and the total number of commercial customers at year-end for the last 5 years.

Response IR-36:

(a-d) Please refer to Attachment 1, also provided electronically.

REDACTED (CONFIDENTIAL INFORMATION REMOVED)

Calculation of the variance of budget to actual for 2015 (forecast), 2014, and 2013.

	2013 ACE Plan	2013 Actual	Actual vs Budget
D004 NEW CUSTOMER REPLACEMENTS.ROUT	7,187,286	6,985,120	(202,167)
D061-New Customers - Residential	11,005,924	7,883,373	(3,122,551)
D062-New Customers - Commercial	5,805,247	5,742,000	(63,247)
Grand Total	**23,998,457**	**20,610,493**	**(3,387,964)**

	2014 ACE Plan	2014 Actual	Actual vs Budget
D004 NEW CUSTOMER REPLACEMENTS.ROUT	7,385,274	7,636,212	250,938
D061-New Customers - Residential	8,442,778	8,355,597	(87,181)
D062-New Customers - Commercial	5,563,386	4,890,885	(672,500)
Grand Total	**21,391,437**	**20,882,694**	**(508,743)**

	2015 Q3 Forecast	2015 Actual	Actual vs Forecast
D004 NEW CUSTOMER REPLACEMENTS.ROUT	8,118,932	7,880,505	238,426
D061-New Customers - Residential	8,259,881	8,876,711	(616,829)
D062-New Customers - Commercial	6,144,696	7,235,487	(1,090,791)
Grand Total	**22,523,509**	**23,992,703**	**(1,469,194)**

Breakdown of the total variance in each year into the portion of the variance which is attributable to a difference in the number of new customers budgeted versus actual, and the portion of the variance attributable to a difference in the cost per new customer budgeted versus actual.

	YE Actual 2013			YE 2013			
	Actual	ACE	Var	Volume Variance	$ Volume Variance	Unit Cost Var Total $	Total Variance
COPS - D061							
# of Units	3,651	4,000	(349)				
Avg Unit Cost / Customer ($) excl. Cap. Contribut	2,639	3,112	(473)				
Total Cost excluding Cap. Contribution	9,634,698	12,446,157	(2,811,459)	(349)	(1,085,927)	(1,725,532)	(2,811,459)
Rebates	113,748	800,000	(686,252)				(686,252)
Capital Contributions	(1,865,072)	(2,240,233)	375,161	(349)	195,460	179,701	375,161
Total Net Forecast	**7,883,374**	**11,005,924**	**(3,122,550)**		**(890,467)**	**(1,545,831)**	**(3,122,550)**

	YE Actual 2013			YE 2013			
	Actual	ACE	Var	Volume Variance	$ Volume Variance	Unit Cost Var Total $	Total Variance
COPS - D062							
# of Units	190	180	10				
Avg Unit Cost / Customer ($) excl. Cap. Contribut	33,545	36,681	(3,137)				
Total Cost excluding Cap. Contribution	6,373,493	6,602,656	(229,163)	10	366,814	(595,977)	(229,163)
Rebates	754,052	398,704	355,348				355,348
Capital Contributions	(1,385,544)	(1,196,113)	(189,431)	10	(66,451)	(122,980)	(189,431)
Total Net Forecast	**5,742,001**	**5,805,247**	**(63,246)**		**300,363**	**(718,958)**	**(63,246)**

	YE Actual 2013		
	Actual	ACE	Var
COPS - D004	6,985,119	7,187,286	(202,167)
% Of D061 & D062	**51%**	**43%**	

	YE Actual 2014			YE Actual 2014			
	Actual	ACE	Var	Volume Variance	$ Volume Variance	Unit Cost Var Total $	Total Variance
COPS - D061							
# of Units	3,037	3,466	(429)				
Avg Unit Cost / Customer ($) excl. Cap. Contribut	3,221	2,728	493				
Total Cost excluding Cap. Contribution	9,782,341	9,455,981	326,360	(429)	(1,170,403)	1,496,763	326,360
Rebates	64,050	351,690	(287,640)				(287,640)
Capital Contributions	(1,490,795)	(1,364,893)	(125,902)	(429)	168,938	(294,840)	(125,902)
Total Net Forecast	**8,355,597**	**8,442,778**	**(87,181)**		**(1,001,465)**	**1,201,923**	**(87,181)**

	YE Actual 2014			YE Actual 2014			
	Actual	ACE	Var	Volume Variance	$ Volume Variance	Unit Cost Var Total $	Total Variance
COPS - D062							
# of Units	214	154	60				
Avg Unit Cost / Customer ($) excl. Cap. Contribut	28,134	40,819	(12,685)				
Total Cost excluding Cap. Contribution	6,020,579	6,286,112	(265,533)	60	2,449,134	(2,714,667)	(265,533)
Rebates	314,085	502,283	(188,198)				(188,198)
Capital Contributions	(1,443,777)	(1,225,009)	(218,768)	60	(477,276)	258,508	(218,768)
Total Net Forecast	**4,890,886**	**5,563,386**	**(672,499)**		**1,971,858**	**(2,456,159)**	**(672,499)**

	YE Actual 2014		
	Actual	ACE	Var
COPS - D004	7,636,212	7,385,274	250,938
% Of D061 & D062	**58%**	**53%**	

	YE 2015			YE 2015			
	Actual	ACE	Var	Volume Variance	$ Volume Variance	Unit Cost Var Total $	Total Variance
COPS - D061							
# of Units	3,015	3,466	(451)				
Avg Unit Cost / Customer ($) excl. Cap. Contribut	3,743	2,727	1,016				
Total Cost excluding Cap. Contribution	11,284,305	9,451,011	1,833,294	(451)	(1,229,777)	3,063,070	1,833,294
Rebates	41,353	351,690	(310,337)				(310,337)
Capital Contributions	(2,448,948)	(1,364,893)	(1,084,055)	(451)	177,601	(1,261,656)	(1,084,055)
Total Net Forecast	**8,876,711**	**8,437,808**	**438,902**		**(1,052,175)**	**1,801,414**	**438,902**

	YE 2015			YE 2015			
	Actual	ACE	Var	Volume Variance	$ Volume Variance	Unit Cost Var Total $	Total Variance
COPS - D062							
# of Units	206	155	51				
Avg Unit Cost / Customer ($) excl. Cap. Contribut	35,703	40,547	(4,844)				
Total Cost excluding Cap. Contribution	7,354,867	6,284,838	1,070,030	51	2,067,914	(997,885)	1,070,030
Rebates	939,452	502,283	437,169				437,169
Capital Contributions	(1,058,832)	(1,225,009)	166,177	51	(403,067)	569,244	166,177
Total Net Forecast	**7,235,487**	**5,562,112**	**1,673,375**		**1,664,847**	**(428,640)**	**1,673,375**

	YE Actual 2015		
	Actual	ACE	Var
COPS - D004	7,880,505	7,382,233	498,272
% Of D061 & D062	**49%**	**53%**	

REDACTED (CONFIDENTIAL INFORMATION REMOVED)

Listing of GL accounts making up the total of each routine, and their corresponding year-end (or closest month available) GL balance.

New Customer Category

	2013 Actual	2014 Actual	2015 Actual	2016 ACE
D061 New Customer - Residential				
Regular and Term Labour	1,778,231	1,621,174	1,916,359	1,796,635
002 Overtime Labour	45,572	60,757	115,179	75,255
012 Materials	3,594,870	3,747,854	4,435,945	3,772,489
013 Contracts	1,740,758	1,769,202	1,922,214	1,449,378
092 Vehicle AO	675,408	852,247	951,609	925,724
095 Admin AO	1,777,697	1,704,862	1,927,616	1,775,078
Other Costs 066 011 014	22,161	26,245	15,381	27,280
Total Excluding Rebates & Contributions	**9,634,698**	**9,782,341**	**11,284,305**	**9,821,840**
064 Rebates	113,748	64,051	41,354	188,690
096 Capital Contributions	(1,865,073)	(1,490,794)	(2,448,948)	(1,957,117)
Total Including Rebates & Contributions	**7,883,373**	**8,355,598**	**8,876,711**	**8,053,412**

	2013 Actual	2014 Actual	2015 Actual	2016 ACE
D062 New Customer - Commercial				
Regular and Term Labour	838,203	748,201	993,171	875,001
002 Overtime Labour	32,737	74,554	96,715	66,001
012 Materials	3,676,569	3,213,768	4,170,967	3,835,105
013 Contracts	709,688	793,149	739,219	686,333
092 Vehicle AO	298,203	395,180	466,236	432,376
095 Admin AO	775,191	780,497	902,433	836,847
Other Costs 066 011 014	42,902	15,228	12,336	17,226
Total Excluding Rebates & Contributions	**6,373,493**	**6,020,577**	**7,381,077**	**6,748,889**
064 Rebates	754,052	314,085	939,451	951,944
096 Capital Contributions	-1,385,545	-1,443,777	-1,085,042	(1,203,778)
Total Including Rebates & Contributions	**5,742,000**	**4,890,885**	**7,235,487**	**6,497,055**

Total New Customer D061 & D062	**13,625,373**	**13,246,483**	**16,112,197**	**14,550,467**

D004 - New Customer Upgrades	2013 Actual	2014 Actual	2015 Actual	2016 ACE
Regular and Term Labour	1,192,264	1,321,849	1,382,381	1,423,548
002 Overtime Labour	94,277	154,885	114,979	103,294
012 Materials	3,693,690	3,569,606	3,715,126	3,557,365
013 Contracts	1,040,629	1,413,255	1,451,615	1,227,083
092 Vehicle AO	450,992	720,336	700,184	751,654
095 Admin AO	1,148,015	1,416,590	1,426,803	1,453,017
Other Costs 066 011 014	40,650	31,800	41,772	75,971
Total Excluding Contributions	**7,660,518**	**8,628,321**	**8,832,860**	**8,591,933**
	-	-		
096 Capital Contributions	(675,399)	(992,109)	(952,354)	(869,106)
Total Including Contributions	**6,985,120**	**7,636,212**	**7,880,506**	**7,722,827**

D004 % of New Customer D061 & D062	**51%**	**58%**	**49%**	**53%**

REDACTED (CONFIDENTIAL INFORMATION REMOVED)

Total number of residential customers and the total number of commercial customers at year-end for the last 5 years.

	2011 Actual	2012 Actual	2013 Actual	2014 Actual	2015 Actual
D061 New Customer - Residential					
Regular and Term Labour	1,728,352	1,827,490	1,778,231	1,621,174	1,916,359
002 Overtime Labour	174,678	110,307	45,572	60,757	115,179
012 Materials	5,451,040	4,507,145	3,594,870	3,747,854	4,435,945
013 Contracts	2,350,900	2,272,776	1,740,758	1,769,202	1,922,214
092 Vehicle AO	927,075	870,280	675,408	852,247	951,609
095 Admin AO	1,967,698	1,875,203	1,777,697	1,704,862	1,927,616
Other Costs 066 011 014	45,176	18,110	22,161	26,245	15,381
Total Excluding Rebates & Contributions	**12,644,919**	**11,481,311**	**9,634,698**	**9,782,341**	**11,284,305**
064 Rebates	235,743	236,531	113,748	64,051	41,354
096 Capital Contributions	(2,455,229)	(1,650,448)	(1,865,073)	(1,490,794)	(2,448,948)
Total Including Rebates & Contributions	**10,425,433**	**10,067,394**	**7,883,373**	**8,355,598**	**8,876,711**
Total Residential Customer Work Units	4101	3650	3,651	3,037	3,015

	2011 Actual	2012 Actual	2013 Actual	2014 Actual	2015 Actual
D062 New Customer - Commercial					
Regular and Term Labour	714,368	797,177	838,203	748,201	993,171
002 Overtime Labour	95,412	83,912	32,737	74,554	96,715
012 Materials	3,876,917	3,809,446	3,676,569	3,213,768	4,170,967
013 Contracts	749,610	1,321,286	709,688	793,149	739,219
092 Vehicle AO	384,021	371,301	298,203	395,180	466,236
095 Admin AO	766,454	889,380	775,191	780,497	902,433
Other Costs 066 011 014	15,993	5,149	42,902	15,228	12,336
Total Excluding Rebates & Contributions	**6,602,776**	**7,277,651**	**6,373,493**	**6,020,577**	**7,381,077**
064 Rebates	802,711	497,874	754,052	314,085	939,451
096 Capital Contributions	(1,286,604)	(1,402,810)	(1,385,545)	(1,443,777)	(1,085,042)
Total Including Rebates & Contributions	**6,118,883**	**6,372,715**	**5,742,000**	**4,890,885**	**7,235,487**
Total Commercial Customer Work Units	162	159	190	214	206
Total New Customer D061 & D062	**16,544,316**	**16,440,108**	**13,625,373**	**13,246,483**	**16,112,197**

D004 - New Customer Upgrades	2011 Actual	2012 Actual	2013 Actual	2014 Actual	2015 Actual
Regular and Term Labour	916953.54	1327212.57	1,192,264	1,321,849	1,382,381
002 Overtime Labour	132961.27	174312.92	94,277	154,885	114,979
012 Materials	2968654.71	3286718.53	3,693,690	3,569,606	3,715,126
013 Contracts	605360.19	1245366.69	1,040,629	1,413,255	1,451,615
092 Vehicle AO	508143.7	652518.89	450,992	720,336	700,184
095 Admin AO	922984.9	1302689.95	1,148,015	1,416,590	1,426,803
Other Costs 066 011 014	22724	46746	40,650	31,800	41,772
Total Excluding Contributions	**6,077,782**	**8,035,566**	**7,660,518**	**8,628,321**	**8,832,860**
096 Capital Contributions	(439,863)	(323,373)	- (675,399)	- (992,109)	(952,354)
Total Including Contributions	**5,637,919**	**7,712,193**	**6,985,120**	**7,636,212**	**7,880,506**
D004 % of New Customer D061 & D062	**34%**	**47%**	**51%**	**58%**	**49%**

Request IR-37:

Please provide the actual 2014 and projected 2015 net book value which was removed from the asset pool for retirements related to routines in each category (similar to IR-48 from the 2015 ACE Plan). Please also provide the number of assets retired in each category and the total original cost of these assets per category for the assets retired in 2015.

Response IR-37:

Please refer to Attachment 1 for the gross book value of actual assets retired related to routine capital projects in 2014 and 2015. Please note that retirements result in an equal reduction of gross book value and accumulated depreciation resulting in no impact to net book value.

NS Power accounts for capital assets at a pooled level. NS Power does not track them at the individual asset level and therefore cannot provide the number of assets retired in each category.

REDACTED (CONFIDENTIAL INFORMATION REMOVED)

2014 & 2015 FULL YEAR RETIREMENTS BY GROUP

$ in thousands

Depreciation Group	2014 FY	2015 FY
001 Land- General Plant	$ 0.6	$ -
002 Land Rights - Trans. Plant	-	-
003 B.S.G. - Hydro Gen	7.0	31.8
004 Misc.Equipment - General Plant	3,917.2	270.8
004 Misc.Equipment - Trans. Plant	21.1	-
007 Environmental - Trans. Plant	103.0	-
022 Elec Contr.Equip. - Trans. Plan	7.6	23.1
023 Power Equip.-Station S - Trans.	-	52.5
028 Dams & Spillway - Hydro Gen	-	12.5
035 Wood Poles - Dist. Plant	5,597.7	3,191.4
035 Wood Poles - Trans. Plant	899.2	377.3
037 Steel Towers - Trans. Plant	-	8.4
038 Insulators - Dist. Plant	-	0.5
038 Insulators - Trans. Plant	279.8	79.6
039 O/H Cond. - Dist. Plant	1,206.5	796.7
039 O/H Cond. - Trans. Plant	514.2	129.2
040 O/H Cond.Devices - Dist. Plant	395.1	535.6
040 O/H Cond.Devices - Trans. Plant	6.7	1.4
041 O/H Line Transf. - Dist. Plant	4,337.4	2,750.1
043 Substn Dev. - Trans. Plant	138.3	210.5
044 Substn.Transf. - Trans. Plant	-	101.5
046 U/G Conductor - Dist. Plant	287.6	213.4
047 U/G Conductor Devices - Dist. P	-	79.3
048 U/G Line Transf. - Dist. Plant	1,469.5	536.6
050 Street Lights - Dist. Plant	46.2	490.3
051 Meters - Dist. Plant	723.6	1,064.5
052 Services - Dist. Plant	494.4	1,664.5
060 Broadband Radio - General Plant	52.6	78.5
065 Transp.Vehicles - General Plant	465.7	1,730.4
066 Work Vehicles - General Plant	1,003.7	3,805.2
072 Computer Equipment - General Pl	1,470.2	-
090 LED Street Lights - Dist. Plant	1.1	7.7
Annapolis	19.6	117.7
Avon	-	5.4
Bear River	29.0	11.9
Black River	44.2	5.7
Digby Wind Farm	60.0	55.0
Grand Etang	-	13.6
Hydro Production Administration	16.8	-
Lequille	-	75.6
Lingan	389.7	371.5
Mersey Hydro	88.1	42.4
PH Biomass	143.4	-
Point Aconi	264.0	245.0
Point Tupper	235.2	168.6
Sheet Harbour Hydro	4.7	21.9
St. Marg Bay Hydro	9.0	18.1
Trenton	203.5	595.3
Tufts Cove	81.0	142.5
Tusket C/T	6.0	-
Wreck Cove	10.9	20.5
	$ 25,051.08	**$ 20,153.82**

Request IR-38:

Why is there such a significant increase in the 2015 projected actual and 2016 budget amounts spent on Work Vehicles routine (total found on pg. 56), over the 2013 and 2014 actual expenditures?

Response IR-38:

Total variances between 2013 and 2014 actual expenditures versus 2015 projection and 2016 budget on Work Vehicle routines are primarily due to fewer vehicle purchases in those years and lower US exchange rate impacts.

Increased 2015 projected amounts are associated with purchasing a higher quantity of Transportation vehicles under P061 Transportation Vehicle Replacements versus the total purchased amount for 2014 replacements. Also, there are additional costs under P062 Work Vehicle Replacements due to the US exchange rate impact on the budgeted average cost for work vehicles. The requirements for Work Vehicles are determined by analysis of the most cost effective method of meeting the needs of the business and can change from year to year.

Request IR-39:

Under P031, NSPI IT Infrastructure, the volume of new laptop or desktop computers to be purchased is listed as 175 versus 18 in the 2015 ACE plan. Why is there such a significant increase in 2016?

Response IR-39:

In addition to laptops and desktops, the quantity for 2016 includes mobile devices and tablets. The use of tablets and mobile devices for business operation is expected to increase, which leads to the increased number of devices listed under P031. In addition to this, an increase in the number of laptop replacements is required in 2016, which is based on laptops currently in-service approaching the end of their service life. The 175 is made up of 100 mobile devices and 75 laptops.

Request IR-40:

Under the detailed listing of work making up the total of T011 Provincial – Planned Transmission Line Replacement (on page 63), there is a total of $1,380,269 described as "1 – 6 Month Inspection Driven Work" on various lines. Please provide the detailed listing of what makes up this total, as well as a description of the type of work being performed under this budget item (if not evident from the listing).

Response IR-40:

The work being performed under the transmission inspection program identifies deteriorated assets that require replacement; work that is assigned a priority of 1-6 Month is completed under the T011 Routine. This work has yet to be finalized; therefore a detailed list cannot be provided. The scope of work to be completed under this routine would be deteriorated assets that require replacement such as: pole replacements, cross arm replacements, insulator replacements, pole line hardware replacements, guy and anchor replacements, etc.

The 1-6 month inspection driven work identified in the late 2015 inspections as well as the first half of 2016 inspections will be addressed as part of T011 "1-6 Month Inspection Driven Work".

Request IR-41:

On page 66, it appears that NSPI will continue to be purchasing the old technology meters. Has NSPI considered not purchasing, but replacing them with the newer technology meters? If not, why not?

Response IR-41:

The D009 meter routine includes meters that need to be replaced to comply with Measurement Canada regulations, as well as new meter installations and meters that need to be replaced for operational reasons (damage, rate change, etc.). The initiation of a smart meter program at NS Power is contingent on business case evaluation. Provided the business case shows a benefit for customers, this would be followed by a vendor selection process for smart meters. As each vendor has a proprietary communications system, premature replacement of meters included in the D009 meter routine with higher cost smart meters prior to vendor selection could lead to incompatibility with a potential future smart meter implementation.

Request IR-42:

In the detail describing the estimate for D005 Unplanned Replacement Deteriorated Equipment (on page 69), a cost of $2,916/person-day was used to generate the estimate. Please provide the derivation of this amount.

Response IR-42:

The cost of $2,916/person-day was recorded incorrectly. The cost per person day should have reflected $2,885. Please refer to the table below:

D005 – Unplanned Replacement Deteriorated Equipment	**2016 ACE Plan ($)**
Regular Labour	1,098,214
Overtime Labour	918,266
Materials	3,381,388
Contracts	1,447,818
Vehicle Overhead	734,757
Administrative Overhead	1,382,203
Other Goods & Services	49,507
Capital Contributions	(209,359)
Total Budget	**8,802,794**

Total Person Days	**3,051**
Total Cost/Person Day	**$2,885**

Request IR-43:

In the detailed breakdown of what makes up P001 FAC – Property Improvements, there is an amount of $300,000 for "1H Office Building General Repairs" (on page 77) and $83,000 for "Fence Gate Repairs" (on page 76). Why are repairs being capitalized?

Response IR-43:

The term repairs should not have been used in these instances. NS Power confirms that in both cases, the work is refurbishment work that is extending the life of the asset it is working on. NS Power does not capitalize general repairs.

Request IR-44:

Please provide an update on anticipated retirement dates for all generating units, as well as their recent, and anticipated annual capacity factors.

Response IR-44:

The following table shows the estimated retirement dates for each thermal generating unit based on the 2014 Integrated Resource Plan.

Unit	IRP Estimated Retirement
Lingan 1	2039
Lingan 2	2018
Lingan 3	2039+
Lingan 4	2039+
Point Aconi	2039+
Point Tupper	2039+
Trenton 5	2035
Trenton 6	2039+
Tufts Cove 1	2025
Tufts Cove 2	2032
Tufts Cove 3	2036

NS Power's Hydro and Gas Turbine units do not have estimated retirement dates within the current planning period.

The table below shows the current anticipated capacity factors for the above units.

2016 Annual Capital Expenditure Plan (NSUARB P-128.16/M07176)
NSPI Responses to NSUARB Information Requests

REDACTED

Unit	Actual 2014 (%)	Actual 2015 (%)	2016 (%)	2017 (%)	2018 (%)	2019 (%)	2020 (%)
Lingan 1	52	52					
Lingan 2	50	29					
Lingan 3	34	40					
Lingan 4	60	58					
Pt. Aconi	72	76					
Pt. Tupper	77	74					
Trenton 5	59	59					
Trenton 6	82	78					
Tufts Cove 1	37	23					
Tufts Cove 2	51	39					
Tufts Cove 3	26	41					

Request IR-45:

Please provide the following copies of the thermal and large hydro unit maintenance schedules, in standard NSPI Gantt chart format:

(a) Maintenance schedule used in the development of 2016 ACE Plan.

(b) Actual maintenance schedule for 2015.

Response IR-45:

(a) Please refer to Confidential Attachment 1.

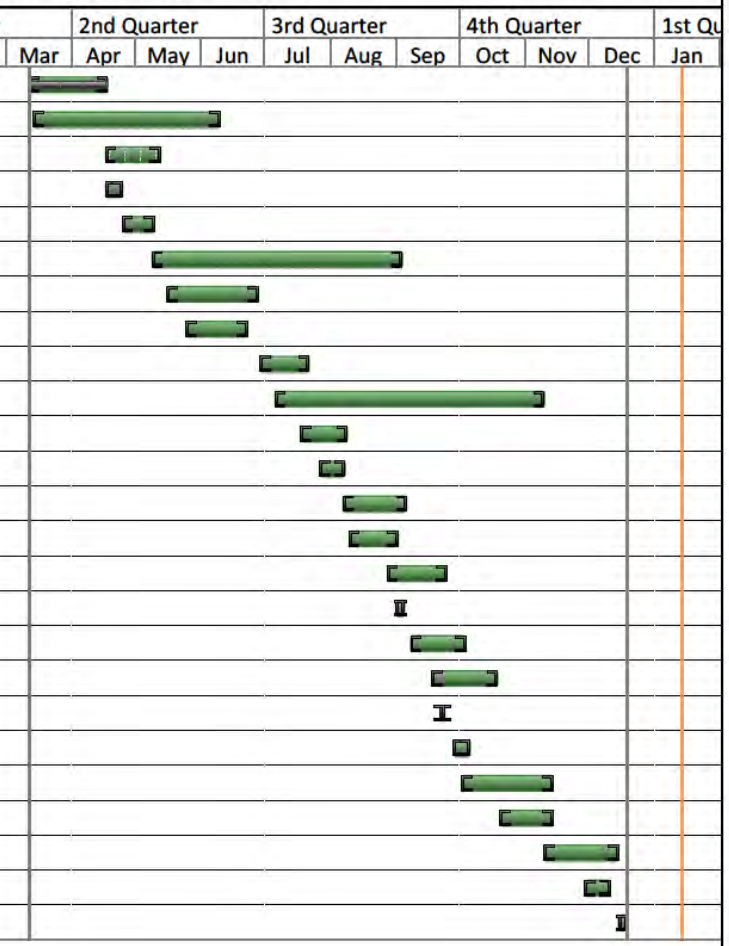
(b) Please refer to Attachment 2.

NSUARB IR-45 Attachment 1 has been removed due to confidentiality.

REDACTED (CONFIDENTIAL INFORMATION REMOVED)

2015 Thermal Maintenance Schedule (Actuals)

ID	Plant	Duration	Start	Finish
11	TUC1	27 days	Thu 12/03/15	Fri 17/04/15
20	LIN3	63 days	Sat 14/03/15	Tue 09/06/15
10	TUC2	18 days	Fri 17/04/15	Tue 12/05/15
18	LIN4	6 days	Fri 17/04/15	Fri 24/04/15
21	LIN2	12 days	Sat 25/04/15	Sat 09/05/15
12	LIN2 (ABNO)	85 days	Sat 09/05/15	Thu 03/09/15
13	TRE6	32 days	Sat 16/05/15	Sat 27/06/15
2	WRC1	21 days	Mon 25/05/15	Mon 22/06/15
14	TRE5	17 days	Mon 29/06/15	Tue 21/07/15
5	TSK1	91 days	Mon 06/07/15	Mon 09/11/15
19	LIN4	17 days	Sat 18/07/15	Sat 08/08/15
24	BS2	10 days	Mon 27/07/15	Fri 07/08/15
15	POT2	22 days	Fri 07/08/15	Sat 05/09/15
25	BS1	17 days	Mon 10/08/15	Tue 01/09/15
17	BIO	20 days	Fri 28/08/15	Thu 24/09/15
23	BS3	4 days	Tue 01/09/15	Fri 04/09/15
7	TUC5	20 days	Tue 08/09/15	Sat 03/10/15
16	POA	22 days	Fri 18/09/15	Sun 18/10/15
8	TUC4	2 days	Tue 22/09/15	Wed 23/09/15
6	TUC6	6 days	Mon 28/09/15	Mon 05/10/15
1	WRC2	31 days	Fri 02/10/15	Fri 13/11/15
22	LIN1	19 days	Tue 20/10/15	Fri 13/11/15
9	TUC3	25 days	Tue 10/11/15	Mon 14/12/15
4	VJ1	10 days	Sun 29/11/15	Thu 10/12/15
3	VJ2	4 days	Tue 15/12/15	Fri 18/12/15



LIN2 Seasonal Layup (ABNO)

Request IR-46:

For each of the thermal generating plants and units, please provide a list of all projects, and relevant costs, that are included in the proposed 2016 ACE Plan amount of $279.9 million.

Response IR-46:

Please refer to Attachment 1, also provided electronically.

REDACTED (CONFIDENTIAL INFORMATION REMOVED)

Major Location	CI#	Project Long Title	2016 ACE
Lingan Generating Station	47658	LIN4 L-0 Blade Replacement	3,550,915
Lingan Generating Station	47673	LIN4 Generator Rotor Rewind	2,602,159
Lingan Generating Station	46068	LIN CW Debris Removal System	1,651,071
Lingan Generating Station	47755	LIN4 Turbine High Temperature Fasteners Replacement	1,073,877
Lingan Generating Station	47870	LIN Cofferdam Outer Cell Refurbishment	850,609
Lingan Generating Station	47505	LIN Coal Mill Refurbishment 2016	749,183
Lingan Generating Station	47657	LIN4 High Voltage Bushing Refurbishment	724,395
Lingan Generating Station	47871	LIN Stack Re-Coating	707,696
Lingan Generating Station	47664	LIN4 Division Wall Replacement	619,243
Lingan Generating Station	47869	LIN4 Bottom Ash	616,599
Lingan Generating Station	47666	LIN4 Boiler Refurbishment 2016	571,859
Lingan Generating Station	47663	LIN4 - SH5 Boiler Tube Replacement	538,776
Lingan Generating Station	47689	LIN4 - Air Heater Refurbishment	521,951
Lingan Generating Station	47953	LIN Rail Car Positioner Upgrade	507,812
Lingan Generating Station	47761	LIN1 Boiler Refurbishment	506,845
Lingan Generating Station	47872	LIN E Gallery Structural Steel Protective Coating	481,492
Lingan Generating Station	47690	LIN4 Burner Front Refurbishment	480,349
Lingan Generating Station	47507	LIN CW Pump Rebuild 2016	441,560
Lingan Generating Station	43170	LIN4 AVR Replacement	418,432
Lingan Generating Station	47762	LIN4 Analytical Panel Replacement	401,658
Lingan Generating Station	10626	LIN - Routine Equipment Replacements	382,564
Lingan Generating Station	47510	LIN Coal Plant Structural Refurbishment Phase 2	359,425
Lingan Generating Station	47506	LIN CW Screen Refurbishment 2016	349,743
Lingan Generating Station	47961	LIN1 Condenser Tube Coating	333,944
Lingan Generating Station	35083	LIN 2011 Ash Site Sealing and Capping	259,308
Lingan Generating Station	47868	LIN Stack Lighting Replacement	241,895
Lingan Generating Station	47933	LIN4 Turbine Vibration Monitoring Upgrade	238,216
Lingan Generating Station	47874	LIN Ash Scale Replacement	237,241
Lingan Generating Station	47867	LIN Bunker Chute Sealing Phase 2	225,956
Lingan Generating Station	47498	LIN - Crusher & Dumper Building Fire System Refurbishment	222,648
Lingan Generating Station	47875	LIN PF Line Replacement	214,575
Lingan Generating Station	47863	LIN4 Turbine Valves Refurbishment	204,548
Lingan Generating Station	47865	LIN Heavy Oil Suction Line Replacement Phase 1	201,870
Lingan Generating Station	47960	LIN1 Control Valve Rebuild	197,976
Lingan Generating Station	43239	LIN4 BFP Proportional Recirculation Line Control	158,524
Lingan Generating Station	47497	LIN - Flyash Transport Air Compressor Replacement	158,439
Lingan Generating Station	47866	LIN4 Condenser Tube Protective Coating	156,043
Lingan Generating Station	47963	LIN Waster Water Stand Pipe Refurbishment	152,065
Lingan Generating Station	41226	LIN - Boiler Feed Pump Proportional Valve Replacements - Unit #1	140,098
Lingan Generating Station	44357	LIN 3 4 Stack Cap Refurbishment	135,801
Lingan Generating Station	47955	LIN4 ID FAN Shaft Refurbishment	124,952
Lingan Generating Station	47508	LIN Coal System Guard Upgrade Phase 2	114,493
Lingan Generating Station	47864	LIN 4160V and 600V Breaker Refur.	104,343
Lingan Generating Station	47873	LIN Plant Communications Upgrade	102,250
Lingan Generating Station	47504	LIN Facilities Upgrade	100,667
Lingan Generating Station	47501	LIN Boiler Fill Pump Suction Line Replacement	84,499
Lingan Generating Station	33863	LIN - Heat Rate Routine	77,300
Lingan Generating Station	47499	LIN Precip Fire Detection Upgrade	60,752
Lingan Generating Station	41229	LIN - Cable Spreading Rooms Fire Protection	53,453
Lingan Generating Station	47503	LIN Propane Skid Steer Tractor Replacement	48,811
Point Aconi Generating Station	46461	POA - Ash Cell Capping 2015	3,307,444.00
Point Aconi Generating Station	47846	POA Ash Cell 4 Stage 3	1,774,305
Point Aconi Generating Station	47847	POA Boiler Refractory Replacement	746,522
Point Aconi Generating Station	47932	POA SH3 Boiler Tube Replacement Phase 2	513,213
Point Aconi Generating Station	47851	POA Boiler Refurbishment	424,158
Point Aconi Generating Station	47843	POA Structural Steel Refurbishment	399,626
Point Aconi Generating Station	43257	POA - Main Oil Tank Refurbishment	226,871
Point Aconi Generating Station	10718	POA - Routine Equipment Replacements	216,186
Point Aconi Generating Station	47352	POA Vortex Finder Replacement 2016	209,021
Point Aconi Generating Station	45029	POA - Auxiliary Boiler Replacement	206,355.50
Point Aconi Generating Station	43138	POA - Air Heater Retube	205,374
Point Aconi Generating Station	47848	POA Boiler Arrowhead Replacement	194,838
Point Aconi Generating Station	47856	POA Limestone Pipe Refurbishment	140,635

REDACTED (CONFIDENTIAL INFORMATION REMOVED)

Major Location	CI#	Project Long Title	2016 ACE
Point Aconi Generating Station	47855	POA Coal Pile Run-off Pond Refurbishment	132,739
Point Aconi Generating Station	47861	POA Start Up Burner Upgrades	125,748
Point Aconi Generating Station	47860	POA Opacity Meter Upgrade	124,593
Point Aconi Generating Station	47852	POA PLC Migration	119,916
Point Aconi Generating Station	27858	POA-ROOFING ROUTINE	110,210
Point Aconi Generating Station	47845	POA HVAC Upgrades	105,408
Point Aconi Generating Station	47857	POA CW Valve Replacement	102,271
Point Aconi Generating Station	47858	POA Equipment Fuel Storage Tanks Replacement	101,294
Point Aconi Generating Station	47931	POA Coal System Guard Upgrade Phase 2	89,082
Point Aconi Generating Station	47850	POA Valve Component Replacement	87,172
Point Aconi Generating Station	43144	POA - Plant Access Improvements	78,073
Point Aconi Generating Station	47849	POA Expansion Joint Replacement	77,068
Point Aconi Generating Station	47842	POA 4KV 600V Breaker Refurbishment	65,909
Point Aconi Generating Station	33865	POA - Heat Rate Routine	42,105
Point Tupper Generating Station	47611	POT - Demolish Unit 1 Stack	1,732,346
Point Tupper Generating Station	47687	POT Boiler Chemical Recondition	855,348
Point Tupper Generating Station	47661	POT - Asbestos management 2016	721,551
Point Tupper Generating Station	47662	POT Coal Mill Overhauls 2016	324,874
Point Tupper Generating Station	47704	POT - Replace Polisher Chemical Skid	321,950
Point Tupper Generating Station	47668	POT - Plant Siding 2016	287,926
Point Tupper Generating Station	27855	POT-ROOFING ROUTINE	270,126
Point Tupper Generating Station	10645	POT - Routine Equipment Replacements	242,162
Point Tupper Generating Station	47719	POT - Unit 2 Boiler Refurbishment 2016	240,083
Point Tupper Generating Station	47692	POT - Fire system upgrades 2016	224,304
Point Tupper Generating Station	47701	POT - Lab upgrades phase 3	207,803
Point Tupper Generating Station	43386	POT - LP dosing automation	195,807
Point Tupper Generating Station	46419	POT - Bay door replacements	193,523
Point Tupper Generating Station	46371	POT - Refurbish 4160KV motors	183,270
Point Tupper Generating Station	30163	POT - Control room and permit room upgrade	172,201
Point Tupper Generating Station	47703	POT - Replace DCS servers	172,078
Point Tupper Generating Station	47676	POT Expansion joint replacements	158,506
Point Tupper Generating Station	47688	POT - Refurbish condensate extraction pump	154,069
Point Tupper Generating Station	47702	POT - Wastewater Treatment Plant chemical system refurbishment	153,313
Point Tupper Generating Station	43038	POT - FeS04 Dosing Control System	138,276
Point Tupper Generating Station	28249	POT Structural Steel Refurbishment on South ID fan and Precipitator ductwork steel	125,179
Point Tupper Generating Station	47674	POT - Circulating Water Pumphouse Motor Control Center Refurbishment	104,836
Point Tupper Generating Station	47707	POT - Replace D belt and refurbish frames and rollers	83,822
Point Tupper Generating Station	33867	POT - Heat Rate Routine	80,499
Point Tupper Generating Station	47708	POT - Vacuum cleaning system upgrade	77,847
Point Tupper Generating Station	47710	POT - Replace selected Polisher valves and solenoid panel	57,840
Point Tupper Generating Station	47709	POT - Replace raw water flow meter	57,117
Point Tupper Generating Station	47711	POT - PI interface to DCS	46,863
Point Tupper Generating Station	46375	POT - Condenser Level Control Upgrade	30,151
Point Tupper Generating Station	47493	POT - Turbine Dehumidifier	13,449
Port Hawkesbury Biomass	47613	PHB - Boiler Refurbishment 2016	604,193
Port Hawkesbury Biomass	47614	PHB - Fuel System Refurbishment 2016	296,556
Port Hawkesbury Biomass	43646	PHB - Routine Equipment Replacements	147,565
Port Hawkesbury Biomass	47615	PHB - HVAC System Upgrades	52,511
Trenton Generating Station	44267	TRE Ash Lagoon Site Closure	5,474,564
Trenton Generating Station	47552	TRE5 Boiler Refurbishment 2016	1,204,387
Trenton Generating Station	44188	TRE Ash Site Phase 1 Capping	1,116,812
Trenton Generating Station	46352	TRE5 Air Heater Refurbishments	530,139
Trenton Generating Station	47554	TRE5 5-1 FD Fan Refurbishment	494,802
Trenton Generating Station	41505	TRE5 - 5F Conveyor Structural Refurbishment	484,801
Trenton Generating Station	47555	TRE5 Coal System Upgrades	414,085
Trenton Generating Station	10673	TRE - Routine Equipment Replacements	380,517
Trenton Generating Station	47617	TRE6 Elevator Controls Upgrade	320,704
Trenton Generating Station	47596	TRE6 ID Fan Damper Upgrades	272,239
Trenton Generating Station	41664	TRE5 Precip Refurbishment	239,816
Trenton Generating Station	47635	TRE Facilities Upgrades	219,301
Trenton Generating Station	46358	TRE5 Burner Refurbishments	207,190
Trenton Generating Station	47593	TRE Sodium Bisulphite Injection System	194,093
Trenton Generating Station	22410	TRE5 5-1 Condensate Extraction Pump Refurbishment	180,956

REDACTED (CONFIDENTIAL INFORMATION REMOVED)

Major Location	CI#	Project Long Title	2016 ACE
Trenton Generating Station	43429	TRE5 Lube Oil Cooler Retube	178,666
Trenton Generating Station	47599	TRE5 5-4 Mill Refurbishments	176,181
Trenton Generating Station	28645	TRE6 - Turbine Controls Power Supplies Replacement	162,230
Trenton Generating Station	47606	TRE5 Sootblower Controls Replacement	158,399
Trenton Generating Station	47602	TRE Oil Forwarding Pump Area Fire Protection	157,172
Trenton Generating Station	47600	TRE Asbestos Abatement (2016)	154,303
Trenton Generating Station	47601	TRE Ash Site Management (2016)	145,235
Trenton Generating Station	47605	TRE Carbon Sulphur Analyzer Replacement	124,788
Trenton Generating Station	47607	TRE5 Common Water Piping Replacements	106,858
Trenton Generating Station	47642	TRE6 Feeder Controls Upgrade	104,734
Trenton Generating Station	46426	TRE6 Fly Ash Compressor Replacement	103,868
Trenton Generating Station	43407	TRE5 Cable Rooms Fire Protection	99,011
Trenton Generating Station	47645	TRE6 6B Instr Air Compressor Replacement	86,196
Trenton Generating Station	33869	TRE - Heat Rate Routine	74,069
Trenton Generating Station	27856	TRE-ROOFING ROUTINE	55,105
Trenton Generating Station	47647	TRE5 4kV Switch Gear Room Fire Protection	45,544
Trenton Generating Station	47646	TRE5 Relay Room Fire Protection	44,564
Tufts Cove Generating Station	48157	TUC Auxiliary Boiler Purchase	2,822,565
Tufts Cove Generating Station	48018	TUC1 IP Blading Refurbishments	1,137,208
Tufts Cove Generating Station	47911	TUC1 High Temperature Fastener Replacement	828,968
Tufts Cove Generating Station	46465	TUC2 Turbine Valve Refurbishment	651,362
Tufts Cove Generating Station	47893	TUC3 Generator Hydrogen Panel Upgrade	301,806
Tufts Cove Generating Station	47945	TUC Electrode-ionization (EDI) Unit Replacement	275,154
Tufts Cove Generating Station	10621	TUC - Routine Equipment Replacements	254,504
Tufts Cove Generating Station	47894	TUC2 Boiler Nat Gas Ignitors	244,362
Tufts Cove Generating Station	47895	TUC3 Lube Oil Purifier Upgrade	234,808
Tufts Cove Generating Station	47947	TUC6 Condenser Waterbox Coating	225,210
Tufts Cove Generating Station	47896	TUC2 Main Steam Piping Weld Replacement (Creep Damage)	214,384
Tufts Cove Generating Station	47897	TUC 4kV/600V Breaker Replacements	210,845
Tufts Cove Generating Station	47898	TUC Asbestos Abatement	209,234
Tufts Cove Generating Station	47892	TUC1 Turbine Valves	184,092
Tufts Cove Generating Station	47899	TUC1 TSE/Data Management Upgrades	171,599
Tufts Cove Generating Station	42973	TUC - #1, 2 and 4 WTP DCS upgrade	162,882
Tufts Cove Generating Station	46484	TUC - Unit 1&2 Analytical Panel Replacement	159,020
Tufts Cove Generating Station	47901	TUC Bailey Control Valves' Replacement	158,479
Tufts Cove Generating Station	47900	TUC1 MgOH Powder System Upgrade	156,145
Tufts Cove Generating Station	47904	TUC3 Vacuum Pump Refurbishment	105,695
Tufts Cove Generating Station	33871	TUC - Heat Rate Routine	104,913
Tufts Cove Generating Station	27854	TUC-ROOFING ROUTINE	101,637
Tufts Cove Generating Station	46495	TUC3 - DCS Upgrade	89,617
Tufts Cove Generating Station	47903	TUC2 Lube Oil Coolers' Inlet/Outlet Waterbox Replacement	87,877
Tufts Cove Generating Station	44727	TUC3 - DCS Upgrade Phase 3	86,161
Tufts Cove Generating Station	42944	TUC3 - Boiler Drum North PSV Replacement	75,132
Tufts Cove Generating Station	48014	TUC DC Battery Bank Replacement	55,524
Tufts Cove Generating Station	47907	TUC6 Vacuum Pumps' Seal Water Cooler Upgrade	55,068
Tufts Cove Generating Station	47909	TUC Nat Gas Valves Refurbishment	54,855
Tufts Cove Generating Station	47905	TUC1 Chimney Access Infrastructure Refurbishment	54,313
Tufts Cove Generating Station	47906	TUC6 Arc Flash Relays	53,881
Tufts Cove Generating Station	46493	TUC2 - Polisher Upgrade	47,036
Tufts Cove Generating Station	42943	TUC2 - Turbine-Generator (T-G) Area Fire Protection	46,161

Request IR-47:

With reference to hydro generation:

(a) Please provide a map of Nova Scotia which shows locations of all hydro generation systems and their generating units.

(b) Provide basic technical information of all hydro production units, including commissioning dates, nameplate capacities, main refurbishment information, etc.

(c) Please describe the scope and size of capital investments in each of these hydro systems and units in the recent 5 years, as well as anticipated investments for the next 5 years.

(d) Provide a 10-year history of actual generation (in MWh), and capacity factors for these units in the recent 5 years, as well as related forecasted values.

(e) Please provide information on any hydro capacity addition, improvement, downgrade, or retirement, over the last 10 years.

(f) Does NSPI anticipate any change in the size of its hydro production fleet, due to retirement, capacity addition, improvement, etc.? If so, please elaborate.

(g) Please submit a table that lists planned hydro capital work for 2016 and beyond.

Response IR-47:

(a) Please refer to Attachment 1.

(b) Please refer to Attachment 2, also provided electronically. It should be noted that the information in Attachment 1 may not match nameplate information on this sheet as the summary in Attachment 1 is based on typical power output and not nameplate rating. It does, however, give details of each generating station to support Attachment 1.

(c) Please refer to Attachment 3.

(d) Please refer to Attachment 4. NS Power uses an average annual generation for Hydro units as opposed to capacity factor. For forecasting, an 11 year average is used, which is included in Attachment 4.

(e) Please refer to Attachment 5. Flow increase projects saw an average of 5.7 ft of head acting on the units due to flow friction reduction. Runner replacements projects saw an average efficiency increase of 8.23%. As for downgrades, both the Harmony and Roseway Hydro Generating Units are no longer operational. Efforts are currently underway to determine the feasibility of returning these units to service.

(f) There are no current plans to increase the size of the Hydro capacity through addition of generating units. Improvements to the efficiency of hydro units will continue through runner replacements or pipeline replacements, which will increase the generating capacity. As discussed in part (e), the Harmony and Roseway Hydro generating units are longer operational and the decision to retire or refurbish these units is currently being evaluated. No retirements of any Hydro units currently operational are anticipated in the foreseeable future.

(g) Please refer to Attachment 6.

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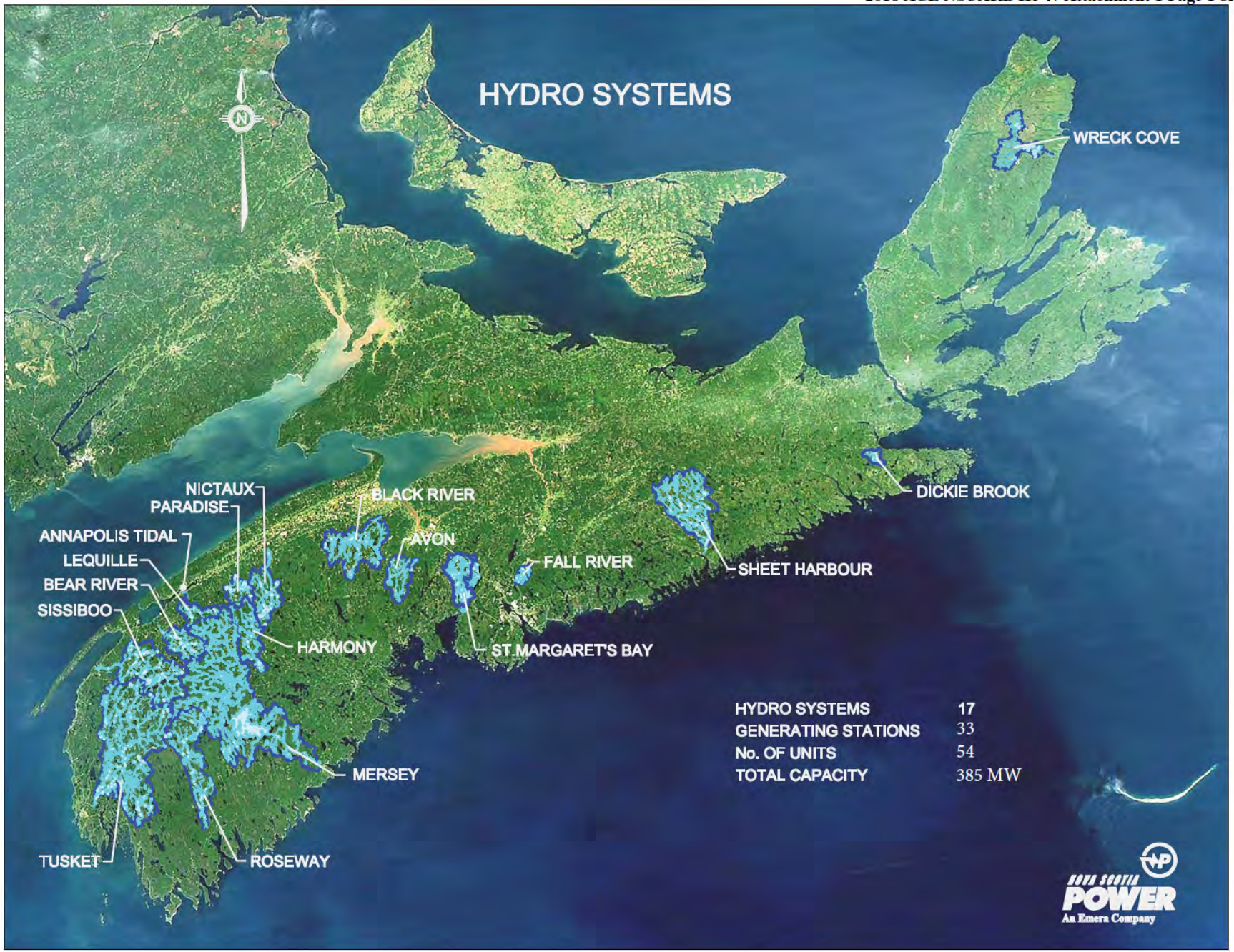
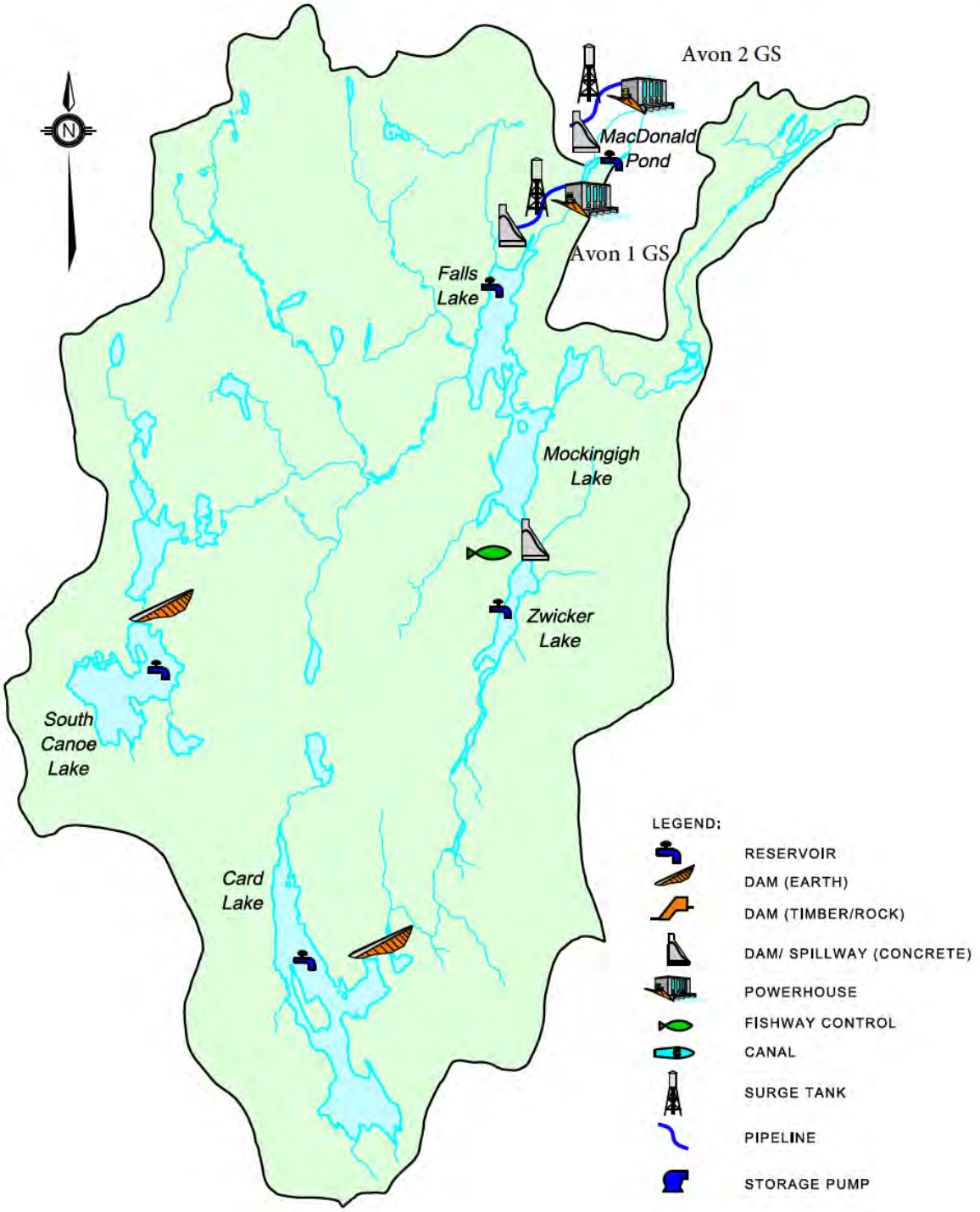
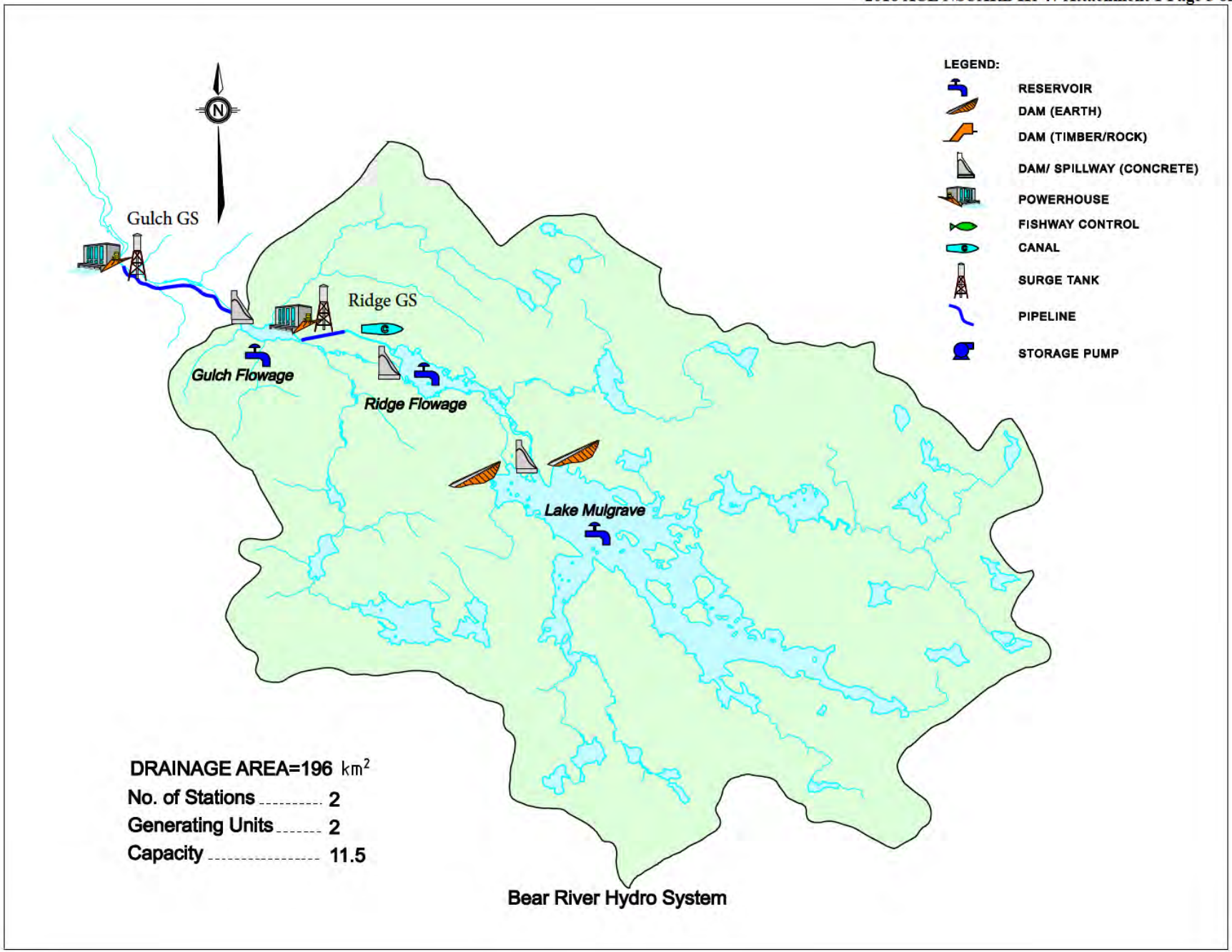


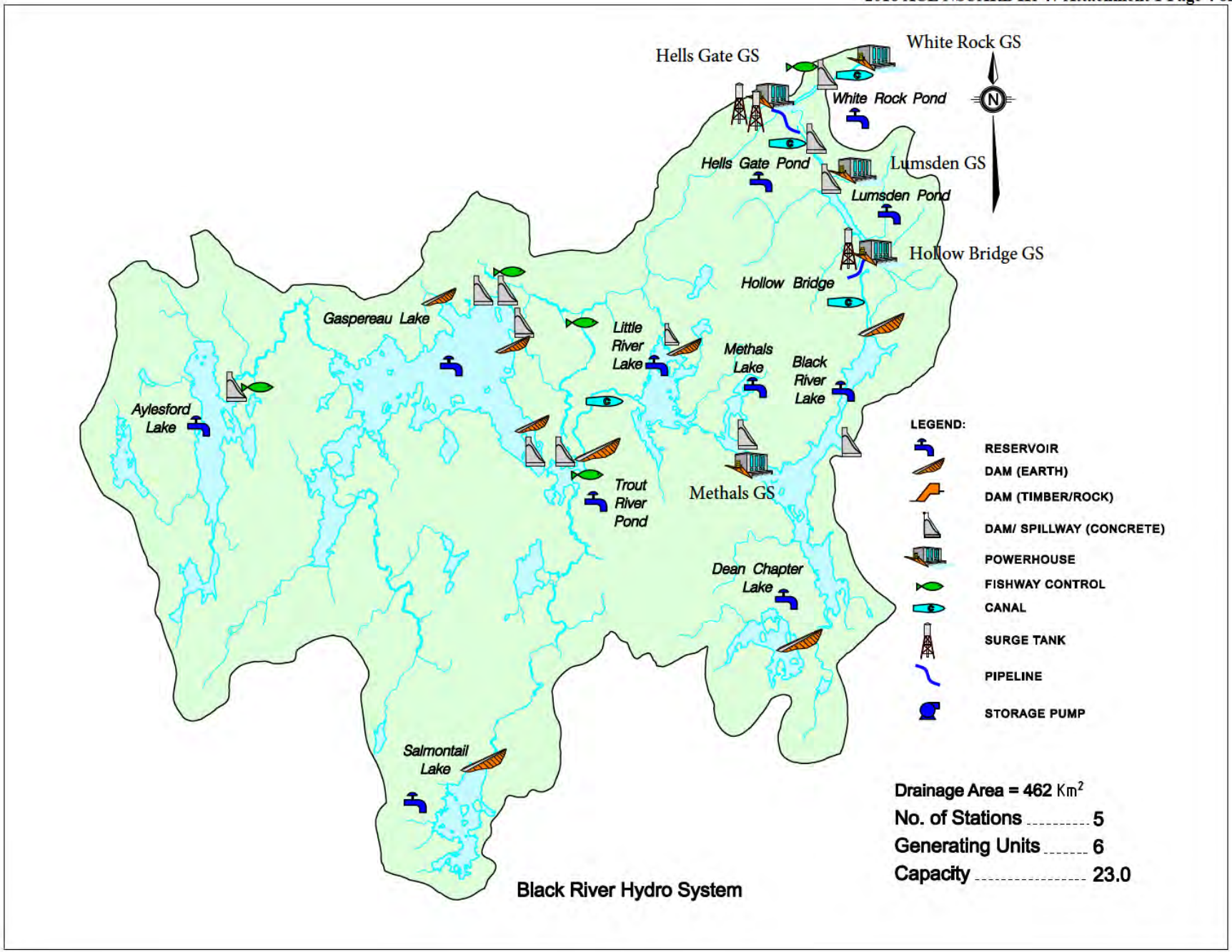


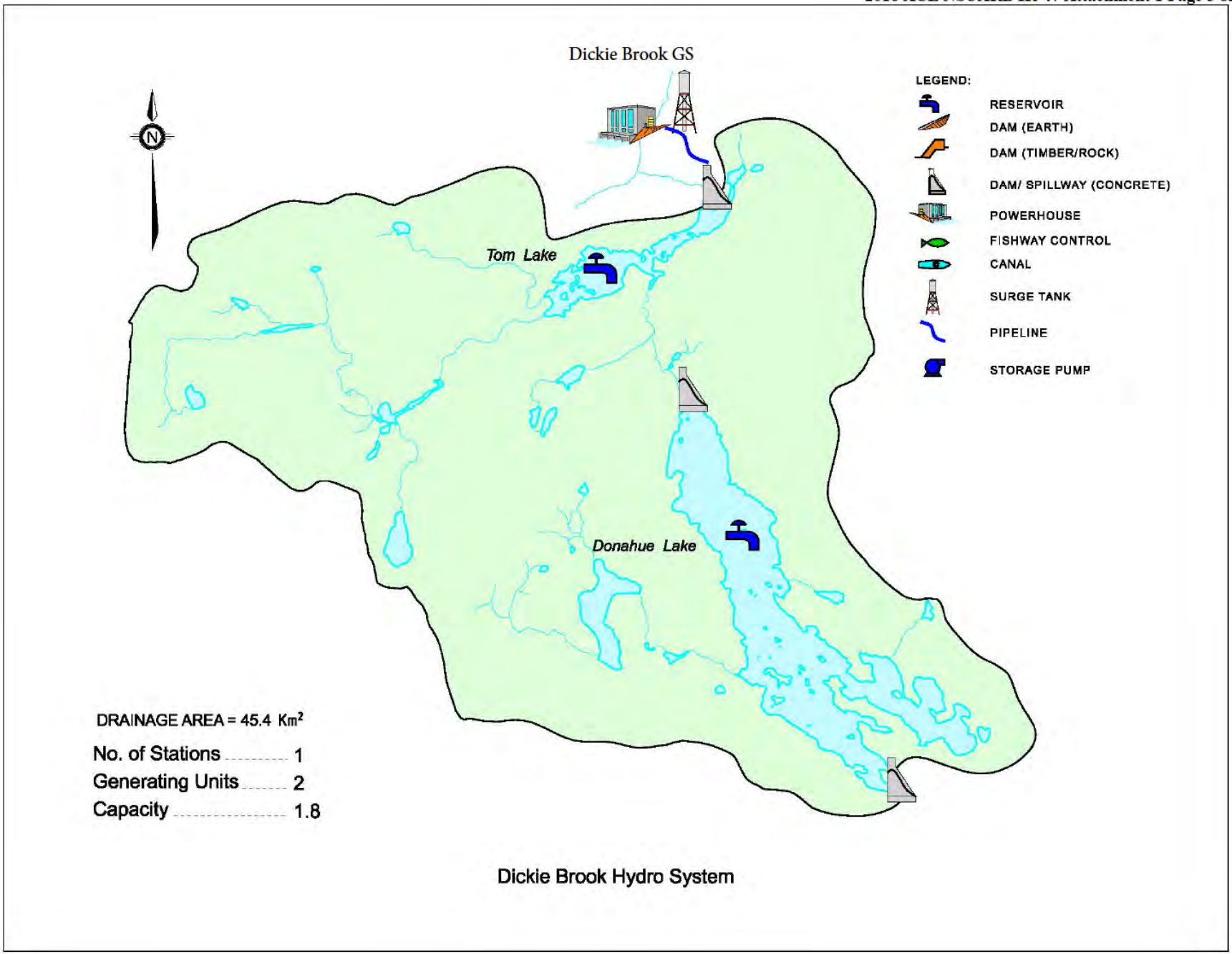
DRAINAGE AREA = 182.5 km²

No. of Stations 2
Generating Units 2
Capacity 7.6

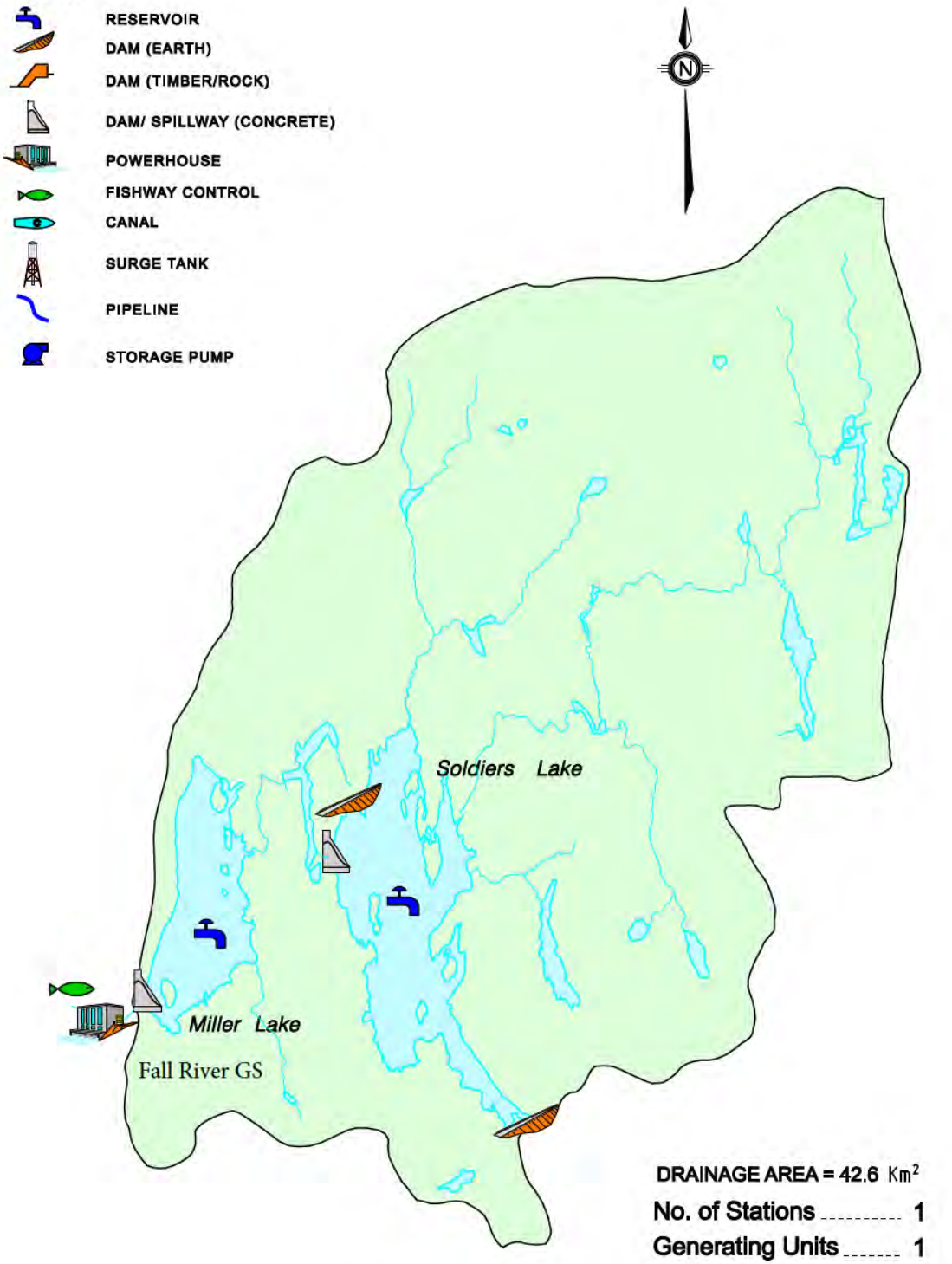
Avon Hydro System


LEGEND:
RESERVOIR
DAM (EARTH)
DAM (TIMBER/ROCK)
DAM/ SPILLWAY (CONCRETE)
POWERHOUSE
FISHWAY CONTROL
CANAL
SURGE TANK
PIPELINE
STORAGE PUMP
Gulch GS
Ridge GS
Gulch Flowage
Ridge Flowage
Lake Mulgrave
DRAINAGE AREA=196 km²
No. of Stations ---------- 2
Generating Units ------- 2
Capacity ---------- 11.5
Bear River Hydro System

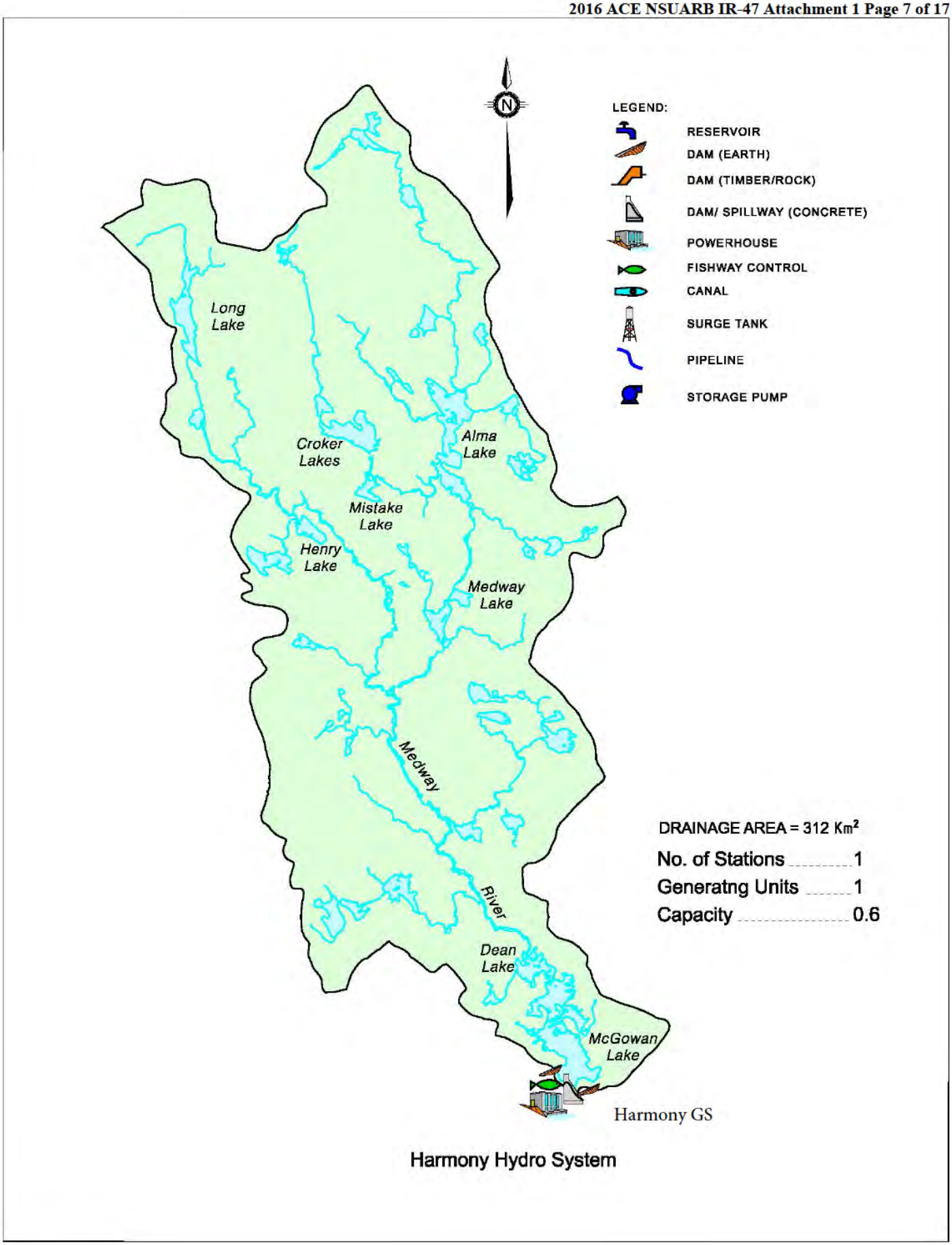

Hells Gate GS
White Rock GS
White Rock Pond
Hells Gate Pond
Lumsden GS
Lumsden Pond
Hollow Bridge GS
Hollow Bridge
Gaspereau Lake
Little River Lake
Methals Lake
Black River Lake
Aylesford Lake
Trout River Pond
Methals GS
Dean Chapter Lake
Salmontail Lake
LEGEND:
RESERVOIR
DAM (EARTH)
DAM (TIMBER/ROCK)
DAM/ SPILLWAY (CONCRETE)
POWERHOUSE
FISHWAY CONTROL
CANAL
SURGE TANK
PIPELINE
STORAGE PUMP
Drainage Area = 462 Km2
No. of Stations 5
Generating Units 6
Capacity 23.0
Black River Hydro System



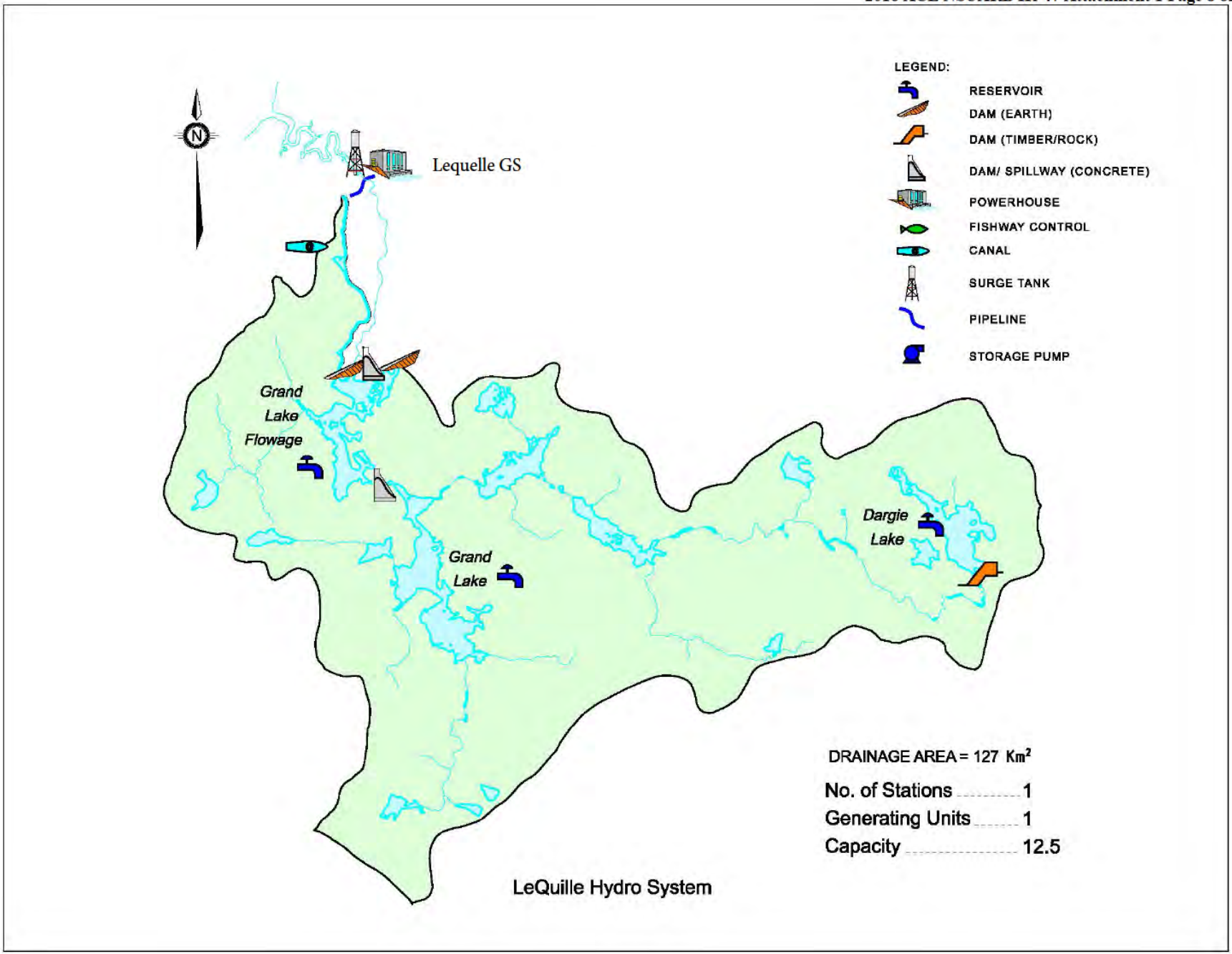
Dickie Brook Hydro System

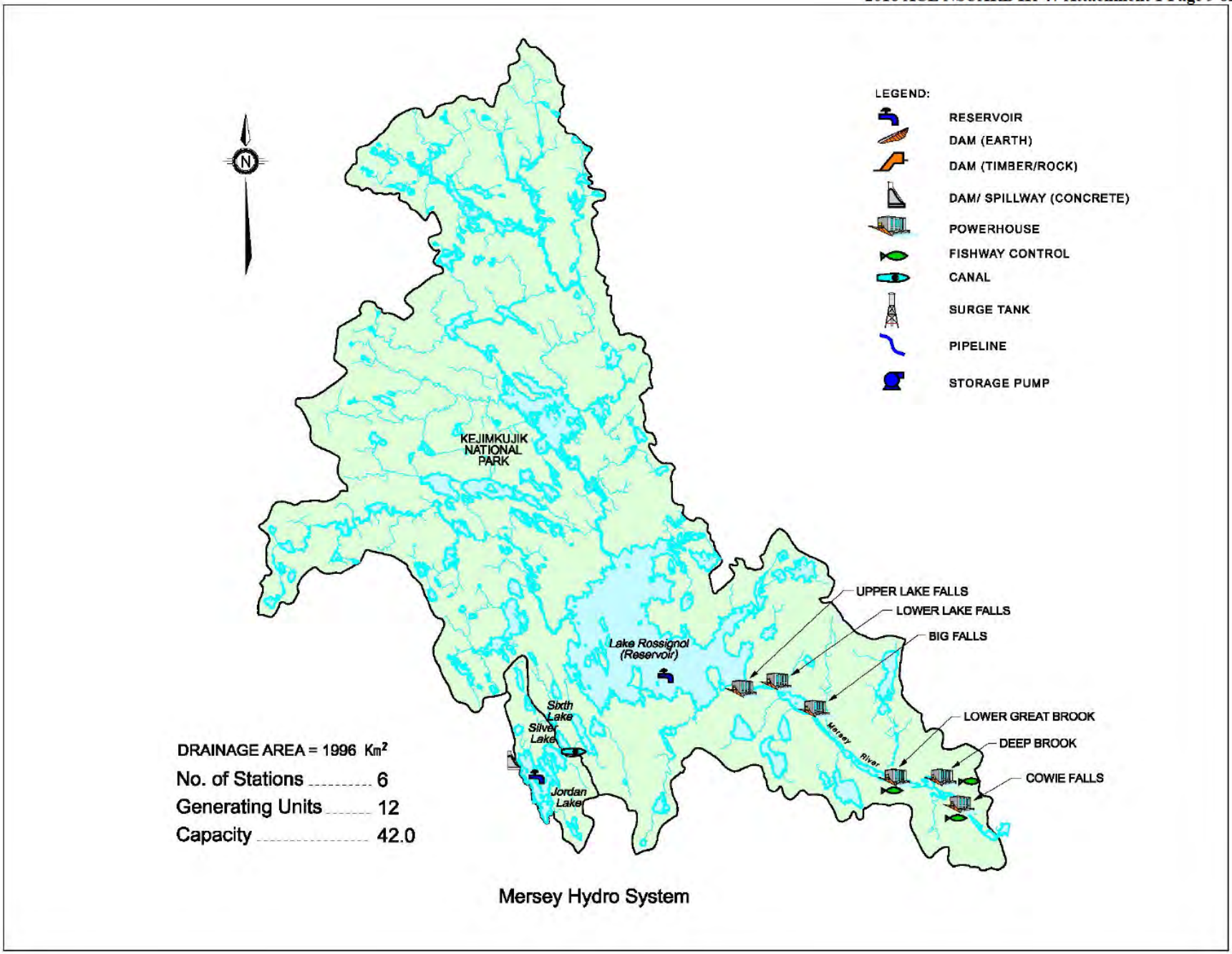


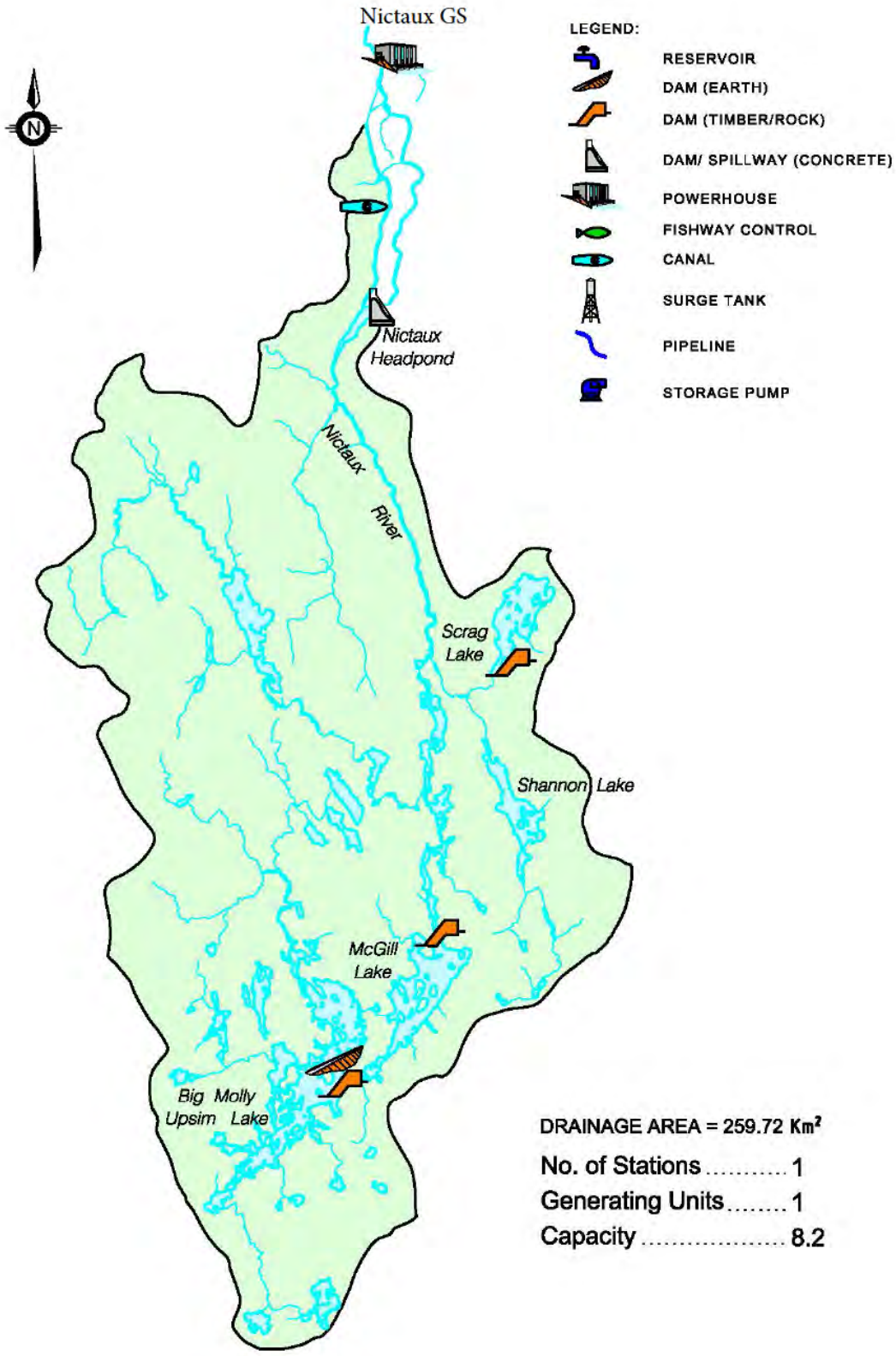
Fall River Hydro System



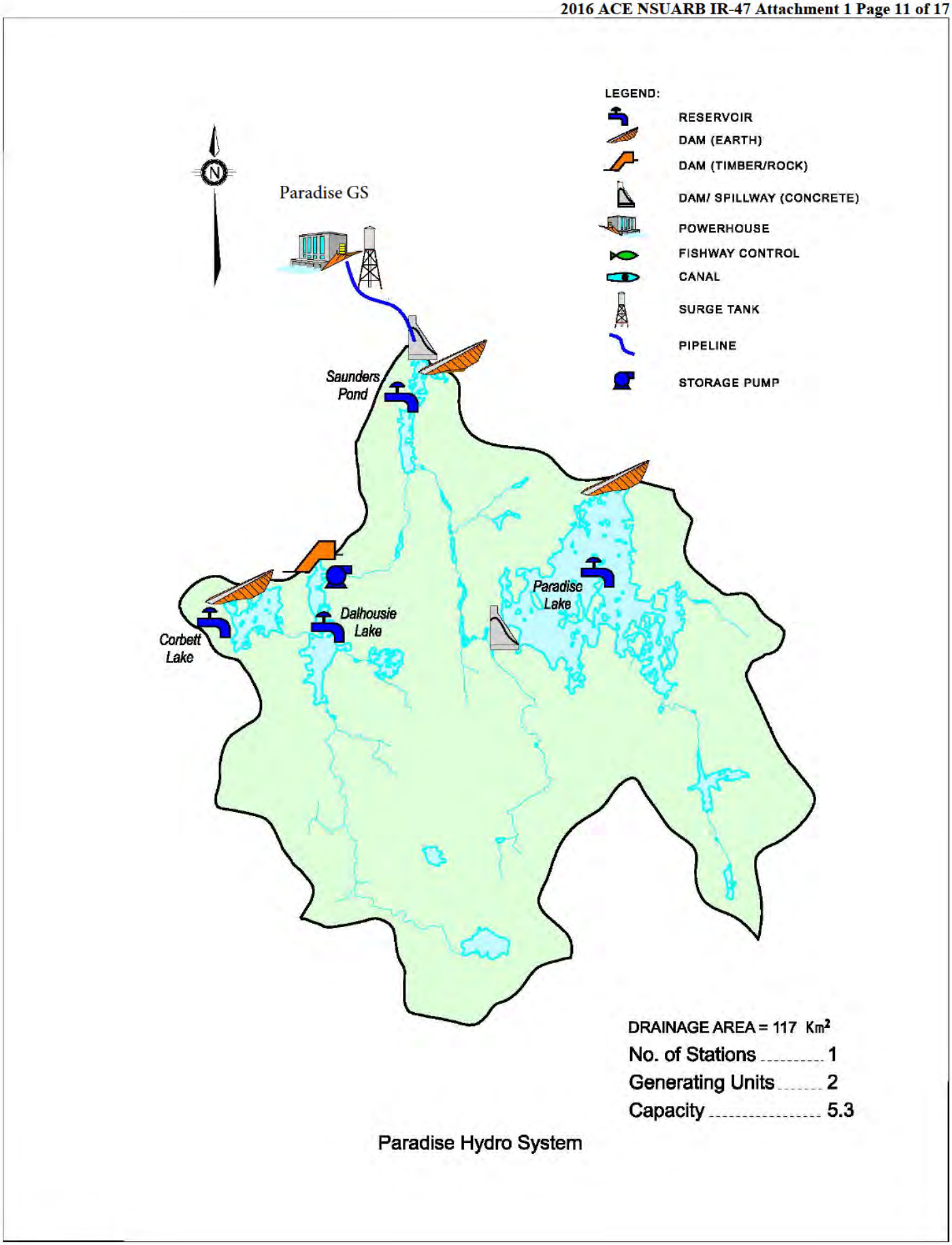
Harmony Hydro System


LEGEND:
RESERVOIR
DAM (EARTH)
DAM (TIMBER/ROCK)
DAM/ SPILLWAY (CONCRETE)
POWERHOUSE
FISHWAY CONTROL
CANAL
SURGE TANK
PIPELINE
STORAGE PUMP
N
Lequelle GS
Grand Lake Flowage
Grand Lake
Dargie Lake
DRAINAGE AREA = 127 Km²
No. of Stations 1
Generating Units 1
Capacity 12.5
LeQuille Hydro System

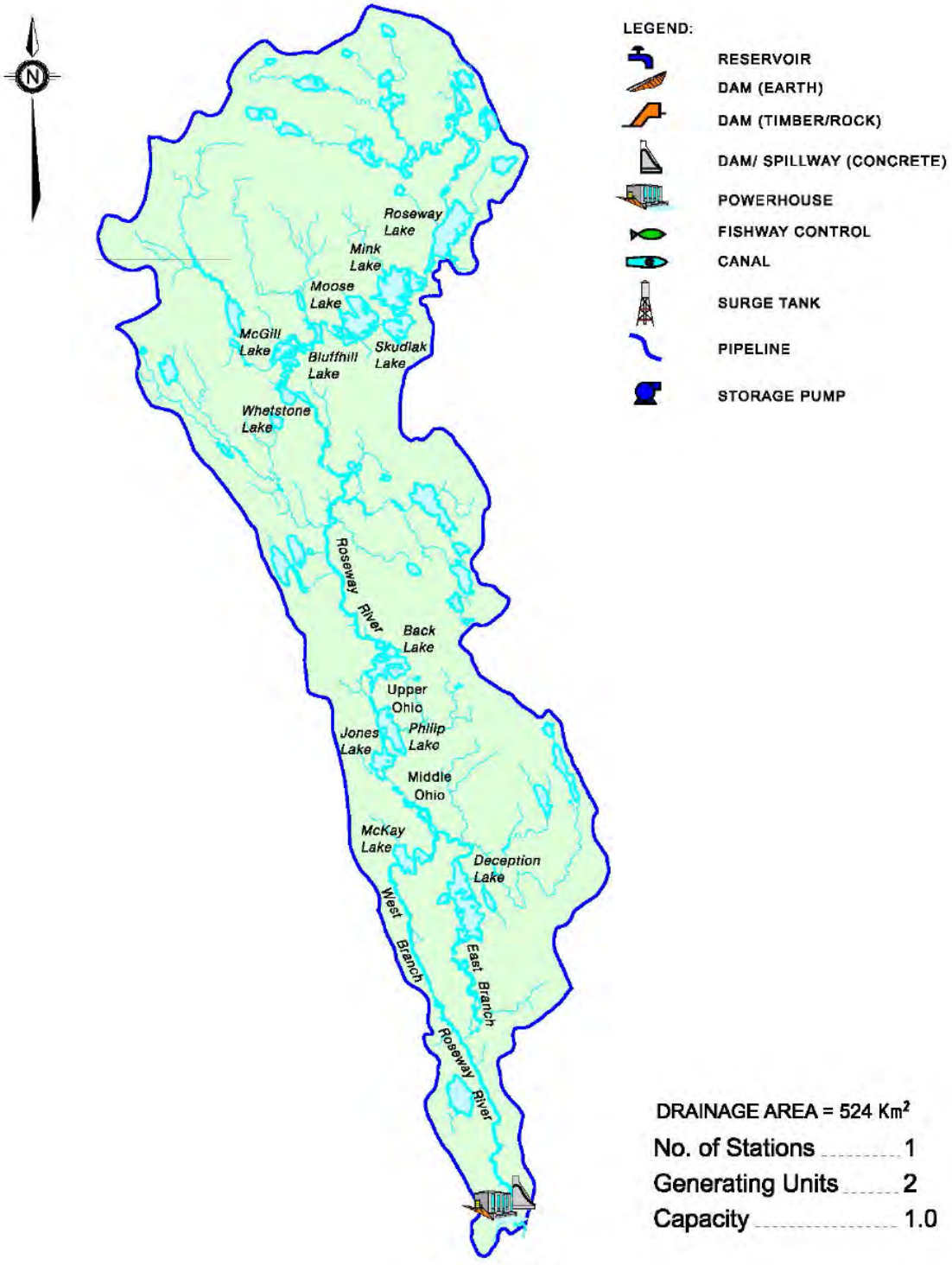

LEGEND:
RESERVOIR
DAM (EARTH)
DAM (TIMBER/ROCK)
DAM/ SPILLWAY (CONCRETE)
POWERHOUSE
FISHWAY CONTROL
CANAL
SURGE TANK
PIPELINE
STORAGE PUMP
N
KEJIMKUJIK NATIONAL PARK
Lake Rossignol (Reservoir)
Sixth Lake
Silver Lake
Jordan Lake
UPPER LAKE FALLS
LOWER LAKE FALLS
BIG FALLS
LOWER GREAT BROOK
DEEP BROOK
COWIE FALLS
Mersey River
DRAINAGE AREA = 1996 Km²
No. of Stations 6
Generating Units 12
Capacity 42.0
Mersey Hydro System



Nictaux Hydro System

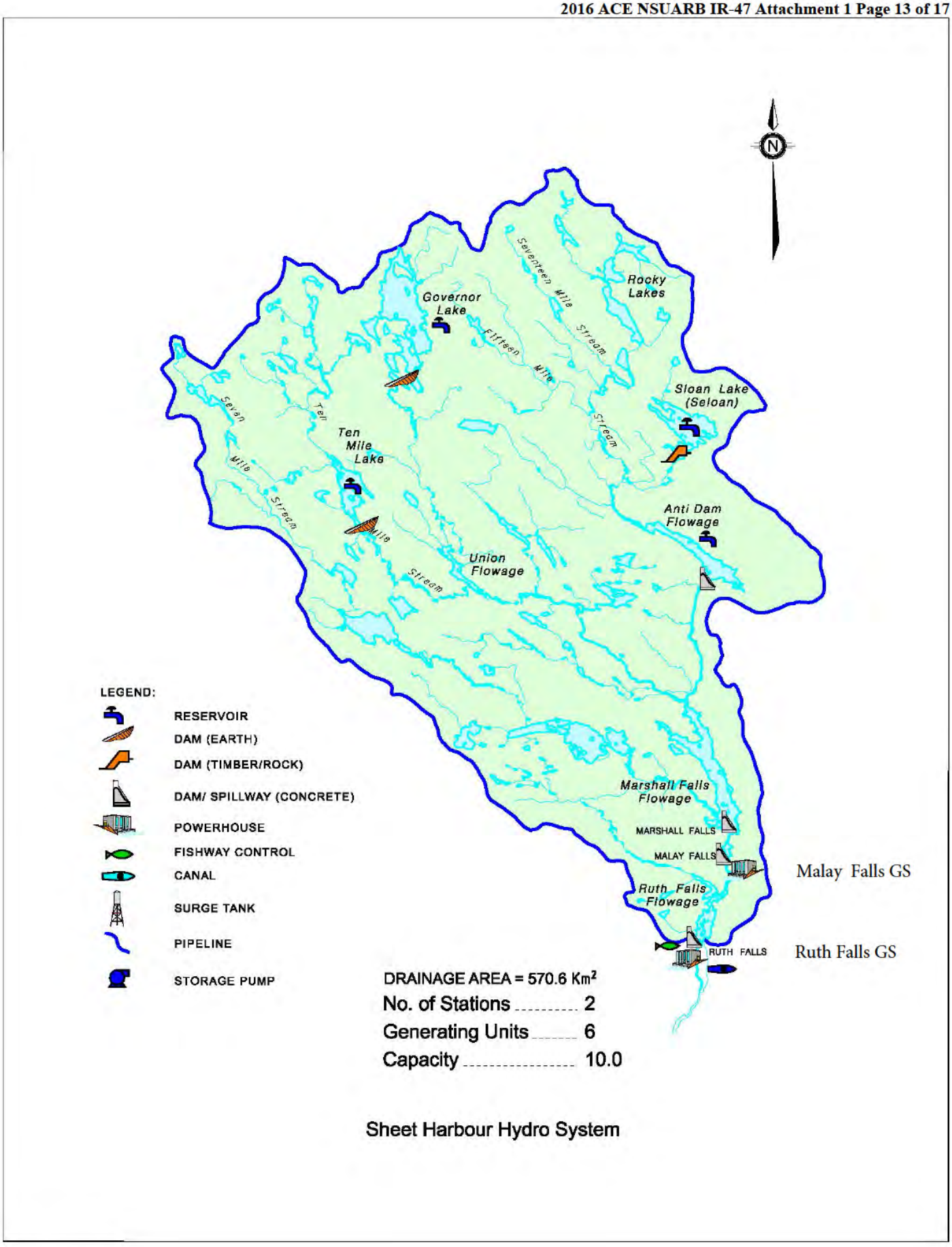


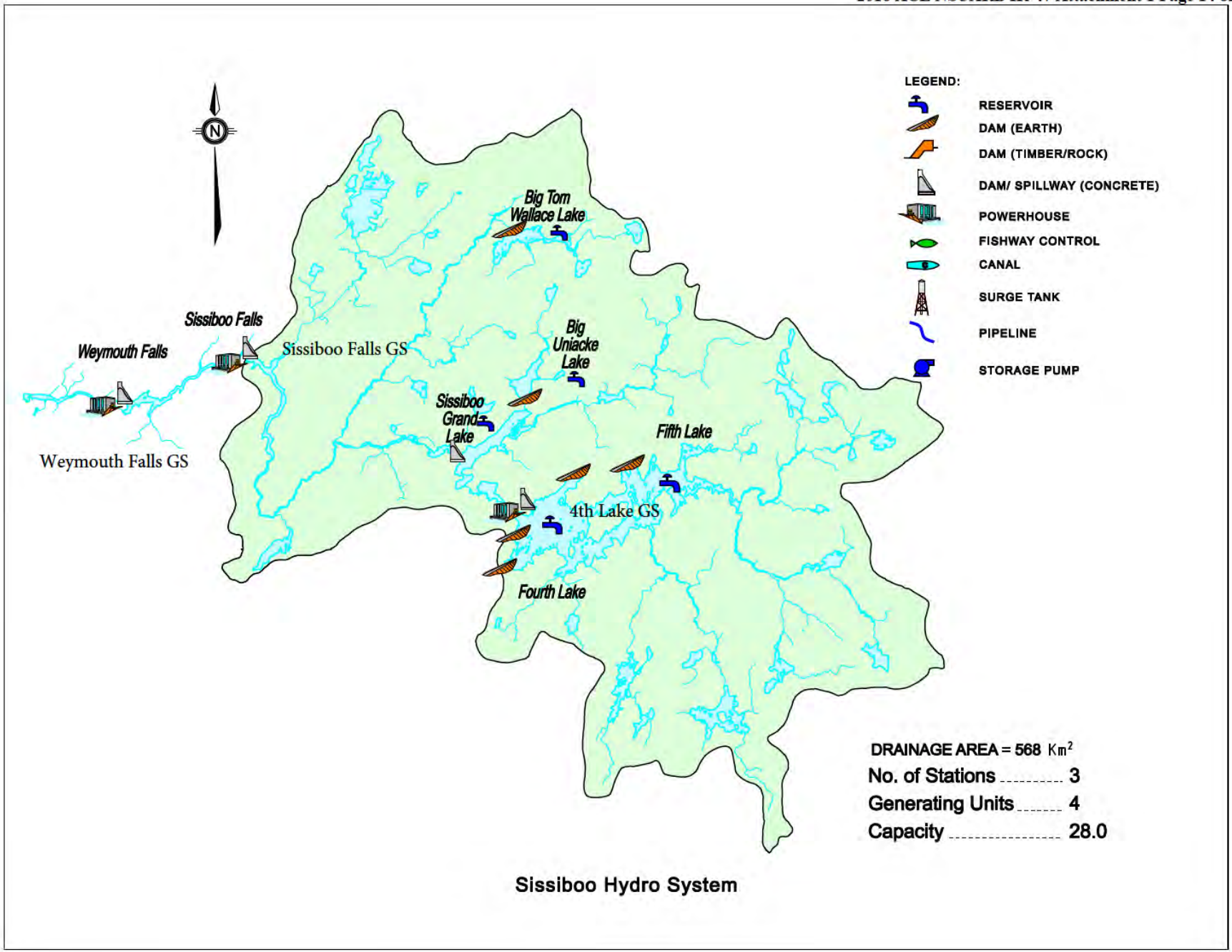
Paradise Hydro System

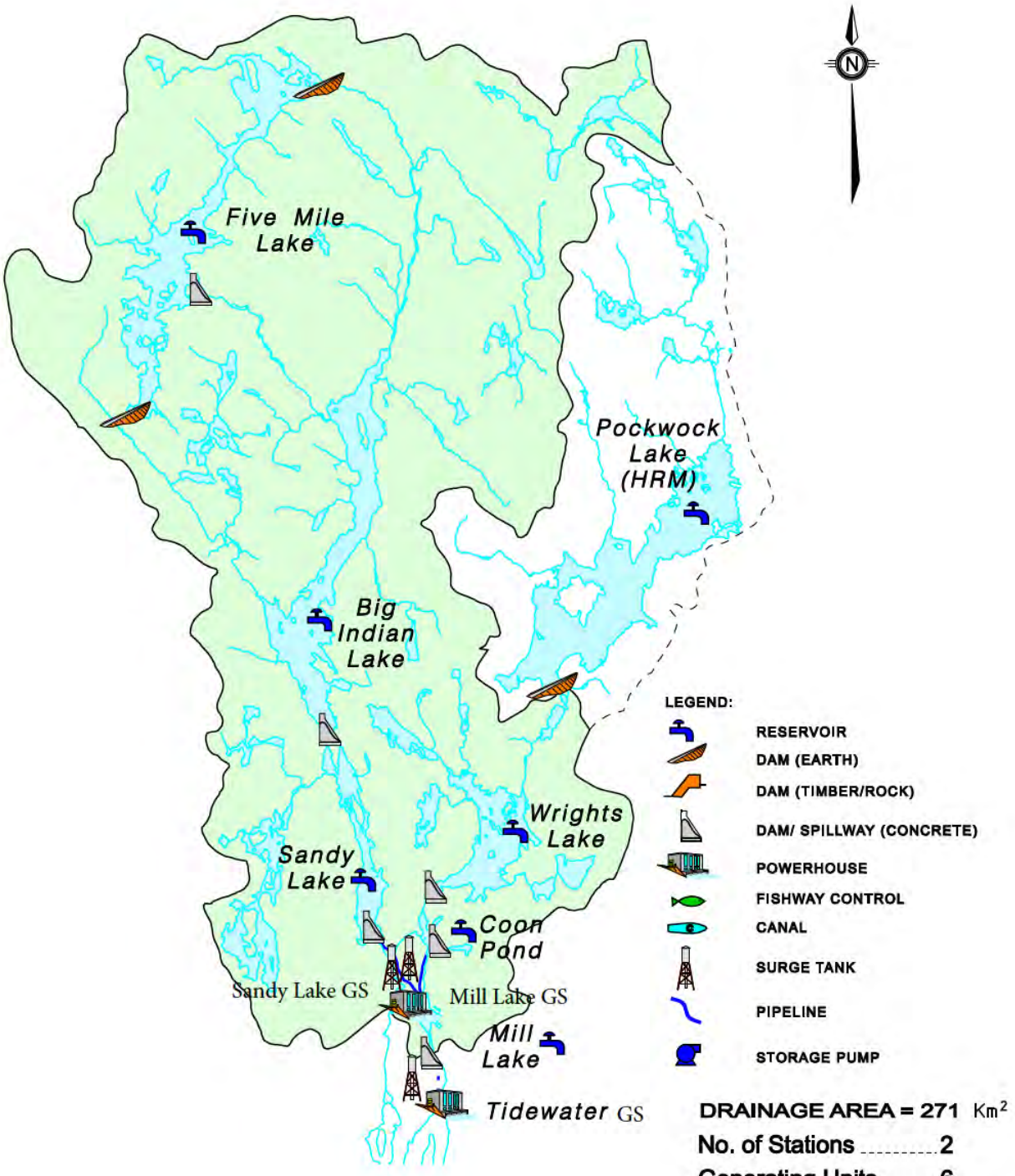


Roseway GS

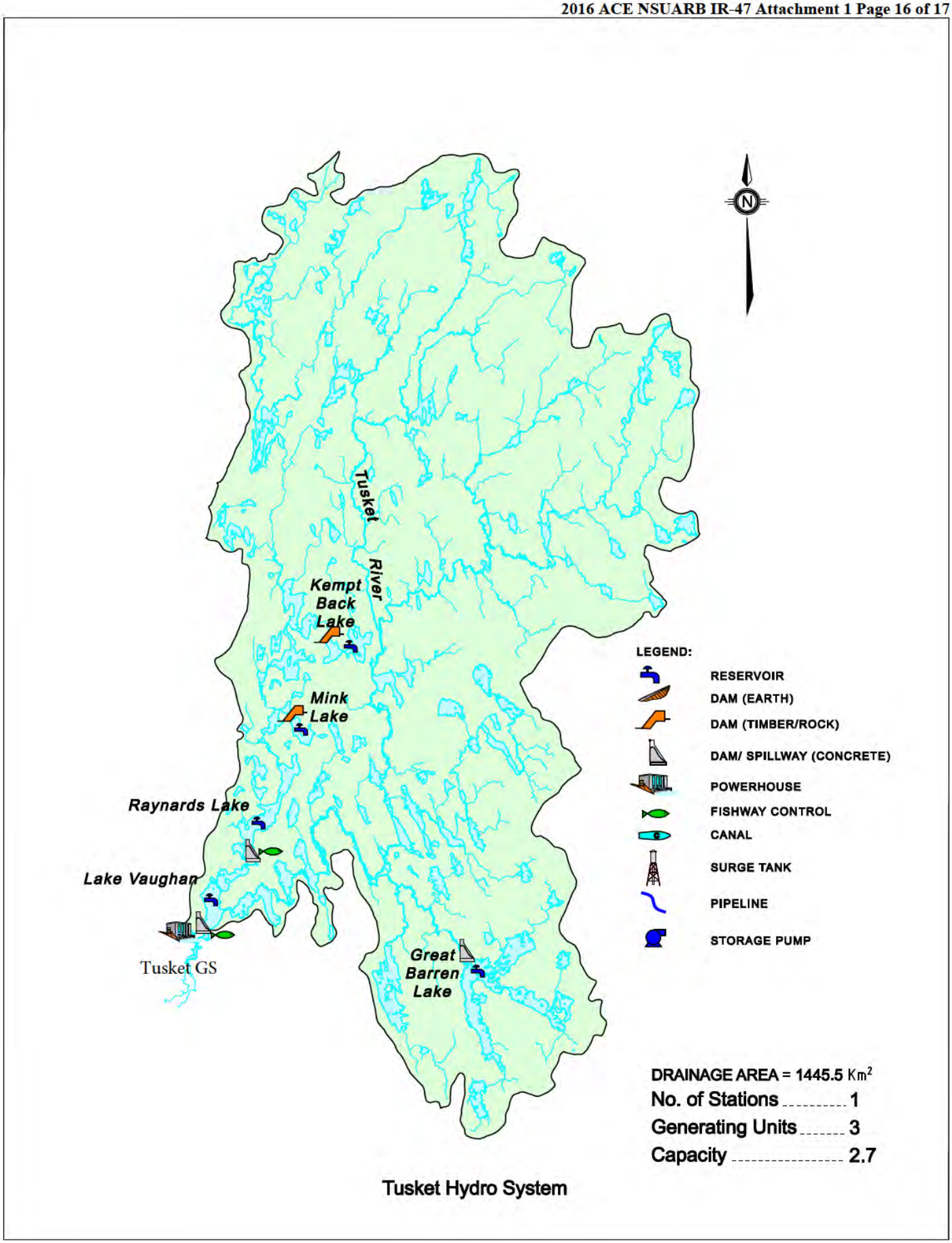
Roseway Hydro System


N
Governor Lake
Rocky Lakes
Seventeen Mile Stream
Fifteen Mile Stream
Sloan Lake (Seloan)
Seven Ten Mile Stream
Ten Mile Lake
Anti Dam Flowage
Union Flowage
Marshall Falls Flowage
MARSHALL FALLS
MALAY FALLS
Malay Falls GS
Ruth Falls Flowage
RUTH FALLS
Ruth Falls GS
LEGEND:
RESERVOIR
DAM (EARTH)
DAM (TIMBER/ROCK)
DAM/ SPILLWAY (CONCRETE)
POWERHOUSE
FISHWAY CONTROL
CANAL
SURGE TANK
PIPELINE
STORAGE PUMP
DRAINAGE AREA = 570.6 Km²
No. of Stations 2
Generating Units 6
Capacity 10.0
Sheet Harbour Hydro System

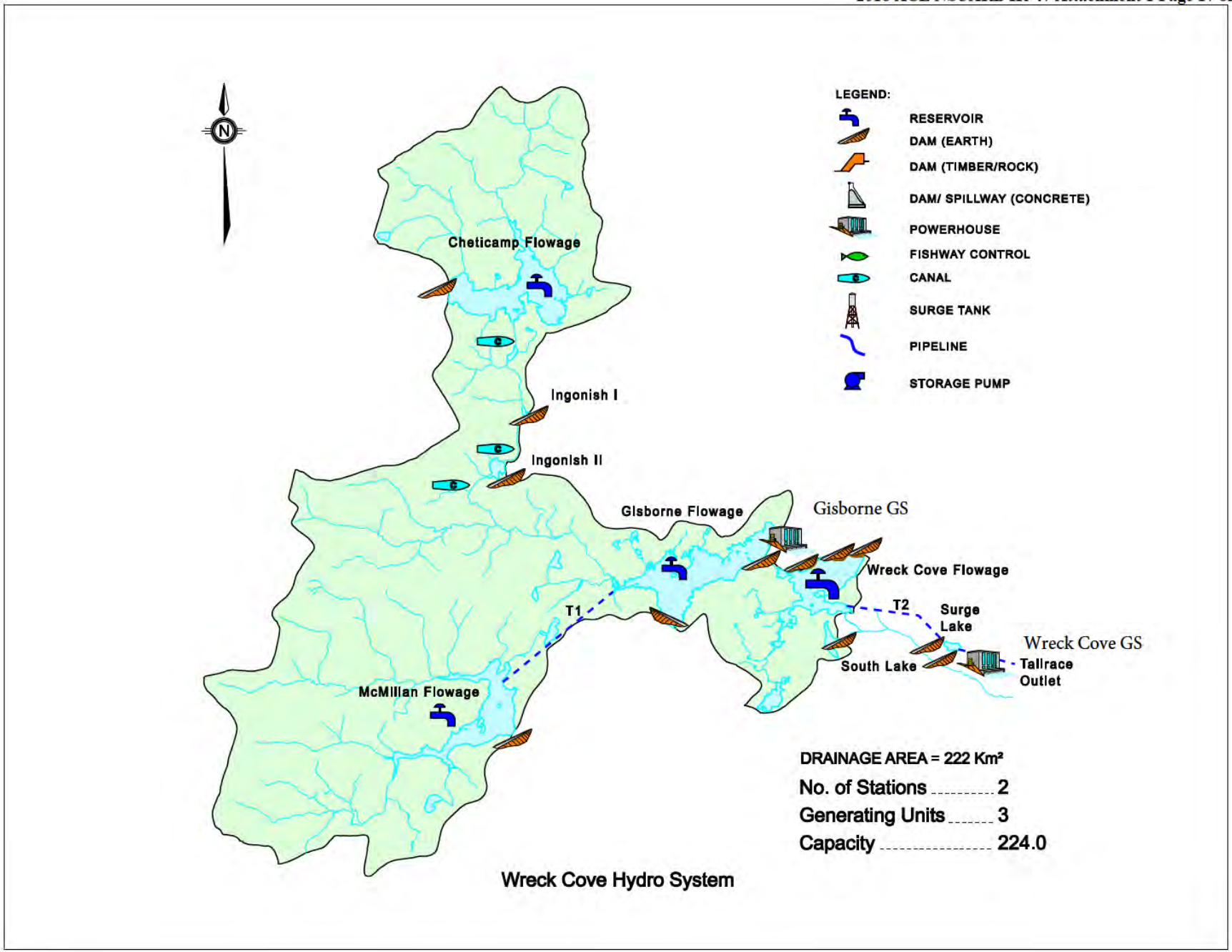

LEGEND:
RESERVOIR
DAM (EARTH)
DAM (TIMBER/ROCK)
DAM/ SPILLWAY (CONCRETE)
POWERHOUSE
FISHWAY CONTROL
CANAL
SURGE TANK
PIPELINE
STORAGE PUMP
Big Tom Wallace Lake
Sissiboo Falls
Weymouth Falls
Sissiboo Falls GS
Big Uniacke Lake
Sissiboo Grand Lake
Fifth Lake
Weymouth Falls GS
4th Lake GS
Fourth Lake
DRAINAGE AREA = 568 Km²
No. of Stations 3
Generating Units 4
Capacity 28.0
Sissiboo Hydro System



St. Margaret's Bay Hydro System



Tusket Hydro System


LEGEND:
RESERVOIR
DAM (EARTH)
DAM (TIMBER/ROCK)
DAM/ SPILLWAY (CONCRETE)
POWERHOUSE
FISHWAY CONTROL
CANAL
SURGE TANK
PIPELINE
STORAGE PUMP
Cheticamp Flowage
Ingonish I
Ingonish II
Gisborne Flowage
Gisborne GS
Wreck Cove Flowage
T1
T2
Surge Lake
Wreck Cove GS
South Lake
Tailrace Outlet
McMillan Flowage
DRAINAGE AREA = 222 Km²
No. of Stations 2
Generating Units 3
Capacity 224.0
Wreck Cove Hydro System

REDACTED (CONFIDENTIAL INFORMATION REMOVED)

System	Station Name	Unit Name	Station Nameplate Capacity (MW)	Annual Generation MWHRS (5 Year Avg if possible)	Date Commissioned	Impoundment Details	Conveyance	Operating Characteristics							
						Dam Type	Penstock Length (m)	Flow Rated Head (CMS)	Flow Real Operating Capacity (CMS)	Head Rated (m)	Head Maximum (m)	Head Minimum (m)	Turbine Type	Turbine Nameplate Capacity (MW)	Runner Manufacturer
WRECK COVE	Wreck Cove	Unit 1	227	157660	1978	Rock fill embankment	490	66	66	366	366	351	Francis	100	
	Wreck Cove	Unit 2		129080	1978								Francis	100	
	Gisborne	Unit 1	4	8445	1982	Earth fill embankment	122	25 8	21 5	25	25	10 6	Kaplan	3.5	
EVH	Avon # One	Unit 1	7.5	11279	1958	Earth fill embankment	65	14.7		35 8	35.8	32 8	Francis	4.5	American Hydro
	Avon # Two	Unit 2		11410	1928		53						Francis	3	Voith
	Methals	Unit 1	3	3716	1948	Earth fill embankment	10	31 8	31.15	17.7	18.3	17.1	Kaplan	3.4	
	Hollow Bridge	Unit 1	5	23186	1940	Earth fill embankment	510	15 9	16.08	45.1	45.3	43 9	Francis	6	American Hydro
	Lumsden	Unit 1	3	10641	1942	Earth fill embankment	100	19	17.84	22	22	20.4	Francis	2.8	American Hydro
	Hell's Gate	Unit 1	7	17548	1931	Concrete gravity	1465	7.6	15.86	56.4	56.4	54 3	Francis	4.2	American Hydro
	Hell's Gate	Unit 2		15603	1949								Francis	3.57	
	White Rock	Unit 1	3	12401	1952	Concrete gravity	30	21 5	25 5	17.7	18.3	17.1	Francis	3.2	American Hydro
	Lequille	Unit 1	13	25565	1968	Earth fill embankment	488	12 2	6.34	117.7	118 3	116.3	Francis	11.18	American Hydro
	Nictaux	Unit 1	7	40404	1954	Earth fill embankment	1350	7.5		122	123 9	121.2	Francis	8.2	American Hydro
	Paradise	Unit 1	5	23028	1950	Earth fill embankment	3688	4.5		153 92	153.92	152 54	Francis	5	American Hydro
FUNDY	Fourth Lake	Unit 1	3	10295	1983	Earth fill embankment	93	17.1	16.26	21 3	22.7	15 2	Kaplan	3	
	Sissiboo	Unit 1	6.2	25731	1961	Concrete gravity	49	28 9		26 5	26.5	25 9	Francis	6.2	American Hydro
	Weymouth	Unit 1	19	40958	1961	Earth fill embankment	261	30 9		37 2	39 01	36	Francis	9.5	American Hydro
	Weymouth	Unit 2			1961								Francis	9.5	
	Tusket	Unit 1	2.4	12476	1929	Concrete gravity		13.7		6.7	8.53	7 31	Kaplan	0.8	
	Tusket	Unit 2			1929								Kaplan	0.8	
	Tusket	Unit 3			1929								Kaplan	0.8	
	Ridge	Unit 1	4	9012	1957	Earth fill embankment	955	11 9		42.7	45.1	43.88	Francis	4	
	Gulch	Unit 1	7.5	21248	1952	Earth fill embankment	3158	10.1		76 2	77.4	76	Francis	7.5	American Hydro
	Annapolis	Unit 1	20	29266	1984					5.5	7.1	1.4	Straflo	19 9	
WESTERN	Upper Lake Falls #1	Unit 1	6	12798	1929			53 2	53 2	10.7	12.8	6.4	Kaplan	2.6	
	Upper Lake Falls #2	Unit 2		11826	1929	Earth fill embankment							Kaplan	2.8	
	Lower Lake Falls #3	Unit 1	7	21503	1929	Earth fill embankment		68 8	68 8	14 6	14.6	13.1	Francis	3.69	Barber
	Lower Lake Falls #4	Unit 2		20688	1929								Francis	3.5	Barber
	Big Falls #5	Unit 1	11	26865	1929	Earth fill embankment		68 2	68 2	17.7	17.7	16	Francis	5.3	American Hydro
	Big Falls #6	Unit 2		25255	1929								Francis	5.3	American Hydro
	Lower Great Brook #7	Unit 1	4	9934	1955	Earth fill embankment		88.4	88.4	6.7	6.7	6.1	Kaplan	2	
	Lower Great Brook #8	Unit 2		9737	1955								Kaplan	1.9	
	Deep Brook #9	Unit 1	9	23204	1950	Earth fill embankment		86 6	86 6	14	14	12 5	Kaplan	4.5	American Hydro
	Deep Brook #10	Unit 2		20366	1950								*Mix Flow	4.6	American Hydro
	Cowie Falls #11	Unit 1	7	18449	1938	Concrete gravity		76.4	76.4	12.7	12.7	10 3	*Mix Flow	3.8	American Hydro
	Cowie Falls #12	Unit 2		17350	1938								*Mix Flow	3.6	American Hydro
	Roseway	Unit 1	1	438	1931	Concrete gravity	24	14.4	14.4	7.6	8 2	7	Francis(2)	0.32	
	Roseway	Unit 2		2216	1931								Francis	0.6	
	Harmony	Unit 1	1	2884	1943	Concrete gravity	46	6.8	6.8	11 3	11.3	10.1	Francis(2)	0.6	
HALIFAX/ EASTERN SHORE	Mill Lake	Unit 1	2	1865	1922	Concrete gravity	1056	6.6	6.6	49.4	49.4	48 8	Francis	1.28	
	Mill Lake	Unit 2		1821	1922								Francis	1.28	
	Sandy Lake	Unit 1	4	6445	1928	Concrete gravity	1757	13	13	38.1	38.1	35 5	Francis	1.8	American Hydro
	Sandy Lake	Unit 2		4624	1928								Francis	1.8	
	Tide Water	Unit 1	4	5383	1922	Concrete gravity	1037	17 6	17 6	29	29	28.4	Francis	2	
	Tide Water	Unit 2		5238	1922								Francis	2.2	American Hydro
	Fall River	Unit 1	1	2207	1985	Concrete gravity	174	2.2	2.2	25.4	25.4	24 2	Francis	0.5	
	Malay Falls	Unit 4	3	12261	1924	Earth fill embankment		14		12 5	12.5		Francis	1.2	American Hydro
	Malay Falls	Unit 5			1924								Francis	1.2	Barber
	Malay Falls	Unit 6			1924								Francis	1.2	American Hydro
	Ruth Falls	Unit 1	7	31825	1925	Earth fill embankment		9.1		33 2	33.2		Francis	2	
	Ruth Falls	Unit 2			1925								Francis	2	
	Ruth Falls	Unit 3			1925								Francis	2.97	
	Dickie Brook	Unit 1	1	7512	1948	Earth fill embankment		1.8		11 3	11.3	11 3	Francis	1	
	Dickie Brook	Unit 2	1		1948								Francis	1	

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System	Station Name	Turbine Details						Generator Details							
		Original Turbine Manufacturer	Turbine Year In Service	Turbine RPM	Turbine Position	Reversible	Turbine Year Last Major OH	Genenerator Nameplate Capacity (MW)	Generator Manufacturer	Generator Year In Service	Gen Frequency	Generator Year Last Rewind	Thrust Bearing Type	Brakes
WRECK COVE	Wreck Cove	Mitsubishi	1978	450	Vertical	No	1998	100	Canadian General Elec.	1978	60			Air
	Wreck Cove	Mitsubishi	1978	450	Vertical	No	2002	100	Canadian General Elec.	1978	60			Air
	Gisborne	Allis Chalmers	1982	262	Horizontal	No	2007	3.5	Shinko	1982	60			
EVH	Avon # One	Can. Vickers	1992	360	Vertical	No	1992	7.5	Brown Boveri	1958	60			
	Avon # Two	Dominion Engineering	1996	400	Vertical	No	2004	3	Dominion Engineering	1928	60	2015		
	Methals	Dominion Engineering	1948	240	Vertical	No	1987	3.4	Westinghouse	1948	60			
	Hollow Bridge	Dominion Engineering	1996	257	Vertical	No	1996	5.312	Canadian General Elec.	1940	60		Spring Bed	Air
	Lumsden	Dominion Engineering	2012	257	Vertical	No	2012	2.8	Westinghouse	1942	60		Kingsbury	
	Hell's Gate	Dominion Engineering	2005	450	Vertical	No	2005	4	A.S.E A.	1930	60	2000		
	Hell's Gate	Dominion Engineering	1949	450	Vertical	No	2003	3 57	Westinghouse	1949	60		Kingsbury	
	White Rock	Dominion Engineering	1998	200	Vertical	No	1998	3.2	American Hydro	1952	60			
	Lequille	Dominion Engineering	1993	514	Vertical	No	1992	11.18	Brown Boveri	1968	60			Air
	Nictaux	Dominion Engineering	2001	600	Vertical	No	2013	6.8	Westinghouse	1954	60	2014	Kingsbury	
	Paradise	Vickers (Leffel)	1999	720	Vertical	No	1999	3.6	Westinghouse	1950	60	1999	Kingsbury	
FUNDY	Fourth Lake	Sultzer	1983	360	Horizontal	No	1996	3.75	General Electric	1983	60		Spring Bed	
	Sissiboo	K M.W. & Johnson (Canada)	1997	225	Vertical	No	2015	7.5	Westinghouse Ltd.	1961	60		Kingsbury	
	Weymouth	K M.W.Johnson & Co. (Cana	2010	257	Vertical	No	2010	11.25	Westinghouse	1961	60	2015	Kingsbury	Air
	Weymouth	K M.W. Johnson Co.	1967	257	Vertical	No	2013	11.25	Can. Westinghouse	1967	60		Kingsbury	Air
	Tusket	S. Morgan Smith Inglis Co.	1929	225	Vertical	No	1981	0.9	Canadian General Elec.	1929	60		Spring Bed	
	Tusket	S. Morgan Smith Inglis Co.	2014	225	Vertical	No	2014	0.9	Can. Westinghouse	1929	60		Kingsbury	
	Tusket	S. Morgan Smith Inglis Co.	1929	225	Vertical	No	2009	0.9	Can. Westinghouse	1929	60		Kingsbury	
	Ridge	S. Morgan Smith Can Ltd.	1957	360	Vertical	No	1994	5	Canadian General Elec.	1957	60		Spring Bed	
	Gulch	Can Vickers Ltd.	1996	400	Vertical	Undefined	2000	9	Can. Westinghouse	1952	60	2000	Kingsbury	
	Annapolis	Straflo	1984		Horizontal		1999	19 9	General Electric	1984			Spring Bed	
WESTERN	Upper Lake Falls #1	Dominion Engineering	1929	180	Vertical	No	2015	2.7	Swedish Gen. Electric	1929	60	1981	Spring Bed	Hydraulic
	Upper Lake Falls #2	Dominion Engineering	1929	180	Vertical	No	1999	2.7	Swedish Gen. Electric	1929	60	1982	Spring Bed	Hydraulic
	Lower Lake Falls #3	S. Morgan Smith Can. Ltd.	1982	150	Vertical	No	1984	3 69	Swedish Gen. Electric	1929	60	1979	Spring Bed	Hydraulic
	Lower Lake Falls #4	S. Morgan Smith Can. Ltd.	1982	150	Vertical	No	1985	3 69	Swedish Gen. Electric	1929	60		Spring Bed	Hydraulic
	Big Falls #5	S. Morgan Smith Can. Ltd.	1988	164	Vertical	No	2011	4.5	Swedish Gen. Electric	1929	60	1980	Spring Bed	Hydraulic
	Big Falls #6	S. Morgan Smith Can. Ltd.	1988	164	Vertical	No	2013	4.5	Swedish Gen. Electric	1929	60		Spring Bed	Hydraulic
	Lower Great Brook #7	S. Morgan Smith Can. Ltd.	1955	128	Vertical	No	1984	2 25	Can. Westinghouse	1955	60		Kingsbury	Hydraulic
	Lower Great Brook #8	S. Morgan Smith Can. Ltd.	1955	128	Vertical	No	1985	2 25	Can. Westinghouse	1955	60		Kingsbury	Hydraulic
	Deep Brook #9	S. Morgan Smith Can. Ltd.	2002	200	Vertical	No	2005	4.5	Can. Westinghouse	1950	60		Kingsbury	Hydraulic
	Deep Brook #10	S. Morgan Smith Can. Ltd.	1997	200	Vertical	No	1998	4.5	Can. Westinghouse	1950	60	2007	Kingsbury	Hydraulic
	Cowie Falls #11	S. Morgan Smith Can. Ltd.	1988	200	Vertical	No	2004	3.6	Oerlicon Can Ltd.	1937	60	1967		Hydraulic
	Cowie Falls #12	S. Morgan Smith Can. Ltd.	1988	200	Vertical	No	2003	3.6	Oerlicon	1937	60			Hydraulic
	Roseway	Can. Vickers	1931	450	Vertical	Undefined	1998	0 32	Bruce Peebles & Co. Ltd.	1931	60	1980		
	Roseway	James Leffel Co.	1959	180	Vertical	No	1999	0.6	General Electric	1959	60		Spring Bed	
	Harmony	Rodney Hunt Mach Co.	1943	200	Horizontal	No	1995	0.8	Westinghouse	1943	60	1988	Kingsbury	
HALIFAX/ EASTERN SHORE	Mill Lake	S. Morgan Smith Co (USA)	1922	450	Vertical	No	1985	1 28	Canadian General Elec.	1922	60	1965	Spring Bed	
	Mill Lake	S. Morgan Smith Co (USA)	1927	450	Vertical	No	2014	1 28	Canadian General Elec.	1922	60	1961	Spring Bed	
	Sandy Lake	Dominion Engineering	2010	450	Vertical	No	2012	1.6	Swedish Gen. Electric	1928	60	2001	Spring Bed	
	Sandy Lake	Dominion Engineering	2012	450	Vertical	No	2005	1.6	Swedish Gen. Electric	1928	60		Spring Bed	
	Tide Water	S. Morgan Smith Can. Ltd.	1922	300	Vertical	No	1986	2 32	Canadian General Elec.	1922	60	1964	Spring Bed	
	Tide Water	S. Morgan Smith Can. Ltd.	1999	300	Vertical	No	1984	2 32	Canadian General Elec.	1922	60	1965	Spring Bed	
	Fall River	Barber Hydraulic	1985	608	Horizontal	No		0.5	Can. Westinghouse	1985	60		Kingsbury	
	Malay Falls	Welman Seaver Morgan	2000	225	Vertical	No	2000	1.2	Can. Westinghouse	1924	60	1971	Kingsbury	
	Malay Falls	James Leffel Co. Ltd.	2015	225	Vertical	No	2015	1.2	Can. Westinghouse	1924	60	1972	Kingsbury	
	Malay Falls	Welman Seaver Morgan	2000	225	Vertical	No	2000	1.2	Can. Westinghouse	1924	60	1971	Kingsbury	
	Ruth Falls	S. Morgan Smith Can. Ltd.	1949	400	Vertical	No	2003	2	Swedish Gen. Electric	1925	60	1990	Spring Bed	
	Ruth Falls	S. Morgan Smith Can. Ltd.	2013	400	Vertical	No	2013	2	Swedish Gen. Electric	1925	60	1971	Spring Bed	
	Ruth Falls	Dominion Engineering	2012	360	Vertical	No	2012	2 97	Mather & Platt	1936	60	1989	Mitchel	
	Dickie Brook	Can. Allis Chalmers Ltd.	1948	900	Horizontal	No	2011	1.2	Westinghouse	1948	60	1991		Air
	Dickie Brook	Can. Allis Chalmers Ltd.	1948	900	Horizontal	No	1991	2.6	A.S E A.	1948	60	1991		Air

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System	CI #	Project	Project Estimate	Year
Annapolis Tidal Power	38907	HYD Fall Protection - Fundy	$ 100,000	2011
Annapolis Tidal Power	40315	HYD - Connell's Dyke Refurbishment	$ 100,000	2012
Annapolis Tidal Power	40316	HYD - Barteaux Culvert Refurbish	$ 200,000	2012
Annapolis Tidal Power	40313	HYD - ANN Safety Pumps	$ 300,000	2012
Annapolis Tidal Power	45286	HYD - U&U Annapolis Stator Repairs	$ 200,000	2013
Annapolis Tidal Power	41126	HYD-ANN Sluiceway Stop Logs	$ 1,300,000	2013
Annapolis Tidal Power	43826	HYD - ANN Roof Hatch Replace U&U	$ 400,000	2014
Annapolis Tidal Power	45892	HYD - ANN Sluiceway Stop Log Repair	$ 200,000	2015
Annapolis Tidal Power	46361	HYD - Annapolis Dyke Pump Replaceme	$ 200,000	2015
Annapolis Tidal Power	44546	HYD - UU ANN Tidal GEMS Building	$ 200,000	2015
Annapolis Tidal Power	46791	HYD - ANN Runner Repair	$ 700,000	2015
Annapolis Tidal Power	41139	HYD - Sluice Gates Refurbishment	$ 1,500,000	2016
Annapolis Tidal Power	41139	HYD - ANN Sluiceway Superstructure	$ 2,400,000	2016
Annapolis Tidal Power	47650	HYD - Annapolis Overhaul	$ 5,000,000	2017
Avon Hydro System	14371	HYD - AVO #2 PIPELINE REPLACE	$ 3,800,000	2011
Avon Hydro System	45171	HYD - Avon 1 Pipeline Replacement	$ 900,000	2015
Avon Hydro System		HYD - Avon Controls Upgrade	$ 800,000	2019
Bear River Hydro System	17618	HYD - BER RIDGE TAILRACE DECK	$ 300,000	2011
Bear River Hydro System	41137	HYD - Gulch Powerhouse Window Repl	$ 100,000	2012
Bear River Hydro System	17583	HYD - BER-GUL - Electrical Refurbis	$ 1,000,000	2013
Bear River Hydro System	46594	HYD Sissiboo Falls Overhaul	$ 1,100,000	2015
Bear River Hydro System	47432	HYD - Ridge Overhaul	$ 700,000	2016
Bear River Hydro System	47652	HYD - Ridge Surge Tank Refurbishment	$ 1,500,000	2017
Bear River Hydro System	47653	HYD - Gulch Surge Tank Refurbishment	$ 1,500,000	2017
Bear River Hydro System	47654	HYD - Gulch Pipeline Replacement	$ 1,000,000	2017
Bear River Hydro System		HYD - Bear River Controls Upgrade	$ 800,000	2018
Black River Hydro System	38905	Fall Protection - Eastern Valley	$ 100,000	2011
Black River Hydro System	41324	HYD-U&U Aylesford Spillway Culvert	$ 100,000	2011
Black River Hydro System	16495	HYD - White Rock Electrical Refurb	$ 700,000	2011
Black River Hydro System	40623	HYD - U&U Hollow Bridge Canal Dyke	$ 1,000,000	2011
Black River Hydro System	36868	Hyd Lumsden Runner Replacement	$ 700,000	2012
Black River Hydro System	41138	HYD-Hollow Bridge Surge Tank	$ 1,000,000	2013
Black River Hydro System	31246	HYD Methals Intake Replacement	$ 4,700,000	2013
Black River Hydro System	47161	HYD - Hells Gate 2 Runner Seal Fail	$ 100,000	2015
Black River Hydro System	46232	HYD - WHR Pipeline Replacement	$ 500,000	2015
Black River Hydro System	16374	HYD Gaspereau Dam Safety	$ 12,000,000	2016
Black River Hydro System	44595	HYD - Hollow Bridge Canal and Intake Refurbishment	$ 2,000,000	2016
Black River Hydro System	47332	HYD - Methals Overhaul	$ 1,500,000	2016
Black River Hydro System		HYD - Hells Gate Runner Replacement	$ 700,000	2017
Black River Hydro System	47649	HYD - Salmon Tail Gate Pedistal Replacement	$ 300,000	2017
Black River Hydro System		HYD - PE Replace Trout River Pond Screens	$ 100,000	2018
Black River Hydro System		HYD - Hells Gate Butterfly Valve Replacement	$ 350,000	2018
Black River Hydro System		HYD - Hells Gate Surge Tank Refurbishment	$ 2,400,000	2018
Black River Hydro System		HYD - Lumsden Stator Rewind	$ 700,000	2019
Black River Hydro System		HYD - White Rock Canal Refurb	$ 2,000,000	2020
Black River Hydro System		HYD - Methals Dam Refurb	$ 2,500,000	2020
Dickie Brook Hydro	39406	HYD U&U Dickie Brook Unit # 1	$ 600,000	2011
Dickie Brook Hydro	42506	HYD - U&U Dickie Brook Penstock	$ 100,000	2012
Dickie Brook Hydro	31204	HYD - Donahoe Lake Dam Refurb	$ 1,500,000	2012
Dickie Brook Hydro	44026	HYD-Dickie Brook #2 Bearings U&U	$ 100,000	2013
Dickie Brook Hydro	46065	HYD - Tom's Lake Spillway Repair	$ 600,000	2015
Dickie Brook Hydro	47660	HYD - Controls Upgrade	$ 300,000	2017
Fall River Hydro	47659	HYD - Fall River Controls Upgrade	$ 200,000	2017
Fall River Hydro		HYD - Miller Lake Dam Refurbishment	$ 2,000,000	2018
Hydro General	47166	HYD - McAskill Brook Decomm	$ 100,000	2016
Hydro General	47651	HYD - Maccan Decommissioning	$ 100,000	2016
Lequille Hydro System	47876	HYD - Lequille Overhaul	$ 700,000	2017
Lequille Hydro System	47648	HYD - Lequille Pipeline Replacement	$ 1,600,000	2017
Lequille Hydro System	47682	HYD - Lequille Switchgear Replaceme	$ 900,000	2017
Lequille Hydro System	46253	HYD - Lequille Tailrace Gate	$ 300,000	2017
Lequille Hydro System	48533	HYD Lequille Headpond Refurbishment	$ 2,500,000	2017
Mersey Hydro System	38873	HYD Fall Protection - Mersey	$ 100,000	2011
Mersey Hydro System	40301	HYD - Big Falls Spillway - Walkway	$ 300,000	2011
Mersey Hydro System	38859	HYD Big Falls Headgate Replacement	$ 5,900,000	2011
Mersey Hydro System	43506	HYD UU DEB9 Runner Seal Replacement	$ 100,000	2012
Mersey Hydro System	42868	HYD - U&U Jordan Lake Diversion	$ 600,000	2012
Mersey Hydro System	41988	HYD - U&U Big Falls #5 Overhaul	$ 1,000,000	2012
Mersey Hydro System	41806	HYD - Big Falls Unit 6 Refurbishmen	$ 800,000	2013
Mersey Hydro System	45811	HYD - Big Falls Dam Repair	$ 200,000	2014
Mersey Hydro System	45431	HYD - ULF Crane Upgrade	$ 200,000	2015
Mersey Hydro System	44667	HYD - Upper Lake Falls Unit #1 Over	$ 600,000	2015
Mersey Hydro System	45189	Upper Lake Falls unit # 2 Overhaul	$ 500,000	2017
Mersey Hydro System	45957	HYD - LLF Sluiceway Repair	$ 2,500,000	2018
Mersey Hydro System	47092	HYD - ULF Spillway Refurbishment	$ 2,000,000	2018
Mersey Hydro System	47091	HYD - Big Falls Dam Refurbishment	$ 5,000,000	2018
Mersey Hydro System		HYD - Dam Deficiency Refurb (Mersey)	$ 5,000,000	2019
Mersey Hydro System		HYD - Dam Deficiency Refurb (Mersey)	$ 5,000,000	2020
Nictaux/Paradise System	16497	HYD - Nictaux Electrical Refurbishm	$ 1,000,000	2011
Nictaux/Paradise System	41127	HYD - Nictaux Headcover Replacement	$ 500,000	2013
Nictaux/Paradise System	45115	HYD - U&U Nictaux Plant Automation	$ 500,000	2014
Nictaux/Paradise System	45958	HYD - Nictaux Rotor Pole Repair	$ 500,000	2014
Nictaux/Paradise System	20758	HYD - Nictaux Pipeline and Intake	$ 3,200,000	2015

REDACTED (CONFIDENTIAL INFORMATION REMOVED)

System	CI #	Project	Project Estimate	Year
Nictaux/Paradise System	47396	HYD - Nictaux Powerhouse Dam Refurb	$ 2,000,000	2016
Nictaux/Paradise System		HYD - PE Curl Hole Lake Dam - Dam Safety	$ 1,500,000	2017
Nictaux/Paradise System	48535	HYD Scragg Lake Dam Spillway Refurb	$ 1,500,000	2018
Paradise System	46171	HYD - Paradise Bearing Repair	$ 400,000	2014
Paradise System	48272	HYD Paradise Road Repairs	$ 100,000	2015
Paradise System	47655	HYD - Paradise Controls Upgrade	$ 500,000	2017
Paradise System	46297	HYD - Neives Lake Dam Refurbishment	$ 1,500,000	2019
Paradise System		HYD - Paradise Surge Tank Refurbishment	$ 1,500,000	2019
Sheet Harbour Hydro System	16387	HYD- Ruth Falls #3 Runner Replmt	$ 800,000	2013
Sheet Harbour Hydro System	39042	HYD - Ten Mile Lake Dam Decomm	$ 900,000	2013
Sheet Harbour Hydro System	27507	HYD - RUF Butterfly Valve Replace	$ 600,000	2014
Sheet Harbour Hydro System	12079	SHH - RUF 1&2 RUNNER REPLACEMENT	$ 1,000,000	2015
Sheet Harbour Hydro System	43607	HYD - Malay Falls #5 Unit Overhaul	$ 1,100,000	2015
Sheet Harbour Hydro System	44594	HYD - Ruth Falls Canal Modifications	$ 200,000	2016
Sheet Harbour Hydro System	47551	HYD - Sheet Harbour Controls Upgrade	$ 1,700,000	2016
Sheet Harbour Hydro System	48020	HYD - RUT3 Generator Refurb	$ 900,000	2016
Sheet Harbour Hydro System		HYD -Ruth Main Dam Refurbishment	$ 4,000,000	2017
Sheet Harbour Hydro System		HYD - Marshall Falls Dam Refurbishment	$ 2,000,000	2017
Sheet Harbour Hydro System		HYD - Anti Dam Refurbishment	$ 1,500,000	2019
Sheet Harbour Hydro System	44668	HYD - Ruth Falls 2 Stator Rewind	$ 600,000	2020
Sissiboo/Weymouth System	41989	HYD - U&U 4th Lake Overhaul	$ 200,000	2011
Sissiboo/Weymouth System	41141	HYD - Sissiboo Grand Lake Spillway	$ 300,000	2012
Sissiboo/Weymouth System	44426	HYD - UU Weymouth #2 Headcover Repl	$ 700,000	2013
Sissiboo/Weymouth System	43039	HYD - Weymouth Surge Tank	$ 2,600,000	2013
Sissiboo/Weymouth System	40308	HYD - Weymouth Falls Pipeline Re	$ 5,900,000	2013
Sissiboo/Weymouth System	41140	HYD-Sissiboo Tailrace Refurbishment	$ 500,000	2014
Sissiboo/Weymouth System	44887	HYD - Sissiboo Pipeline Replacement	$ 700,000	2015
Sissiboo/Weymouth System	20571	HYD - Weymouth Falls Tailrace Deck	$ 400,000	2016
Sissiboo/Weymouth System	17581	HYD - Weymouth Electrical Replaceme	$ 1,600,000	2016
Sissiboo/Weymouth System	43136	HYD - Weymouth Headcover Replace	$ 800,000	2016
Sissiboo/Weymouth System	44596	HYD - Sissiboo Falls Dam Refurbishment	$ 4,000,000	2017
Sissiboo/Weymouth System		HYD Sissiboo Falls Headgate Refurbishment	$ 1,000,000	2017
Sissiboo/Weymouth System		HYD Weymouth Falls #1 and #2 Headgate Refurbishment and Hoist Replacement	$ 2,000,000	2017
Sissiboo/Weymouth System		HYD - Sissiboo River Controls Upgrade	$ 1,500,000	2019
St.Margaret's Hydro System	38906	HYD Fall Protection - St Margaret's	$ 100,000	2011
St.Margaret's Hydro System	42008	HYD - U&U Tidewater Penstock Repair	$ 100,000	2011
St.Margaret's Hydro System	33262	U&U STM Sandy Lake Band Replacement	$ 200,000	2011
St.Margaret's Hydro System	41110	U&U Tidewater Pipeline Repairs	$ 200,000	2011
St.Margaret's Hydro System	17830	HYD - STM Big Indian Lake Dam Safet	$ 3,300,000	2011
St.Margaret's Hydro System	41143	HYD -Tidewater Surge Tank Refurbish	$ 1,100,000	2012
St.Margaret's Hydro System	40282	HYD- Coon Pond Dam Refurbishment	$ 2,400,000	2012
St.Margaret's Hydro System	31245	HYD - Sandy Lake Dam Refurbishment	$ 5,800,000	2012
St.Margaret's Hydro System	40309	HYD -Tidewater Pipeline Repl	$ 7,500,000	2012
St.Margaret's Hydro System	17853	HYD - STM-SAL #4 Runner	$ 600,000	2013
St.Margaret's Hydro System	45830	HYD - Sandy Lake Sluice Gate Repair	$ 100,000	2014
St.Margaret's Hydro System	44294	HYD - U&U Mill Lake Unit 2 Refurb	$ 1,000,000	2014
St.Margaret's Hydro System	45433	HYD - Tidewater Crane Upgrade	$ 200,000	2015
St.Margaret's Hydro System	43066	HYD - Little Indian / Mill Lake	$ 1,300,000	2015
St.Margaret's Hydro System	40283	HYD - Wrights Lake Dam Refurbishmen	$ 1,500,000	2015
St.Margaret's Hydro System	41142	HYD- Sandy Lake Fish Passage	$ 2,400,000	2015
St.Margaret's Hydro System	46254	HYD Mill Lake Surge Tank Refurbishment	$ 1,500,000	2016
St.Margaret's Hydro System	47172	HYD - Tidewater 1 Overhaul	$ 1,500,000	2016
St.Margaret's Hydro System	47167	Sandy Surge Tank Refurbishment	$ 1,200,000	2016
St.Margaret's Hydro System	46298	HYD - 5 Mile Dam Refurbishment	$ 3,000,000	2016
St.Margaret's Hydro System		HYD - Tidewater Tailrace gates	$ 400,000	2020
Tusket Hydro	28726	HYD Carlton Lake Dam Refurbishment	$ 6,300,000	2011
Tusket Hydro	41903	HYD - U&U Tusket Fish Passage	$ 200,000	2012
Tusket Hydro	43469	HYD-U&U Raynard's Lake Fish Ladder	$ 300,000	2012
Tusket Hydro	16379	HYD-Mink Lake Dam Replacement	$ 200,000	2014
Tusket Hydro	42666	HYD - Tusket #2 Overhaul	$ 1,300,000	2015
Tusket Hydro	47163	HYD - Tusket Controls Upgrade	$ 900,000	2016
Tusket Hydro	48397	HYD - Mink Lake Dam Repair	$ 200,000	2016
Tusket Hydro	29807	HYD - Tusket Main Dam	$ 8,000,000	2017
Tusket Hydro		HYD - Tusket No 1 Overhaul	$ 800,000	2017
Wreck Cove Hydro System	41603	U&U Surge Lake Radio Tower Replacem	$ 100,000	2011
Wreck Cove Hydro System	40306	HYD - Replacement Front End Loader	$ 200,000	2011
Wreck Cove Hydro System	41783	HYD-U&U MacMillan Dam Spillway	$ 200,000	2011
Wreck Cove Hydro System	41109	HYD-U&U Wreck Cove Culvert Replace	$ 400,000	2011
Wreck Cove Hydro System	40276	HYD - WRC Tailrace Tunnel Bulkhead	$ 600,000	2011
Wreck Cove Hydro System	41136	HYD Gisborne Roof Hatch Replacement	$ 100,000	2012
Wreck Cove Hydro System	41745	HYD-WRC Powerhouse Light/Vent U&U	$ 100,000	2012
Wreck Cove Hydro System	43927	HYD - WRC #1 Rotor Repairs U&U	$ 200,000	2012
Wreck Cove Hydro System	43849	HYD - WRC #2 Rotor Repairs U&U	$ 200,000	2012
Wreck Cove Hydro System	43848	HYD - WRC D4 Riparian Valve U&U	$ 200,000	2012
Wreck Cove Hydro System	44506	HYD - WRC 600V Breaker Refurb	$ 100,000	2014
Wreck Cove Hydro System	43846	HYD - WRC Piping Modifications U&U	$ 100,000	2014
Wreck Cove Hydro System	46294	HYD - WRC1 Stator Repairs U&U	$ 200,000	2014
Wreck Cove Hydro System	44968	HYD - WRC Unit 2 Excitation Sytem	$ 500,000	2014
Wreck Cove Hydro System	44248	HYD-MacMillan Dam D-7 Refurb	$ 3,400,000	2014
Wreck Cove Hydro System	44886	HYD - WRC #1 Hydro Generator Assess	$ 200,000	2015
Wreck Cove Hydro System	45971	HYD - WRC Weir Improvements	$ 200,000	2015
Wreck Cove Hydro System	45370	HYD - WRC Unit 1 Excitation System	$ 500,000	2015

REDACTED (CONFIDENTIAL INFORMATION REMOVED)

System	CI #	Project	Project Estimate	Year
Wreck Cove Hydro System	47476	HYD - WRC Tailrace Tunnel Rockfall	$ 2,600,000	2015
Wreck Cove Hydro System	43067	HYD - Cheticamp Dam D-1 Refurb	$ 5,800,000	2015
Wreck Cove Hydro System	44978	HYD - Wreck Cove Controls Upgrade	$ 2,600,000	2016
Wreck Cove Hydro System	47814	HYD - WRC Evacution Tunnel Upgrade	$ 400,000	2016
Wreck Cove Hydro System	44669	HYD - Wreck Cove Fire Sup. Upgrades	$ 800,000	2016
Wreck Cove Hydro System	43128	HYD - GIS Gearbox & Bearing Replace	$ 300,000	2016
Wreck Cove Hydro System	45330	HYD - WRC C3 Culvert Replacement	$ 200,000	2016
Wreck Cove Hydro System	47397	HYD - D4 Remedial Works	$ 2,500,000	2016
Wreck Cove Hydro System	48536	HYD Wreck Cove Brook Dam D-9 Refurb	$ 1,000,000	2017
Wreck Cove Hydro System		HYD - D5, D6,1, D62 remedial works	$ 1,500,000	2018
Wreck Cove Hydro System	37702	HYD - Wreck Cove Overhaul (LEM)	TBD	2019
Wreck Cove Hydro System		HYD - WRC Unit 1 Runner Replacement	$ 5,000,000	2019
Wreck Cove Hydro System		HYD - WRC Unit 2 Runner Replacement	$ 5,000,000	2020
Wreck Cove Hydro System		HYD - WRC Unit 1 Switchgear Replacement	$ 2,000,000	2020
Wreck Cove Hydro System		HYD - WRC Unit 2 Switchgear Replacement	$ 2,000,000	2020

REDACTED (CONFIDENTIAL INFORMATION REMOVED)

Hydro Production Generation Summary - KWh

Year	White Rock	Hells Gate #1	Hells Gate #2	Lumsden	Hollow Bridge	Methals	Avon#1	Avon#2	Nictaux	Paradise
2004	11,563,200	18,978,603	16,177,061	10,946,218	25,236,343	4,690,544	9,158,550	8,794,369	36,696,000	17,802,000
2005	15,979,200	20,965,034	23,831,291	14,495,495	32,975,480	5,961,869	15,308,617	12,890,703	50,856,000	28,650,000
2006	14,020,800	15,423,876	23,770,425	11,691,341	28,349,326	5,141,311	14,386,461	15,676,929	57,060,000	21,475,100
2007	14,925,196	16,530,065	22,469,418	13,712,057	30,048,109	5,497,458	11,018,319	12,350,712	40,212,000	23,556,900
2008	14,928,000	25,608,112	19,025,399	13,807,193	31,462,520	5,658,659	14,196,077	15,749,720	44,172,000	26,286,000
2009	15,408,000	23,902,073	21,213,980	14,347,343	33,462,283	6,375,729	14,239,839	14,029,532	41,436,000	18,393,000
2010	7,963,200	19,932,529	18,204,167	11,867,991	26,411,666	5,054,387	11,354,393	9,530,835	45,552,000	22,781,000
2011	12,158,000	21,669,046	18,343,664	9,370,728	27,207,119	5,088,721	15,576,609	10,849,142	39,108,000	33,388,000
2012	11,715,000	14,514,281	19,658,805	5,845,263	23,605,600	4,453,629	11,306,692	13,219,548	40,924,000	18,763,000
2013	12,561,000	13,706,784	21,467,340	10,939,984	24,172,971	3,342,717	12,372,649	14,331,170	34,423,000	21,933,000
2014	14,941,000	20,509,256	22,237,486	15,125,435	30,639,144	5,124,010	16,298,475	14,388,823	32,564,000	19,298,000
2015	12,853,000	19,760,683	20,075,810	15,099,470	32,657,360	5,891,017	11,731,868	10,136,521	33,164,000	25,872,000
11-yr average	13251299.7	19291695.2	20539570.5	12270709.8	28852326.8	5190004.3	13079045.8	12662333.7	41347250.0	23183166.7

Hydro Production Generation Summary - GWh

2004	11.6	19.0	16.2	10.9	25.2	4.7	9.2	8.8	36.7	17.8
2005	16.0	21.0	23.8	14.5	33.0	6.0	15.3	12.9	50.9	28.7
2006	14.0	15.4	23.8	11.7	28.3	5.1	14.4	15.7	57.1	21.5
2007	14.9	16.5	22.5	13.7	30.0	5.5	11.0	12.4	40.2	23.6
2008	14.9	25.6	19.0	13.8	31.5	5.7	14.2	15.7	44.2	26.3
2009	15.4	23.9	21.2	14.3	33.5	6.4	14.2	14.0	41.4	18.4
2010	8.0	19.9	18.2	11.9	26.4	5.1	11.4	9.5	45.6	22.8
2011	12.2	21.7	18.3	9.4	27.2	5.1	15.6	10.8	39.1	33.4
2012	11.7	14.5	19.7	5.8	23.6	4.5	11.3	13.2	40.9	18.8
2013	12.6	13.7	21.5	10.9	24.2	3.3	12.4	14.3	34.4	21.9
2014	14.9	20.5	22.2	15.1	30.6	5.1	16.3	14.4	32.6	19.3
2015	12.9	19.8	20.1	15.1	32.7	5.9	11.7	10.1	33.2	25.9
11-yr average	13.3	19.3	20.5	12.3	28.9	5.2	13.1	12.7	41.3	23.2

REDACTED (CONFIDENTIAL INFORMATION REMOVED)

Hydro Production Generation Summary - KWh

Year	Lequelle	Upper Lake Falls 1	Upper Lake Falls 2	Lower Lake Falls 3	Lower Lake Falls 4	Big Falls 5	Big Falls 6	Lower Great Brook	Lower Great Brook	Deep Brook 9
2004	21,624,000	9,434,880	10,598,400	20,030,880	17,938,080	23,856,600	24,666,600	8,919,500	8,613,300	19,639,028
2005	33,352,000	14,469,840	18,918,000	25,342,560	25,950,720	27,994,200	37,507,200	11,784,300	11,439,900	21,353,929
2006	30,283,000	13,826,880	18,619,920	25,962,240	25,634,400	34,586,400	30,009,600	8,118,300	13,751,900	20,842,431
2007	17,698,000	13,397,760	11,487,600	26,460,000	16,404,480	31,689,000	22,254,600	11,777,600	7,778,100	26,670,301
2008	28,871,000	11,316,240	18,391,320	22,257,600	23,730,240	26,191,200	33,349,200	9,491,600	11,411,400	16,045,200
2009	30,897,000	12,428,280	22,116,960	23,715,840	26,788,500	38,182,800	25,501,200	10,706,200	12,468,600	23,318,172
2010	26,737,000	14,061,240	12,380,760	26,241,120	17,783,040	24,724,200	33,712,200	8,856,900	10,937,000	29,579,370
2011	32,725,000	16,651,080	16,970,760	25,821,120	22,904,640	15,574,200	15,118,200	11,529,400	11,512,100	32,784,489
2012	19,376,000	14,547,600	11,264,400	21,490,080	17,256,000	12,060,600	24,007,800	9,506,600	9,126,400	16,196,669
2013	26,310,000	9,709,200	19,537,200	25,766,880	20,129,760	34,228,200	13,512,600	12,230,400	10,084,500	30,224,245
2014	35,073,000	17,265,600	18,219,600	23,313,120	23,645,760	28,871,400	33,484,200	11,179,700	11,198,600	30,204,523
2015	26,878,000	11,192,400	20,534,400	22,837,440	23,558,880	34,047,000	33,360,000	10,297,200	12,078,300	28,889,481
11-yr average	27485333.3	13191750.0	16586610.0	24103240.0	21810375.0	27667150.0	27206950.0	10366475.0	10866675.0	24645653.2

Hydro Production Generation Summary - GWh

2004	21.6	9.4	10.6	20.0	17.9	23.9	24.7	8.9	8.6	19.6
2005	33.4	14.5	18.9	25.3	26.0	28.0	37.5	11.8	11.4	21.4
2006	30.3	13.8	18.6	26.0	25.6	34.6	30.0	8.1	13.8	20.8
2007	17.7	13.4	11.5	26.5	16.4	31.7	22.3	11.8	7.8	26.7
2008	28.9	11.3	18.4	22.3	23.7	26.2	33.3	9.5	11.4	16.0
2009	30.9	12.4	22.1	23.7	26.8	38.2	25.5	10.7	12.5	23.3
2010	26.7	14.1	12.4	26.2	17.8	24.7	33.7	8.9	10.9	29.6
2011	32.7	16.7	17.0	25.8	22.9	15.6	15.1	11.5	11.5	32.8
2012	19.4	14.5	11.3	21.5	17.3	12.1	24.0	9.5	9.1	16.2
2013	26.3	9.7	19.5	25.8	20.1	34.2	13.5	12.2	10.1	30.2
2014	35.1	17.3	18.2	23.3	23.6	28.9	33.5	11.2	11.2	30.2
2015	26.9	11.2	20.5	22.8	23.6	34.0	33.4	10.3	12.1	28.9
11-yr average	27.5	13.2	16.6	24.1	21.8	27.7	27.2	10.4	10.9	24.6

REDACTED (CONFIDENTIAL INFORMATION REMOVED)

Hydro Production Generation Summary - KWh

Year	Deep Brook 10	Cowie Falls 11	Cowie Falls 12	Harmony	Roseway 1	Roseway 2	Mill Lake 1	Mill Lake 2	Sandy Lake 3	Sandy Lake 4
2004	21,227,125	16,495,680	18,870,720	1,909,378	0	2,295,683	1,449,600	1,368,000	5,000,400	4,802,400
2005	32,348,112	23,960,160	22,960,800	3,166,418	0	3,011,563	2,980,800	3,300,000	8,665,200	6,670,800
2006	30,603,383	20,277,120	23,306,880	3,173,712	0	3,778,957	1,903,200	2,544,000	5,788,800	5,860,800
2007	18,378,479	19,946,400	18,492,000	2,094,024	0	2,063,144	484,800	458,400	5,385,600	5,598,000
2008	28,035,167	21,098,400	20,569,920	2,702,320	0	2,193,045	1,135,200	1,101,600	3,560,400	9,979,200
2009	26,483,697	25,136,160	20,702,400	1,676,855	0	0	0	0	5,292,000	7,912,800
2010	19,231,701	20,934,720	16,476,000	0	0	0	0	0	5,292,000	7,912,800
2011	23,754,806	19,783,200	25,237,440	0	0	0	0	0	10,411,200	0
2012	27,590,037	16,996,800	19,459,200	0	0	786,565	0	0	7,599,600	0
2013	23,542,324	23,515,200	21,412,800	0	0	0	0	33,600	6,321,600	3,668,400
2014	28,369,520	23,476,800	25,377,600	0	0	0	0	2,210,400	4,071,600	4,676,400
2015	28,631,215	22,977,600	21,129,600	0	0	0	0	4,812,000	6,811,200	7,074,000
11-yr average	25682963.8	21216520.0	21166280.0	2453784.5	0.0	2354826.2	1590720.0	1978500.0	6183300.0	6415560.0

Hydro Production Generation Summary - GWh

2004	21.2	16.5	18.9	1.9	0.0	2.3	1.4	1.4	5.0	4.8
2005	32.3	24.0	23.0	3.2	0.0	3.0	3.0	3.3	8.7	6.7
2006	30.6	20.3	23.3	3.2	0.0	3.8	1.9	2.5	5.8	5.9
2007	18.4	19.9	18.5	2.1	0.0	2.1	0.5	0.5	5.4	5.6
2008	28.0	21.1	20.6	2.7	0.0	2.2	1.1	1.1	3.6	10.0
2009	26.5	25.1	20.7	1.7	0.0	0.0	0.0	0.0	5.3	7.9
2010	19.2	20.9	16.5	0.0	0.0	0.0	0.0	0.0	5.3	7.9
2011	23.8	19.8	25.2	0.0	0.0	0.0	0.0	0.0	10.4	0.0
2012	27.6	17.0	19.5	0.0	0.0	0.8	0.0	0.0	7.6	0.0
2013	23.5	23.5	21.4	0.0	0.0	0.0	0.0	0.0	6.3	3.7
2014	28.4	23.5	25.4	0.0	0.0	0.0	0.0	2.2	4.1	4.7
2015	28.6	23.0	21.1	0.0	0.0	0.0	0.0	4.8	6.8	7.1
11-yr average	25.7	21.2	21.2	2.5	0.0	2.4	1.6	2.0	6.2	6.4

REDACTED (CONFIDENTIAL INFORMATION REMOVED)

Hydro Production Generation Summary - KWh

Year	Tide Water 1	Tide Water 2	Fall River	Ruth Falls # 1	Ruth Falls # 2	Ruth Falls # 3	Malay Falls # 1 (4)	Malay Falls # 2 (5)	Malay Falls # 3 (6)	Dickie Brook # 1
2004	2,112,000	8,126,400	2,016,800	6,686,040	7,842,960	15,623,280	4,342,720	1,890,840	4,122,880	2,334,020
2005	4,699,200	11,352,000	2,674,400	6,713,280	7,447,320	19,816,920	4,597,760	2,530,560	5,186,880	5,224,682
2006	3,091,200	9,446,400	2,613,600	6,908,200	7,607,880	15,298,560	2,737,760	4,096,640	5,092,960	5,955,743
2007	1,824,000	10,108,800	2,284,000	8,261,640	5,854,320	13,223,160	3,569,920	3,172,160	5,055,680	4,382,050
2008	4,987,200	10,228,800	2,798,400	6,953,400	12,431,880	19,603,440	5,834,240	3,728,960	6,282,400	2,387,045
2009	6,225,600	7,670,400	2,068,000	9,259,920	15,749,640	12,084,840	5,768,160	1,910,400	6,951,680	5,026,199
2010	6,225,600	7,670,400	2,068,000	12,663,360	12,094,920	7,070,760	5,472,160	0	5,532,160	107,724
2011	4,660,800	9,672,000	2,783,200	9,905,040	13,659,120	19,746,360	7,354,560	0	7,240,960	0
2012	5,107,200	2,884,800	2,171,200	13,033,440	11,389,680	8,009,640	6,654,880	640	6,027,360	3,087,231
2013	4,267,200	8,073,600	2,580,000	8,814,240	14,754,240	14,160,600	6,901,600	0	6,979,200	5,585,411
2014	4,910,400	9,316,800	2,612,000	10,120,320	4,865,040	15,179,400	21,498	0	5,594,080	4,082,756
2015	4,089,600	10,032,000	2,396,000	13,358,160	13,914,000	12,077,280	7,342,240	0	6,366,080	3,505,041
11-yr average	4350000.0	8715200.0	2422133.3	9389753.3	10634250.0	14324520.0	5049791.5	2475742.9	5869360.0	3788900.2

Hydro Production Generation Summary - GWh

2004	2.1	8.1	2.0	6.7	7.8	15.6	4.3	1.9	4.1	2.3
2005	4.7	11.4	2.7	6.7	7.4	19.8	4.6	2.5	5.2	5.2
2006	3.1	9.4	2.6	6.9	7.6	15.3	2.7	4.1	5.1	6.0
2007	1.8	10.1	2.3	8.3	5.9	13.2	3.6	3.2	5.1	4.4
2008	5.0	10.2	2.8	7.0	12.4	19.6	5.8	3.7	6.3	2.4
2009	6.2	7.7	2.1	9.3	15.7	12.1	5.8	1.9	7.0	5.0
2010	6.2	7.7	2.1	12.7	12.1	7.1	5.5	0.0	5.5	0.1
2011	4.7	9.7	2.8	9.9	13.7	19.7	7.4	0.0	7.2	0.0
2012	5.1	2.9	2.2	13.0	11.4	8.0	6.7	0.0	6.0	3.1
2013	4.3	8.1	2.6	8.8	14.8	14.2	6.9	0.0	7.0	5.6
2014	4.9	9.3	2.6	10.1	4.9	15.2	0.0	0.0	5.6	4.1
2015	4.1	10.0	2.4	13.4	13.9	12.1	7.3	0.0	6.4	3.5
11-yr average	4.4	8.7	2.4	9.4	10.6	14.3	5.0	2.5	5.9	3.8

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Hydro Production Generation Summary - KWh

Year	Dickie Brook # 2	Weymouth G1	Weymouth G2	Sissiboo G1	4th Lake G1	Gulch G1	Ridge G1	Tusket G1	Tusket G2	Tusket G3
2004	1,436,821	12,178,000	22,312,000	19,213,000	9,127,000	21,242,600	9,010,000	0	0	0
2005	2,919,504	24,214,000	24,913,000	28,148,000	15,005,000	25,883,000	10,506,000	3,065,000	3,067,000	2,978,700
2006	1,827,212	21,890,000	22,666,000	26,853,000	12,298,000	28,365,150	12,237,000	2,240,000	3,909,000	3,835,000
2007	4,562,959	14,354,000	16,779,000	18,730,000	9,218,000	18,377,120	8,143,000	3,312,000	4,120,000	3,270,000
2008	3,170,504	20,016,000	27,457,000	24,685,000	6,828,000	27,543,540	12,481,000	4,397,000	5,351,000	439,000
2009	4,891,549	6,462,000	49,878,000	32,977,000	7,711,000	32,468,100	10,793,000	5,331,000	5,965,000	0
2010	5,431,310	8,303,000	31,677,000	23,151,000	9,156,000	24,323,400	9,516,000	3,191,000	2,661,000	2,733,000
2011	8,086,589	31,078,000	20,043,000	30,896,000	8,988,000	34,178,700	15,181,000	4,061,600	2,390,000	5,319,300
2012	124,569	24,656,000	12,130,400	23,989,000	7,571,200	18,271,600	9,403,400	4,221,400	0	5,490,700
2013	4,097,625	19,812,000	8,751,600	27,014,000	10,186,400	24,851,000	10,741,600	6,816,700	0	6,662,300
2014	5,419,603	32,996,000	27,302,000	31,330,000	11,866,400	34,648,000	13,163,700	5,308,800	0	5,601,200
2015	7,291,482	21,963,000	29,308,000	17,677,000	13,871,200	30,790,000	12,205,420	4,626,500	1,643,000	4,225,500
11-yr average	4104977.3	19826833.3	24434750.0	25388583.3	10152183.3	26745184.2	11115093.3	4233727.3	3638250.0	4055470.0

Hydro Production Generation Summary - GWh

2004	1.4	12.2	22.3	19.2	9.1	21.2	9.0	0.0	0.0	0.0
2005	2.9	24.2	24.9	28.1	15.0	25.9	10.5	3.1	3.1	3.0
2006	1.8	21.9	22.7	26.9	12.3	28.4	12.2	2.2	3.9	3.8
2007	4.6	14.4	16.8	18.7	9.2	18.4	8.1	3.3	4.1	3.3
2008	3.2	20.0	27.5	24.7	6.8	27.5	12.5	4.4	5.4	0.4
2009	4.9	6.5	49.9	33.0	7.7	32.5	10.8	5.3	6.0	0.0
2010	5.4	8.3	31.7	23.2	9.2	24.3	9.5	3.2	2.7	2.7
2011	8.1	31.1	20.0	30.9	9.0	34.2	15.2	4.1	2.4	5.3
2012	0.1	24.7	12.1	24.0	7.6	18.3	9.4	4.2	0.0	5.5
2013	4.1	19.8	8.8	27.0	10.2	24.9	10.7	6.8	0.0	6.7
2014	5.4	33.0	27.3	31.3	11.9	34.6	13.2	5.3	0.0	5.6
2015	7.3	22.0	29.3	17.7	13.9	30.8	12.2	4.6	1.6	4.2
11-yr average	4.1	19.8	24.4	25.4	10.2	26.7	11.1	4.2	3.6	4.1

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Hydro Production Generation Summary - KWh

Year	Annapolis	Wreck Cove 1	Wreck Cove 2	Gisborne
2004	26,547,000	150,706,000	144,640,000	10,875,200
2005	27,643,000	132,626,000	131,310,000	10,528,000
2006	20,072,000	133,786,000	112,814,000	9,021,600
2007	24,296,000	146,549,000	130,850,000	9,245,600
2008	16,352,000	138,692,000	193,573,000	10,068,800
2009	30,880,000	82,766,000	197,869,000	9,184,000
2010	28,592,000	190,940,000	313,480,000	8,316,000
2011	26,896,000	170,328,000	157,576,000	8,814,400
2012	28,048,000	144,880,000	97,467,000	8,489,600
2013	16,368,000	209,628,000	106,916,000	8,736,000
2014	16,736,000	206,383,000	126,380,000	8,702,400
2015	14,304,000	154,846,000	130,930,000	2,368,800
11-yr average	23061166.7	155177500.0	153650416.7	8695866.7

Hydro Production Generation Summary - GWh

2004	26.5	150.7	144.6	10.9
2005	27.6	132.6	131.3	10.5
2006	20.1	133.8	112.8	9.0
2007	24.3	146.5	130.9	9.2
2008	16.4	138.7	193.6	10.1
2009	30.9	82.8	197.9	9.2
2010	28.6	190.9	313.5	8.3
2011	26.9	170.3	157.6	8.8
2012	28.0	144.9	97.5	8.5
2013	16.4	209.6	106.9	8.7
2014	16.7	206.4	126.4	8.7
2015	14.3	154.8	130.9	2.4
11-yr average	23.1	155.2	153.7	8.7

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Project	River System	Impact
HYD - AVO #2 PIPELINE REPLACE	Avon River	Flow efficiency increase
HYD - Avon 1 Pipeline Replacement	Avon River	Flow efficiency increase
PE Avon Pipeline Replacement # 2	Avon River	Flow efficiency increase
HYD - Uniacke Lake Dam Removal	Bear River	Loss of storage reservior, no impact to generation
BLR HELLS GATE RUNNER REPLACEMENT	Black River	Runner efficiency improvement
HYD - WHR Pipeline Replacement	Black River	Flow efficiency increase
Hyd Lumsden Runner Replacement	Black River	Runner efficiency improvement
HYD Methals Intake Replacement	Black River	Flow efficiency increase
HYD - U&U Dickie Brook Penstock	Dickie Brook	Flow efficiency increase
SHH- DIB PIPELINE REPLACEMENT	Dickie Brook	Flow efficiency increase
HYD PE Harmony Re-Development	Harmony	Unit Condemned
HYD - Upper Lake Falls Unit #1 Over	Mersey River	Runner efficiency improvement
HYD - Nictaux Pipeline and Intake	Nictaux River	Flow efficiency increase
HYD Paradise Wood Stave Pipeline R	Paradise	Flow efficiency increase
HYD PE Roseway Re-Development	Roseway	Unit Condemned
HYD - Malay Falls #5 Unit Overhaul	Sheet Harbour	Runner efficiency improvement
HYD - Ten Mile Lake Dam Decomm	Sheet Harbour	Loss of storage reservior, no impact to generation
HYD- Ruth Falls #3 Runner Replmt	Sheet Harbour	Runner efficiency improvement
SHH - RUF 1&2 RUNNER REPLACEMENT	Sheet Harbour	Runner efficiency improvement
HYD - Weymouth Falls Pipeline Re	Sissiboo River	Flow efficiency increase
HYD - Sissiboo Pipeline Replacement	Sissiboo River	Flow efficiency increase
HYD Weymouth Falls # 1 Runner	Sissiboo River	Runner efficiency improvement
HYD - U&U Mill Lake Unit 2 Refurb	St Margarets Bay	Flow efficiency increase
HYD -Tidewater Pipeline Repl	St Margarets Bay	Flow efficiency increase
HYD - Sandy Lake Dam Refurbishment	St Margarets Bay	Flow efficiency increase
POND LAKE LOWER PIPELINE REPLACEMEN	St Margarets Bay	Flow efficiency increase
ST. MARGARETS-SANDY LAKE #3 RUNNER	St Margarets Bay	Runner efficiency improvement
HYD - STM-SAL #4 Runner	St Margarets Bay	Runner efficiency improvement
U&U Coon Pond Pipeline Replacement	St Margarets Bay	Flow efficiency increase
HYD - Mill Lake Unit 1 Refurb	St Margarets Bay	Unit Offline, not economic to refurbish
HYD - Tusket #2 Overhaul	Tusket River	Runner efficiency improvement

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2016 Capital Work Planning

Ser	River System	CI #	WO	Project Title	Planned Year				
					2016	**2017**	**2018**	**2019**	**2020**
1	Annapolis	48052	BS	HYD - Annapolis HVAC Replacement	x				
2	Annapolis		BS	HYD - Annapolis Overhaul		x			
3	Avon		BS	HYD - Controls Upgrade				x	
4	Bear River	47432	BS	HYD - Ridge Overhaul	x				
5	Bear River	47652	BS	HYD - Ridge Surge Tank Refurbishment		x			
6	Bear River	47653	BS	HYD - Gulch Surge Tank Refurbishment		x			
7	Bear River	47654	BS	HYD - Gulch Pipeline Replacement		x			
8	Bear River		BS	HYD - Controls Upgrade			x		
9	Black River	47332	BS	HYD - Methals Runner Replacement	x				
10	Black River	44595	S	HYD - PE Hollow Bridge Canal and Intake Refurbishment	x				
11	Black River		BS	HYD - Hells Gate Runner Replacement		x			
12	Black River	47649	S	HYD - Salmon Tail Gate Pedistal Replacement		x			
13	Black River		BS	HYD - Hells Gate Butterfly Valve Replacemen			x		
14	Black River		BS	HYD - Hells Gate Surge Tank Refurbishment			x		
15	Black River		E	HYD - PE Replace Trout River Pond Screens			x		
16	Black River		BS	HYD - Lumsden Stator Rewind				x	
17	Black River		S	HYD - White Rock Canal Refurb					x
18	Black River		S	HYD - Methals Dam Refurb					x
19	Dickie Brook	47660	BS	HYD - Controls Upgrade		x			
20	Fall River	47659	BS	HYD - Controls Upgrade		x			
21	Fall River		S	HYD - PE Miller Lake Dam Refurbishment				x	
22	Hydro	47166	S	HYD - MacAskils Brook Dam Decommissioning	x				
23	Hydro	47651	S	HYD - Maccan spillway study	x				
24	Hydro		BS	HYD - Overhaul Placeholder			x		
25	Hydro		BS	HYD - Overhaul Placeholder			x		
26	Hydro		BS	HYD - Overhaul Placeholder			x		
27	Hydro		BS	HYD - Overhaul Placeholder			x		
28	Hydro		BS	HYD - Overhaul Placeholder			x		
29	Hydro		BS	HYD - Overhaul Placeholder				x	
30	Hydro		BS	HYD - Overhaul Placeholder				x	
31	Hydro		BS	HYD - Overhaul Placeholder				x	
32	Hydro		BS	HYD - Overhaul Placeholder				x	
33	Hydro		BS	HYD - Overhaul Placeholder				x	
34	Lequelle	47648	BS	HYD - Lequelle Pipeline Replacement		x			
35	Lequelle	46253	BS	HYD - Lequelle Tailrace Gate sturcture		x			
36	Lequelle	47682	BS	HYD - Lequelle Switchgear Replacement		x			
37	Lequelle	47876	BS	HYD - Lequelle Overhaul		x			
38	Lequelle	46296	S	HYD - PE Main Dam and Spillway Refurbishment		x			
39	Mersey		S	HYD - Dam Deficiency Refurb (Mersey)				x	
40	Mersey		S	HYD - Dam Deficiency Refurb (Mersey)					x
41	Mersey	45189	BS	Upper Lake Falls unit # 2 Overhaul		x			
42	Mersey	47092	S	HYD - ULF Spillway Refurbishment				x	
43	Mersey	47091	S	HYD - Big Falls Dam Refurbishment				x	
44	Nictaux	47396	S	HYD - Nictaux Powerhouse Dam Refurb	x				
45	Nictaux	39800	S	HYD - PE Scragg Lake Dam - Dam Safety		x			
46	Nictaux		S	HYD - Nictaux Main Dam Refurb				x	
47	Paradise	47655	BS	HYD - Controls Upgrade		x			
48	Paradise		BS	HYD - Paradise Surge Tank Refurbishment				x	
49	Paradise	46297	S	HYD - Neives Lake Dam Refurbishment					x
50	Roseway	38927	BS	HYD - PE Roseway Re-development		x			
51	Sheet Harbour	47551	BS	HYD - Controls Upgrade	x				
52	Sheet Harbour		S	HYD -Ruth Main Dam Refurbishment		x			
53	Sheet Harbour		S	HYD - Marshall Falls Dam Refurbishment		x			
54	Sheet Harbour		S	HYD - Anti Dam Refurbishment				x	
55	Sheet Harbour	44668	BS	HYD - Ruth Falls 2 Stator Rewind					x
56	Sissiboo		S	PE Sissiboo Falls Headgate Refurbishment			x		
57	Sissiboo	44596	S	HYD - Sissiboo Falls Dam Refurbishment			x		
58	Sissiboo		S	PE Weymouth Falls #1 and #2 Headgate Refurbishment and Hoist Replacement			x		
59	Sissiboo		BS	HYD - Controls Upgrade				x	
60	St Margaret's Bay	46254	BS	HYD Mill Lake Surge Tank Refurbishment	x				
61	St Margaret's Bay	18133	BS	PE - Tidewater #1 Runner replacement	x				
62	St Margaret's Bay	47167	BS	HYD - Sandy Surge Tank Refurbishment	x				
63	St Margaret's Bay	46298	S	HYD - 5 Mile Dam Refurbishment	x				
64	St Margaret's Bay		S	HYD - Tidewater Tailrace gates					x
65	Tusket	47163	BS	HYD - Controls Upgrade	x				
66	Tusket	29807	S	HYD - PE Tusket Main Dam	x				
67	Tusket		BS	HYD - Tusket No 1 Overhaul		x			

68	Wreck Cove	45330	BS	HYD - WRC C3 Culvert Replacement	x				
69	Wreck Cove	47397	S	HYD - D4 Remedial Works	x				
70	Wreck Cove		S	HYD - WRC D9 Refurbishment		x			
71	Wreck Cove		S	HYD - D5, D6,1, D62 remedial works			x		
72	Wreck Cove	37702	BS	PE - Wreck Cove Overhaul (LEM)				x	
73	Wreck Cove		BS	HYD - WRC Unit 1 Runner Replacement				x	
74	Wreck Cove		BS	HYD - WRC Unit 2 Runner Replacement					x
75	Wreck Cove		BS	HYD - WRC Unit 1 Switchgear Replacement					x
76	Wreck Cove		BS	HYD - WRC Unit 2 Switchgear Replacement					x

Request IR-48:

With reference to Dam Safety Reports:

(a) Please provide a list of NSPI's Dam Safety Reports, and their completion dates.

(b) Please provide summaries of these reports that outline the need and scope of the work that is needed on these hydro systems.

Response IR-48:

(a)

System	Date of Last DSR
Annapolis	2010
Avon	2011
Bear River	2014
Black River	2009
Dickie Brook	2014
Fall River	2015
Harmony	2011
Lequille	2011
Mersey	2008
Nictaux	2012
Paradise	2013
Roseway	2007
Sheet Harbour	2015
Sissiboo	2015
St. Margaret's Bay	2009
Tusket	2013
Wreck Cove	2010

(b) Please refer to Attachment 1. This attachment includes a summary of the Dam Safety Reports that are leading to dam safety capital investment in the next 3-5 years.

Wreck Cove

Summary of Findings:

Embankment Structures

Most of the Wreck Cove dams require the addition of freeboard, i.e., crest rising, to satisfy CDA criteria, with a corresponding rising of the impervious core.

The calculated factors of safety for all six dams analysed do not meet CDA criteria for at least one of two steady state (FSL) cases (upstream and/or downstream). All other load conditions for all the dams meet criteria with the exception of the Rapid Drawdown case (LSL) for Dam D-6-1. However, it can be noted that all the dams remain "stable" under all load cases, including the steady state (FSL) cases.

Concrete Structures

All concrete structures in the system appear to be in good condition and require general types of repair and maintenance.

The stability analysis of the concrete structures was performed in accordance with the CDA guidelines. All of the structures are relatively small overflow concrete structures and generally performed adequately for the summer, seismic and flood loading scenarios with the exception of Spillway S-4 that did not meet the CDA criteria under flood conditions. None of the spillways met minimum acceptance criteria under ice loading which is typical of small concrete hydraulic structures.

All of the structures are overflow spillways and by definition will have water flowing over them during flood events. The results of the stability analysis indicate that all of the structures fail under ice loading.

Structure	Deficiency	Recommendation
Dam D-5	D-5, has inadequate normal and minimum freeboard	Raise the crest/core of the dams to meet freeboard requirements. Consider/establish need for improved core frost protection at that time.
Dam D-6-1 and D-6-2	D-6-1 and D-6-2 have inadequate normal and minimum freeboard	Raise the crest/core of the dams to meet freeboard requirements. Consider/establish need for improved core frost protection at that time.
Dam D-6-1	The high exit gradient at the toe of Dam D-6-1 has the potential for allowing piping of fines from the foundation soil. The high pressure head within the dam foundation also decreases the effective stresses resulting in lower factors of safety for downstream slope.	Further study of the high foundation head, artesian pressures, critical exit gradients, and effectiveness of pressure relief wells at the toe of Dam D-6-1 is required. The proposed study should also address the low downstream factors of safety, any potential need for maintaining

Structure	Deficiency	Recommendation
		existing or installing new relief wells, and the required remediation methods for Dam D-6-1. Also included should be an assessment of whether defunct piezometers should be reinstituted and/or if new piezometers are required to supplement existing.
Dam D-9	Dam D-9 has inadequate normal freeboard.	Raise the crest/core of the dams to meet freeboard requirements
Dam D-9	Dam D-9 has inadequate minimum freeboard	Raise the crest/core of the dams to meet freeboard requirements
Dam D-9	The left downstream toe area of Dam D-9 between the diversion and the left abutment is very ponded and largely inaccessible.	This area of Dam D-9 should be regraded to direct flow to the weir more quickly.

Lequille

Summary of Findings:

For the most part, the structures were in fair to good condition. Key findings from of this DSR are the required increase in crest elevation of the dams at the Lequille Headpond (by 5.1 to 6.6 ft) and an increase of the crest at Grand Lake Dam by 4 ft. Options should be examined to determine if the tainter gates at the Lequille Spillway should be replaced with a combination of gates and an overflow spillway. Also, the increase of the crest elevation at the Grand Lake dam to accommodate the IDF will require consideration of the flowage rights in Grand Lake. Modifications to the spillway may be required at the Grand Lake Dam. Nova Scotia Power Inc. (NSPI) owns all of the land around the Lequille Headpond, so there is no constraint on maximum elevation there. The study should be done to optimize the combination of spillway length and embankment crest elevations.

Structure	Deficiency	Recommendation
Dargie Lake Dam	The condition of the dam is poor and is deteriorating. The dam is not currently being used to hold back water. The gate structure is not in service. The concrete spillway and sluiceway were in poor condition.	NSPI should decide whether to continue maintaining the dam or decommission it.
Grand Lake Main Dam	The normal and minimum freeboard requirements were not met.	Raise the crest/core of the dams to meet freeboard requirements. An evaluation should be done that determines the amount of dam raise that can be undertaken that also considers the flowage rights. An increase in the capacity of the spillway may also be considered
Lequille Main Dam	The normal and minimum freeboard requirements were not met.	Raise the crest/core of the dams to meet freeboard requirements.
Lequille Main Dam	Riprap is not adequate.	Assess/Repair/Replace Riprap
Lequille Wing Dams No. 3 and 4	The normal and minimum freeboard requirements were not met.	Raise the crest/core of the dams to meet freeboard requirements.
Lequille Wing Dams No. 3 and 4	Riprap is not adequate.	Assess/Repair/Replace Riprap
Lequille Spillway	The tainter gates cannot pass the IDF without overtopping the embankment dams.	An evaluation should be done of the tainter gate system at the Lequille Spillway. Options should be examined to determine if the tainter gates should be replaced with a combination of gates and an overflow spillway.

Nictaux

Summary of Findings:

Embankment Structures

The calculated factors of safety (FOS) for four (McGill Dam, Scrag Dam, Nictaux Canal Embankment, and Intake Embankment) of the six structures analyzed did not meet CDA criteria for at least one of two steady state (FSL) cases (upstream and/or downstream). However, of the four structures that did not meet the CDA criteria, it should be noted that two of the structures (McGill Dam and Nictaux Intake Embankment) showed marginal FOS and were considered adequate based on the conservative material properties used in the analyses. The seismic loading conditions were met for all structures with the exception of the Nictaux Canal Embankment. Two structures met the maximum flood level (IDF) condition for stability while the McGill Dam, Scrag Dam, Nictaux Canal Embankment, and Nictaux Intake Embankment did not.

Concrete Structures

The stability analyses of the structures were performed in accordance with the CDA Guidelines. There are a variety of types of structures in the Nictaux Hydro System including concrete overflow spillways, gated sluiceways, timber crib spillways and earth/concrete composite structures. The results of the stability analyses indicate that several of the structures do not satisfy the minimum acceptance criteria outlined in the CDA Guidelines.

Many of the structures do not meet the CDA stability criteria under ice loading, including McGill Lake overflow spillway, Scrag Lake spillway, Powerhouse Dam and low sections of the Nictaux headpond overflow spillway. These results are not unusual for small hydraulic structures in cold climates. It is recommended that these structures be rehabilitated and stabilized or further investigations be completed to provide additional information to refine the stability analyses.

Structure	Deficiency	Recommendation
Scragg Lake Dam	Based on a preliminary riprap assessment, the riprap size range for the dam is not adequate at the lower end of the rock sizes and for the layer thickness.	Complete a full riprap assessment to determine the upgrade requirements for structure.
Scragg Lake Dam Concrete Spillway	Large horizontal cracks on downstream face.	Cracks in the downstream face should be repaired.
Scragg Lake Dam Concrete Spillway	Structure does not meet all CDA stability criteria	Rehabilitate/stabilize structure.

Mersey

Summary of Findings:

Structure	Deficiency	Recommendation
Upper Lake Falls Spillway	The spillway "T-section" satisfies the stability criteria (i.e. sliding, overturning and flotation) for all the cases considering the current maximum operating level of 278.0 ft. The only case where the stability requirements are not satisfied is the unusual or flood case. However, this is conditional to the stability criteria of the ogee section being satisfied and the implementation of the recommendations for this structure (i.e. ogee section). The intermediate section of the ogee structure does not satisfy the stability requirements for the normal, normal and ice, and seismic cases The base or foundation section of the ogee structure does not satisfy the stability requirements for the normal and ice load case as well as all of the seismic cases.	Conduct an investigation to confirm if vertical reinforcement or dowels are present in the upstream section of the ogee section and analyze the structure with this reinforcement. If no such reinforcement is present or it is found to be inadequate, install post-tensioned anchors along the ogee crest. Install 1-3/8 inch diameter reinforcing steel bars - ASTM A 722 (Grade 150) along the ogee crest at approximately every 11.2 ft (say 3.4 m). Since it is not necessary that these anchors extend into the rock foundation, the bottom of these anchors would be located just above the foundation level. The average anchor would be approximately 18 ft long (5.5 m)
Big Falls Development	The powerhouse bulkhead section does not satisfy the sliding and overturning criteria. Both criteria are not satisfied by a significant margin.	Remedial (stabilization) works are considered necessary.
Big Falls Development	The results of the analysis indicate that the intermediate section of the spillway does not satisfy the stability criteria by a significant margin.	Remedial (stabilization) works are considered necessary.
Big Falls Development	The sluiceway section does not satisfy the sliding and overturning criteria by a significant margin.	Remedial (stabilization) works are considered necessary.
Big Falls Development	Confirm the geometry and details of the downstream	Install post-tensioned anchors with double corrosion protection

Structure	Deficiency	Recommendation
	section of the spillway section and conduct a search to determine if any steel reinforcement has been installed along the upstream face of the spillway section.	on the crest of a portion or all of the spillway structure depending on the outcome of the search.
Big Falls Development	The crest level is too low to satisfactorily protect against wave overtopping.	Raise the elevation of the dam's crest to 190.3 ft.

Sheet Harbour

Summary of Findings:

Embankment Structures

For the minimum freeboard requirement, the peak IDF water surface at each dam was used. None of the dams have adequate freeboard during the IDF loading condition.

The stability analyses results indicate that several of the sections analyzed; do not meet the minimum recommended CDA sliding safety factors. Analyses indicate that all of the dams, except Malay Falls Main Dam, have at least one slope stability loading condition that does not meet the minimum required factor of safety. To meet the required factors of safety, dam safety modifications may be required.

Concrete Structures

The stability analyses results indicate that several of the sections analyzed do not meet the minimum recommended CDA sliding safety factors.

The Marshall Falls spillway section analyzed was found to not meet sliding safety factors for all four loads cases (normal, normal plus ice, IDF, and earthquake). The results indicate the structure has a sliding safety factor at or below 1.0 for all loading conditions.

The Ruth Falls spillway and sluiceway sections were found to not meet sliding safety factors. The spillway section did not meet sliding safety factors for IDF conditions, while the sluiceway section did not achieve the required sliding safety factors for ice, IDF, and earthquake conditions.

Structure	Deficiency	Recommendation
Ruth Falls Spillway/ Sluiceway	The Ruth Falls spillway and sluiceway sections were found to not meet sliding safety factors. The spillway section did not meet sliding safety factors for IDF conditions, while the sluiceway section did not achieve the required sliding safety factors for ice, IDF, and earthquake conditions.	Consider adding additional resistance to sliding and overturning, possibly via rock anchors, to spillway sections.
	Inadequate spillway capacity/freeboard to prevent overtopping during an IDF event.	Consider increasing spillway capacity and/or raising earthen embankments to prevent overtopping. Also consider defining flood operations of stoplogs/gates to reduce IDF headpond water surface elevations
Marshall Falls Spillway	The Marshall Falls spillway section analyzed was found to not meet sliding safety factors for all four loads cases (normal, normal plus ice, IDF, and earthquake). The results indicate the structure has a sliding safety factor at or below 1.0 for all loading conditions. It is likely that the spillway structure bays do not act as	Consider adding additional resistance to sliding and overturning, possibly via rock anchors, to spillway sections.

Structure	Deficiency	Recommendation
	independent monoliths, and likely receive additional sliding resistance from adjacent bays and the spillway walkway.	

Sissiboo

Summary of Findings:

Embankment Structures

The results indicate that both the upstream and downstream slopes of the Sissiboo Falls Main Dam have adequate factors of safety under all conditions of the reservoir operation. It may be noted that the FOS values apply to the average slopes.

The dam crest and upstream and downstream slopes of the earthfill embankments are in satisfactory condition.

Concrete Structures

The analysis results show that the calculated FOS for the usual loading case is about seven percent lower than the recommended FOS for both the gravity dam and the spillway sections. The FOS values for both the Flood and Earthquake loading cases are acceptable.

The Normal and Minimum Freeboard requirements are both met.

Structure	Deficiency	Recommendation
Sissiboo Falls – Main Dam	Alkali aggregate reaction (AAR)	Examine the potential for AAR
Sissiboo Falls – Main Dam	Rubber Bags will be nearing the end of their serviceable life.	Investigate new Rubber Bags for Dam.

Request IR-49:

With respect to the following projects:

(a) G01 (CI 46298 - HYD Five Mile Lake Dam Refurbishment)

(b) G02 (CI 47397 - Gisborne Dam D4 and Spillway S4 Upgrade)

(c) G03 (CI 47396 - HYD Nictaux Powerhouse Dam Refurbishment)

Please provide the following:

(i) The noted "Start Date" of these projects was April 2015. Please describe work that has been completed, and related costs.

(ii) With respect to "Capital Project Detailed Estimate", please describe the process that was, or will be used, to solicit bids, compare the proposals, and award the contracts related to these projects.

Response IR-49:

(i) (a) To date, non-destructive concrete testing and preliminary engineering have been completed. The related costs to December 31, 2015 are $122,782.

(b) To date, topographic surveying, geotechnical investigations and preliminary engineering have been completed. The related costs to December 31, 2015 are $92,560.

(c) To date, preliminary engineering has been completed. The related costs to December 31, 2015 are $98,374.

(ii) For all three projects, the work will be awarded as a result of a competitive bidding process, described as follows:

Requests for Proposals (RFPs) will be issued.

Submitted proposals will be reviewed and the project awarded based on the following criteria:

- Insurability
- Ability to be Bonded
- Safety performance record, including WCB Letter of Good Standing and Experience Ratings (or equivalent)
- Pricing
- Understanding and ability to provide a project plan which meets Specification requirements
- Experience in the industry and relevant and specific expertise and competence of proposed project team/key personnel
- Understanding and ability to meet Specification requirements
- Environmental performance record
- Terms of Payment
- Any previous work with NS Power and familiarity with NS Power standard work methods and requirements
- Adherence to RFP requirements

Request IR-50:

With respect to G04 (CI 47172 - HYD Tidewater Unit 1 Overhaul), G05 (CI 47332 - HYD Methals Overhaul), and G06 (CI 47432 - HYD Ridge Overhaul), under the heading "Why do this project now?", NSPI states:

> **As of 2015, generation from NS Power's legacy hydro facilities will qualify under the provisions of the Nova Scotia Renewable Electricity Regulations. Generation from hydro facilities is an important part of NS Powers compliance plan to serve 25 percent of sales from qualifying renewable generation sources.**

(a) Since the anticipated "In-Service Date" for these projects is September/October 2016, please explain how does the above statement provides a justification to proceed with these projects "now"?

(b) Does NSPI foresee any impact on the availability of Maritime Link project energy on replacement energy cost estimates, as used in the Avoided Cost Calculation? Please elaborate.

(c) Please explain possible implications of the completion of the Maritime Link project on the need, cost efficiency and timing of this, and other hydro generation related projects.

Response IR-50:

(a) This statement is included in these Hydro capital work orders due to their importance to NS Power's ability to meet the renewable energy standards of 25% of generation being renewable, starting in 2015. Proceeding with this project now is justified due to the fact that this legacy hydro generation is included in the calculation of the 25%; therefore, the benefit of preserving their generation is realized immediately.

(b) The availability of energy from the Maritime Link is included in the replacement energy cost calculation.

(c) The completion of the Maritime Link is not expected to have an effect on the need, cost efficiency and timing of any investment in NS Power's legacy Hydro system.

Request IR-51:

With respect to G07 (CI 47552 - TRE5 - Boiler Refurbishment 2016), please provide a condition assessment, and an overview of the anticipated scope, frequency, and costs related to the refurbishment of deteriorated boiler tubes, tube bends, and erosion shields.

Response IR-51:

The table below outlines the condition assessment of the Trenton 5 Boiler. The anticipated scope is determined by the condition assessment which includes component replacement of the Intermediate Reheater Tubes, Boiler Waterwall Tubes and Secondary Superheater Outlet Tubes. Tube Bends, shields and screens may also be replaced. The detailed scope of work including costs is determined by the inspection that will be completed early in the 2016 outage.

Selective replacements are typically completed on an annual basis.

Trenton 5 Boiler Condition Assessment

	Criticality	Condition	Risk
Economizer Group			
Economizer Inlet Header	4	1	4
Economizer	3	4	12
Economizer Outlet Header	4	3	12
Steam Drum			
Steam Drum	5	2	10
Waterwall Group			
Waterwall Tubing	3	4	12
Waterwall Headers	4	3	12
Superheaters Group			
Primary Superheat Inlet Header	4	3	12
Primary Superheater Tubing	3	4	12
Primary Superheat Outlet Header	4	3	12
Secondary Superheat Inlet Header	4	3	12
Secondary Superheater Tubing	3	5	15
Secondary Superheat Outlet Header	4	3	12
Attemperator Group			

	Criticality	Condition	Risk
Superheat Attemperator	4	1	4
Reheat Attemperator	4	2	8
Reheater Group			
Reheat Inlet Header	4	2	8
Reheater Tubing	3	5	15
Reheat Outlet Header	4	2	8

1

Request IR-52:

With respect to G09 (CI 47613 - PHB Boiler Refurbishment 2016), and G39 (CI 47614 - PHB Fuel System Refurbishment 2016), these are defined capital projects for the Port Hawkesbury boiler. How do these requirements compare to the original projections that were used to justify the purchase of this boiler in the beginning?

Response IR-52:

The original capital projection included in the capital work order to purchase and construct the Biomass Generating Station was $1.1 million annually. The 2016 capital investment included in the 2016 ACE Plan is the same as the original projection.

Request IR-53:

With respect to G12 (CI 46352 - TRE5 Air Heater Refurbishment), it is stated that cold end baskets slated for replacement were installed in 2008. Does the required replacement of these cold end baskets indicate that they have reached the end of their originally expected service life, or they need to be replaced earlier than originally expected? Please elaborate.

Response IR-53:

Normal life expectation for cold end air baskets can range from 5-10 years, depending on coal types being burned, operational temperatures and frequency of soot blower use. Corrosion effects are greater on cold end baskets than on hot end baskets and as a result have a shorter life expectancy. This replacement is within expected life interval.

This project is also based upon replacement of the cold end support grids (which hold the baskets in place) which were not replaced in 2008. Grid replacement requires removal of the baskets; it is therefore advantageous to replace the baskets coincidental with the replacement of the grids.

Request IR-54:

With respect to G13 (CI 47689 - LIN4 Air Heater Refurbishment):

(a) When were the air heater baskets originally installed?

(b) Please compare the expected service lives of air heater baskets, and actual frequency and scope of their replacements, between the LIN4 and TRE5 units.

Response IR-54:

(a) The air heater baskets are part of the original design of the boiler. There are two air heaters, north and south, on the Lingan Unit #4 boiler and consist of hot end and cold end baskets in each heater. The north air heater had cold end baskets replaced in 2005 and hot end baskets replaced in 1998. The south air heater had cold end baskets replaced in 2003 and hot end baskets replaced in 1998.

(b) Trenton Unit #5 has a similarly designed air heater configuration as Lingan Unit #4 with both cold end and hot end baskets. Cold end baskets generally have a service life of approximately 5-10 years but it is highly dependent on service conditions including fuel quality. Depending on service conditions, fuel quality and age, different air heater structural repairs may also be required. The table below illustrates the timing of past air heater basket changes for these two units. Note that Trenton 5 will have a cold end basket change in 2016.

1

Air Heater Basket Replacement Years				
	Lingan 4		**Trenton 5**	
	Hot End	Cold End	Hot End	Cold End
North	1998	2005	1996	2001
South	1998	2003	1996	2001
North			2010	2008
South			2010	2008

2

Request IR-55:

With respect to G28 (CI 47611 - POT - Demolish Unit 1 Stack), please explain the terms of NSPI's Asset Retirement Obligation related to Pt. Tupper Generation Station.

Response IR-55:

NS Power is legally required to return the Pt. Tupper Generation Station site to brownfield as part of the decommissioning process at the time of the Generating Station's retirement.

Normally Asset Retirement Obligations are settled at the end of the plant's life. However, as Pt. Tupper is a multi-unit facility which has Unit #1 be retired prior to Unit #2, the retirement costs associated with Unit #1 decommissioning will not be occurring at the same time as the full Generating Station decommissioning. As such, NS Power has made the decision to settle this portion of the obligation now and demolish Unit 1 stack due to safety concerns.

Request IR-56:

With respect to G29 (CI 47505 - LIN Coal Mill Refurbishment 2016), NSPI states that investment on Unit #2 could still be the best option. Taking into account the relatively close retirement date for Lingan Unit #2, please explain potential benefits associated with refurbishment of any mill on this unit.

Response IR-56:

As noted in the description of CI 47505, these mill components are transferable to other mills in the event investment was needed on the mills for Lingan Unit 2:

> …if mills on Unit #2 were found to require refurbishment in 2016, investment on Unit #2 could still be the best option. All four units at Lingan are similar and as such, the components refurbished on this coal mill can be transferred to any of the other Lingan coal mills when Lingan Unit #2 is retired. This includes welded steel rollers and tables with ceramic wear components, worm gear and shaft, vertical shaft and other components that will be addressed in this capital item. The useful life of these coal mill components is more than double the payback period shown in the EAM, providing a significant benefit to all of the coal mills at Lingan.

Alternatively, if during final scoping of this capital project, it is found that a coal mill on Unit #2 needs to be refurbished to continue operation, NS Power will undertake an economic analysis to determine if the deration of Unit #2 from not having the mill in working order will cause replacement energy costs or alternate fuel costs (HFO, for capacity) that are greater than the cost of the capital investment to refurbish the mill.

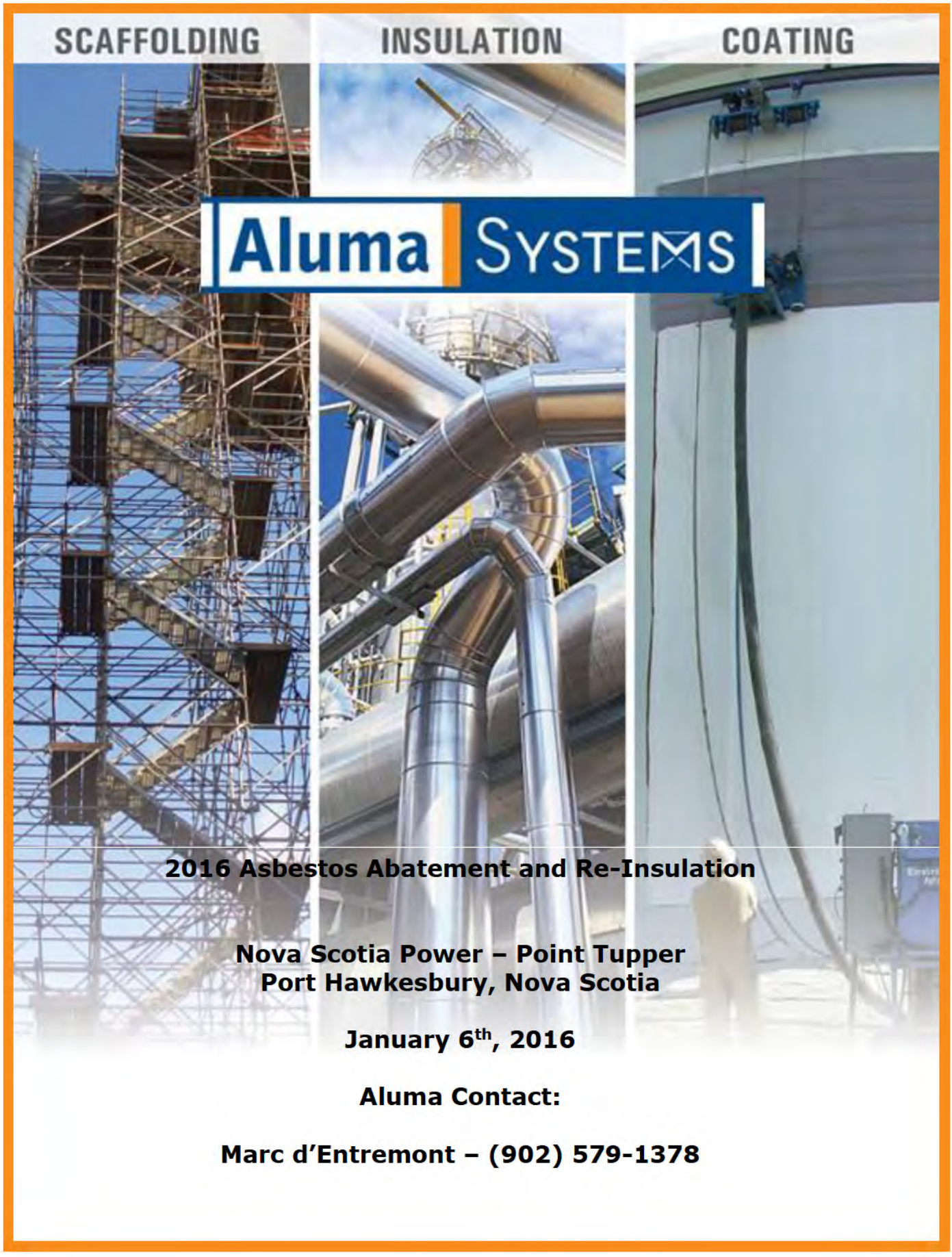
If refurbishment is found to be uneconomic, NS Power will operate the unit with the reduced generating capacity or with HFO in place of coal.

Request IR-57:

With respect to G30 (CI 47661 - POT – Asbestos Management 2016), and the Capital Project Detailed Estimate provided on page 4 of the submission, please provide a quotation and/or other supporting cost details associated with the estimated costs for Materials, Contracts, and Consulting.

Response IR-57:

Please refer to Partially Confidential Attachment 1.



2016 Asbestos Abatement and Re-Insulation

Nova Scotia Power – Point Tupper
Port Hawkesbury, Nova Scotia

January 6th, 2016

Aluma Contact:

Marc d'Entremont – (902) 579-1378

Aluma SYSTEMS

January 6, 2016

Mr. Brent MacLeod,

Aluma Systems Inc. and our parent company, Brand Energy & Infrastructure Services are pleased to offer our proposal for the requested asbestos abatement / re-insulation project at Nova Scotia Powers facility in Point Tupper.

The rates submitted in this proposal are valid until July, 2016.

The rates submitted do not include any provision for holdback.

Safety

Compliance with the Site Safety Plan is paramount to our collective safe operations. It is Aluma's policy to comply with the most stringent of requirements, whether they are the client's or our own. One of the reasons why we have such a high retention rate is because our employees know that we live by our Safety Values. Our industry leading safety program has been recognized twice in the last 6 years from the Canadian Construction Association as "one of the best" in the industry!
Our 2014 Total Recordable Incident Rate of 0.16 certainly supports that recognition.

We look forward to working with NSP on this exciting project and are committed to providing the most cost-effective, high-quality work that you can expect from a veteran ISO 9001:2008 certified company.

Sincerely,

Marc d'Entremont

Thermal Insulation Estimator / Project Manager
Office: (902) 468 - 9533
Email: mdentremont@aluma.com

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Aluma SYSTEMS

CORPORATE OVERVIEW

Originally founded in 1964 Brand-Aluma is now a leading provider of specialty multi-craft services to the North American industrial markets. Our extensive portfolio of service offerings includes work access, specialty coatings, abrasive blasting, insulation, corrosion protection, weatherproofing and other related soft trades. Aluma operates in all industrial sectors including offshore oil and gas, mining, refining, oil sands, power generation, pulp and paper, and petrochemical. The company also serves the infrastructure construction markets throughout North America and in strategic international regions.

Brand-Aluma is the largest scaffolding contractor in the North American industrial marketplace (American Lift & Handler Magazine Issue July-August 2010) and has also been ranked as 3rd overall specialty contractor in North America (Engineering News Record Issue 2010). These clearly demonstrate our extensive experience in the maintenance and construction industries. With over 89 offices and 200 jobsites throughout North America, we employ a stable workforce of roughly 15,000 specialty craftspeople; 10,000 Scaffolders/Carpenters, 1,600 Painters, 3,000 Insulators and 600 Refractory Specialists. Aluma has 27 Professional Engineers licensed in all US States and Canadian provinces, totaling over 400 years combined experience, and resulting in an extensive database of over 6000 engineered drawings.

Our service promise to our customers is based on three key principles: we provide **Safe, Smart, & Efficient** solutions – consistently!

Safe Aluma leads the industry with our safety culture, training, and proactive approach. In 2010 alone, we delivered millions of labor-hours and achieved industry leading safety performance. We routinely receive numerous prestigious industry and customer safety awards.

Smart Aluma provides the most integrated and comprehensive multi-craft services. Our unique multi-craft approach delivers significant savings to clients by reducing manpower and overhead requirements, delivering enhanced productivity, and improving communication through a single point of contact.

Efficient Aluma's experienced management and supervisory staff, innovative products, and advanced project management tools enable us to deliver superior project execution. We offer over four decades of experience and expertise to help make our client's maintenance, capital and turnaround projects a success.

Industrial Scaffolding

Aluma currently maintains an inventory pool valued in excess of $1 Billion – the largest in North America. Aluma also has the unique ability to provide forming and shoring solutions for new construction, as well as full service capability to owners or contractors for maintenance, turnarounds, outages, and capital projects. Aluma has the largest pool of trained, skilled scaffold builders and Project Managers in the industry. Our extensive inventory of rental assets is managed by a global asset management system, for maximum responsiveness. Our state-of-the-art rigorous quality assurance programs for equipment (manufacturing and maintenance) ensure a superior product of choice.

We are able to provide a variety of service offerings for Industrial Scaffolding that include bid assistance, estimating/project consulting & planning to support our full erection and dismantling services, or can be offered independent of those services. Aluma can provide project & inventory management systems (on or off site), custom scaffold solutions, and certified engineering designs in addition to complete scaffold safety programs and training

Aluma SYSTEMS

Insulation Services

Aluma has over 3,000 trained, skilled insulators and supervisors with multiple years of craft experience. We also have significant expertise with advanced materials (new technology), which has resulted in significant cost savings for our clients. Our insulation experts have developed many superior heat conservation programs and manage over 3 million labour hours annually. This gives Aluma the advantage with Turnkey solutions such as reducing overhead and equipment costs, as well as our Safety and Quality Assurance program delivering maximum efficiency in job execution.

Aluma's insulation expertise has allowed for a multitude of service offerings including demolition and installation, piping and process equipment, Calcium Silicate/Mineral Wool/Foam Glass pipe & block systems and experience in insulation for hot and cold systems along with insulation for heat tracing. Aluma also has the ability to do heat loss appraisals. This involves our NIA Energy-certified appraisal experts evaluating the thermal performance of insulated or under-insulation processes in facilities, and providing the client with cost effective solutions. Aluma also has available removable and reusable covers, weather proofing, and standing seam panels.

Corrosion under Insulation (CUI) Management

CUI Management Programs are designed to mitigate active areas of corrosion and rehabilitate the entire coating/insulation system in order to extend pressure equipment and piping inspection cycles. With the addition of Protherm to the Aluma family, we now provide our clients the combination of more than 10 years of experience in delivering turnkey Corrosion under Insulation (CUI) Management solutions. As a leader in providing integrated specialty service solutions, Aluma has the expertise and experience to unite the necessary services that are required to provide clients a successful CUI Management Program that delivers significant cost savings.

Backed by an extensive multi-skilled workforce and cross trained supervision, Aluma is able to reduce client's investment costs by increasing productivity and reducing overhead costs. As a part of our proactive approach to CUI management, we employ 35+ NACE trained and certified coatings inspectors. Our specialists have advanced training in CUI identification and mitigation and are trained on work practices for in-service equipment. Aluma leverages its CUI management experience and multi-service expertise to build partnerships with its clients to exceed the goals of their CUI Management Program.

Coatings

With all the years of experience and innovative programs, Aluma's service offerings continue to grow and advance daily allowing for more opportunities such as cutting edge surface preparation to suit all our clients growing needs including; wet abrasive blasting, robotic blasting, vacuum blasting, water-jetting as well as standard abrasive blasting. Our coatings professionals are constantly striving to provide our clients with the best coatings solutions including but not limited to; secondary containments and acid brick, tank maintenance, reinforced fiberglass, below ground coatings as well as thin film linings. Aluma carries airless and plural component spray equipment not counting one of the largest air compressor fleets in the industry to meet all our clients' demands. Aluma also benefits from National Agreements with all major coatings manufacturers which incurs savings that get passed on to increase the value provided to our clients. In addition, Aluma has trained personnel in Specialty Coatings such as fireproofing, chemical resistant liners, polyurethane coatings, internal pipe coatings and thermal spray aluminum (TSA) coatings.

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Budgetary Price:

Schedule – Abatement workers / Insulators working 3 shifts 7 – 8 hour days per week

Estimated Duration – 6 weeks – set-up scaffolding, set-up enclosure, abatement, re-insulation, tear down enclosure and tear down scaffolding

Estimated Crew Size – 30 – (2) Non-working Foreman (day / night), (18) Painters / Asbestos, (18) Insulators, 10 scaffolders.

Asbestos Abatement – We have allowed to complete all of the work associated with removing the asbestos within the facility as per our site visit July 2015. The 4 lines 20″ x 5″ running approximately 80′, 20″ x 4″ running approximately 80′, 14″ x 5″ running approximately 80′ and the 6″ x 4″ running approximately 201′as identified by Brent MacLeod during the site visit. We have allowed to create scaffolding structure that we will create a large type 3 enclosure approximately 40′ (wide) x 60′ (long) x 60′ (high) with levels inside to complete the removals and re-insulation(see attached Aluma's scaffolding price provided by Kyle MacDonald). The removals will be completed in the type three enclosure, shower trailers will be provided and have been included for in our price, negative air fans and Hepa Vac with additional filters and pleates. We have been told by Brent MacLeod, that the systems will not be operational and out of service. Air testing as per site visit with Brent MacLeod will be performed by the mill on a weekly basis. We have included for disposal fees in our price and can provide clarification it is being disposed of properly. For the re-insulation portion of our price we will be installing mineral wool pipe covering with 0.016 smooth jacketing banded on with ½″ stainless steel banding and clips. We will be installing multiple layers of Enerwrap mineral wool insulation to match the original thickness of the pipes.

Work Plan – Preparation of at least 2 months in advance to begin mobilization would ensure that any issue will be identified far enough out time line wise to hopefully work around. Proper site coordination and preparation, consumables ordering of that magnitude for the abatement work and the re-insulation side of this project will take time to be ordered and brought to site in those quantities. We could be in two to three weeks prior to shut-down to begin erecting the scaffolding, one to two week prior to shut down setting up the type three enclosure, shower trailers and other pre-shutdown prep work. Once the shutdown begins you have instructed us that it will be for two weeks. That leaves us with 3 crews (day, afternoon and night) each crew with 6 guys working 8 hour shifts, I have allowed for two non-working foreman both working 10 hour shifts for supervision purposes. For the re-insulation it will be the same 3 crews (day, afternoon and night) each crew with 6 guys working 8 hour shifts, I have allowed for two non-working foreman both working 10 hour shifts for supervision purposes.

Labour Abatement / Re-Insulation..... [redacted]

LOA / Travel..... [redacted]

Material / Consumable Cost..... [redacted]

Staging..... [redacted]

Hourly Charge out Rates (See Attached)

Aluma SYSTEMS

Clarifications

The pricing above: if proceeding on a time and material basis for the labor rates noted above

1. As per our site visit with Brent MacLeod in July, 2015 to the NSP facility in Point Tupper, Nova Scotia. All work to be performed under the auspices of this agreement with the Local 116 Heat and Frost Insulators Union, the Local 1945 Painters and Asbestos Workers Union and the Local 83 Carpenters Union Minimum pay, call-ins, shift differentials, premium-time and holidays will be paid and billed in accordance with the agreement.
2. Does not include for items such as height pay, mileage, premiums, turnaround allowances, etc. These items, and like items, will be invoiced, with applicable burdens added, at cost plus [redacted]
3. Does not include Flights or other travel costs, room and board incentives etc., which may be applicable. These costs will be invoiced at cost plus [redacted]
4. Does not include any Drug and Alcohol or medical testing. If these are necessary, the costs will be invoiced at cost plus [redacted]
5. Does not include material costs, material will be invoiced at cost plus [redacted]
6. Does not include any freight charges. Freight if needed will be invoiced at cost plus [redacted]
7. Do not include any equipment. Equipment will be invoiced in accordance to the rates provided. Any equipment not listed will have a rate negotiated prior to mobilization.
8. Acceptance of this budgetary price will require another internal bid review by Aluma Systems.
9. Our price is valid for 60 days for date of submission.

Invoicing

1. Invoices will be submitted weekly.
2. Payment terms are net 30 days.
3. There will be no retainage or holdback applicable to this contract.
4. Our proposal is contingent upon having a mutually-agreed billing format and payment process in place prior to the commencement of work

Site Establishments

All Site establishments will be supplied by NSP, if required at no cost to Aluma Systems, including but not limited to:

1. Lunch Facilities
2. Office Space
3. Fabrication Facilities
4. Washroom Facilities
5. Mobile equipment that may be needed. I.e. Forklift, Crane, JLG, etc.

Equipment Rental Rates

Insulation Equipment	
ITEM	Weekly Rental
Pin Welder	$ [redacted]
Combination Machine	$ [redacted]
Sheet Metal 4' Pan Brake	$ [redacted]
Sheet Metal 4' Bending Brake	$ [redacted]
Slip roll 50" 16 gauge (Electric)	$ [redacted]
Slip roll 50" 16 gauge (Manual)	$ [redacted]

** Unless specified, equipment charges do not include fuel. Fuel will be provided by NSP at no cost to Aluma Systems.
** Any Freight needed will be invoiced at cost plus [redacted].

Responsibility Matrix

Item	Description	Client Supply	Aluma Included in Price	Aluma Not in Price, Recoverable
1.00	**Site Facilities / Services**			
1.01	LOA			X
1.02	Change Rooms	x		
1.03	Lunchroom Trailers	x		
1.04	Office Trailers	x		
1.05	Janitorial Services & Cleaning Supplies	x		
1.06	Medical Centre	x		
1.07	Site Fabrication Facility			x
1.08	Site Security	x		
1.09	Temporary heating on Work Site	x		
1.10	Temporary lighting for Contractor's work	x		
1.11	Utility Hook-ups; Gas, Electricity, Water	x		
1.12	Utility Supply; Gas, Electricity, Water	x		
1.13	Trailers – Site Mobilization, Demobilization	x		
1.14	Washrooms/Wash Cars	x		
2.00	**A & D Testing**			
2.01	Pre-Access Testing			x
2.02	Post Incident Just Cause per Canadian Model (Oct 2005)			x
3.00	**Training**			
3.01	H2S Training			x
3.02	Aerial Platform			x
3.03	Confined Space			x
3.04	Fall protection – Initial			x
3.05	Fall protection – Renewal			x
3.06	Fire Watch			x
3.07	Regional Orientation Training			x
3.08	SCBA Training (Self Contained Breathing Apparatus)			x
3.09	Site Indoctrination (2 hours per person)			x
3.10	Site Safety Meetings			x
3.11	Site Specific Training, Permit Training			x
4.00	**Subsistence**			
4.01	Camp / Living out Allowances ("LOA"), Directs			x
4.02	Camp / Living out Allowances ("LOA"), Indirect and Foremen			x
5.00	**Transportation**			
5.01	Flights			x
5.02	Bussing - to / from site			x
5.03	Transportation – onsite			x
5.04	Transportation - to / from camp			x
5.05	Aerial Work platforms / Swing Stages			x
5.06	Cranes			x

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Item	Description	Client Supply	Aluma Included in Price	Aluma Not in Price, Recoverable
5.07	Forklifts			x
5.08	Hand Pull Carts			x
5.09	Material Refuse Containers (supply & service)			x
5.10	Scaffold Wagons / Trailers, as per rate sheet, if required			x
5.11	Trucks, 1 ton flatbed, as per rate sheet, if required			x
5.12	Trucks, 3/4 ton, as per rate sheet, if required			x
5.13	Truck Oil Changes and Maintenance			x
5.14	Fuel - Equipment & vehicles on Site	x		
5.15	Fuel - Equipment & vehicles off Site			x
5.16	Freight Costs			x
6.00	**Contractor Work Area Protection**			
6.01	Fire blanket Installation			x
6.02	Provide & maintain fire extinguishers in Contractors vehicles			x
6.03	Provide & maintain fire extinguishers for the Work area			x
7.00	**Consumables**			
7.01	Banding			X
7.02	Caution / Do Not Enter Flagging			X
7.03	Dunnage, 8'			X
7.04	Poly			X
7.05	Fire blanket			X
7.06	Tarps			X
7.07	Plywood & Lumber			X
7.08	Material Refuse Bags			X
7.09	Rope			X
8.00	**PPE**			
8.01	Anchor Slings			X
8.02	Ankle straps			X
8.03	Balaclavas			X
8.04	Carabineers			X
8.05	Cartridges			X
8.06	Chin Straps			X
8.07	Coveralls			X
8.08	Coverall Cleaning			X
8.09	Disposable Suits – White			X
8.10	Ear Muffs			X
8.11	Ear Plugs, box of 200			X
8.12	Full face Masks			X
8.13	Glove Liners			X
8.14	Goggles			X
8.15	Hard Hats			X
8.16	Hard Hat Liners			X
8.17	Harnesses & Lanyards			X
8.18	Lens Cleaning stations and cleaner			X
8.19	Lens Wipes			X
8.20	Neck warmers			X

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Item	Description	Client Supply	Aluma Included in Price	Aluma Not in Price, Recoverable
8.21	Protective Eyewear			X
8.22	Protective Gloves			X
8.23	Rain Coats			X
8.24	Reflective Tape (Yellow)			X
8.25	Respirators / 1/2 mask			X
8.26	Rope Grabs			X
8.27	Rubber Boots			X
8.28	Rubber Gloves			X
8.29	Sweat Bands			X
8.30	Winter Jackets			X
9.00	**Tools**			
9.01	Canvas Buckets			X
9.02	C-cans	X		
9.03	Fire Extinguishers (Vehicles Only)			X
9.04	Fire Extinguisher annual inspection (Vehicles Only)			X
9.05	SCBA (Self Contained Breathing Apparatus)			X
9.06	H2S Monitors			X
9.07	H2S Calibration Equipment			X
9.08	Tools - up to $1,000.00			X
9.09	Tools - over $1,000.00			X
9.10	Tape Measures			X
9.11	Toolboxes (Gang Boxes)			X
10.00	**Scaffolding**			
10.01	Scaffold Labor			x
10.02	Scaffold Materials			x
10.03	Scaffold Delivery on-site			x
10.04	Scaffold Delivery to Site			x
10.05	Scaffold Tags (RYG)			x
11.00	**Insulation**			
11.01	Materials			x
11.02	Material Delivery			x
11.03	Tools - up to $1,000.00			X
11.04	Tools - over $1,000.00			x
12.00	**Communications**			
12.01	Air cards			X
12.02	All Mobile Cellular Phones		X	
12.03	Intrinsically Safe Radios			X
12.04	Long Distance		X	
13.00	**Office Equipment**			
13.02	Desks / Chairs	X		
13.03	Computers & Software, Desk top			x
13.04	Computers & Software, Lap top			x
13.05	Printer / Fax Copy Paper	x		
13.06	Photocopier, Scanner, Printer , Facsimile	x		
13.08	Stationary materials, Office			x
14.03	Potable water	X		
	NOTES:	-	-	-

Item	Description	Client Supply	Aluma Included in Price	Aluma Not in Price, Recoverable
1	Client supply items will be supplied free issue to Aluma Systems.			
2	Recoverable items will be charged at Cost Plus 12%.			

Terms and Conditions

1. **Contract Effectiveness.** Any price quotation as set out in the Contract is valid for ninety (90) days from the date of the Contract. The Contract is conditional upon Aluma's credit approval of Customer. These Terms and Conditions and any attached quotation and/or proposal are referred to herein collectively as the "Contract".
2. **Temporary Facilities and Other Support Items**. Customer shall provide and pay for: flagmen, temporary barriers, signs, traffic control devices, safety nets, permits, lights, and any other similar items that may be required by law; electrical power, water, lighting, and other utilities; washrooms, dumpsters, lunch areas, toilets, parking; and security for the jobsite.
3. **Price**. The price for materials, equipment or services shall be exclusive of all taxes and any costs of freight or transportation to the jobsite. The price for any materials, equipment or services shall be increased as a result of:
   - **a.** any increase in any wage rates including, but not limited to, any collective bargaining agreement to which Aluma is a party as well as any governmental assessment affecting wages or increases in insurance costs and rental rates;
   - **b.** any equipment damaged or lost pursuant to Paragraph 25 of these Terms and Conditions;
   - **c.** any additional materials, equipment or services provided ;
   - **d.** any other charges for which Customer may be responsible under these Terms and Conditions; and
   - **e.** Customer shall pay all charges and taxes (local, state and federal) which are now or may hereafter be imposed upon the ownership, leasing, rental, sale, purchase, possession or use of the equipment excluding, however, all taxes on or measured by Aluma's income.
4. **Retention / Holdbacks.** Aluma shall not be subjected to any retention or holdback from its payment, unless expressly required by law.
5. **Payment.** Payment for materials or equipment rented or purchased shall be due Aluma 30 days after the date of invoice. Payment for all labor and technical services shall be due Aluma 15 days after the date of invoice. These terms are valid unless otherwise agreed to by Aluma in writing. All late payments shall bear interest calculated at the rate of 18% per annum or the highest legal rate, whichever is less. Notwithstanding any other provision in the Contract, payment to Aluma under this Contract shall not be conditioned in any way on receipt of payment by the Customer.
6. **Default and Termination**. Should the Customer fail to make any payment as provided herein or become insolvent or bankrupt or breach any provision of these Terms and Conditions, the Customer shall be in default. Upon default, Aluma may, without notice and without prejudice to any other remedy it may have, immediately terminate the Contract, take possession of the equipment and materials without notice and without becoming liable for trespass, and recover all monies due and owing to Aluma, including any expenses incurred in recovering the equipment and materials and any rentals, services and other charges incurred after termination. The Customer will pay on demand all such costs, charges, and expenses, including reasonable legal expenses, incurred in retaking possession of the materials or equipment and/or in the collection of any monies which may be due and owing to Aluma by the Customer.
7. **Entire Contract.** This Contract contains the full and entire Contract between the parties. There are no agreements, conditions, representations, warranties, or otherwise, except as are contained herein. No course of prior dealings between the parties and no usage of trade shall be relevant or admissible to supplement, explain, or vary any provisions hereof. Moreover, no general contract, specification, drawing or other item shall be incorporated into or made a part of the Contract or binding on Aluma unless it is agreed to in writing by Aluma. Commencement of performance shall be deemed the acceptance by Customer of this Contract
8. **WAIVER OF CONSEQUENTIAL, LIQUIDATED, DELAY DAMAGES.** Aluma shall not be responsible for lost profits, indirect, incidental or consequential damages arising out of or relating to this Contract. Notwithstanding any other provision in the Contract, in no event shall Aluma be responsible or liable for liquidated damages.
9. **NOTICE**. Any notice or other communication required to be given hereunder must be sent by (a) first class mail to addresses of the parties listed or any other address communicated in writing by one party to the other, or (b) by facsimile.
10. **WAIVER OF SUBROGATION.** To the extent that any loss or damage occurs at the project involving or related to Aluma's services, equipment or materials, the Customer agrees to look solely to its insurance for any loss, damage or injury incurred, whether or not the insurance is sufficient fully to reimburse the Customer. Customer waives any right of subrogation against Aluma to recover for any loss, damage or injury.

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11. **Claims.** All claims for losses, damages, back charges or offsets by Customer shall be submitted to Aluma in writing within 15 days of the first discovery of the potential for a claim. If Customer fails to provide such written and timely notice, Aluma will be prejudiced in its ability to inspect and correct any problems. Accordingly, claims not made in accordance with this paragraph are waived.
12. **Emergencies.** In the event of an accident or situation involving death, bodily injury or product failure involving or related to Aluma's materials, equipment or services, Customer agrees to immediately notify Aluma. Aluma shall be afforded opportunity to immediately visit the site and perform any reasonable tests, analyses or investigation.
13. **INDEMNITY.** To the extent permitted by law, Customer shall defend, indemnify and hold harmless Aluma against any and all claims, actions, expenses, damages, losses and liabilities, including attorney's fees and expenses, for personal injuries (including death) and/or property damage arising from or in connection with this Contract and/or Aluma's equipment and services, but only to the extent such claims, actions, expenses, damages, losses and liabilities are caused by the acts or omissions of Customer or anyone directly or indirectly employed by them or anyone for whose acts they may be liable.
14. **Compliance with Laws.** Customer agrees to observe and conform to all applicable governmental laws, rules and regulations and Customer shall defend and indemnify Aluma for any cost or liability arising from the Customer's failure to comply with such laws, rules and regulations. All parties agree that they will abide by provisions of 41 CFR 60-1.4(b).
15. **Law of Contract.** The terms and provisions of the Contract shall be construed and enforced in accordance with the laws of the Province or State in which the project is located.
16. **Technical Information.** Where Aluma has provided to Customer technical data, drawings, information or specifications for use of Aluma materials or equipment, the following conditions will apply:
    - **a.** Customer agrees to defend, indemnify and hold Aluma harmless against and from liability or claim for damage or injury sustained by reason of deviation in whole or part from such technical information.
    - **b.** All technical information shall remain the property of Aluma and may not be used on any other project of any kind or nature without the express written consent of Aluma.
    - **c.** Assembly drawings will be charged out at $50.00 per hour.
    - **d.** All notes, note sheets, specifications, and other information provided with Aluma's drawings shall be incorporated into this Contract.
17. **Insurance.** Customer shall purchase and maintain at his own expense the following minimum insurance: WORKER'S COMPENSATION insurance, including occupational disease, as prescribed by applicable law, and Employer's Liability with a limit of not less than $500,000 per occurrence; COMPREHENSIVE AUTOMOBILE LIABILITY insurance, which shall include coverage for all owned, non-owned, hired or leased vehicles, and shall have a combined single limit of not less than $2,000,000 per occurrence for bodily injury and property damage; COMPREHENSIVE GENERAL LIABILITY insurance for bodily injury and property damage with a combined single limit of not less than $2,000,000 per occurrence. All coverages shall name Aluma as an additional insured and shall be primary and non-contributory.
18. **Standard of Performance.** Aluma shall provide services with the care and skill ordinarily used by similar persons operating under similar circumstances. Aluma makes no representations, warranties, express or implied, in conjunction with these services. Aluma shall not be responsible whatsoever for any claim or demand in respect to any technical information, opinion, data, drawings or specifications which are not marked or stamped by a Professional Engineer engaged by Aluma.
19. **Information Supplied by Others.** Aluma shall be entitled to rely upon information supplied by or through Customer in performing its services. Customer warrants that the information supplied to Aluma shall be accurate, complete, and appropriate for the project and Aluma's scope of work. Customer agrees to defend, indemnify and hold Aluma harmless from, any and all costs, expenses, damages, liabilities, claims, and causes of action, including reasonable attorney's fees, arising out of or related to any error or inaccuracy or defect in the information supplied by Customer or on Customer's behalf to Aluma.
20. **Scope of Services.** Aluma shall provide services as outlined in the attached proposal. In the performance of these services, Aluma shall only supervise the work of its own employees and agents. Aluma shall not supervise, direct, or control the work of others or have a right to control the means, methods, techniques, or sequences of engineering, design or construction by others.
21. **Miscellaneous.** Customer is precluded from assigning the Contract in any manner whatsoever. Time shall be of the essence of this Contract. In the event any term, provision or condition of this Contract is held to be invalid, illegal, or unenforceable, it shall not affect the validity, illegality or enforceability of the remainder of the Contract. This Contract shall inure to the benefit of and shall be binding upon the parties and their successors. Each party agrees to execute such further papers and documents that may be necessary to carry out the intent and purpose of this Contract and its provisions.
22. **Hoisting.** All hoisting and lifting of material to heights above 10' will require that the Customer provide a crane or any other means of mechanical lifting and a qualified operator; this also includes the provision of a forklift, if necessary, unless otherwise specified. Unreasonable delays to loading and unloading areas for any reason will be reported and considered reimbursable *stand-by time.*

23. **Damage for Delays.** Notwithstanding any other provisions to the contrary, Aluma may recover delay damages when the delays are caused by persons other than Aluma or events beyond Aluma's control.
24. **Substitution of Materials or Equipment.** In the event the materials or equipment set forth in Aluma's proposal are unavailable in time to support the Customer's schedule for the work, Aluma reserves the right to substitute materials or equipment which can perform the same function.
25. **Loss or Damage to Materials or Equipment.** The Customer is responsible for all loss or damage to all materials and equipment in its possession or control. The materials and equipment shall be deemed to be in the possession of the Customer for all purposes of this Contract from the time it is received by the Customer until the time that the materials or equipment has been returned to Aluma's yard or is in Aluma's possession. All shortages and damages to materials or equipment in Customer's possession will be charged to and paid by the Customer at Aluma's then current list price or such other rate agreed between Aluma and Customer in writing, at the time such loss or damage is discovered by Aluma.
26. **NO WARRANTIES. Aluma, makes no warranties, express or implied, including the implied warranty of merchantability or fitness for a particular purpose. All materials and equipment are rented, sold or supplied on an "as is" basis.**
27. **Inspection.** When the materials and equipment are received the Customer should inspect the condition of the materials and equipment and the quantity of equipment shipped. If the equipment count is incorrect or if the materials and equipment is received in damaged condition the Customer should notify Aluma in writing within 24 hours. If the Customer does not inspect and count the materials and equipment when it is received on site then the Customer is conclusively deemed to have accepted that the quantity of equipment as shown in Aluma's shipping documents as correct and, in addition, that the materials and equipment are in good, operating and marketable condition, fit for the purpose of their intended use.
28. **Maintenance of Equipment.** Customer shall at its own expense maintain and return to Aluma the materials and equipment in the same repair, operative and marketable condition as when it was shipped. The materials and equipment are to be installed, maintained, and operated in conformity with safe industry practice in accordance with the requirements of all applicable laws, ordinances and regulations as well as any specifications or product data provided by or available from Aluma. Aluma shall have the right at any time to enter the site where the equipment is situated and shall be given free access for the purpose of inspection of the equipment. The Customer shall in no circumstances attempt to modify or repair the equipment.
29. **Title to Equipment.** Title to the materials and equipment, shall at all times and at all places, remain with Aluma. The materials and equipment shall not, without prior written consent of Aluma, be removed from the site designated by the Customer at the time of shipment and shall not be intermingled, connected or used with any equipment of others. Aluma shall have the right, at any time, to file or register its ownership, interest and/or title in or to the materials and equipment, and this Contract as may be permitted by law. The Customer shall not pledge or encumber nor permit any pledge or encumbrance to attach upon the equipment.
30. **Access to the Work Site.** Customer shall obtain the necessary permits or permission for Aluma to have access to the site, or to erect from adjoining property, if required. Aluma shall have complete access to perform its work as outlined in the attached proposal and Customer agrees to provide the following:
    - **a.** a firm foundation for the scaffold or shoring;
    - **b.** sufficient storage area within a reasonable distance of the work;
    - **c.** maintained traffic patterns in a manner to facilitate our planned erection sequence, including any lane closures;
    - **d.** the ability to utilize the crane as needed to maintain Aluma's progress at no cost to Aluma;
    - **e.** that the roof on which Aluma is working is capable of supporting the scaffold;
    - **f.** permission to tie into the face of the building and the ability to make a sufficient number of ties;
    - **g.** additional ties for tarpaulins or other temporary enclosures which are not part of Aluma's scope, and shall be billed as an extra;
    - **h.** that the existing building or bridge will safely support the loading from the scaffold;
    - **i.** removal of any glass, windows, grit or other items which must be removed prior to erection or replace same following dismantling;
    - **j.** ladders and landings per OSHA regulations, Provincial Occupational & Health or WCB regulations, or as required by project site safety regulations
    - **k.** controls to ensure that loading of the scaffold does not exceed specified loads;
    - **l.** barges, boats and personnel for water work;
    - **m.** that scaffolds shall be dismantled and re-erected only as outlined in the attached proposal. Any additional dismantling and remobilization of scaffold shall be billed as an extra.
31. **Safety Compliance.** Unless more stringent statutes are imposed by the owner facility, all scaffolds under the terms of this Contract will be erected and dismantled in accordance with applicable government regulations (OSHA or Provincial Agency) and applicable codes and standards with deference given to current governmental directives and manufacturers' specifications.

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It is understood that the use of scaffolds provided hereunto shall comply with the above-stated Regulations, Codes and Standards and the Customer agrees to indemnify and hold harmless Aluma from any claim, cost or liability arising out of deviation from such use.

32. **Location.** The equipment shall be kept at the location specified; or, if none is specified, at Customer's address as set forth in this Contract and shall not be removed therefrom without Aluma's prior written consent.
33. This proposal is based upon a forty-hour, straight time work schedule.
34. Any standby or waiting time that may be incurred is not included in Aluma's price.
35. **ARBITRATION CLAUSE.** Aluma and the Customer agree to conduct their relations under this Contract on the basis of friendship, fair dealing and mutual respect. In the event, however, of any controversy or claim arising out of or relating to this Contract, or the breach thereof , Aluma and the Customer agree to resolve such controversy or claim expeditiously through discussion and consultation and, if necessary, through consultations at their highest management levels. In the event that such a controversy or claim cannot be resolved through discussion and consultation, it shall be settled by arbitration administered by the American Arbitration Association under its Commercial Arbitration Rules, and judgment on the award rendered by the arbitrator(s) may be entered in any court having jurisdiction thereof.
36. **Service of Notice of Arbitration.** The parties agree that service of any notices in reference to such arbitration at their addresses as given in this Contract (or as subsequently varied in writing by them) shall be valid and sufficient.

Request IR-58:

Please list all transmission projects, including those contained within Routines, which are expected to be completed by NSPI affiliates and/or external contractors. Please include contract cost and total cost for each project.

Response IR-58:

Please refer to Attachment 1, also provided electronically.

REDACTED (CONFIDENTIAL INFORMATION REMOVED)

Capital Item	Project	Title	Functional Class	Total Contract	Affiliate / External Contractor	Total Project
23115	T001	Provincial - Unplanned Transmission Line Replacements	Transmission	530,956	Affiliate	876,369
23120	T003	Provincial - Transmission Substation Primary	Transmission	304,727	External Contractor	2,081,372
23121	T004	Provincial- Substation Additions & Modifications	Transmission	178,807	External Contractor	832,457
43827	T010	Transmission ROW Widening	Transmission	4,486,442	External Contractor	5,999,956
23118	T011	Provincial - Planned Transmission Line Replacements - all part projects under this program are Affiliate	Transmission	3,339,723	Affiliate	4,764,488
14841	T016	Protection Modifications And Replacements	Transmission	20,000	External Contractor	433,690
41519	T731	Harbour East 138 kV Tx Line	Transmission	5,447,621	Affiliate	11,672,021
43205	T808	L5510 Insulator Replacements	Transmission	2,133,528	Affiliate	2,883,371
43261	T831	6V-GT1 Hollow Bridge Hydro Replace	Transmission	92,714	External Contractor	631,275
43266	T887	89S Point Aconi ST2 Replacement	Transmission	371,661	External Contractor	1,460,546
43267	T835	13V Gulch Replace 13V-GT1 & 13V-VR1	Transmission	210,483	External Contractor	919,441
43291	T786	67N-Onslow BPS Upgrades 230KV	Transmission	622,207	External Contractor	3,334,478
43490	T860	Steel Tower Life Ext - Hali Harbour	Transmission	703,000	External Contractor	1,012,154
43678	T800	Separate L8004/L7005	Transmission	5,393,986	External Contractor	10,767,280
44976	T832	10H 25kV Breaker Rplcmnt & Reconfig	Transmission	345,000	External Contractor	885,390
44981	T871	2C Port Hastings Tx Replacement	Transmission	329,490	External Contractor	2,053,799
44987	T820	L7003 Lidar Upgrades	Transmission	5,824,951	Affiliate	10,110,148
45066	T802	Upgrade L6511 and L7019	Transmission	1,401,247	Affiliate / External Contractor	3,061,258
45306	T822	Prime Brook Substation Addition	Transmission	909,419	Affiliate / External Contractor	3,645,403
46333	T864	L6538 Replacements	Transmission	559,399	Affiliate	870,586
46339	T825	120H Replace SVC Controls	Transmission	5,100,640	External Contractor	10,021,839
46397	T855	Substation Telemetry	Transmission	5,175	External Contractor	162,560
46513	T827	3C Port Hastings BPS Upgrade	Transmission	1,061,451	External Contractor	3,391,187
46587	T856	Metro Voltage Support Add Capacitor	Transmission	874,940	External Contractor	3,373,511
46591	T828	88S Lingan Replace 230kV GIS	Transmission	3,162,796	External Contractor	14,249,882
46757	T867	88S Lingan 230kV BPS Upgrades	Transmission	631,909	External Contractor	3,218,221
46811	T872	2H Armdale Transformer Addition	Transmission	905,000	External Contractor	2,545,596
47131	T858	L8001 Structure 58 Replacement	Transmission	525,000	External Contractor	948,142
47912	T873	L6552 Replacements and Upgrades	Transmission	660,575	Affiliate	1,054,326
47914	T874	L6537 Replacements and Upgrades	Transmission	858,845	Affiliate	1,382,705
47935	T875	L5040 Replacements	Transmission	806,411	Affiliate	1,241,298
47949	T876	L5028 Replacements and Upgrades	Transmission	731,459	Affiliate	1,144,355
47950	T881	L5017 Replacements & Upgrades	Transmission	1,346,605	Affiliate	2,182,142
47952	T869	L7001 Replacements (Phase 3 & 4)	Transmission	1,073,508	Affiliate	1,617,933
48022	T888	Spider Lake Substation Addition	Transmission	360,000	Affiliate / External Contractor	6,348,981
48023	T889	103H LAK: Capacitor Bank Additions	Transmission	215,000	External Contractor	3,231,190
48024	T890	90H Sackville: Capacitor Bank Addit	Transmission	215,000	External Contractor	3,852,989
48025	T891	L7018 Upgrade to 345kV & Capacitor	Transmission	505,000	Affiliate / External Contractor	21,495,059
48066	T880	2016 PCB Removal - Substation	Transmission	1,102,390	External Contractor	3,500,427
48067	T892	2016 Oil Containment Program	Transmission	130,451	External Contractor	468,963
48113	T882	2016 Steel Tower Refurbishment	Transmission	509,780	Affiliate	1,032,578
48114	T893	2016 Steel Tower Life Extension	Transmission	975,000	External Contractor	1,477,739
48116	T883	2016 Sacrificial Anode Installation	Transmission	668,422	Affiliate	970,909
48026		L-6033/L-6035 CT Ratio Changes 1H	Transmission	25,000	External Contractor	50,372
48111		East Switch Upgrades 15S	Transmission	29,744	Affiliate / External Contractor	122,220
48112		11W King Street Substation Ret	Transmission	56,500	External Contractor	91,927
48154		L5527 Reconductor	Transmission	308,034	Affiliate / External Contractor	497,606
48156		East Switch Upgrades 58C	Transmission	29,744	Affiliate / External Contractor	122,220
				56,079,739		**158,092,359**

Request IR-59:

Please identify all projects from the 2016 ACE Plan that are required in order to comply with Northeast Power Coordinating Council ("NPCC") Bulk Power System ("BPS") protection risk reduction plan.

Response IR-59:

CI	Project Title	2016 Budget ($)	Total Estimate ($)	2016 ACE Category
46757	88S Lingan 230kV BPS Upgrades	265,641	3,218,221	Request Approval
46513	3C Port Hastings BPS Upgrade	468,251	3,391,187	Carryover
43291	Protection Risk Reduction 67N-Onslow 230KV	293,342	3,334,478	Carryover
Total		**1,027,234**	**9,943,886**	

Request IR-60:

Please identify all capital items included in the 2016 ACE Plan that are related to the Maritime Link project.

Response IR-60:

The following table lists the capital items related to Maritime Link and the manner in which they were listed in the 2016 ACE Plan. In accordance with the Board's 2014 ACE Plan directive, none of the associated costs are in rate base at this time.

CI	Project Title	Listing
43678	Separate L8004/L7005 on Canso Crossing Double Circuit Tower(DCT)	Subsequent Submittal
43324	L6513 Rebuild/Upgrade Line Terminals	Carryover
45066	Upgrade L6511 and L7019 Thermal Rating	Carryover
45067	67N Onslow 345 KV Node Swap	Carryover

Request IR-61:

With respect to T01 (CI 46591 - 88S Lingan Replace 230kV GIS):

(a) When was this project initiated?

(b) Please describe the work that has been completed, and related expenses.

(c) Please explain the relationship between T01 and T04 (CI 46757 - 882 Lingan 230kV BPS Upgrade.

(d) Is this project being done simultaneously with the work related to the Maritime Link? If so, please explain the criteria used by NSPI to assign costs to each of the projects.

Response IR-61:

(a) This project was first initiated in late 2014.

(b) As of the end of 2015, $133,161 has been spent on this project, associated with the scoping of alternative solutions for the replacement of the existing Westinghouse 5-breaker Gas Insulated Substation (GIS) and Gas Insulated Breaker (GIB) portion of the Lingan Substation along with respective preliminary engineering and cost estimates of alternatives considered.

(c) T01 and T04 are not related. T04 (88S Lingan 230kV BPS Upgrade) is a standalone project to meet NS Power's obligation to comply with NPCC's bulk power system protection criteria associated with the risk reduction implementation plan (NPCC-Directory 4), regardless of what other work is required/planned at Lingan.

(d) This project is independent of any work related to the Maritime Link.

Request IR-62:

With respect to T02 (CI 48066 -2016/2017 Substation Polychlorinated Biphenyl (PCB) Equipment Removal Program), there is an amount of $65,000 per breaker for installation included in the costs (under contracts). The 2015 ACE plan amount (included in CI 46586 and submitted for subsequent approval on May 5, 2015) had no amount included under contracts for breaker installation but had 4 breakers included in costs (under materials).

(a) On page 615, the project to replace PCBs is defined. NSPI was notified of a change to the deadline to meet the PCB requirements in April 2014. Is there a chance that this deadline may be further extended? And if so, will the Company be looking at reducing the annual costs to complete this program?

(b) Were the 4 breakers noted above installed in 2015?

(c) If so:

(i) Were they installed by NSPI employees? If so, what were the labour costs incurred?

(ii) Or were they installed using an external party? If so, what was the unit price incurred for the installation?

(d) Does NSPI expect to meet the 2025 deadline, given the rate of replacement to date?

Response IR-62:

(a) There has been no indication that this deadline will be extended further. The plan is to continue at a rate of replacement which conforms to the regulations as they currently exist.

(b) Yes, the four breakers were installed in 2015 (15V-550, 2C-643, 2C-648, 91H-609).

(c) One breaker (15V-550) was installed completely by NS Power employees while the other three breakers were installed by a combination of NS Power employees and the manufacturer recommended installer.

Breaker	NS Power Labour ($)	Contractor Costs ($)
15V-550	60,018	-
2C-643	15,136	43,470
2C-648	19,182	57,960
91H-609	32,551	57,960

(d) Yes, given the current rate of replacement the expectation is that this work will be completed by the deadline.

Request IR-63:

With respect to T03 (CI 46587 - Metro Voltage Support - Add Capacitor Bank):

(a) Please provide a short description of all possible alternatives, and explain why this option was selected.

(b) Please provide a copy of a report or study that provides a detailed description and justification for the above project.

(c) NSPI's list of related capital items includes five additional projects. Please describe the relationship between these projects.

(d) Was this project discussed during the recent IRP proceeding? If yes, please provide details.

(e) Were these six projects totaling approximately $38.4 million included in the IRP modelling? If not, please explain.

Response IR-63:

(a) Capacitor banks are the least expensive static reactive power source available in the market, so only this alternative and the 'Do Nothing' alternative were compared in the business case. The alternative for installation of capacitor banks under CI 46587 was chosen because it offered the most favourable economic return.

(b) The detailed description and justification for this project is included starting on page 618 of the 2016 ACE Plan as part of the capital project approval request.

(c) CI 46587 was identified as the first phase of reducing the requirement to run Tuft's Cove generation to support steady state voltage levels in the Metro Halifax area. Further study was required to complete system studies and validate the economic benefits to increase the Onslow South transfer level (phase 2) and further reduce the requirement to dispatch Tuft's Cove generation uneconomically for system voltage support. CIs 48022, 48023, 48024, 48025 and 48026 are part of the other related CIs that will be subsequently submitted for approval as required.

(d) No.

(e) No. These projects were studied after the IRP was concluded.

Request IR-64:

With respect to T04 (CI 46757 - 88S Lingan 230kV BPS Upgrades), page 648, please clarify and explain how the following statement relates to doing this project now:

> **Mr. DiFilippo reported that NSPI submitted a request (provided in the Agenda package) for an extension to the 2016 mitigation schedule for the BPS risk reduction implementation plan identified at 88S Lingan Substation. A two-year extension was requested to coordinate with the end-of-life replacement project in 2017 and the planned retirement of the generator G2 in 2018 at this substation.**

Response IR-64:

The above statement is related to the timing of this project. In the absence of the extension that was granted, the project was required to be completed by the end of 2016. However, as a result of the extension, this work is not required to be completed until the end of 2018, which is the new requirement.

Request IR-65:

With respect to T06 (CI 47950 - L-5017 Replacements and Upgrades), please provide a quotation and/or other supporting cost details associated with the cost estimate for Materials and Contract Line Work.

Response IR-65:

The contracts portion of this project will be sourced through NS Power's existing Power Line Technician (PLT) Service Agreement. All materials required for this project are considered stock items and would have been acquired through a competitive bidding process.

Request IR-66:

With respect to T07 (CI 44981 - 2C Port Hastings Transformer Replacement), please provide a copy of the relevant sections of the Distribution Planning Study for this area, or any other study that provides a support for this project.

Response IR-66:

This project is justified based on the deteriorated condition of 2C-T1 and supporting infrastructure and the environmental and reliability concerns associated with the leaking transformer. 2C-T1 serves as the source to distribution feeders 2C-401 and 2C-402. There are no alternative paths to provide electrical service to the customers supplied by these feeders. As such, a planning study was not completed for this project, as options to address this issue are limited to those that maintain the source to these feeders. The plan put forward in this project is the least cost method to address the deteriorated equipment requiring replacement.

Request IR-67:

With respect to T09 (CI 48061 - New Mobile Substation, 69-25/12-4kV, 6MVA), please provide a copy of NSPI's system spares study that supports this investment.

Response IR-67:

NS Power's system spares strategy is focused on NS Power's spare transformer fleet and ensuring that all equipment has an identified spare available as appropriate. NS Power does not explicitly study the requirements for mobile equipment. Mobile equipment is required to provide immediate, short term response to unexpected failures. From an operational perspective, timelines to restore service to substations at the 69-4.16kV voltage level in the 5MVA range could be extended if 3P is not available.

This project is also supported by operational experience; last year there were events when the 3P mobile was installed for maintenance and if an unexpected failure had occurred on one of the transformer units previously identified there was a potential for a prolonged (3-5 days) outage due to the unavailability of the 3P mobile substation.

Request IR-68:

With respect to T10 (CI 48114 - 2016 Steel Tower Life Extension - HRM), please provide a quotation and/or supporting cost information associated with the cost estimate for Contracts in the amount of $975,000.

Response IR-68:

The contract in the amount of $975,000 represents the estimated cost to apply protective coating to [redacted] lattice steel towers at an estimated cost of $[redacted] per tower. This estimate is based on Partially Confidential Attachment 1, a quote to apply protective coating to structures 1-9 on L6033, which is considered to be of similar scope to the towers in this project. (The quote includes an average cost of $[redacted] per tower; three of the nine towers were quoted over $[redacted]). This amount is a reasonable estimate and accounts for potential complications due to the location of the towers to be painted. A Request for Proposal will be completed for this scope of work in Q1 2016.

NOVA SCOTIA POWER
Response to RFP P-15-051

TOWER POWER

Transmission Tower Painting

ITEM NO.	SUB ITEM NO.	COST ACCOUNT NO.	PAINTING OF NSPI STEEL LATTICE TRANSMISSION LINE TOWERS DESCRIPTION	APPROX. QUANTITIES	UNIT	UNIT PRICE (EXCLUDING HST/GST)	TOTAL AMOUNT (EXCLUDING HST/GST)
1			L6014 – Halifax Harbour Crossing – Structure #006 - 138 kV Dead End Tower (previously painted, gray, and approximately 143 feet high)	1	L.S.	[redacted]	[redacted]
2			L6014 - Halifax Harbour Crossing – Structure #005 - 138 kV Suspension Tower (previously painted, red and white, approximately 280 feet high)	1	L.S.	[redacted]	[redacted]
3			L6033/6035 – Structure #001 - 138 kV Heavy Angle Tower (previously painted, gray, approximately 103 feet high)	1	L.S.	[redacted]	[redacted]
4			L6033/6035 – Structure #002 - 138 kV Dead End Tower (gray, approximately 123 feet high)	2	L.S.	[redacted]	[redacted]
5			L6033/6035 – Structure #003 - 138 kV Suspension Tower (gray, approximately 91 feet high)	2	L.S.	[redacted]	[redacted]
6			L6033/6035 – Structure #004 - 138 kV Suspension Tower (gray, approximately 97 feet high)	1	L.S.	[redacted]	[redacted]
7			L6033/6035 – Structure #005 - 138 kV Medium Angle Towers (previously painted, gray, approximately 99 feet high)	1	L.S.	[redacted]	[redacted]
8			L6033/6035 – Structure #006 - 138 kV Medium Angle Towers (previously painted, gray, approximately 95 feet high)	1	L.S.	[redacted]	[redacted]
9			L6033/6035 – Structure #007 - 138 kV Medium Angle Towers (gray, approximately 116 feet high)	1	L.S.	[redacted]	[redacted]
10			L6033/6035 – Structure #008 - 138 kV Medium Angle Towers (previously painted, gray, approximately 78 feet high)	1	L.S.	[redacted]	[redacted]
11			L6033/6035 – Structure #009 - 138 kV Dead End Towers (gray, approximately 111 feet high)	1	L.S.	[redacted]	[redacted]
12			Transformer 103H-T81 - Lakeside Substation, Halifax, NS.	1	L.S.	[redacted]	[redacted]
13			Transformer 91H-T11 - Tufts Cove Substation, Dartmouth, NS	1	L.S.		
14			Transformer 99W-T72 - Bridgewater Substation, Bridgewater, NS	1	L.S.		
				TOTAL ITEMS 1 TO 11 (EXCLUDING HST/GST)			[redacted]

Request IR-69:

With respect to T12 (CI 47935 - L-5040 Replacements), how does NSPI determine which components or pieces of transmission lines should be replaced and how they are prioritized?

Response IR-69:

The transmission inspection program identifies deteriorated assets that require replacement. Transmission lines are inspected on a 3 year cycle. Assets identified for replacement are prioritized by their condition and criticality pursuant to Section 6.2 Ranking Process of the Capital Expenditure Justification Criteria approved by the Board on November 17, 2015.

High priority deteriorated assets found during inspections would be completed promptly using the T001 Routine. Deteriorated assets that are prioritized as needing to be completed in 1–6 months would be completed using the T011 Routine. All other priorities for a specific line would be packaged together and used to create a project in subsequent years.

Request IR-70:

With respect to T15 (CI 48113 - 2016 Steel Tower Refurbishments), the steel tower for refurbishment program is defined. How does NSPI optimize the use of ground crews in looking at towers either individually or in groupings?

Response IR-70:

The use of ground crews are optimized through NS Power's transmission inspection program, which identifies the towers to be repaired. The structures to be repaired in the 2016 Steel Tower Refurbishments are identified through this program. Towers on a transmission line are inspected in a sequential order during regular inspections and each line is inspected on a three year cycle. When a deficiency is identified during an inspection, mitigation measures are investigated and prioritized based on the criticality and condition of the structure.

Request IR-71:

With respect to T16 (CI 48059 - 2016/2017 Transmission Switch & Breaker Replacements), please identify the switches and breakers which have been already retired and replaced under this program, as well as those to be retired and replaced.

Response IR-71:

Under the Switch & Breaker Replacements program, the table below identifies those breakers that will be replaced in 2016 as well as those that have been replaced in previous years. The breakers that have been selected for replacement in 2016 are currently the ones which pose the greatest risk of failure.

Device	Program Year
50W-513	2016
75W-603	2016
75W-604	2016
90H-502	2016
74N-511	2015
43V-506	2015
20V-503	2015
13V-516	2015
101H-600	2015
50N-604	2014
30N-614	2014
82V-411	2014
58H-501	2014
58H-500	2014
99H-507	2014
17V-502	2014
17V-504	2014
30W-620	2014
89S-551	2014
1C-688	2013
1C-684	2013

Device	Program Year
50N-508	2013
50N-511	2013
50N-522	2013
43V-501	2013
43V-503	2013
15V-505	2013

1

Request IR-72:

With respect to T18 (CI 48067 - 2016 Oil Containment Program), the oil containment program is defined and the priority criteria used to identify which sites should be done first. It is further identified that this program will continue into 2017 and 2018. Will this be sufficient time and a sufficient budget to complete this program?

Response IR-72:

NS Power identified 30 sites having the highest risk for pathways to be created between the potential sources of oil and potential receiving waters or wetlands. The current plan is to complete six sites per year with the program being completed in 2020.

Request IR-73:

With respect to T20 (CI 48062 - 2016/2017 Reactor Breaker Replacements), the reactor breaker replacements are discussed. Is the intent of NSPI to replace all reactor breakers? If so, over what time period?

Response IR-73:

The intent is to replace all NS Power reactor breakers over the next two to three years. This decision was made due to increasing failure rates in this asset class in recent years. There are 11 reactor breakers on the system. As noted in the Summary of Related CIs in CI 48062, projects were submitted to replace three reactor breakers in the 2014, 2015 and 2016 ACE Plans, and another is anticipated to be submitted for 2017/2018.

Request IR-74:

Please list all distribution projects, including those contained within Routines, which are expected to be completed by NSPI affiliates and/or external contractors. Please include contract cost and total cost for each project.

Response IR-74:

Please refer to Attachment 1, also provided electronically.

REDACTED (CONFIDENTIAL INFORMATION REMOVED)

Capital Item	Project	Title	Functional Class	Total Contract	Affiliate / External Contractor	Total Project
26716	D004	New Customer Upgrades	Distribution	1,288,842	External Contractor	7,779,098
23158	D005	Unplanned Replace Deteriorated Plant	Distribution	1,447,817	External Contractor	8,802,794
23135	D006	Regulatory Replacement - Province	Distribution	371,971	External Contractor	993,306
23136	D007	Contractual Replacements (Joint Use)	Distribution	278,907	External Contractor	599,541
23361	D008	Provincial Storm	Distribution	741,150	External Contractor	2,391,974
23127	D010	Distribution Right-Of-Way Widening	Distribution	2,489,575	External Contractor	2,994,461
29038	D051	System Performance Improvement	Distribution	120,000	External Contractor	450,562
23137	D055	Planned Replacement Deteriorated Plant	Distribution	1,562,812	External Contractor	5,455,204
47226	D700	22W-311GA - Daniels Head Rd Reconductor - Part of D055	Distribution	258,406	Affiliate	372,718
47778	D706	54H Feeder Exit Cable Replacement - Part Of D055	Distribution	50,467	Affiliate / External Contractor	93,134
47791	D708	103H Feeder Exit Cable Replacement - Part Of D055	Distribution	10,845	External Contractor	60,769
48432	D696	16W-301 Rodney Road Rebuild - Part Of D055	Distribution	96,274	External Contractor	320,018
48434	D695	25W-302G Lockes Island Reconductor - Part Of D055	Distribution	47,500	External Contractor	73,344
48437	D711	36W-301 East Sable Road Line Extension - Part Of D055	Distribution	49,559	External Contractor	147,296
48071		2016 Manhole Cover Replacement - Part Of D055	Distribution	24,000	External Contractor	103,045
48652		46V-303 Remove Abandoned Line - Part Of D055	Distribution	9,825	External Contractor	26,410
48672		83V-301 Grand Pre - Reconductor - Part Of D055	Distribution	6,058	External Contractor	37,181
48673		3S-307 Epoxy Arm Changeout - Sydney Mines - Part Of D055	Distribution	21,221	External Contractor	98,188
39766	D061	New Customer - Residential	Distribution	1,360,976	External Contractor	8,124,181
39770	D062	New Customer - Commercial	Distribution	604,659	External Contractor	5,422,263
40320	D454	LED Street Light Conversion	Distribution	3,315,299	External Contractor	35,077,425
41383	D418	2012 Halifax UG Feeder Cable Replmt	Distribution	78,654	External Contractor	666,535
44749	D527	Tiverton Tower Refurbishment	Distribution	475,430	External Contractor	1,157,069
44826	D562	2014 Build-to-Roadside	Distribution	261,692	Affiliate / External Contractor	628,407
44836	D684	Halifax 4kV Conversion Part 2	Distribution	334,593	Affiliate / External Contractor	534,173
45003	D652	2015 Hydraulic Recloser Repl	Distribution	31,500	External Contractor	204,784
45031	D630	3N Oxford Conversion Phase 1	Distribution	45,000	Affiliate / External Contractor	539,146
46456	D592	11W Yarmouth 4kV Conversion	Distribution	72,040	External Contractor	649,665
46593	D664	70V Bridgetown Voltage Conversion	Distribution	90,032	Affiliate	553,377
47124	D635	Automated Metering Infrastructure	Distribution	600,000	External Contractor	100,000,000
47471	D675	131H-422G-East Uniacke Rd Load Grow	Distribution	200,127	External Contractor	926,781
47721	D670	2016 PCB Phase-out for Pole Top Tx	Distribution	2,747,725	Affiliate / External Contractor	4,409,579
47732	D699	131H-424/137H-412 Feeder Tie	Distribution	221,743	Affiliate / External Contractor	337,133
47752	D701	4S-333 Bentinck St Rebuild	Distribution	345,469	Affiliate / External Contractor	575,357
47753	D688	24C-442GB Hwy 16 Reconductor Ph 2	Distribution	709,304	Affiliate / External Contractor	1,154,302
47754	D702	63V-313 Ward Rd Reconductor	Distribution	202,881	Affiliate / External Contractor	308,994
47756	D703	36V-303 Reconductor Middle Dyke Rd	Distribution	64,582	External Contractor	226,303
47760	D691	85S-402 Re-Insulate	Distribution	1,192,441	Affiliate / External Contractor	1,855,988
47765	D704	58C-405 Belle Cote Phase 2	Distribution	328,660	Affiliate	477,154
47773	D674	3N Oxford Conversion Phase 2	Distribution	99,960	External Contractor	631,715
47777	D705	70W-321 Wile Lake Road	Distribution	69,877	Affiliate / External Contractor	122,264
47784	D698	103H-Lakeside Feeder Reconfiguration	Distribution	382,109	Affiliate / External Contractor	579,868
48092	D685	2016 Subs Recloser Replacement	Distribution	44,398	External Contractor	529,270
48093	D686	2016 Padmount Replacement Program	Distribution	171,144	Affiliate / External Contractor	1,911,470
48152	D692	20H-Spryfield Voltage Conversion Ph	Distribution	197,609	Affiliate / External Contractor	375,848
47734		1C-411 Highway 4 Reconductor	Distribution	292,961	Affiliate / External Contractor	437,410
47766		70V-302 Centerlea Rebuild	Distribution	318,393	Affiliate / External Contractor	456,314
47774		546C-311 West Bay Upgrade	Distribution	42,836	Affiliate / External Contractor	81,516
47775		67C/58C Inverness Transfer Scheme	Distribution	23,978	Affiliate	141,564
47776		111S Prime Brook Feeder Exits & Fee	Distribution	854,062	Affiliate / External Contractor	1,560,144
47786		129H Kearney Lake New Feeder	Distribution	145,583	Affiliate	311,817
47787		2H Armdale New Feeder	Distribution	695,346	Affiliate / External Contractor	1,272,415
47792		Distribution Automation Remote Comm	Distribution	18,100	External Contractor	415,762
48195		Halifax 4kV Conversion Ph 3	Distribution	52,029	External Contractor	250,336
				25,566,421		**203,705,372**

Request IR-75:

Please provide lists of the worst performing feeders for the recent 3 years.

Response IR-75:

The following table lists the 20 feeders that have experienced the highest customer hours of interruption (CHI) from January 1, 2013 to November 30, 2015. The feeders are ranked by the total CHI over the past 3 years. The SAIFI (System Average Interruption Frequency Index) and SAIDI (System Average Interruption Duration Index) measures are also included in the table to show the customer experience for the customers on each feeder. The tables below do not include Extreme Events, due to the significant influence to the list from Post-Tropical Storm Arthur.

Extreme Events Removed			
Feeder	**CHI**	**Annual SAIFI**	**Annual SAIDI**
73W-411	260,335	2.76	15.06
57S-401	178,772	4.32	28.43
50W-412	154,639	3.75	15.11
65V-302	153,857	1.79	23.50
11S-411	127,852	4.97	14.58
59C-402	109,907	4.16	20.14
13V-303	102,995	2.88	22.16
77V-401	102,554	4.18	25.50
22N-402	100,813	3.64	10.88
85S-401	99,352	3.95	15.50
22C-404	90,672	3.99	12.86
50N-410	90,644	4.03	11.27
67C-412	90,570	4.67	18.43
58C-405	80,831	6.13	17.90
83V-303	80,425	4.47	25.36
82V-423	79,491	3.02	9.65
36V-303	79,353	3.91	14.06
24C-442	77,312	6.47	26.88
22W-311	76,984	8.55	22.61
93V-313	75,377	2.97	12.94

The table below also lists the top 20 worst performing feeders, but includes only those outages as a result of loss of supply, defective equipment and tree contact outages for each feeder, with Extreme Events removed.

Extreme Events Removed Loss of Supply, Defective Equipment and Tree Contact Outages			
Feeder	**CHI**	**Annual SAIFI**	**Annual SAIDI**
73W-411	155,938	1.49	9.02
57S-401	132,475	3.01	21.07
50W-412	118,904	2.92	11.62
65V-302	108,891	1.01	16.63
59C-402	78,740	2.50	14.43
83V-303	71,656	3.39	22.60
22W-311	70,049	7.43	20.57
22N-402	67,413	2.05	7.27
13V-303	66,784	1.47	14.37
85S-401	63,180	2.37	9.86
11S-411	61,406	3.00	7.00
58C-405	59,919	5.05	13.27
77V-401	57,861	2.16	14.39
67C-412	55,827	2.97	11.36
25W-301	53,936	4.53	19.79
50N-410	52,835	1.98	6.57
57C-422	52,458	4.60	14.60
36V-303	50,741	2.10	8.99
22N-401	50,691	4.80	6.90
16W-302	49,688	1.68	12.36

Request IR-76:

With reference to page 863, please provide a description of the "Transformative" category.

Response IR-76:

The term "transformative" is used to represent capital projects that are not like for like replacements, upgrades or general improvements to NS Power's assets. The distribution projects included in this category are LED Street Light Conversion and Automated Metering Infrastructure, for example. Both of these projects are replacing NS Power assets with a "new" type of asset, thus transforming that section of NS Power's asset base.

Request IR-77:

With respect to D01 (CI 47721 - 2016 PCB Phase-out for Pole Top Transformers), a number of costs have increased significantly over the 2015 ACE Plan amounts (included in CI 46576). Please explain the following increases:

(a) The unit price for the pole top transformers has increased to $250/unit from $100/unit in the 2015 ACE Plan. Why has there been such a significant increase? How many transformers were replaced in 2015 and what was the total cost? (materials only)

(b) The cost of the oil sampling has increased to $210/unit from $125/unit in the 2015 ACE Plan. Why has there been such a significant increase? How many transformers were tested in 2015 and what was the total cost? (testing costs only)

(c) A 10% contingency has been included in the 2016 ACE Plan amount increased from nil in the 2015 ACE Plan. If the included costs are based on quoted materials or contract prices why is such a significant contingency required?

Response IR-77:

(a) The unit price for pole top transformers has not increased. Rather, the volume of planned transformer replacements has increased to 250 transformers in 2016 from 100 transformers in the 2015 ACE Plan.

124 transformers were replaced under CI 46576 with a total material cost of $251,294.68, which includes the transformers and related transformer devices such as cut-outs.

(b) The $125/unit included in CI 46576 did not include traffic control costs. Traffic control costs are included in the $210/unit in CI 47721. In addition, the contractor utilized for CI

46576 underestimated the traffic control requirements in Nova Scotia and the related productivity impacts to the sampling rate. The unit rate utilized in the estimate for CI 47721 is based on revised contractor quotes.

2,065 transformers were sampled and tested under CI 46576 for a cost of $335,010, which includes contract costs for sampling in the field, traffic control and lab testing.

(c) The 10% contingency included in CI 47721 is not related to the quoted contract and material costs. It accounts for the variability in transformers that actually require replacement based on testing results. The transformer replacement cost estimate is based on an average cost of 10kVA, 25kVA, 50kVA, 75kVA and 100kVA transformers. The actual sizes of replacement transformers required are not known until oil testing is completed. In addition, transformers are replaced with larger capacity units in some cases to account for load growth.

Request IR-78:

With respect to D03 (CI 47752 - 4S-333 Bentinck St. Rebuild), page 872 talks about a project that had been identified in the Sydney 4kV Conversion and Membertou Load Growth Planning Study. It appears from the study that some of this work should have been started in 2014. Please explain the delay in starting this project. What are the plans for future implementation?

Response IR-78:

Planning Study 283-0212-E27 (Sydney 4KV Conversion and Membertou Load Growth) was revised to reflect updates to contributing factors. Revision 1 was included in the 2016 ACE Plan in error. The latest revision of this study is Revision 3, issued on June 5, 2015. Please refer to Partially Confidential Attachment 1.

Recommendations from planning studies are reviewed in conjunction with actual system conditions. Timing of specific projects can be advanced or delayed based on this analysis. In this case, analysis of actual loading and construction requirements (permits, etc.) have led to the following revised project schedule.

CI	Project	Year
47752	4S-333 Bentinck St	2016
45306	Prime Brook Substation Addition	2016/2017
47776	111S Prime Brook Feeder Exits & Feeders	2016/2017
TBD	Harold Street Conversion	2017
TBD	Bernard Lind Drive Rebuild	2017
TBD	Birch Hill Drive Conversion	2018
TBD	Townsend Street Conversion	2018
TBD	High Street Conversion	2019

CI	Project	Year
TBD	Terrace Street	2020
TBD	6S-Terrace Street Retirement	2021

Projects planned for implementation beyond 2016 will continue to be reviewed and ranked annually during ACE plan preparation, taking into consideration the recommended time frame for the retirement of the 6S Substation, as per the current planning study or any subsequent revisions.

Sydney 4kV Conversion and Membertou Load Growth
DISTRIBUTION PLANNING STUDY

Report number 283-0212-E27

Revision		Date	Drafted By	Reviewed by	Approved By
0	Issued for Study	16-Feb-2012	JMQ		
1	Issued for Release	16-Aug-2013	JMQ	MGS PZ	
2	Issued for Release	7-Apr-2014	JMQ	JC	JC
3	Issued for Release	5-June-2015	BH	YL/MD	

EXECUTIVE SUMMARY

This study was initiated by the Eastern Territory, in order to determine solutions to the anticipated large load growth in the Membertou area, of Sydney. Solutions were studied and recommendations made to address near and long term load growth in previous revisions. This revision was initiated to address two changes since the last revision:

- Additional reduction of 69kV load required as per transmission planning study, 049-2013-TSMG
- Unable to procure land for proposed substation location

Sydney 4kV to 12kV conversions are underway: Mason St, Cabot St and Rockdale Ave conversions are complete. Further conversion projects will continue until the eventual retirement of 6S-Terrace Street. The advancement or deferral of the 6S-Terrace Street conversion projects will be influenced by factors including residential/commercial development, feeder reconfigurations and/or ranking of capital projects within the ACE plan.

Creation of another supply into Membertou is partially completed. This will enable the transfer of load from the existing feeders, to a feeder that is more lightly loaded. The long term solution for the growth in Membertou is a new substation, which will now be located on Gabarus Hwy in Prime Brook, rather than on George St. This substation will be NSPI standard construction with a capacity of 15/20/25MVA rather than the initially recommended 15MVA pad-mounted option.

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1.0 SCOPE

This study was initiated by the Eastern Territory and undertaken by the Distribution Planning Department to identify solutions to meet the anticipated load growth in the Membertou area. Membertou is currently one of the fastest growing areas in the province. With the amount of development that has been announced for the area, there is a need to ensure enough capacity is available to meet this anticipated growth. This study outlined near and long term solutions to meet the growth in the Membertou area. This current revision (Rev 3), will address changes since the last revision:

- Additional reduction of 69kV load required as per transmission planning study, 049-2013-TSMG
- Unable to procure land for proposed substation location on George Street

Capital work for the recommended short term solution is underway. This solution eliminated an island of 4kV distribution and retired the 533S-Mason Street step-down. Reconfiguration of the feeders on Kings Road will allow the removal of a deteriorated off-road section of feeder 4S-333. A new feeder tie on Alexandra Street will create an additional 12kV supply into Membertou, which will allow balancing between existing feeders. These recommendations are unchanged in revision 3.

This study outlines the conversion of load from 6S-T1, in preparation for retirement of this substation. The first phases of conversions have been completed. The current 4kV breakers are being replaced with reclosers in 2015 to allow the substation to operate until its retirement. These recommendations are unchanged in revision 3.

The construction of a new 15/20/25MVA substation at the intersection of the transmission corridor and Gabarus Hwy will provide the long term solution for Membertou. This replaces the original recommendation for a 15MVA 138-12kV pad-mounted substation, as it does not meet the required capacity. Transmission planning study, 049-2013-TSMG, specified a 20MVA reduction of the 69kV load forecast in 2018, contingent on a new 138-12kV substation near Membertou. The release of this transmission study was the driver for revision 3 of this study.

A Distribution Automation study will be completed to outline future development of automatic transfer schemes in the Sydney area.

2.0 EXISTING SYSTEMS

2.1 Transmission

Presently, a transmission corridor exists from 2S-Victoria Junction to 101S-Woodbine. Prior to the corridor crossing the Louisburg Highway (Highway 22), one of the 138kV transmission lines, L-6539, separates from this corridor to join L-5564, which extends to 3S-Gannon Road. The System Operating Diagrams are attached, in Appendix A.

Table 1 Transmission Line Ratings

Transmission Line	Substation		MVA Rating	
	From	To	Summer	Winter
L-7011	88S-Lingan	3C-Port Hastings	298	383
L-7012	88S-Lingan	3C-Port Hastings	398	398
L-7014	88S-Lingan	101S-Woodbine	404	462
L-6516	2S-Victoria Junction	2C-Port Hastings	110	115
L-6539	2S-Victoria Junction	3S-Gannon Road	115	115
L-5564	2S-Victoria Junction	3S-Gannon Road	55	72
L-5563	2S-Victoria Junction	4S-Townsend Street	31	45
L-5560	2S-Victoria Junction	4S-Townsend Street	29	42
L-5569	4S-Townsend Street	6S-Terrace Street	43	43

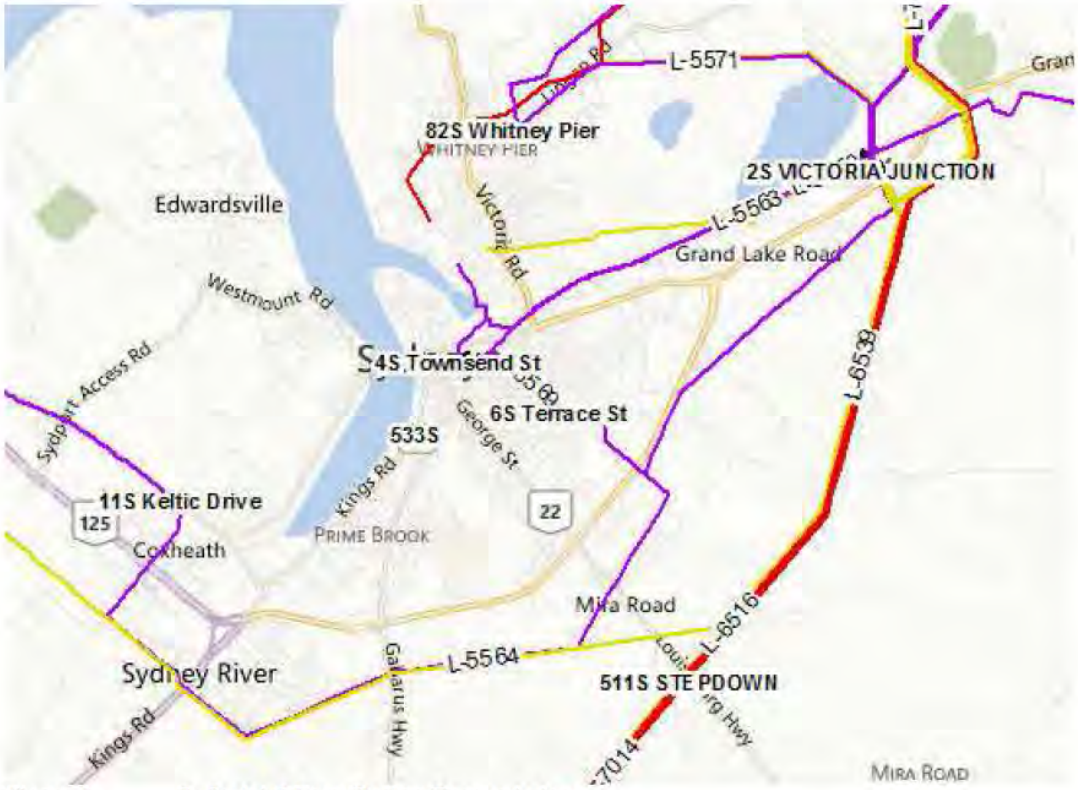


Figure 1 Industrial Cape Breton Transmission

2.2 Sub-Transmission

The sub-transmission system within the Sydney area operates at 69kV. It is supplied by three 138-72kV auto-transformers, two located at 2S-Victoria Junction and one located at 3S-Gannon Road. The System Operating Diagrams are attached, in Appendix A.

Table 2 Sydney Area Sub-Transmission

Substation	Auto-Transformer Data				
	ID	MAN	kV	Rating	Age
2S-Victoria Junction	T1	CGE.	138-72	60/80/100//112	1973
2S-Victoria Junction	T2	CGE.	138-72	60/80/100//112	1972
3S-Gannon Road	T1	CGE	138-72	30/40/50//56	1972

2.3 Distribution

The distribution system being studied in this report includes the 12kV feeders supplied from 4S-Townsend Street and 11S-Keltic Drive substation. The 4kV feeders supplied by the 6S-Terrace Street substation are also considered. The 25kV feeders from 11S-Keltic Dive have not been considered in this study.

Table 3 provides the transformer data for the substations that are directly impacted by the scope of this study.

Table 3 Sydney Area Distribution Transformers

Substation	Transformer Data				
	ID	MAN	kV	Rating	Age
4S-Townsend Street	T52	Federal Pioneer	69-12.47	15/20//24.6	1972
4S-Townsend Street	T53	Federal Pioneer	69-12.47	15/20//22.4	1973
6S-Terrace Street	T1	Moloney Electric	69-4.16	7.5/10	1969
11S-Keltic Drive	T51	Federal Pioneer	69-12.47	10/13.3//14.9	1972
11S-Keltic Drive	T52	Federal Pioneer	69-12.47	10/13//14.8	1972
11S-Keltic Drive	T53	Virginia Transformer	69-26.4	15/20/25	1999

2.3.1 533S-Mason Street

This area has been converted to 12kV as recommended in revision 2 of this study.

2.3.2 6S-Terrace Street

The lone transformer at the 6S-Terrace Street substation (6S-T1) was placed into service in 1969. This 69-4kV transformer is rated at 7.5/10MVA. The transformer annually peaks above 6MVA, with a recent maximum winter peak of 6.7MVA, recorded in the winter 2010 / 2011.The only suitable mobile transformer, in the NSPI fleet, is 3P-MS, which is rated at 6MVA, at 4kV. Given this, the mobile transformer is unable to assume the peak load on 6S-T1 without transferring a portion of customer load to 534S; the lone neighbouring 4kV stepdown transformer (near 4S-Townsend Street). While this response to a loss of 6S-T1 is feasible, it would extend the duration of the outage experienced by customers due to the failure of 6S-T1. The 4kV area covered by Terrace Street, as of 2014, can be found below in Figure 2. As per revision 2 of this study, this area has been partially converted as a short term solution. This reduces the load at 6S and allow mobile to be used in contingency situations. The remainder of the 4kV conversions will be planned for the future. See further details in the recommendations section.

The average age of the distribution plant in the area is greater than 40 years. At the present time, there is difficulty with maintaining the substation breakers due to the age and condition of the building structure. There is also an inability to source replacement components for the breakers themselves, representing a significant reliability concern. Replacement of these breakers is underway and will be completed in 2015. See further details in the recommendations section.

Figure 2 6S-Terrace Street extents as of 2014

3.0 LOAD HISTORY AND FORECAST

The loading for those feeders being studied is largely residential, with a small number of commercial customers. As illustrated in the load history for these feeders, Appendix B, the feeders being studied have had a larger winter peak than summer. Historical load data for the feeders and transformers studied in revision 2 was collected from the Distribution Load Check Database and presented in the tables below.

3.1 Load Forecast

Customer load has been generally consistent in the Sydney area, demonstrating a slight overall growth in recent years. That being stated, the community of Membertou has seen the largest growth in Sydney in recent years. This load growth is anticipated to continue for the next several years, due to the proposed developments outlined in subsequent sections of this study.

The growth rates indicated in following tables were determined through examination of the peak load check data over the past 15 years. The forecasted load growth was then calculated using the 90th percentile, to determine potential peak load growth in the area. The forecasted loading of the substation transformers are indicated in Table 7.

Table 4 90th Percentile Load Forecast for 4S-Townsend Street, in Amps (2014)

Year / Load Growth	4S-321	4S-322	4S-323	4S-324	4S-331	4S-332	4S-333	4S-334
Load Growth	2.64%	-0.97%	1.48%	0.03%	2.76%	-0.05%	1.53%	2.72%
2014 Peak	**234**	**188**	**256**	**290**	**118**	**279**	**244**	**67**
2014 / 2015	236	226	269	289	190	297	283	129
2015 / 2016	244	223	274	289	197	297	288	134
2016 / 2017	252	221	278	289	204	297	294	139
2017 / 2018	261	219	283	289	211	297	299	144
2018 / 2019	269	217	288	289	218	296	304	148
2019 / 2020	277	215	293	289	226	296	310	153
2020 / 2021	285	213	298	289	233	296	315	158
2021 / 2022	294	210	303	289	240	296	320	163
2022 / 2023	302	208	307	289	247	296	325	167
2023 / 2024	310	206	312	290	254	296	331	172
2024 / 2025	319	204	317	290	261	296	336	177
2025 / 2026	327	202	322	290	268	295	341	182
2026 / 2027	335	199	327	290	275	295	346	186
2027 / 2028	344	197	332	290	283	295	352	191
2028 / 2029	352	195	336	290	290	295	357	196
2029 / 2030	360	193	341	290	297	295	362	201

Note:

- 4S-331 supplies the 534S-Stepdown transformer, near 4S-Townsend Street.
- 4S-333 current supply to Membertou area and 533S-Mason Street.

Table 5 90th Percentile Load Forecast for 6S-Terrace Street, in Amps (2014)

Year / Load Growth	6S-221	6S-223	6S-224	6S-225
2014 Load Clip	**54**	**163**	**153**	**263**

Note:

- Load Clip measurements are presented for the 6S-Terrace Street feeders, as there isn't enough data to accurately forecast the load.
- These clip measurements were taken on a day with ambient temperature of -12°C.

Table 6 **90th Percentile Load Forecast for 11S-Keltic Drive, in Amps (2014)**

Year / Load Growth	11S-301	11S-302	11S-303	11S-304	11S-305	11S-306
Load Growth	0.83%	0.52%	0.57%	-0.53%	0.21%	0.61%
2014 Peak	**190**	**240**	**240**	**210**	**300**	**244**
2013 / 2014	197	237	307	151	307	246
2014 / 2015	199	238	309	150	307	248
2015 / 2016	201	239	311	149	308	250
2016 / 2017	202	241	313	148	309	251
2017 / 2018	204	242	315	147	309	253
2018 / 2019	206	243	317	146	310	255
2019 / 2020	208	245	319	146	311	256
2020 / 2021	210	246	321	145	311	258
2021 / 2022	212	248	323	144	312	260
2022 / 2023	214	249	325	143	313	261
2023 / 2024	215	250	327	142	313	263
2024 / 2025	217	252	329	142	314	265
2025 / 2026	219	253	331	141	314	266
2026 / 2027	221	255	333	140	315	268
2027 / 2028	223	256	334	139	316	270
2028 / 2029	225	257	336	138	316	271

Note:

- 11S-305 is the alternate supply to the Membertou area.

Table 7 **90th Percentile Load Forecast for Sydney Transformers, in MVA (2014)**

Year / Load Growth	4S-T52	4S-T53	6S-T1	11S-T51	11S-T52
Load Growth	0.42%	1.77%	-0.02%	0.51%	0.49%
2014 Peak	**20.9**	**14.4**	**4.6***	**13.4**	**13.4**
2013 / 2014	20.8	19.3	6.5	15.4	15.2
2014 / 2015	20.9	19.7	6.5	15.5	15.2
2015 / 2016	21.0	20.2	6.5	15.6	15.3
2016 / 2017	21.0	20.6	6.5	15.7	15.4
2017 / 2018	21.1	21.0	6.5	15.8	15.5
2018 / 2019	21.2	21.4	6.5	15.9	15.6
2019 / 2020	21.3	21.9	6.5	16.0	15.6
2020 / 2021	21.4	22.3	6.5	16.1	15.7
2021 / 2022	21.5	22.7	6.5	16.1	15.8
2022 / 2023	21.6	23.1	6.5	16.2	15.9
2023 / 2024	21.7	23.6	6.5	16.3	16.0
2024 / 2025	21.8	24.0	6.5	16.4	16.1
2025 / 2026	21.9	24.4	6.5	16.5	16.1
2026 / 2027	22.0	24.8	6.5	16.6	16.2
2027 / 2028	22.1	25.3	6.5	16.7	16.3
2028 / 2029	22.2	25.7	6.5	16.8	16.4

Note:

- No Peak load data for 2014 available for 6S-T1, 2014 peak values have been indicated (*).

4.0 OVERLOADS AND OTHER CONSIDERATIONS

The following section identifies issues that warrant correction based on NSPI's *Capital Expenditure Justification Criteria*.

4.1 Feeder Overloads

There are several feeders whose peak loading is approaching 325A. These peak values can be seen in the feeder histories, located in Appendix B. These feeders include

- 6S-224 consistently peaked above 300A,with a peak above 325A in 2010
- 6S-225 peaked above 300A, in 2003 and 2004
- 4S-321 peaked above 325A, in 2007

4.2 Contingency Loss of Supply

4.2.1 6S-T1

The lone transformer at 6S-Terrace Street, 6S-T1, has not exceeded its nameplate rating, in recent years; however the peak winter loading was exceeding the capacity of the mobile substation, 3P-MS, as of 2014. Conversions have been completed which should allow the mobile transformer to be used under peak loading conditions.

4.2.2 533S-Mason Street

This area was converted to 12kV and 533S transformer retired as per revision 2 of this study.

4.3 Age of Plant

The average age of poles and equipment in the Hardwood Hill area of Sydney is greater than 40 years old. Inspections have confirmed this equipment is at or is nearing full service life.

The current breakers at 6S-Terrace Street are obsolete. The breaker manufacturer is no longer in business. The sourcing of replacement components is nearly impossible. Added to this is the deteriorated condition of the breaker house. In the event of a breaker failure, the duration of an outage would be significant in length.

Replacement of deteriorated plant is underway, including the replacement of 6S breakers which will be completed in 2015. The remainder will be budgeted and completed in phases.

4.4 Proposed Load Growth

There are several areas of load growth in the Sydney area impacting this study. The two largest developments are detailed below.

4.4.1 Membertou Load Growth

The community of Membertou is in the midst of large growth, through commercial and residential developments within the community. The anticipated increase in load has been considered throughout this study. Future development plans in the community include:

- Multi-surface ice rink (construction commencing summer 2013)
- New School
- New overpass across Highway 125 related to a new multi-unit Business Park,
- Expanding residential housing areas

Currently there are three supplies into the area, via Churchill Drive and Membertou Street, as seen in Figure 3 and Figure 4. The two feeders capable of supplying the area from the Kings Road side of the development, 11S-305 and 4S-333, do not have excess capacity to serve this proposed growth. The third feeder, 4S-332, has less capacity than those feeders capable supplying from the other side of the development. From the 2011/2012 winter load checks these feeders were measured at 249amps, 269amps, and 292amps respectively. Accordingly, a prolonged outage of one of these feeders could result in an extended customer outage, as the remaining feeders cannot support the peak winter load.

Figure 3 Feeders Currently Serving Membertou from Kings Road area

Figure 4 Feeder Currently Serving Membertou from George Street area

4.4.2 Cossitt Heights New Housing Development

A new housing development is planned for the Cossitt Heights area. This new subdivision is approximately 114 Acres and is slated to have both detached homes and multi-unit dwellings. This load will be added to one of the following feeders; 4S-324 or 4S-331. The area of this proposed development is shown below, in Figure 5.

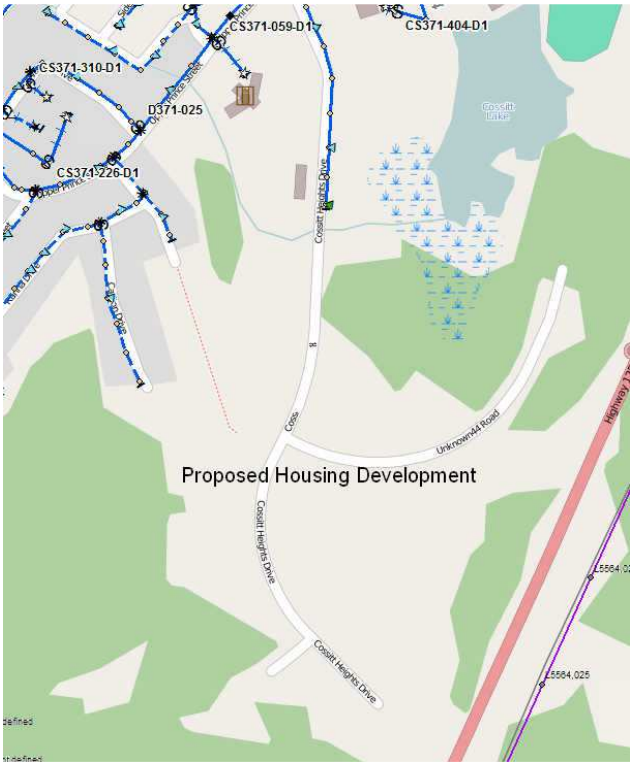


Figure 5 Cossitt Heights Residential Development

5.0 SOLUTIONS AND EVALUATION

Membertou is in the midst of large growth, in both residential and commercial developments. Due to the proposed and developing construction, the amount of expected load will exceed the existing capacity available. NSPI is obligated to accommodate this increased load growth, both in the short and long term.

The short term solution to meet this load growth is to create an additional supply into Membertou via existing distribution feeders. This is underway and the additional feeder, 4S-334, will pick up load from Membertou in 2015. Remainder of work will be completed in 2016, which will remove deteriorated off-road sections of 4S-333.

The longer term solution is to construct a new substation to supply this growing load and provide additional contingency to the distribution system in Sydney.

5.1 Mason Street

Currently, there are three feeders capable of supplying the Membertou area: 11S-305, 4S-333 and 4S-332. Two of these feeders, 11S-305 and 4S-333 supply Membertou from the Alexandra Street. 4S-332 enters from the George Street side of the community, but does not supply load in Membertou. Presently, these three feeders are heavily loaded, with 4S-332 serving as the primary supply for the Cape Breton Regional Hospital. Reducing the load on the existing feeder supplying Membertou or the extension of another feeder into Membertou is required to meet the forthcoming load, currently in the early project stages.

There were four alternatives outlined in revision 2 of this study. Alternative 533S-B was selected and capital work is in progress. The Mason Street area has been converted to 12kV and the step-down transformer (533S) has been retired. An additional feeder, 4S-334, will pick up Membertou load in 2015. Work will be completed in 2016 which will allow remaining deteriorated off-road sections of feeder 4S-333 to be removed. Full details of Alternative 533S-B are outlined below. Other alternatives have been removed in this revision.

5.1.1 Alternative 533S-B Convert 533S-Mason Street, via Bentinck Street

Alternative 533S-B would see the supply on Kings Road between School Street and Churchill Drive change from 4S-333 to 4S-334. This alternative would also see the conversion to 12kV of the islanded 4kV supplied by 533S-Mason Street to 12kV. Also included in this alternative would be the creation of another supply into Membertou via Towerview Place. Refer to Figure 6 for an overview of this proposed work.

Currently, Kings Road is supplied by 4S-333 which has a large off-road section, between Townsend Street and Kings Road. This off-road section is along the existing railway tracks, limiting access and prolonging response time to faults on this section of line. This off-road section is deteriorated and approaching its end of service life. Feeder 4S-334 currently supplies a portion of Kings Road from Falmouth Street to just prior to School Street; extending 4S-334 along Kings Road would be accomplished through the reconfiguration of the distribution at the Kings Road and School Street intersection. This reconfiguration would enable the use of a lightly loaded feeder, 4S-334, to supply Kings Road and Membertou.

In addition to resupplying a portion of Kings Road, the removal of the islanded 4kV supplied by 533S-Mason Street would also be addressed. The conversion, as outlined in Alternative 533S-A would entail the conversion of the lone 4kV feeder, 533S-211, to 12kV. Supplying this new section of 12kV would be accomplished through the rebuilding of Bentinck Street and supplying Argyle Street via 4S-333.

With the newly converted section of 4S-333 along Alexandra Street, the opportunity exists to create an additional supply into Membertou, as outlined in Alternative 533S-A, through the extension and rebuilding of Alexandra Street from Xavier Drive to Castle Drive. Extending the 3 phase circuit along Towerview Place to the Millard Street intersection would bring a second lightly loaded feeder into Membertou, 4S-333.

The detailed outline of this conversion and feeder tie creation is outlined in the recommendations section of this study.

Figure 6 Alternative 533S-B Reconfigure Shipyard Supply

5.2 6S-Terrace Street

The substation infrastructure at the 6S-Terrace Street substation is approaching its end of service life. In order to extend the service life of the substation, the replacement of the existing breakers with reclosers is

required. In order to facilitate the replacement of these breakers, an overall reduction of load on 6S-T1 is necessary. Additionally, the 4kV distribution plant supplied by 6S-Terrace Street is approaching end of service life. This eventually leads to the planned retirement of 6S-T1 upon completion of the 4kV conversion.

There were three alternatives outlined in revision 2 of this study. These alternatives explored the timing conversions and retirement date for 6S. The fourth alternative to rebuild 6S with a new 69-4kV transformer was not considered since the 4kV voltage level is being phase out in Nova Scotia. The sections on each alternative have been removed in this revision as they only spoke to the timing of the recommended work.

The recommended solution would see retirement of 6S-Terrace Street by 2021. Capital work is in progress: initial 4kV to 12kV conversions are complete, which allow the mobile transformer to be installed under peak conditions, without the need to transfer a portion of the load to 534S. Upgrades to 6S will be completed in 2015, as outlined in recommendations section. The retirement of 6S-Terrace Street is planned for 2021, but this will depend on completion of remaining conversions which are dependent on the progress of other capital work outlined in this study.

5.3 Sydney Transformation

To meet the anticipated load growth in the Membertou area, a new source in Sydney will be required. Given the layouts at both 4S-Townsend Street and 11S-Keltic Drive, the ability to install additional feeders to supply developing load would be quite difficult. It makes sense to have a new source close to developing load.

Revision 2 of this study recommended Alternative Sub-D, the installation of a 15MVA 138-12kV pad-mounted substation at the intersection of existing 138kV transmission corridor and George Street. This recommendation has been re-evaluated since the release of transmission study, 049-2013-TSMG, which indicated a 20MVA reduction on the 69kV load forecast in 2018. The location of this substation was also revised due to issues with the purchase of land at this location. The new proposed location for alternatives Sub-A and Sub-D will be at intersection of Gabarus Hwy and existing 138kV transmission corridor – in Prime Brook. The construction year for all options was also revised to 2016.

The details of the four alternative solutions are outlined in further detail below.

5.3.1 Alternative Sub-A New Substation in Prime Brook

This alternative would address growth in Membertou with construction of a new 15/20/25MVA substation near the transmission right-of-way. This new 138-12kV substation would need to be in service prior to the end of 2016 to meet the developing load in the area. This substation would allow for the offloading of the the 69kV system. The location of this new substation would be near the intersection of existing transmission corridor and Gabarus Hwy. In constructing this substation, an additional 12kV supply would be added to the Sydney area for additional contingency to meet the load growth in the Membertou area. Creating a tap off of L-6539 would remove load from the existing 69kV loop that feeds 4S-Townsend Street, 6S-Terrace Street and 11S-Keltic Drive via 2S-Victoria Junction or 3S-Ganon Road.

Initially 4 new 12kV feeders would be able to provide new feeds to the Membertou community, as well as George Street and Alexandra Street. Additional feeders could be used to reduce loading or for contingency purposes for both 4S-Townsend Street and 11S-Keltic Drive feeders, further reducing loading on the 69kV.

In order for this alternative to proceed, land would need to be acquired and a new tap off of L-6539 would need to be engineered. In addition to this preliminary work, further investigation into the substation design would need to be considered. Refer to Figure 7 below for a proposed location.

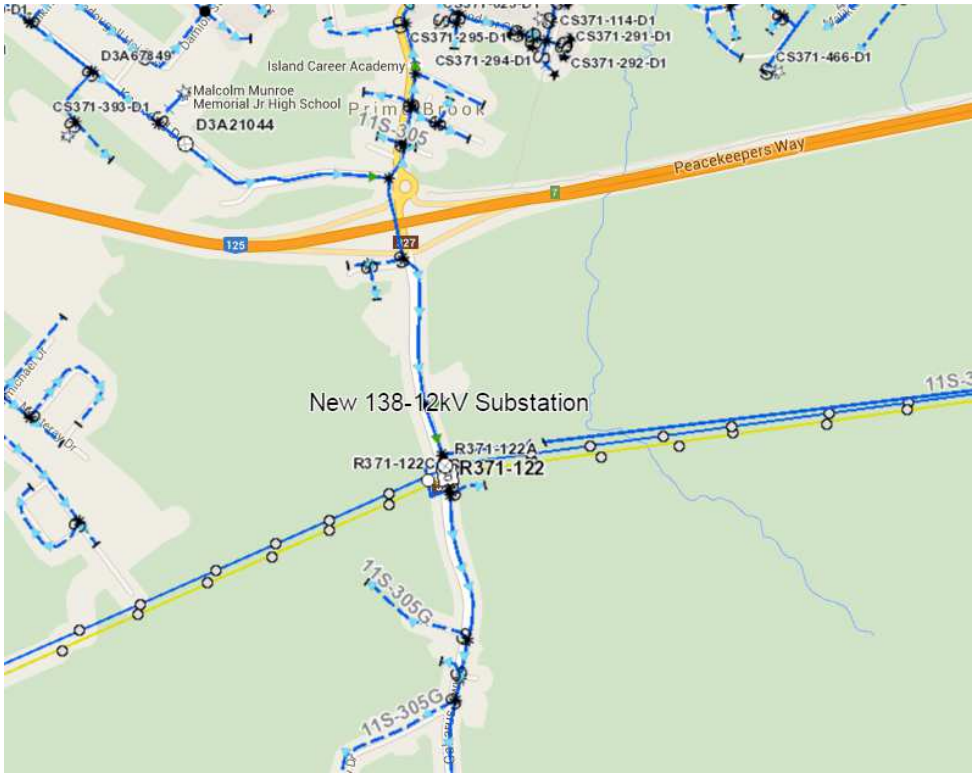


Figure 7Alternative Sub-A Construct New Substation in Prime Brook

5.3.2 Alternative Sub-B New 138-25kV Substation in Prime Brook

Similarly to Alternative Sub-A, the construction of a new substation near the transmission right-of-way would be capable of supplying the newly developing load in the Membertou area. Construction of the new 15/20/25MVA 138-25kV substation would be off of the Highway 327, near the transmission corridor and within close proximity to the existing 25kV distribution feeders in Sydney River. In constructing this substation, an additional 15/20/25MVA 25kV supply would be added to the Sydney area for additional contingency of 11S-Keltic Drive and to meet the load growth in the Membertou area. Creating a tap off of L-6539 would transfer existing load from the 69kV loop that supplies 4S-Townsend Street, 6S-Terrace Street and 11S-Keltic Drive, via 2S-Victoria Junction or 3S-Ganon Road. The loading on the 69kV loop would be further reduced with future customer conversions from 12kV to 25kV, in Sydney River and on Alexandra Street.

These new 25kV feeders would be able to provide feeders directly to the new growth in Membertou. Conversion of portions of Sydney River would enable the creation of new feeder ties between the new feeders and 11S-Keltic Drive 25kV feeders.

In order for this alternative to proceed land would need to be acquired and a new tap off of L-6539 would need to be engineered. In addition to this preliminary work, further investigation into the substation design would need to be considered. Refer to below Figure 8 for a proposed location.

Figure 8Alternative Sub-B Construct New Substation on Alexandra Street

5.3.3 Alternative Sub-C New 69-12kV transformer at 6S-Terrace Street

To meet the planned growth in Membertou, a new 69-12kV 7.5/10/12.5MVA power transformer would be installed, at the 6S-Terrace Street property, in 2015. This new transformer would initially be limited to loading, as the existing 4kV load is reduced. The new transformer would assume the load of the current 4kV transformer, upon load conversions to 12kV.This new transformer would also provide an alternate supply to the George Street area.

Another substation, possibly a padmount design would be required to further supply the Membertou load as it continues to materialize. The padmount substation would require a smaller footprint and be able to supply an additional two feeders to the developing load. It is estimated that this substation would be required in 2017, as the load growth continues, in Membertou. Annual monitoring of the load growth in the Sydney area would be required to ensure that the installation of additional transformation in the area coincides with the continued load growth in the area.
Refer to Figure 9 for an overview of the area.

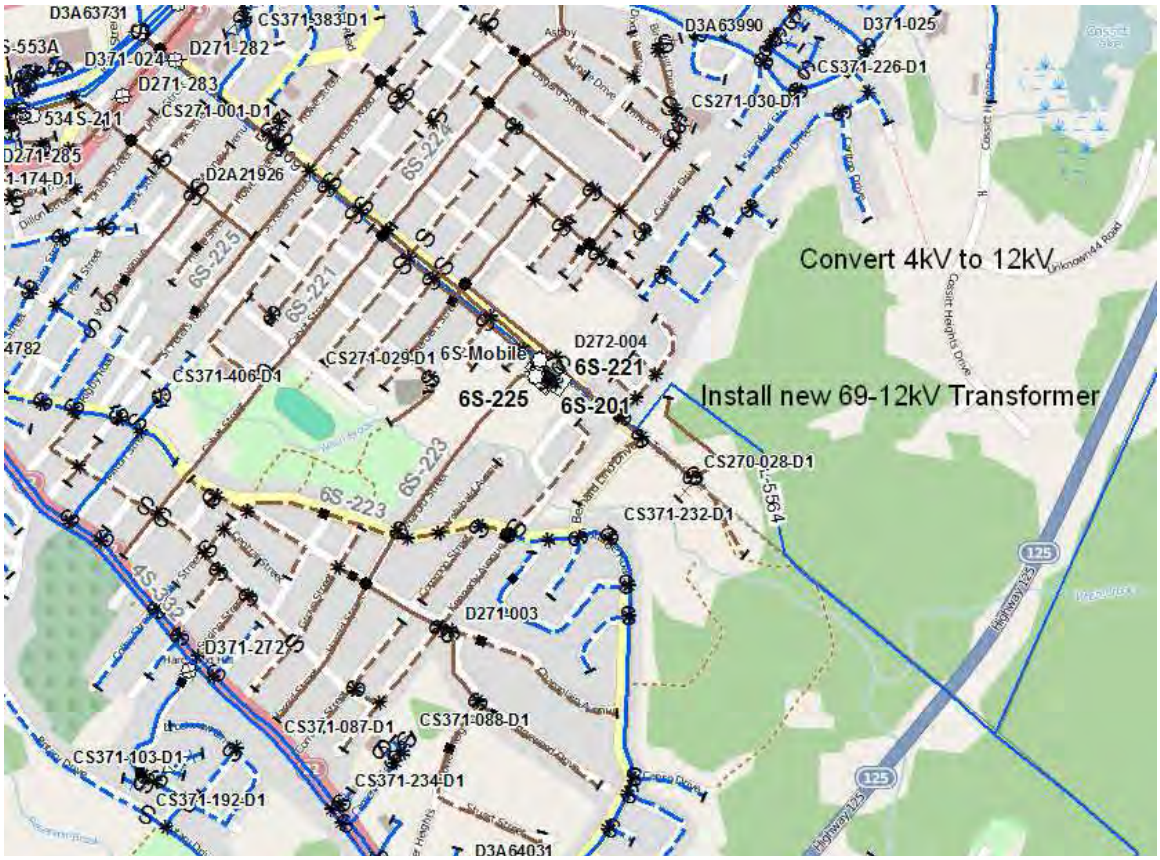


Figure 9 Alternative Sub-C Install New 69-12kV Transformer

5.3.4 Alternative Sub-D New 138-12kV Pad-Mounted Substation

This alternative is similar to Alternative Sub-A, in that a new 15MVA 12kV source would be constructed near the 138kV transmission corridor and George Street. Refer to Figure 10 below. The alternatives differ, in that this substation will have less capacity and be pad-mounted in design. The new 15MVA transformer would be supplied via a new tap off of L-6539, one of the 138kV transmission lines in the area. This substation would require less space than a traditional substation and does not require a substation fence, as all of the equipment is dead-front.

Unlike Alternative Sub-A, only three feeders would be supplied via this substation. One of these feeders would supply Membertou via a new highway crossing. This feeder will reduce the loading on the existing Membertou supply (4S-333). The second feeder will continue along the transmission Right of Way (ROW) to Alexandra Street. Load from 11S-305 will be transferred to this new feeder, allowing for a load reduction on 11S-305. The third feeder will extend to George Street and assume a portion of the loading along George Street.

As the load continues to grow, in both the Sydney and Membertou area, continual monitoring will indicate the need for any future additional transformation in the area. Given the modularity of the pad-mounted substation, future installations could occur near the 138kV transmission line, closer to the developing load center, when required. Initially, it was thought that expansion would not be required until 2027, but due to transmission planning requirements, an additional transformer would be required in 2018.

As with the introduction of any new equipment, spare components will be required with the initial purchase, but not necessarily for subsequent applications.

Figure 10 Alternative Sub-D New 138-12kV Pad-Mounted Substation

5.3.5 Sydney Transformation Recommendation

Alternative Sub-D was the least cost option when the Economic Assessment was completed in revision 2 (see Appendix C). With the requirement to remove 20MVA from the 69kV forecast by 2018, an additional pad-mounted transformer must be planned in the short term, rather than 2027. By moving the second pad-mount expansion to 2018, the cost of alternative Sub-D does not offer economic advantage over alternative Sub-A. The additional advantages to alternative Sub-A make it the best choice:

- Less risk due to standard substation construction
- No new spare equipment required
- Standard substation can accommodate mobile transformer, whereas pad-mounted option cannot

A detailed outline of conversions and substation construction is outlined in the recommendations section of this study.

6.0 RECOMMENDATIONS

In summary, the following provide the impetus for the recommendations contained herein:

- The existing feeders supplying the Membertou area are at or near their criteria limits and cannot be utilized to supply the long term capacity needs of Membertou.
- Membertou load growth is forecasted to continue as there are plans for a retail centre adjacent to Hwy125 at the site of the new highway interchange presently under construction
- The 4kV distribution facilities at 6S-Terrace Street are nearing their end of life and key components are obsolete, exposing customers to prolonged outages.
- The 4kV distribution facilities at 533S-Mason Street and 6S-Terrace Street are islanded 4kV that are susceptible to prolonged outages as load cannot be transferred to an adjacent feeder.
- Transmission study has indicated the need to remove 20MVA from 69kV system peak

This study revision does not recommend any change to the capital work underway for the conversion of 533S-Mason Street, as outlined in Alternative 533-B, section 5.1.1.

The recommendation for 4kV conversion and retirement of 6S-Terrace Street is unchanged in this revision. The Economic Assessment Model, refer to Appendix C, recommends the conversions of the 4kV distribution supplied by 6S-Terrace Street be converted to 12kV by 2020, as outlined in Alternative 6S-C, in section 5.2.3. Upon completion of these conversions, the 6S-Terrace Street substation will be retired. The advancement or deferment of these projects may be influenced by factors including: residential/commercial development, feeder reconfigurations and/or ranking of capital projects within the ACE plan.

The second Economic Assessment Model, refer to Appendix D, recommends the installation of a pad-mounted substation, with three feeders prior to the 2015/2016 winter peak. This has been re-evaluated in revision 3 of this study, as outlined in section 5.3. The new recommendation will be for a standard 15/20/25MVA substation constructed in 2016. This added transformation in the Sydney area will meet the area load growth for the next several years and allow for 20MVA reduction of forecasted peak load on 69kV system.

A detailed outline of the components of each of these alternatives is outlined below, organized by capital year completion. The originally recommended capital years were left intact for items that were not modified within this revision of the study. Comments were added to indicate the progress of each recommendation.

6.1 Recommendations by Capital Year

6.1.1 2013 Capital Year

The capital items to be completed in 2013 include the work associated with the conversion of 533S-Mason Street, as well as the work associated with the reduction of 4kV load at 6S-Terrace Street, to enable the retirement of the existing breakers at the substation.

The Shipyard Area Reconfigure and Mason Street Conversion were grouped as one capital item that is well underway. Full completion expected in summer 2015.

The Cabot Street and Rockdale Avenue conversions are complete and the 6S-Terrace Street substation upgrades are in their final stages.

6.1.1.1 Shipyard Area Reconfigure

This portion of the project outlines the change of supply within the Shipyard area, of Sydney. The supply for Kings Road will be changed from 4S-333 to 4S-334.The supply for Argyle Street will also be changed from 4S-321 to 4S-333. Refer to Figure 11 below. The details of this work are as follows:

- Dead-end 4S-333 adjacent to railway tracks, at Bentinck Street and open.
- Jumper 4S-334, to the existing 4S-333, on Kings Road.
- Remove the de-energized section of 4S-333, adjacent to the railway tracks, from Kings Road to Bentinck Street.
- Rebuild Bentinck Street, from Crescent Street to Argyle Street, to 3 phases.
- Open Argyle Street at George Street.

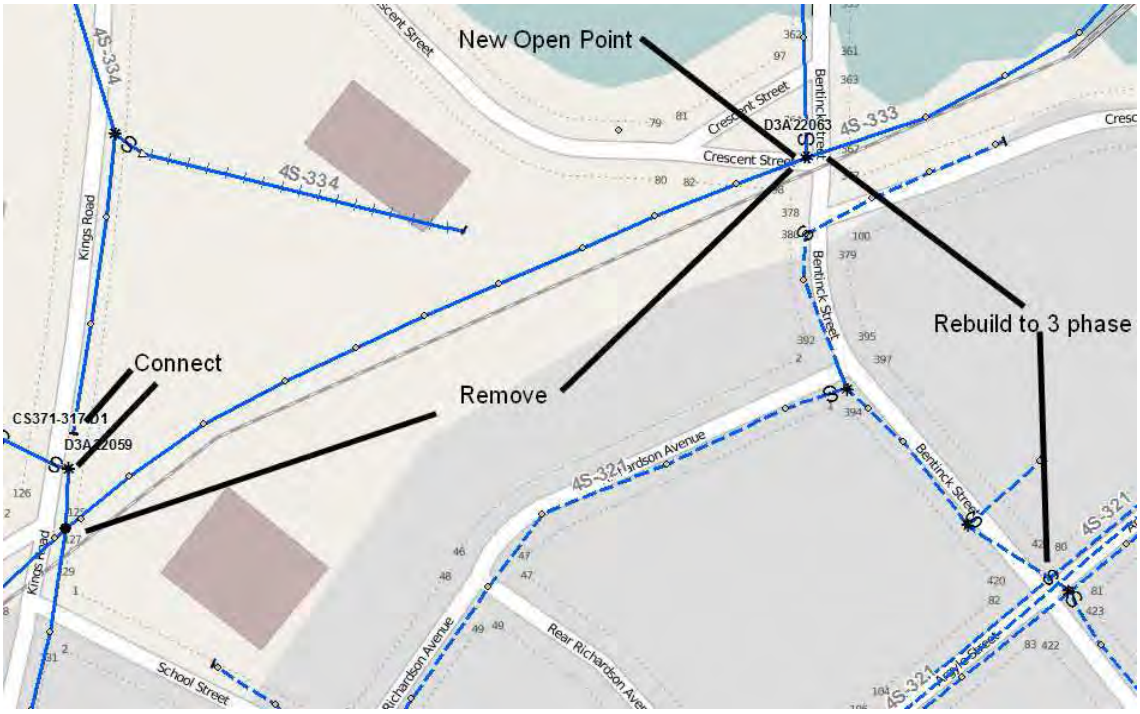


Figure 11 2013 Reconfigure Supply to Shipyard Area

6.1.1.2 533S- Mason Street Conversion

This portion of the project will convert 533S-Mason Street changing the supply to the area from Kings Road to Argyle Street. This portion of the project will also see the removal of the 533S-Mason Street stepdown, upon completion of the conversion to 12kV. Upon completion of this portion of the project, Alexandra Street will be supplied by 4S-333 from Yendys Street to Harbourview Drive. Refer to Figure 12 below. The details are as follows;

- Reconductor Mason Street to 336.
- Open Mason Street, at Kings Road
- Close D3A19725 on Argyle Street, at Kent Street
- Replace neutral on Argyle Street and Yendys Streets to 4/0.
- Reconductor primary and neutral on Xavier Drive to 2/0ACSR.
- Remove single phase primary on Xavier Drive.
- Convert area from 4kV to 12kV.

Figure 12 2013 533S-Mason Street Conversion

6.1.1.3 Cabot Street Conversion

This portion of the project will convert Cabot Street, north of Terrace Street. This conversion, along with the Rockdale Avenue conversion, will reduce the load on 6S-T1, to enable the installation of the mobile substation, minimizing the requirement to transfer load to 534S. Refer to Figure 13 below. This will be accomplished by:

- Fill in the gap on Cabot Street and Upper Prince Street
- Create open point at Cabot and Terrace.
- Install open point on Cornwallis Street at McConnell Drive.
- Convert shaded areas, including side streets.

Figure 13 2013 Cabot Street Conversion

6.1.1.4 Rockdale Avenue Conversion

This portion of the project will convert Rockdale Avenue and Cottage Road to Harold Street. This phase of the project will further reduce the overall load on 6S-T1, reducing the need to transfer customer load to 534S, when the mobile substation is installed. Refer to Figure 14 below. This will be accomplished by:

- Close switch at Oxford Street onto George Street.
- Install cutout, on single phase along Cottage Road, at the intersection with Oxford Street.
- Open Harold and Cottage Road.
- Convert Oxford Street, to open point on Cottage Road, from 4kV to 12kV.
- Convert Rockdale Avenue, Champlain Avenue and Cottage Road, to Harold Street, including all side streets and branch lines, as indicated in Figure 14.

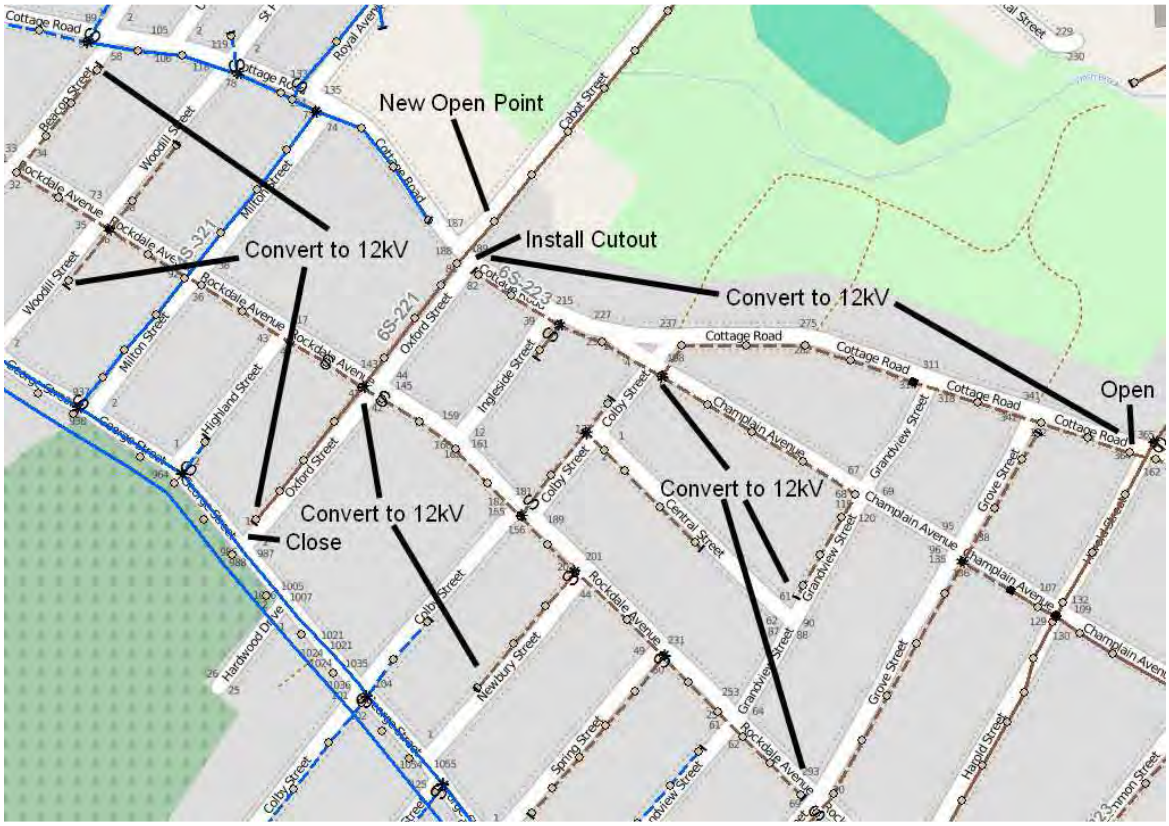


Figure 14 2013 Rockdale Conversion

6.1.1.5 6S-Terrace Street Substation Upgrades

This portion of the project will see the removal of the existing switchgear building, as well as the installation of pole mounted reclosers. This will be accomplished by:

- Installation of three dedicated power cables and buried ducts.
- The installation of three temporary pole mounted reclosers, to be supplied from new power cables.
- Removal of existing 4kV switchgear and building.

6.1.2 2014 Capital Year

The 2014 capital year includes completion of the reconfiguration of the Shipyard area supply, as well as the construction of a new feeder tie into Membertou. This continuation of work will increase the reliability and contingency within the Shipyard and Membertou areas.

The Membertou feeder tie has been completed and the new open point on Kings Road will be done in the summer of 2015. The Bentinck Street upgrades have been deferred until 2016.

New George Street pad-mounted substation preliminary engineering work has been removed.

6.1.2.1 Bentinck Street Upgrades

This portion of the project will upgrade the remaining conductor on Bentinck Street, to enable the removal of the remaining off-road section of feeder, along the railway tracks. This feeder 4S-333, is deteriorated and approaching its end of life. Rebuilding Bentinck Street and reconductoring the previously retired 4kV conductor on Townsend Street will enable 4S-333 to be adjacent to the road, from the substation to the majority of the load it supplies. Refer to Figure 15 below. The details are as follows:

- Reconductor Bentinck Street, from Crescent Street to Townsend Street.
- Reconductor lower circuit on Townsend Street, from 4S-Townsend Street to Bentinck Street, with 336.
- Remove 4S-333, adjacent to the railway tracks, from Bentinck Street to Townsend Street, except for the first two spans from George Street towards Townsend Street.
- Install new 3 phase tap from the remaining portion of 4S-333 to the top circuit along George Street, to supply the customers at the start of Glenwood Street.

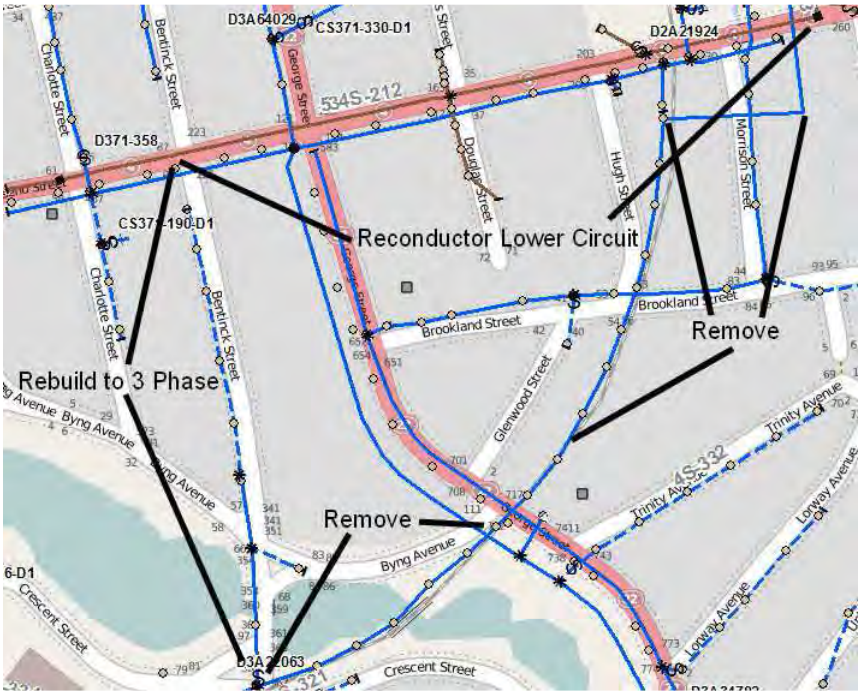


Figure 15 2014 Bentinck Street Upgrades

6.1.2.2 Membertou Feeder Tie

This portion of the project will see the creation of a feeder tie between the recently converted portion of Alexandra Street and the existing feeder on Alexandra Street. Also included in this portion of work is the construction of an additional feeder tie with the primary Membertou supply, on Maillard Street. Refer to Figure 16 below. The details are as follows:

- Extend newly converted 12kV (4S-333) along Alexandra Street to St. Anthony Drive, reconductoring from St Anthony Drive to the new open point with 336.
- Create new, normally closed, solid blade, sectionalizing point on Alexandra Street, at Xavier Drive.
- Create new open point on Alexandra Street, between Castle Drive and Harbourview Drive.
- Reconductor Towerview Place and extend to Maillard Street.
- Create new open point, on Maillard Street, on the north side of the intersection of Churchill Drive and Maillard Street.

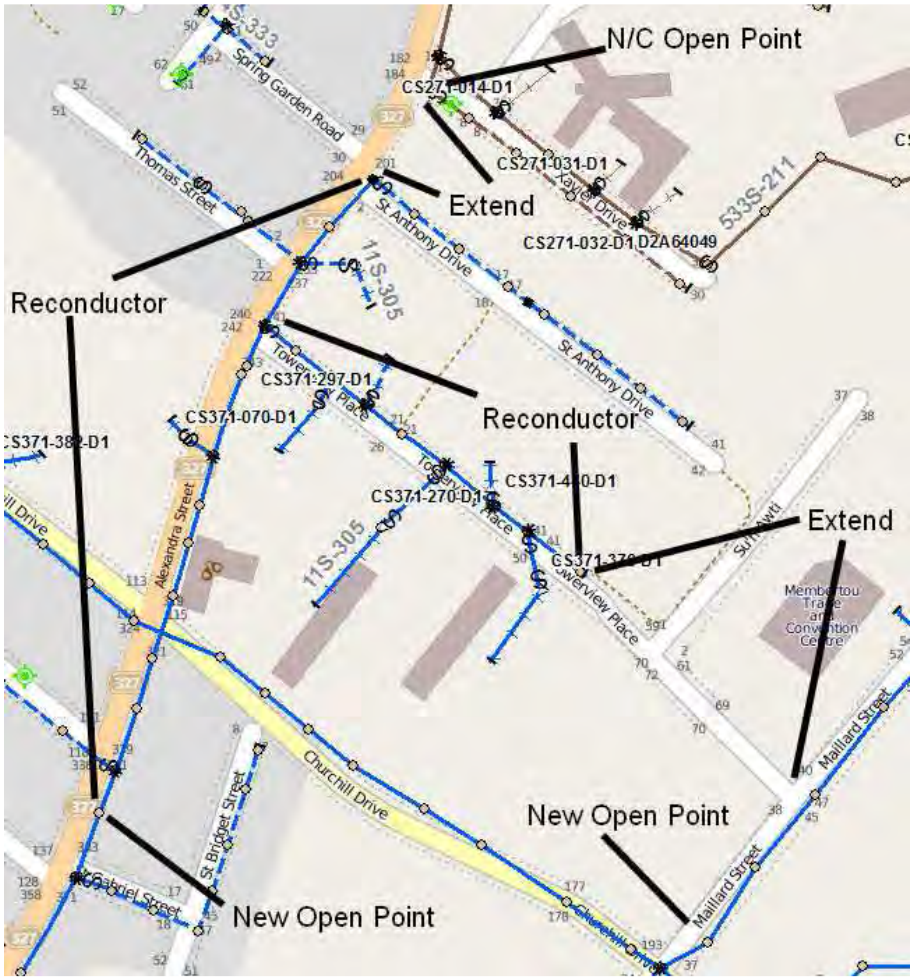


Figure 16 2014 Membertou Feeder Tie

6.1.2.3 New Kings Road Open Point

This portion of the project will enable the transfer of a portion of load from 4S-Townsend Street to 11S-Keltic Drive. This load transfer will reduce the overall loading on 4S-334 that will be supplying Membertou via Churchill Drive. Refer to Figure 17 below. The details are as follows:

- Install new open point on Kings Road, between Harbourview Drive and Churchill Drive.

Figure 17 2014 Kings Road Open Point

6.1.3 2015 Capital Year

The capital 2015 work includes the completion of items noted above in 2013 and 2014 Capital Year sections, as well as the preliminary engineering of the new Prime Brook substation. Further 4kV to 12kV conversions at 6S-Terrace Street will be deferred until after substation construction.

6.1.3.1 New Prime Brook Substation Preliminary Work

This portion of the project will detail the preliminary work required with the construction of the new 15/20/25MVA 138-12kV substation on Gabarus Hwy, near the intersection of the 138kV and 69kV transmission lines, L-6539 and L-5564. Refer to Figure 18 below. This will be accomplished by:

- Secure land rights to new substation location.
- Completion of the substation engineering and sourcing of long lead items.

6.1.4 2016 Capital Year

6.1.4.1 New Prime Brook Substation Construction

This portion of the project will detail the construction of the new 15/20/25MVA 138-12kV substation in Prime Brook. Refer to Figure 18 below. This will be accomplished by:

- Construction of a new tap off of L-6539 and the installation of associated equipment.
- Construction of 15/20/25MVA 138-12kV substation and associated equipment.

6.1.4.2 New Prime Brook Substation Feeders

This portion of the project will construct the new feeders, from the new Prime Brook substation. Refer to Figure 18 below. This will be accomplished by:

- Four new feeder exits will be created.
- The first feeder will connect to existing 11S-305 feeder on Gabarus Hwy.
- Existing 11S-305 feeder along transmission ROW will be rebuilt to double circuit which will extend from the substation to George Street and toward Highway 125 up to existing highway crossing. One feeder will tie to existing 4S-321 feeder at highway crossing. The other feeder will extend beyond existing highway crossing and tie to existing 4S-332 feeder. The location of R371-103 will be determined in a subsequent distribution protection study.
- The fourth feeder will extend north of the substation and use existing ducting to cross Highway 125 and tie to existing 4S-333 feeder on Tupsi Drive.

Figure 18 2016 New Prime Brook Substation

6.1.5 2017 Capital Year

Remaining 4kV to 12kV conversions will be dependent on the completion of Prime Brook substation. These conversions have been redistributed based on the new timeline for substation construction. The 2021 retirement of 6S-Terrace Street substation has been maintained.

6.1.5.1 Harold Street Conversion

This portion of the project will see the conversion of the Harold Street area, south of the 6S-Terrace Street substation. This will also include the conversion of the remaining sections of Champlain Avenue, Cottage Road and adjacent streets. This new conversion will be supplied via one of the 12kV feeders, on George Street. The off-road section of the existing 4kV feeder will be removed, between Harold Street and Holly Street. Holly Street will remain at 4kV. Refer to Figure 19below. This will be accomplished through the following:

- Create new N/C open point on Harold Street at George Street.
- Rebuild Cottage Road to Bernard Lind Drive with 3phase, 336ACSR.
- Create a new open point on Cottage Road, at Bernard Lind.
- Convert east of Harold Street to 12kV, as well as Grove Street.
- Remove off-road portion of feeder between Harold Street and Holy Street.
- Extend one phase on Holly Street to Terrace Street and remove the remaining two phases.
- Remove 2 phases from Harold Street, from Cottage Road towards Holly Street.

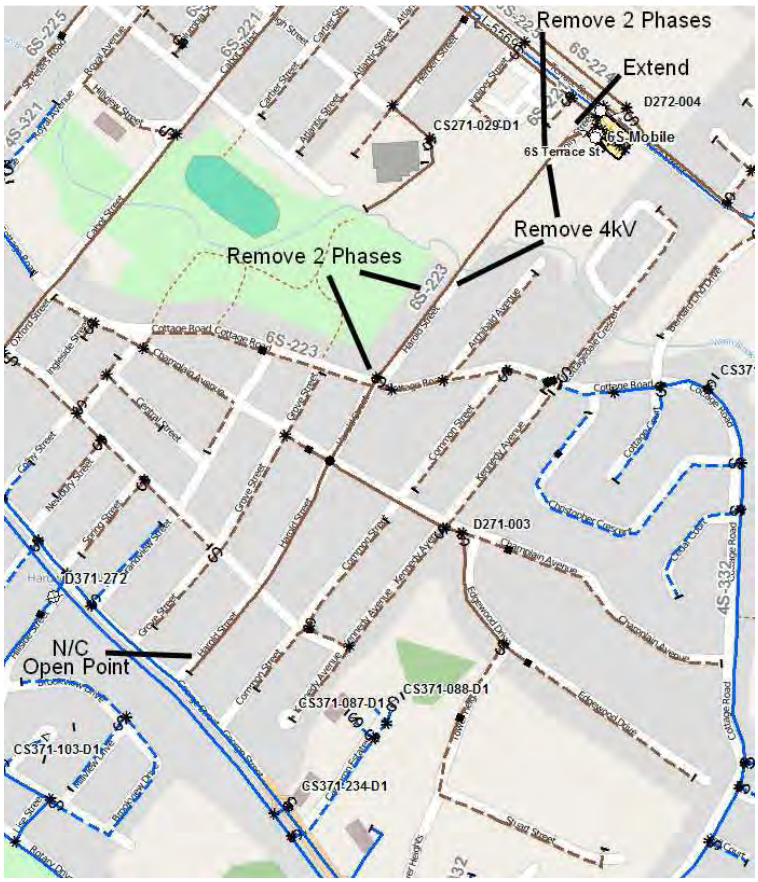


Figure 19 2015 Harold Street Conversion

6.1.5.2 Bernard Lind Drive Rebuild

This portion of the project will convert Terrace Street, east of the 6S-Terrace Street substation. This portion of the project will also see the addition of two phases along Bernard Lind Drive, supplying the area via Cottage Road. Refer to Figure 20 below. This will be accomplished by:

- Rebuild Bernard Lind Drive with three phase 4/0 primary and 4/0 neutral, from Cottage Road to Terrace Street.
- Install a new open point east of the 6S-Terrace Street substation.
- Convert Terrace Street east of the 6S-Terrace Street substation.
- Create new Open Point at the end of Bernard Lind Drive and Cottage Road.

Figure 20 2016 Bernard Lind Rebuild

6.1.6 2018 Capital Year

6.1.6.1 Birch Hill Drive Conversion

This portion of the project will convert Birch Hill Drive and its side streets from 4kV to 12kV. This newly converted section will be supplied via 4S-324. Refer to Figure 21 below. The details are as follows;

- Extend 3phase on Birch Hill Drive to Upper Prince Street.
- Create new N/C open point at the intersection of Birch Hill Drive and Upper Prince Street.
- Convert Birch Hill Drive, McConnell Drive, Ashby Road and Herbert Street to Terrace Street, including side streets, from 4kV to 12kV.
- Change supply of Herbert Street, south of Terrace Street, to 6S-221. This portion of the street will be converted in a following portion of work.

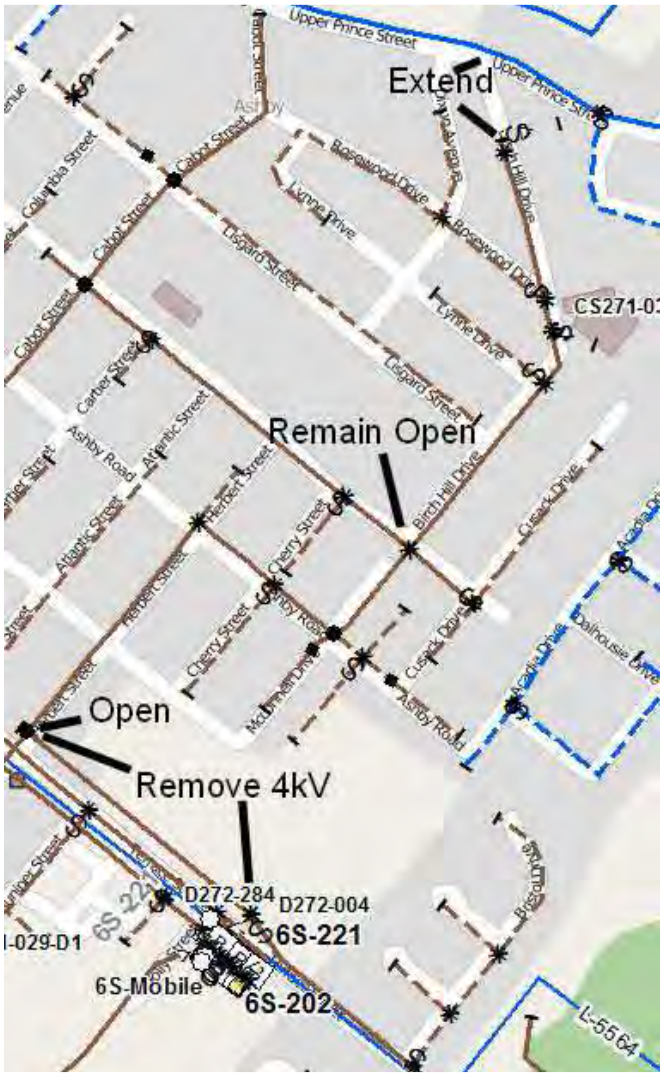


Figure 21 2017 Birch Hill Drive Conversion

6.1.6.2 Townsend Street Conversion

This portion of the project will convert the 4kV customer load on Terrace Street, from St. Peters Road to Townsend Street. The load will be supplied via 4S-324, until the remaining section of Terrace Street is converted. High Street, from St. Peters Road to Townsend Street will continue to be supplied via 6S-225. Refer to Figure 22 below. The details are as follows;

- Install open point on Terrace Street, between Howe Street and St. Peters Road.
- Open Howe Street, between High Street and Terrace Street.
- Install new open point on the north side of the Howe Street and High Street intersection.
- Install new tap on south Howe Street, to High Street.
- Open D271-283.
- Extend High Street to St Peters Road.
- Install new open point on Park Street, at Terrace Street.
- Convert Terrace Street, from St. Peters Road to Townsend Street, as well as the side streets indicated in Figure 22.

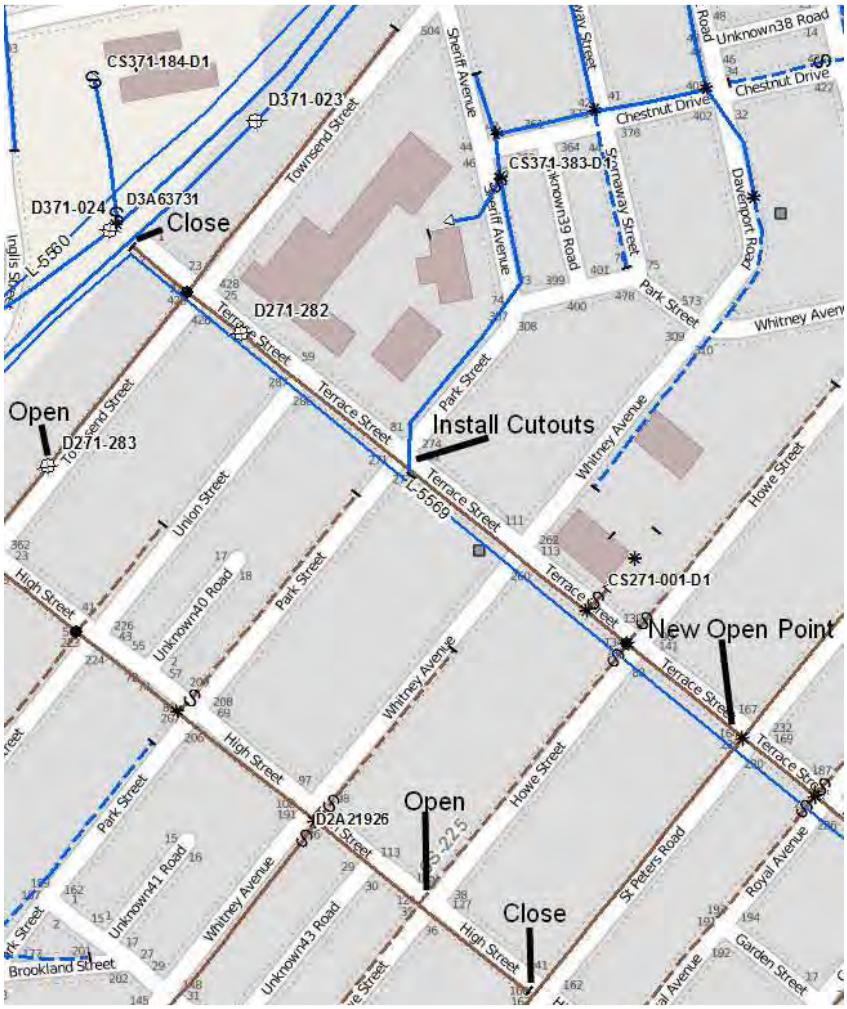


Figure 22 2018 Townsend Street Conversion

6.1.7 2019 Capital Year

6.1.7.1 High Street Conversion

This portion of the project will convert the High Street area, from 4kV to 12kV. The load will be supplied by 4S-324, via the open point on Townsend Street. Upon completion of this portion of work, the 534S stepdown will be removed from service, as there will be no load able to be transferred to it. Refer to Figure 23 below. The details are as follows;

- Close D271-283, on Townsend Street.
- Install new Open Point on Terrace Street, between St. Peters Road and Royal Avenue.
- Convert High Street, from Styles Lane (534S stepdown) to St. Peters Road, including all side streets.
- Convert St. Peters Road, including all side streets.
- Remove 534S stepdown.

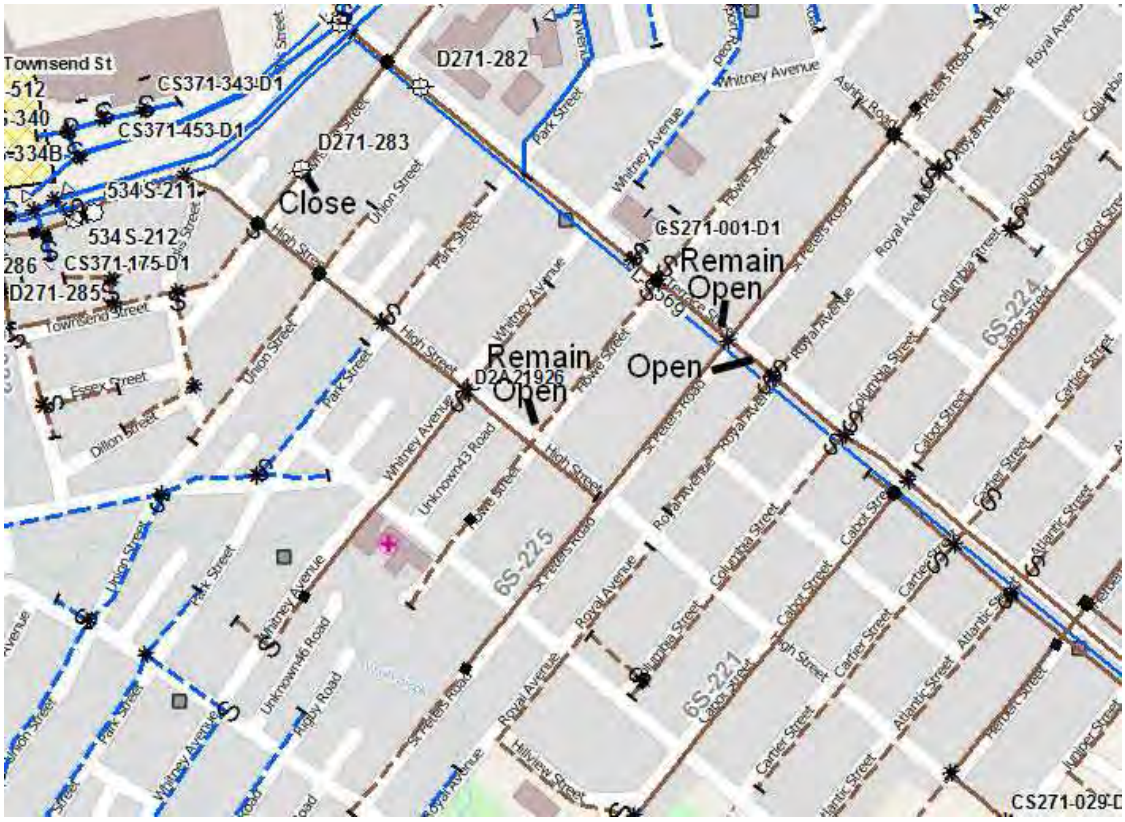


Figure 23 2019 High Street Conversion

6.1.8 2020 Capital Year

6.1.8.1 Terrace Street

This portion of the project will see the conversion of the remaining 4kV, east of the 6S-Terrace Street substation. This conversion will include rebuild of a section of Terrace Street, from the substation to Cabot Street. This rebuild will reduce the feeders along Terrace Street from a maximum of three to one. Refer to Figure 24 below. The details are as follows;

- Convert Terrace Street, from the 6S-Terrace Street substation to St. Peters Road, from 4kV to 12kV, including all side streets that have not been previously converted.
- Rebuild Terrace Street, from the 6S-Terrace Street substation, to St. Peters Road with one, 3-phase 336, circuit.

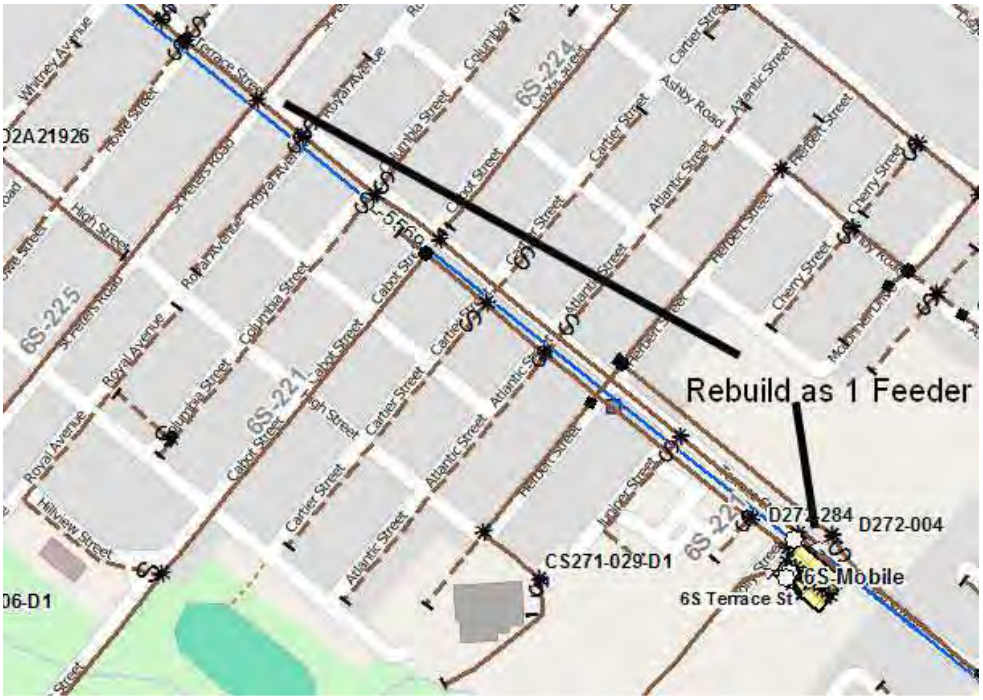


Figure 24 2020 Terrace Street

6.1.9 2021 Capital Year

6.1.9.1 6S-Terrace Street Retirement

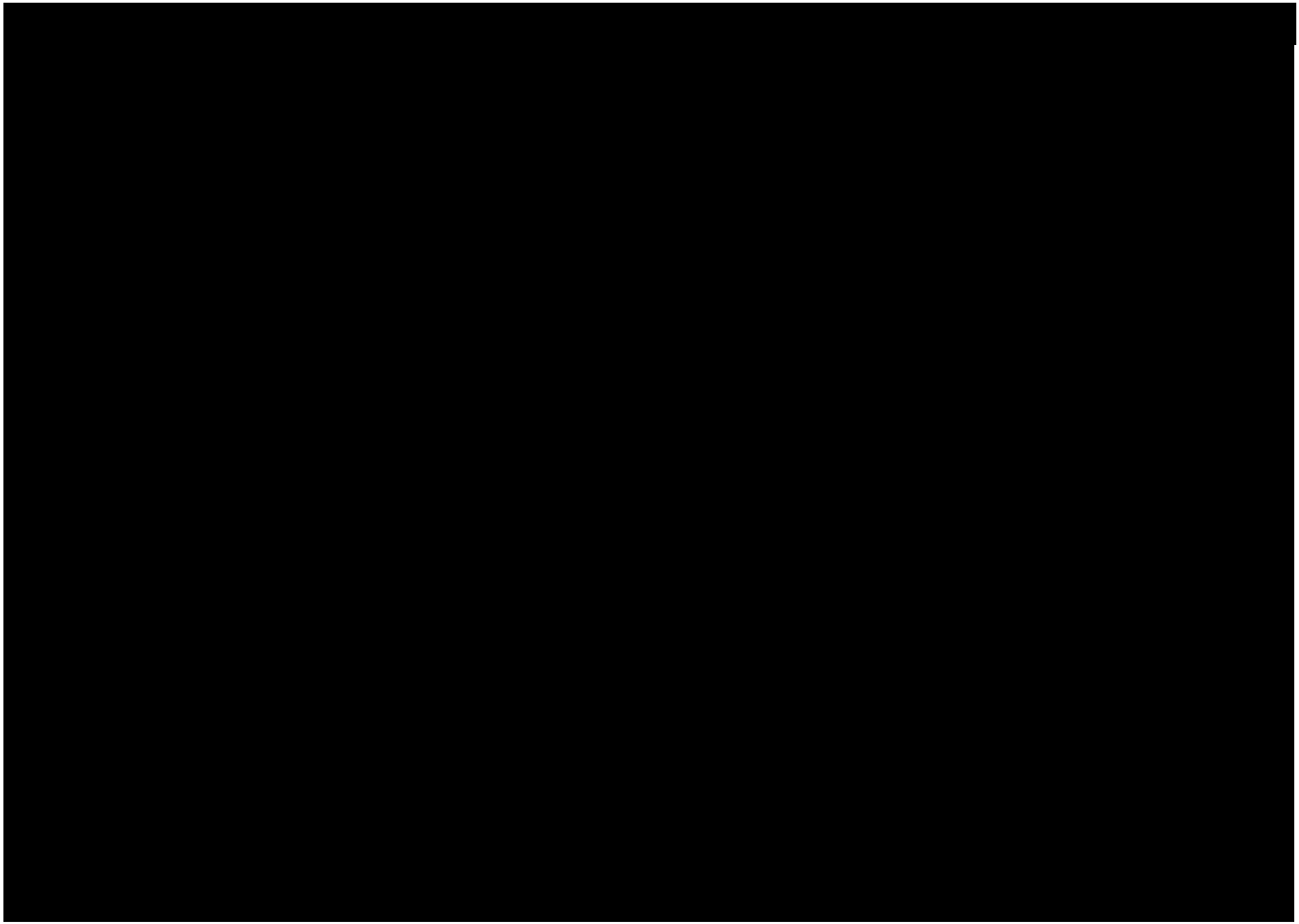
This portion of the project will see the retirement of the 6S-Terrace Street substation. This will include the decommissioning of 6S-T1, as well as the removal of most substation equipment. A requirement to modify the 69kV transmission will be necessary, to facilitate the removal of the substation buswork. Refer to Figure 25 below. This will be accomplished by:

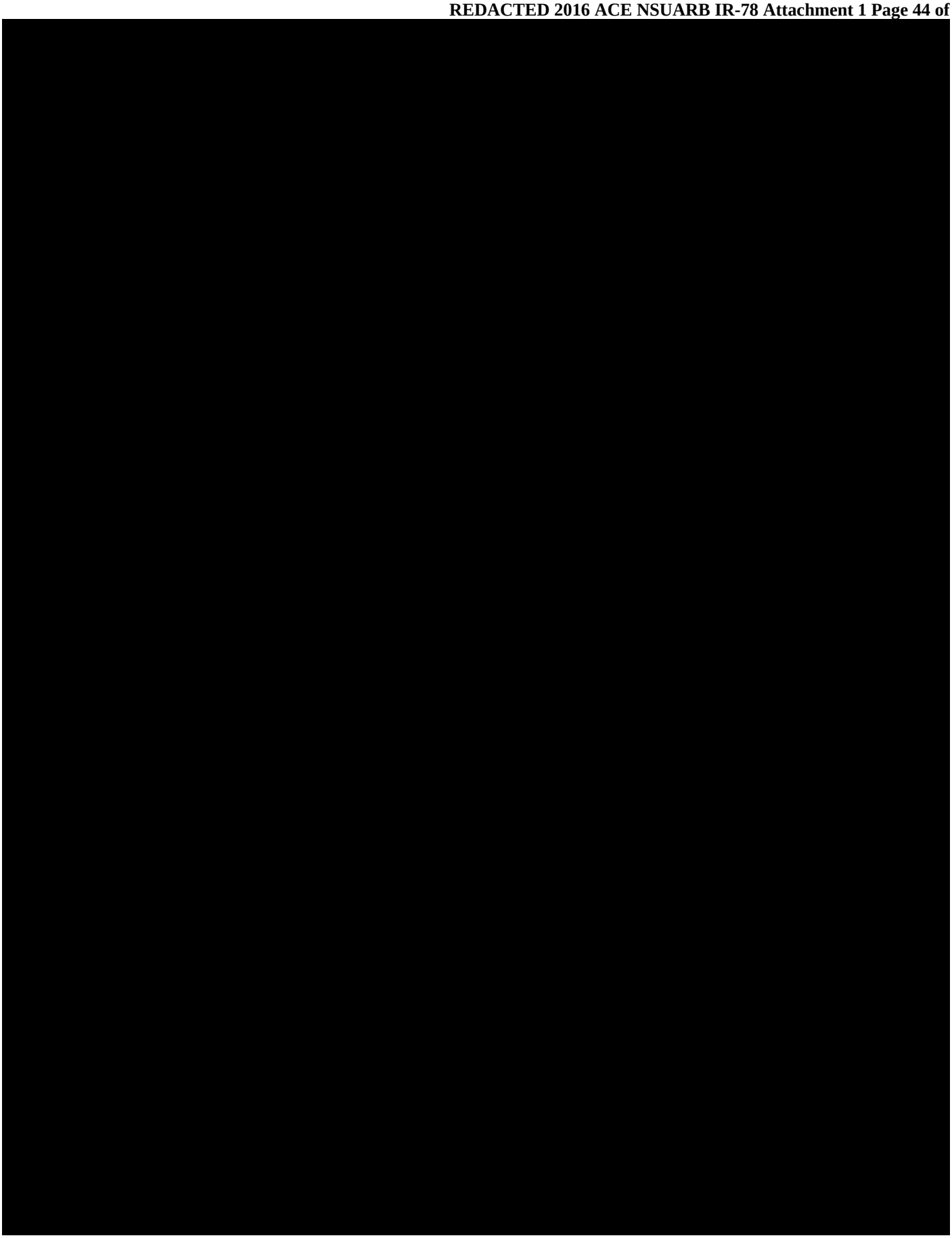
- Decommission 6S-T1.
- Reconfigure L-5564, in front of the 6S-Terrace Street substation, to bypass the substation.
- Remove buswork and all NSPI owned equipment.

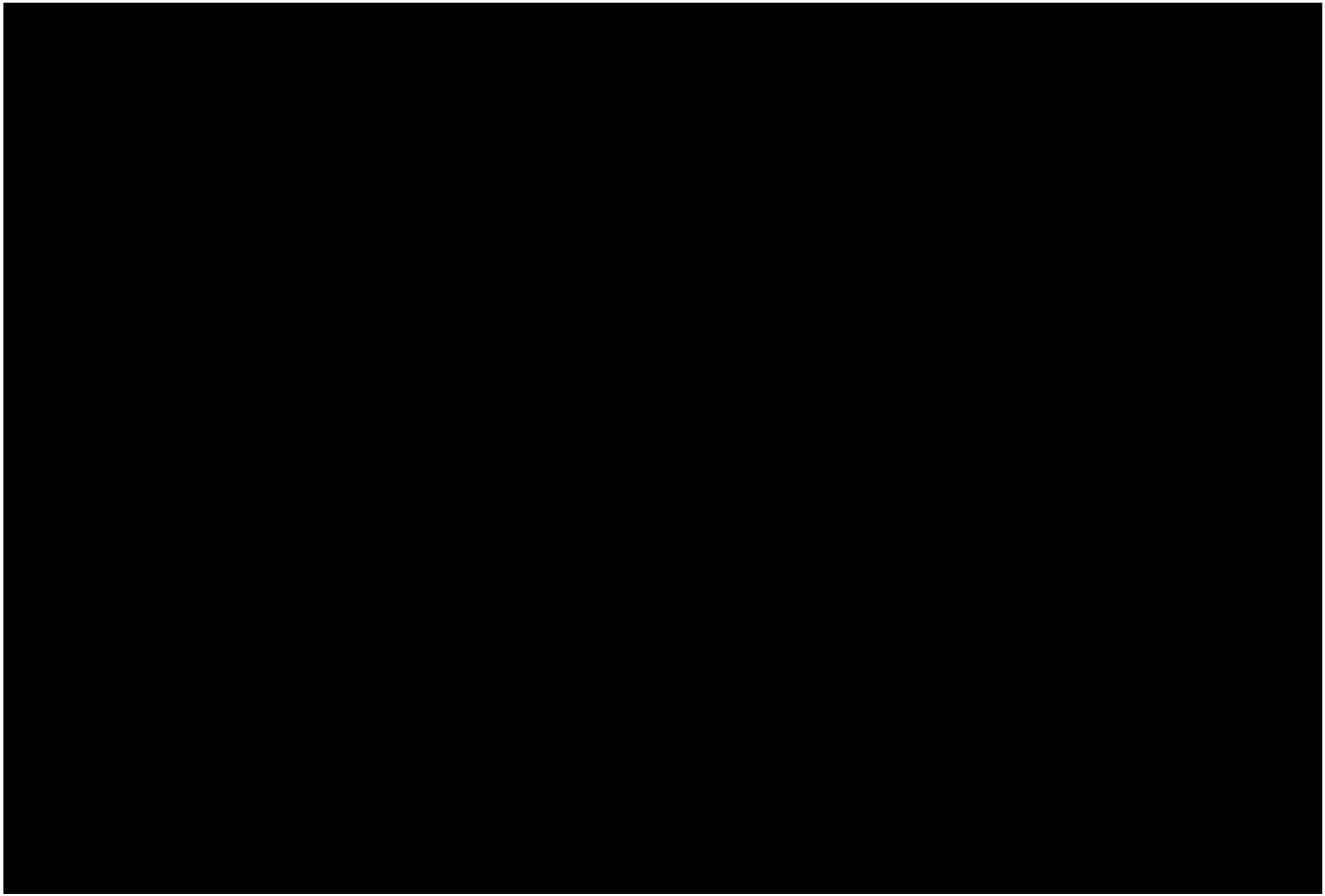
Figure 25 2021 6S-Terrace Street Retirement

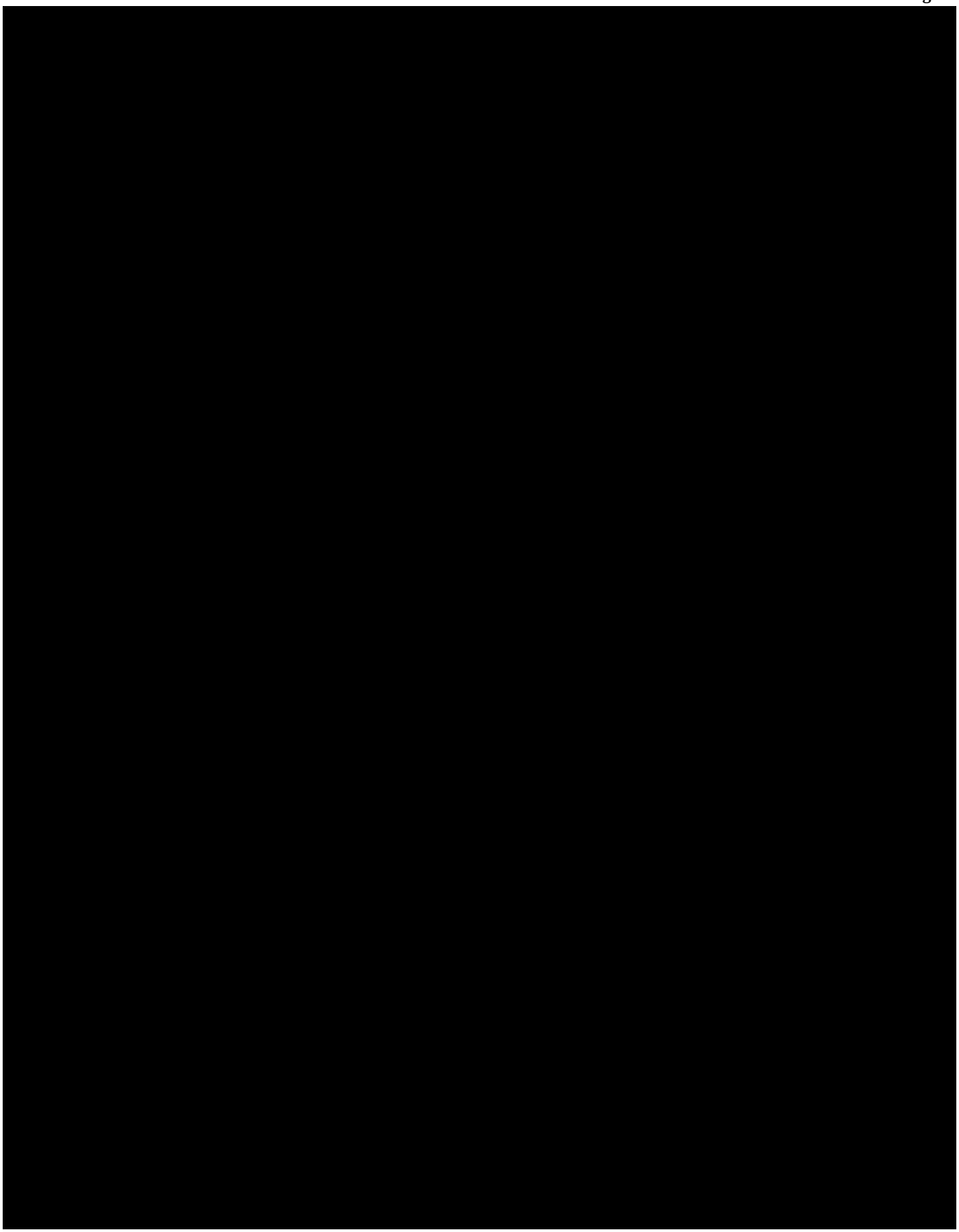
APPENDIX A

System Operating Diagrams









APPENDIX B

Load History and Forecast

Please refer to section 3.2 Load Forecast for the 90th Percentile Data values

Figure 32 4S-T52 Load History

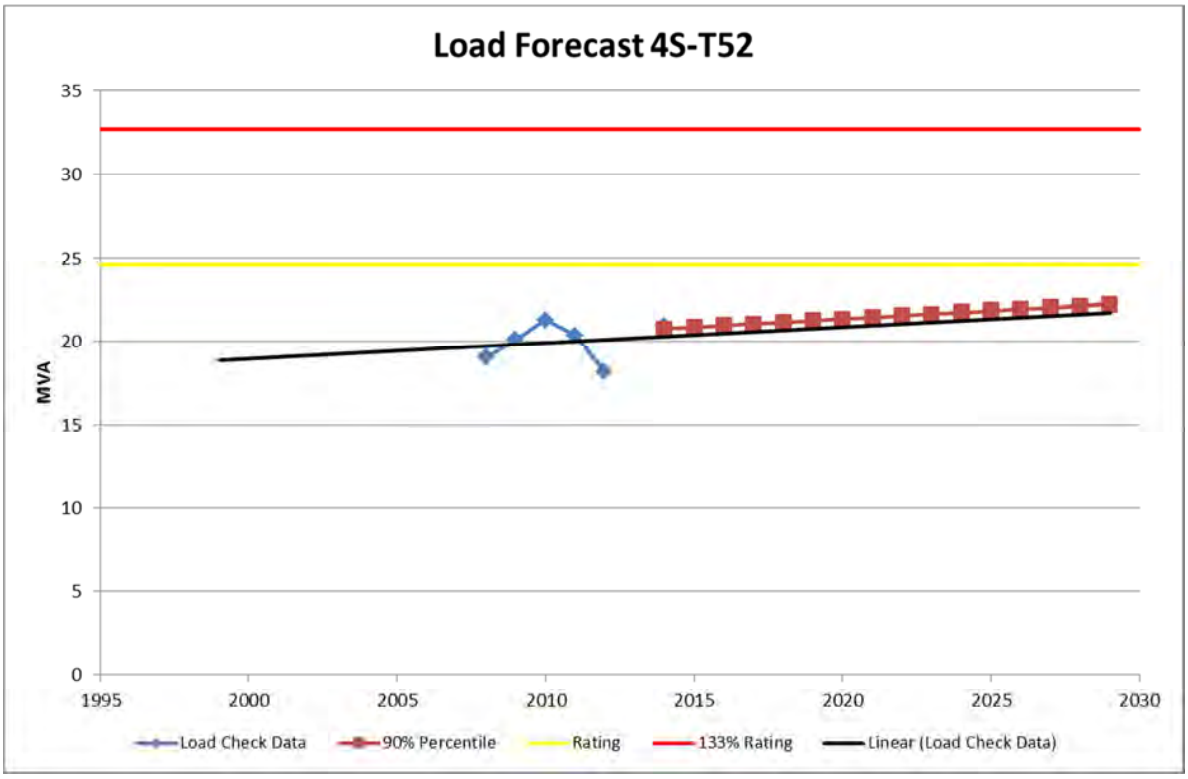


Figure 33 4S-T52 Load Forecast

Load Growth 0.42%**

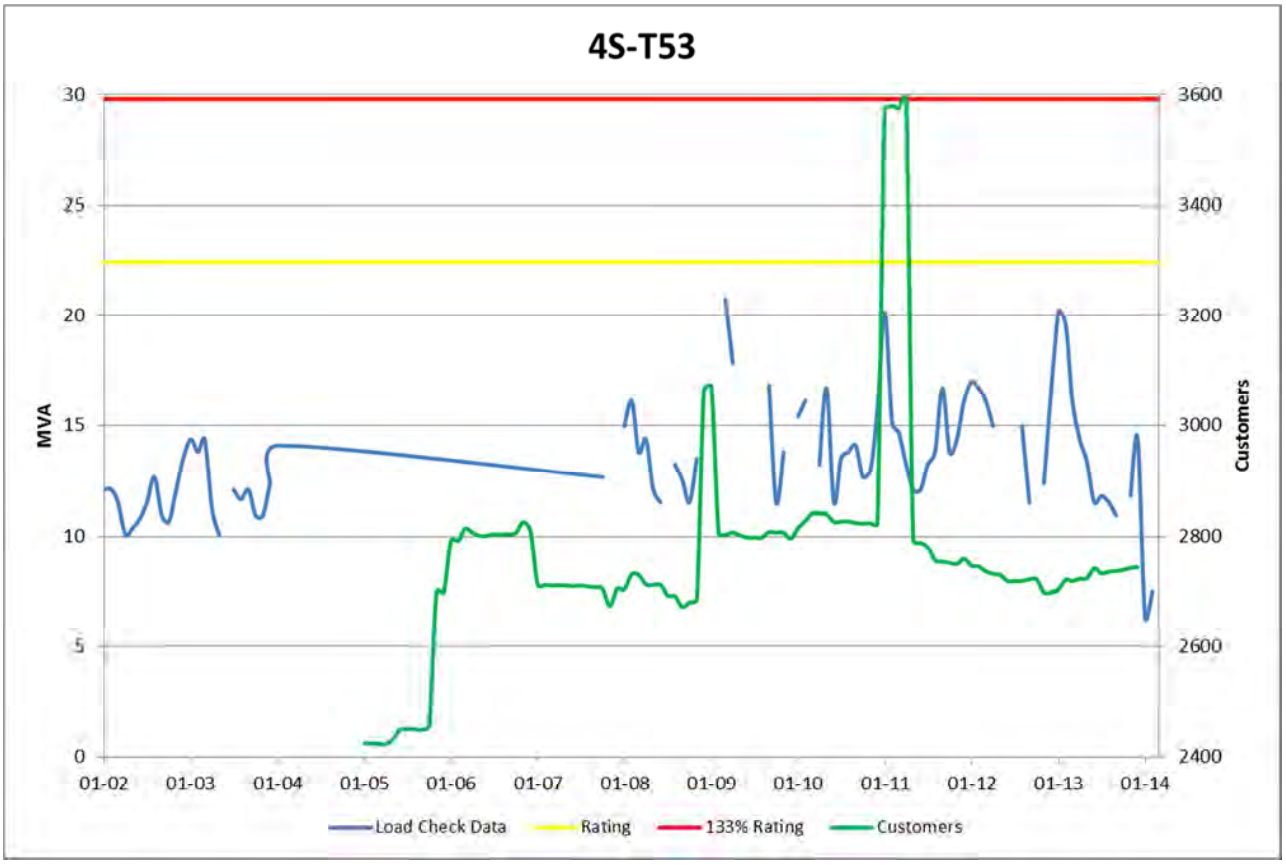


Figure 34 4S-T53 Load History

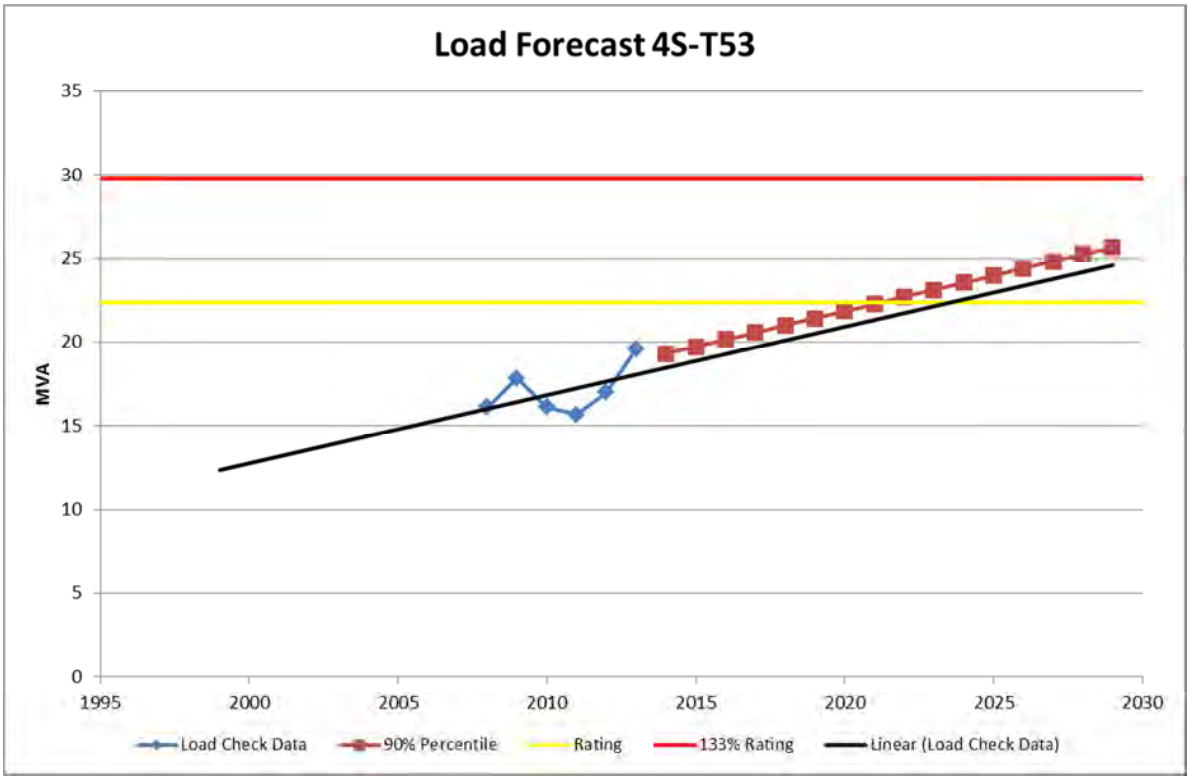


Figure 35 4S-T53 Load Forecast

Load Growth 1.77%

Appendix B: Load History and Forecast

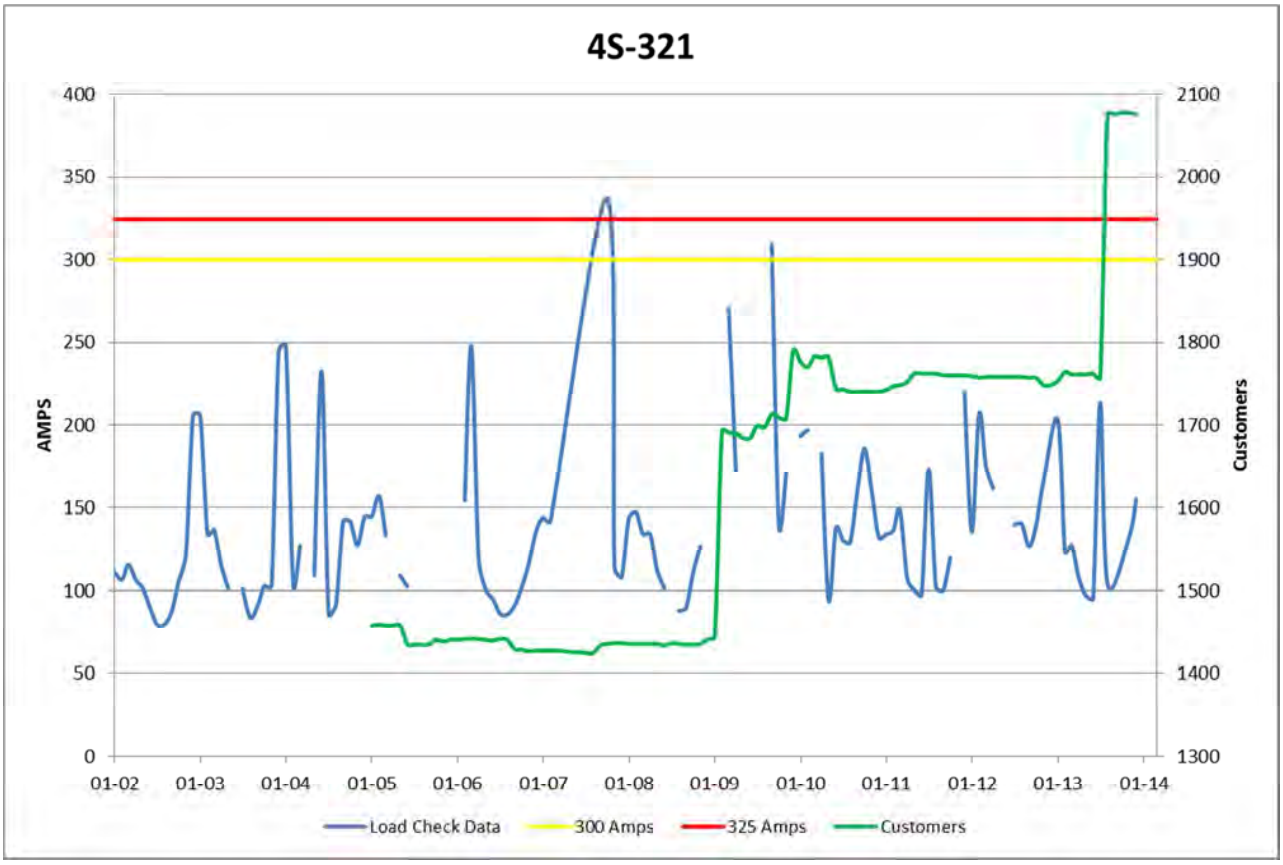


Figure 36 4S-321 Load History

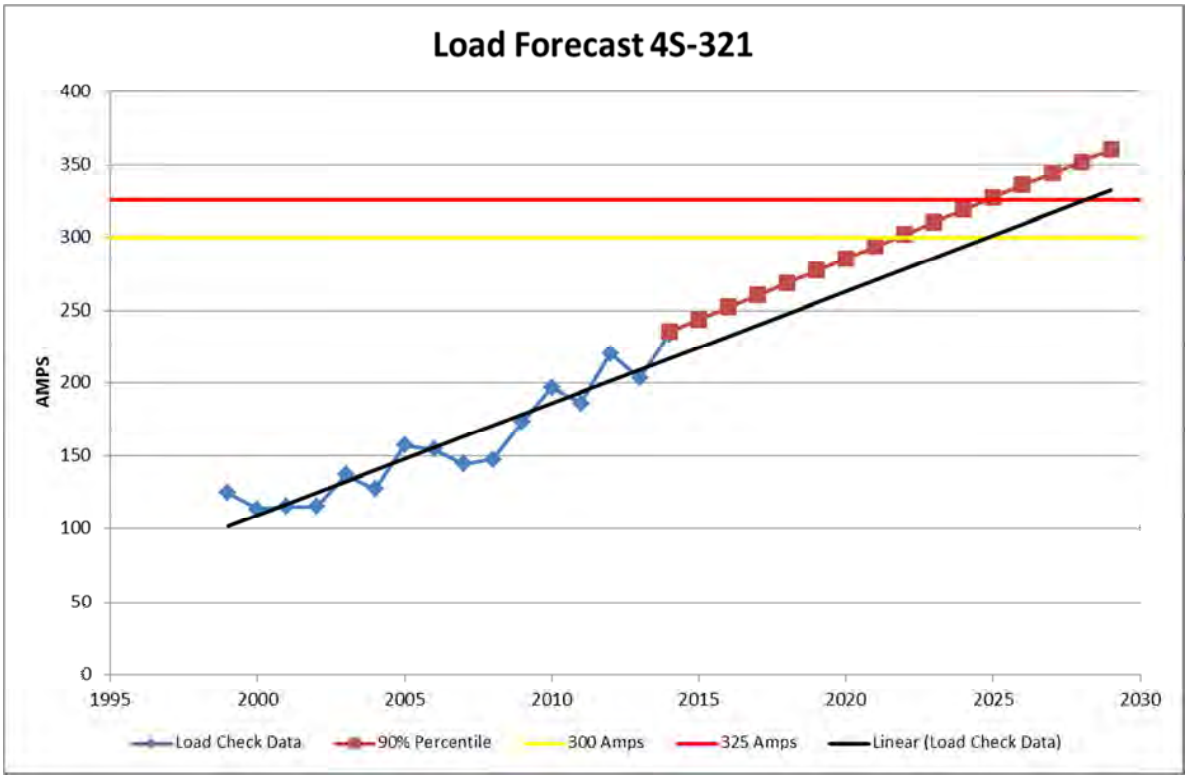


Figure 37 4S-321 Load Forecast

Load Growth 2.64%

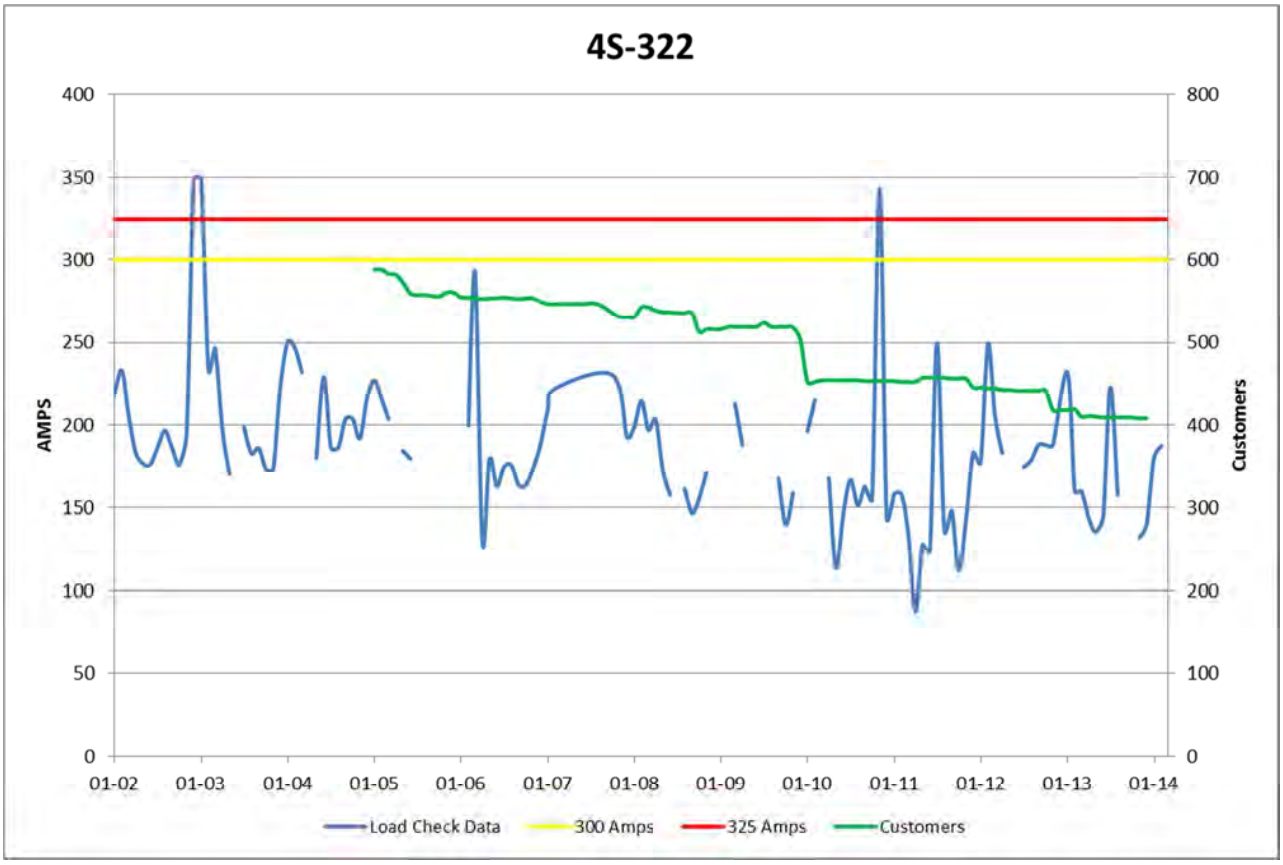


Figure 38 4S-322 Load History

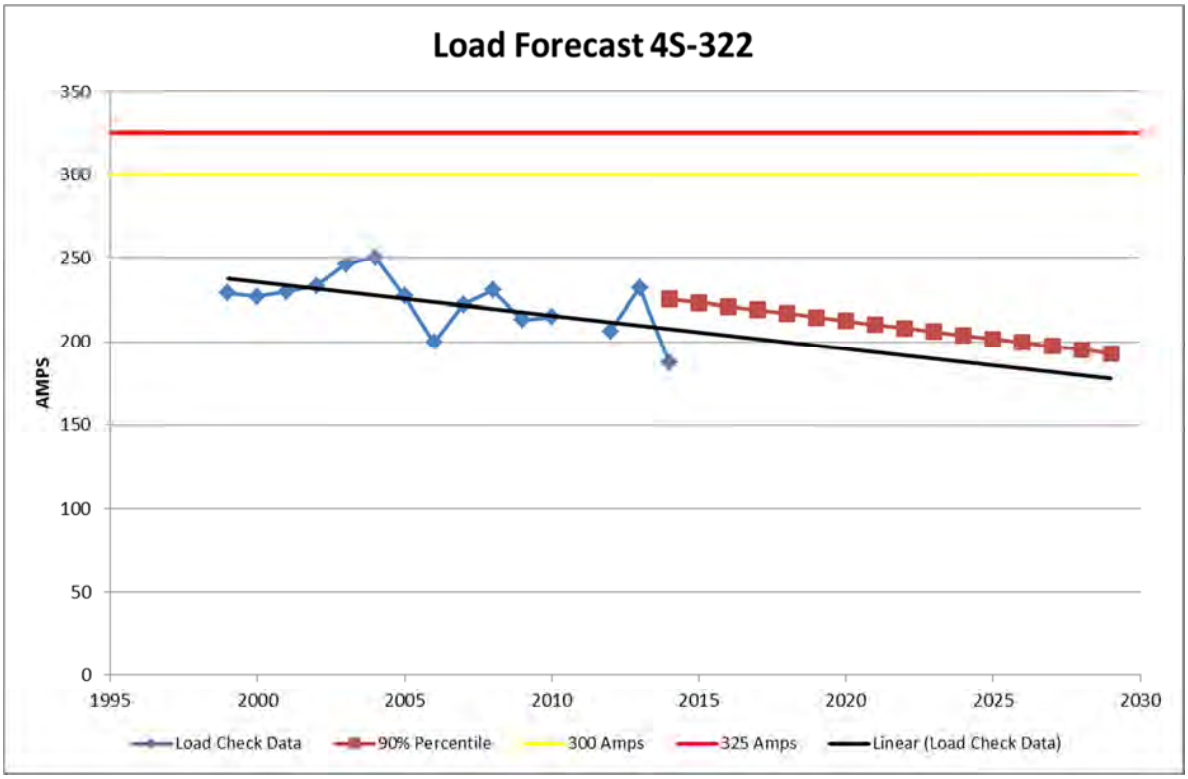


Figure 39 4S-322 Load Forecast

Load Growth -0.97%

Appendix B: Load History and Forecast

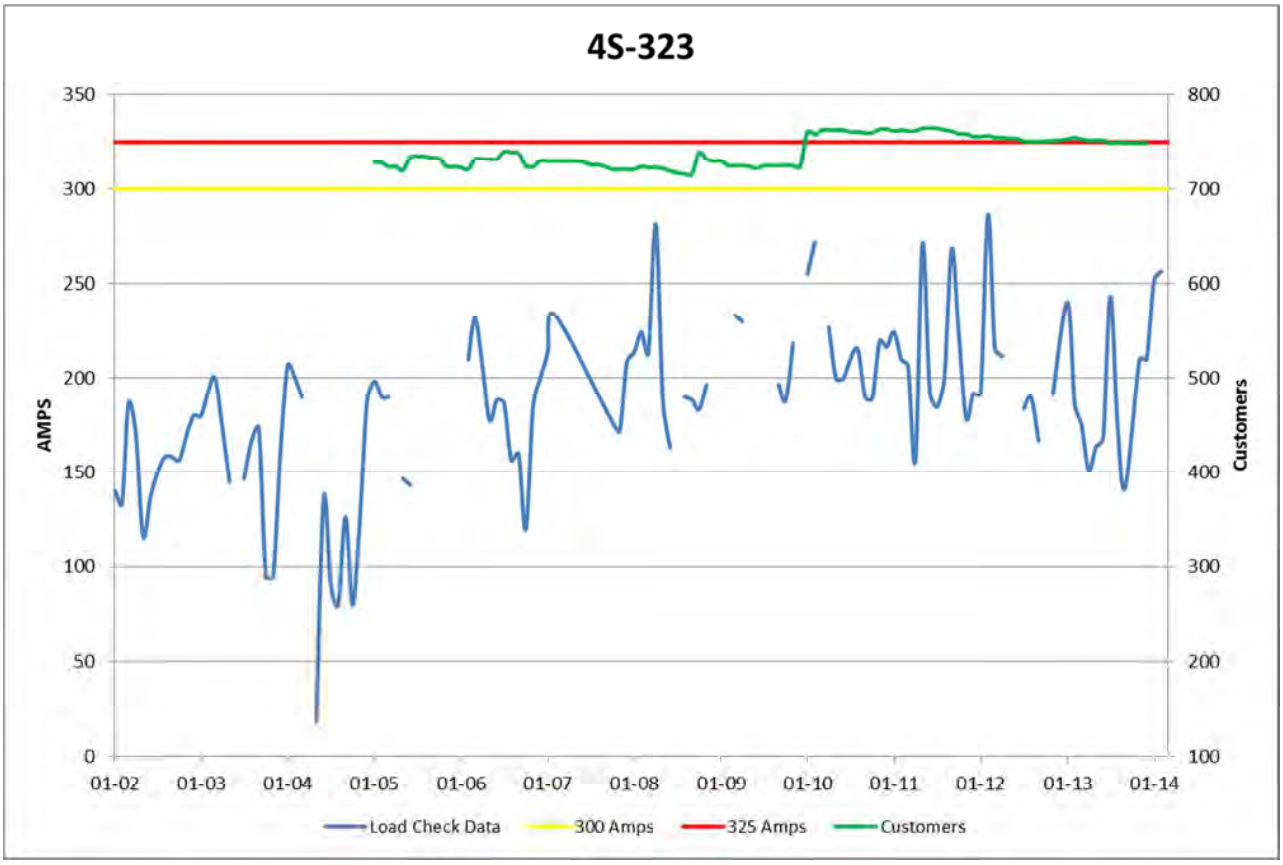


Figure 40 4S-323 Load History

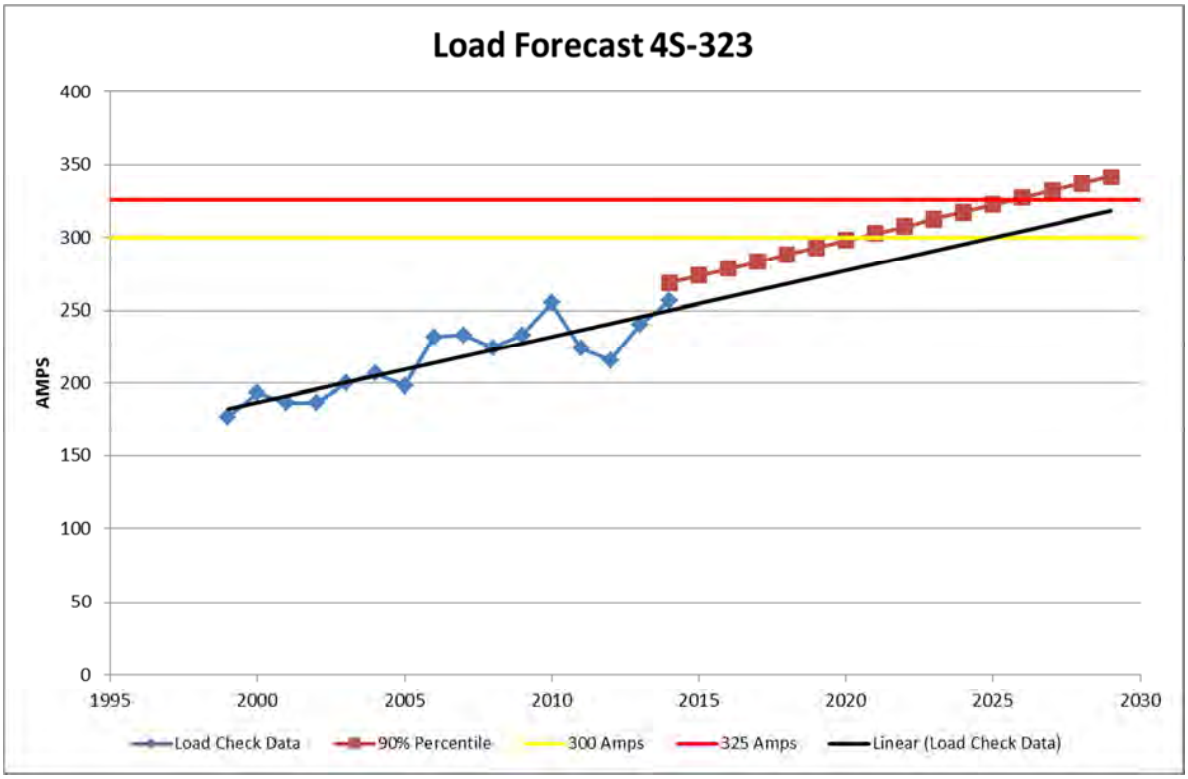


Figure 41 4S-323 Load Forecast

Load Growth 1.48%

Appendix B: Load History and Forecast

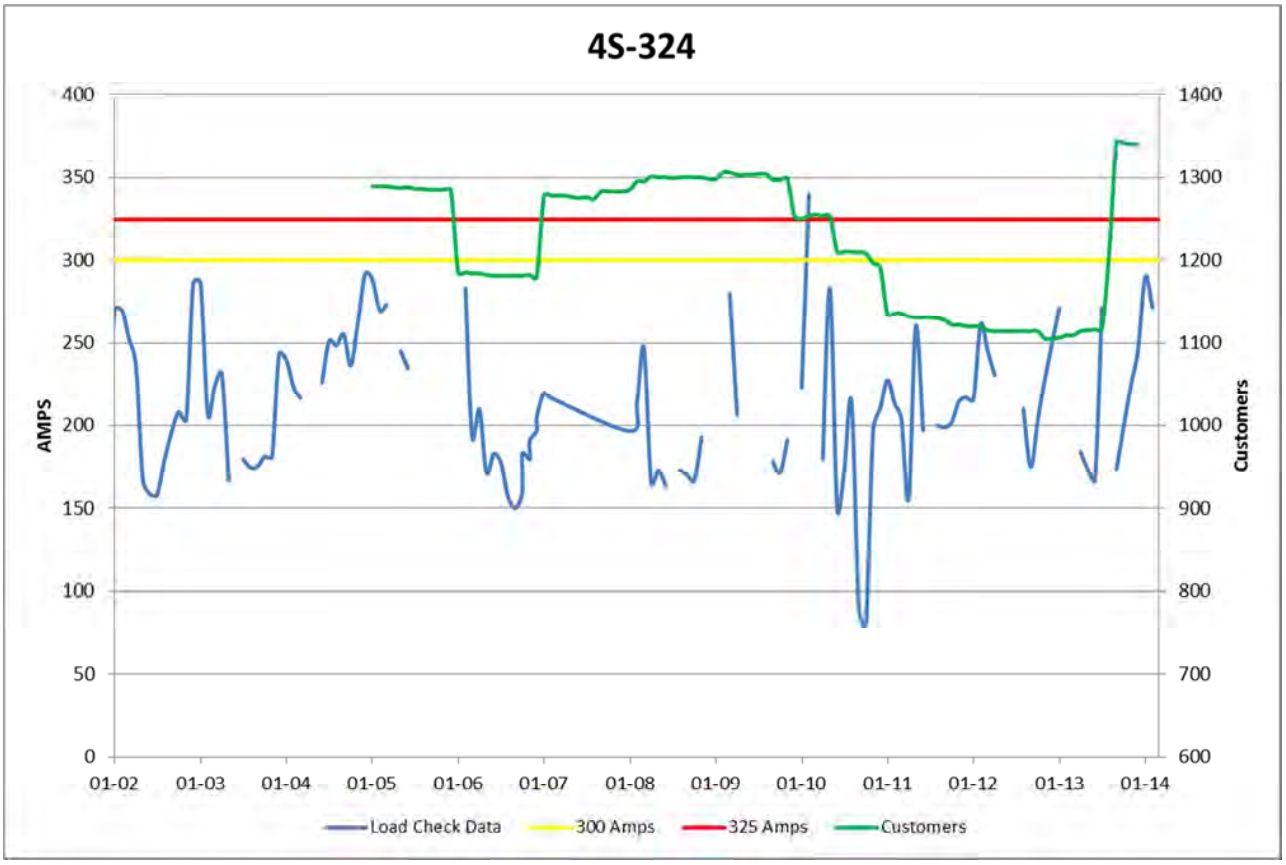


Figure 42 4S-324 Load History

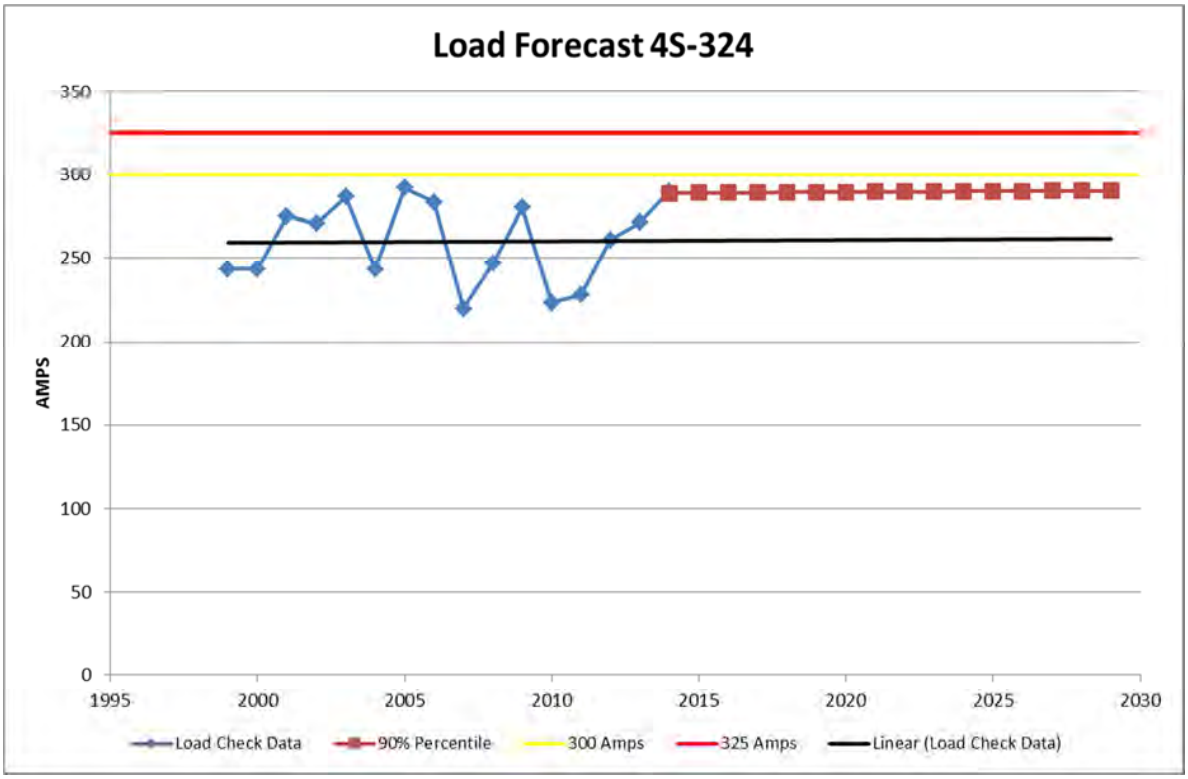


Figure 43 4S-324 Load Forecast

Load Growth 0.03%

Appendix B: Load History and Forecast

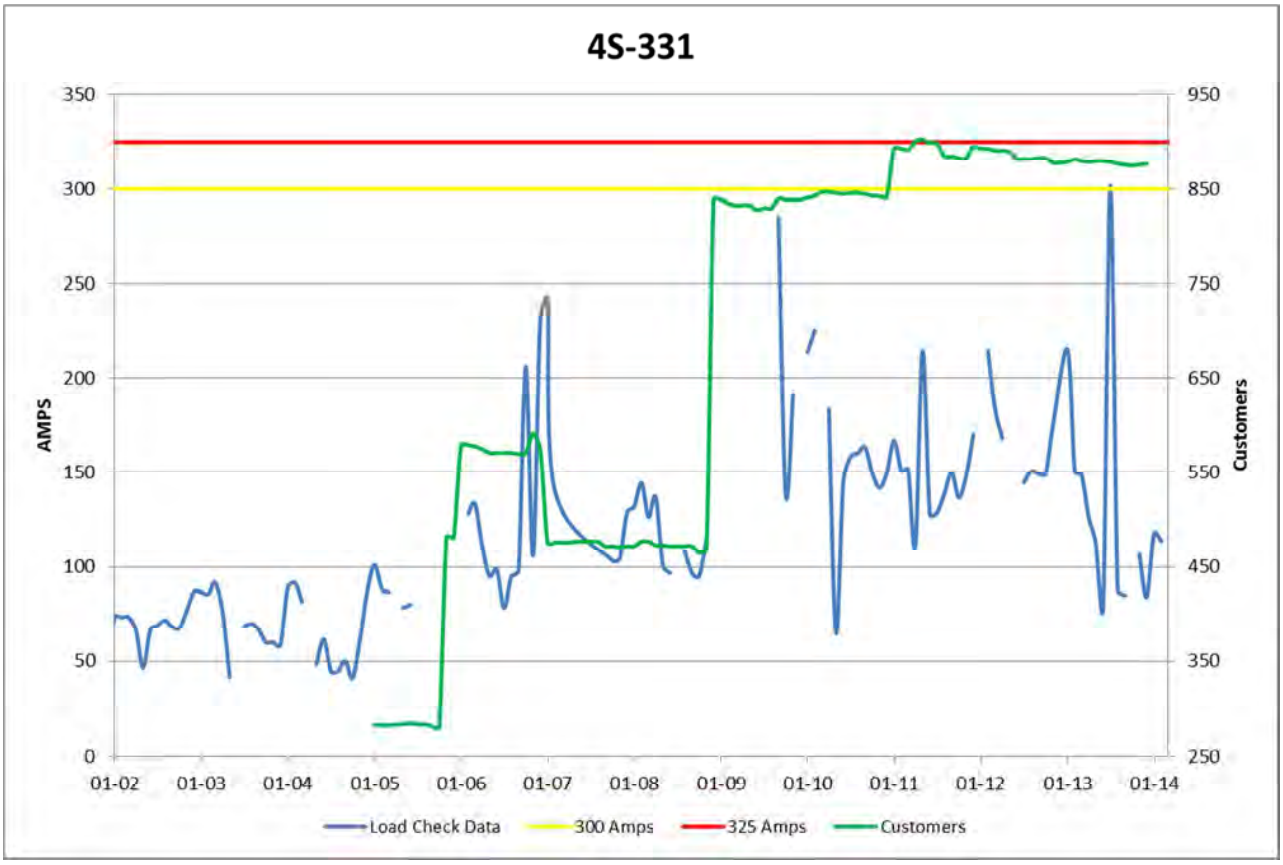


Figure 44 4S-331 Load History

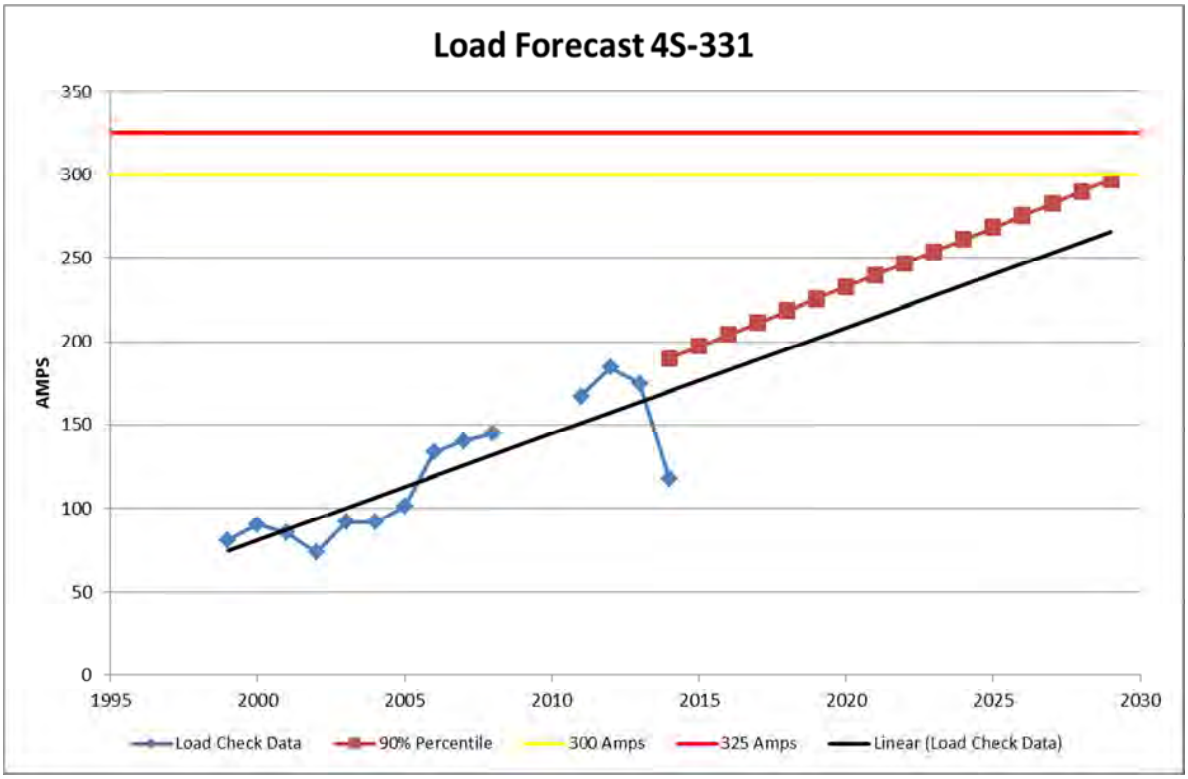


Figure 45 4S-331 Load Forecast

Load Growth 2.76%

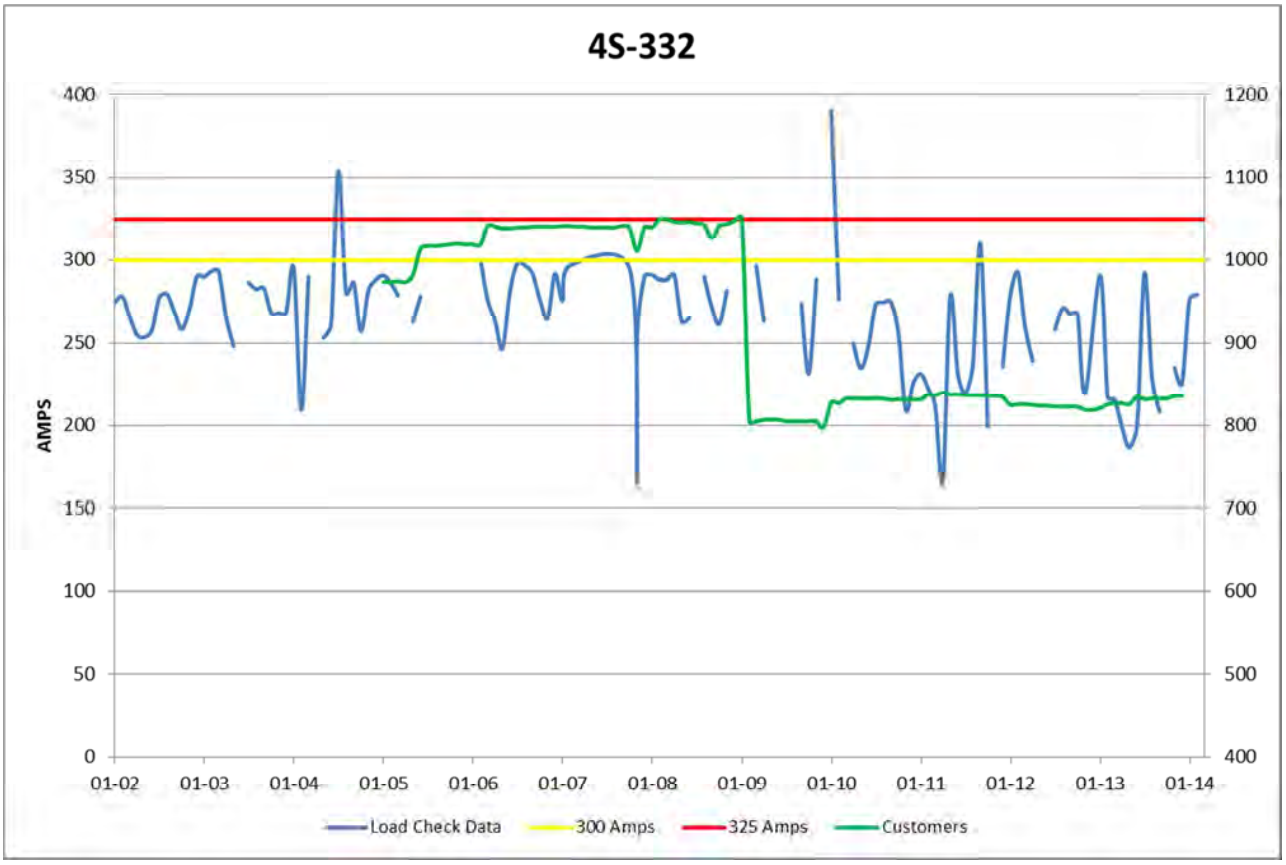


Figure 46 4S-332 Load History

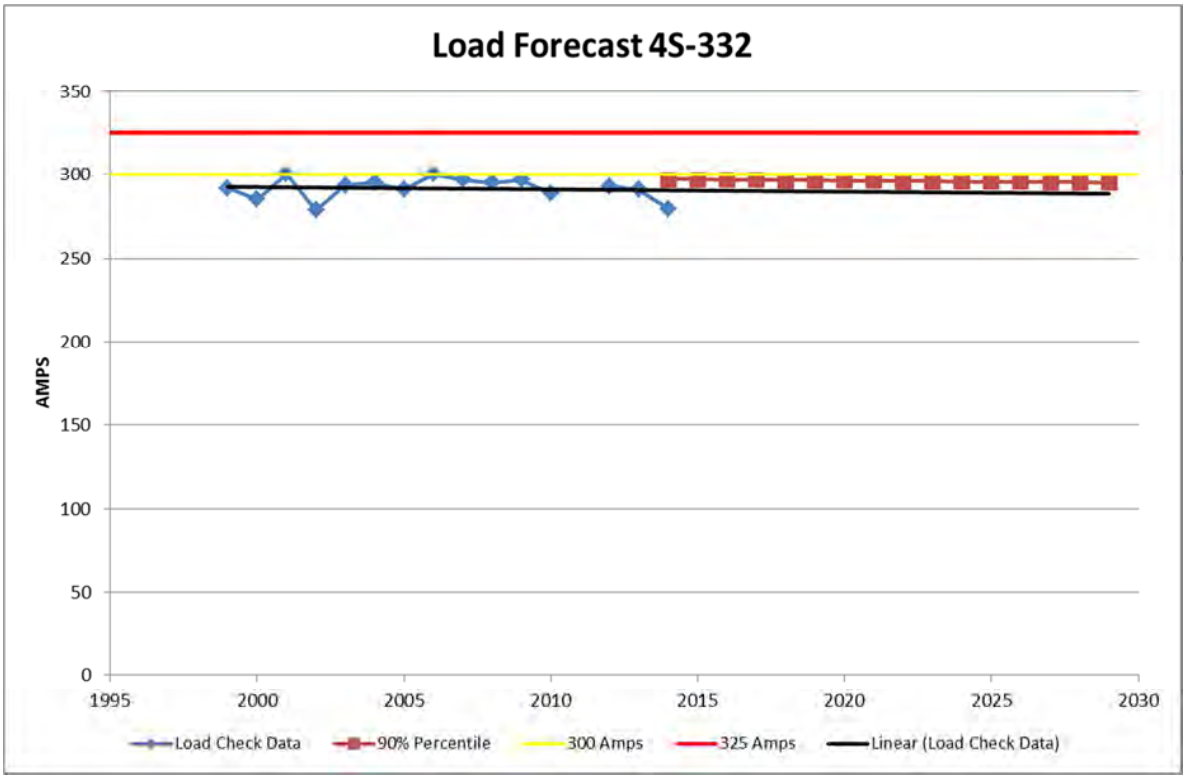


Figure 47 4S-332 Load Forecast

Load Growth -0.05%

Appendix B: Load History and Forecast

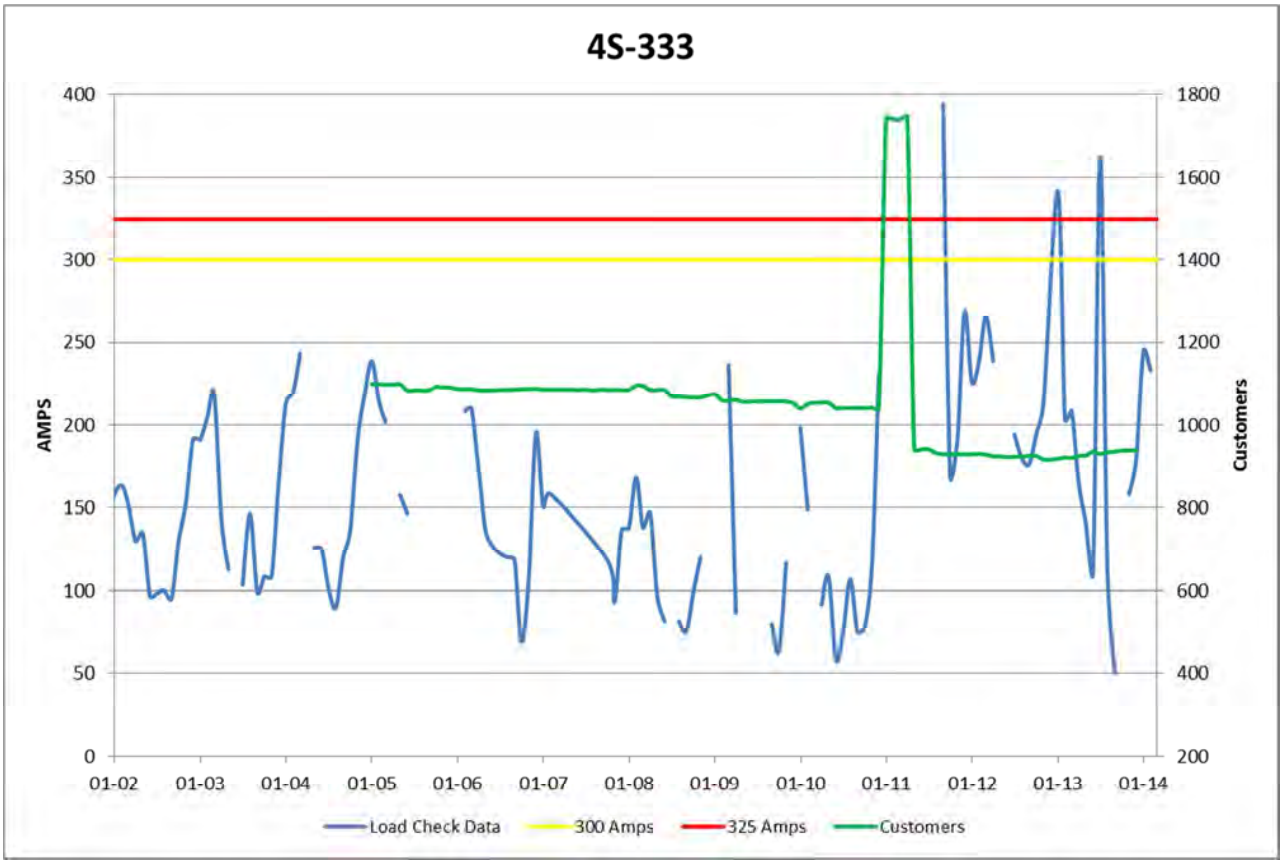


Figure 48 4S-333 Load History

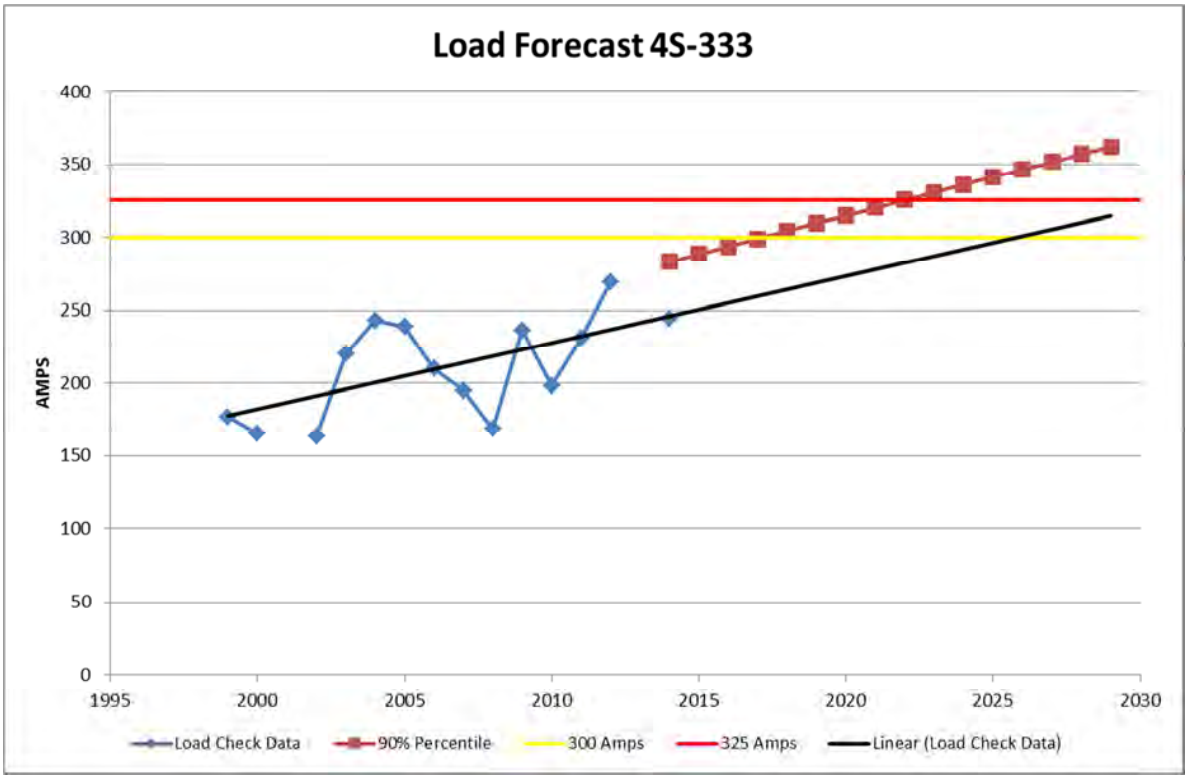


Figure 49 4S-333 Load Forecast

Load Growth 1.53%

Appendix B: Load History and Forecast

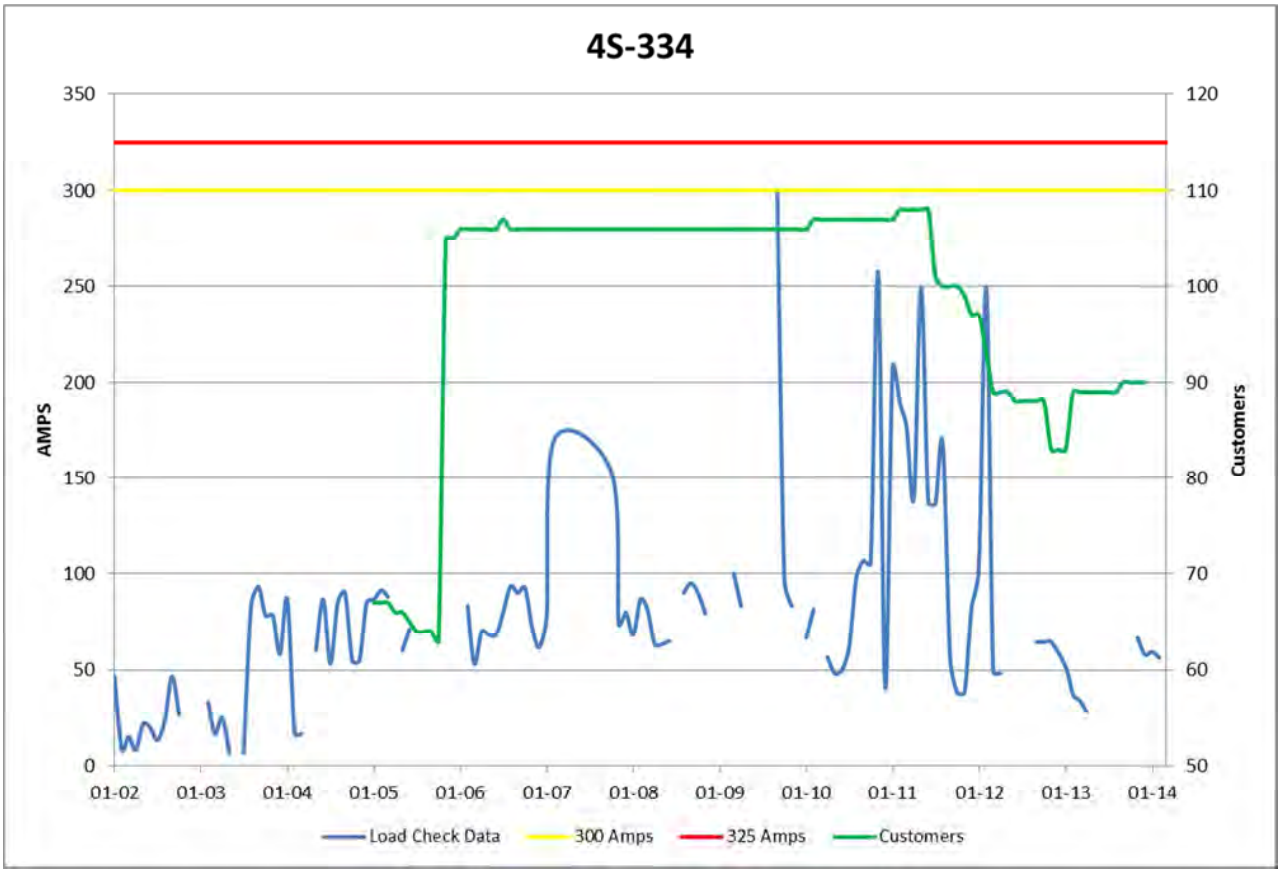


Figure 50 4S-334 Load History

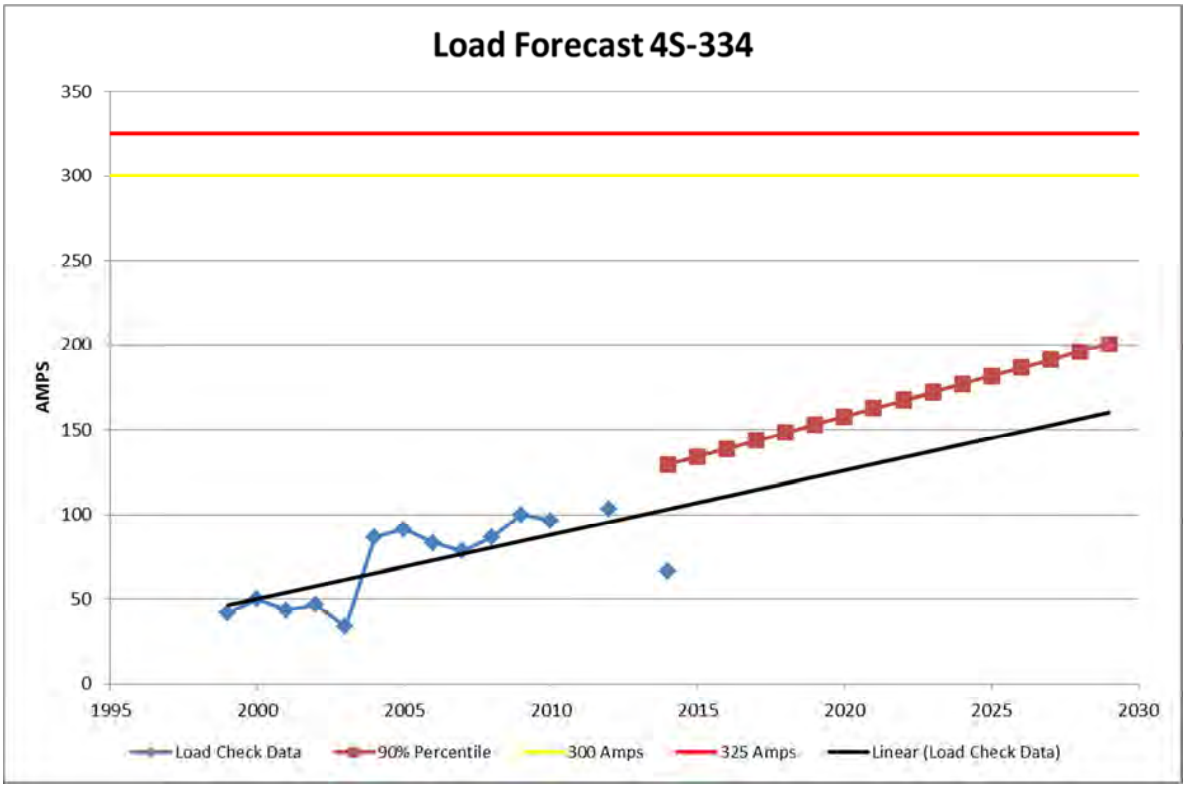


Figure 51 4S-334 Load Forecast
Load Growth 2.72%

Appendix B: Load History and Forecast

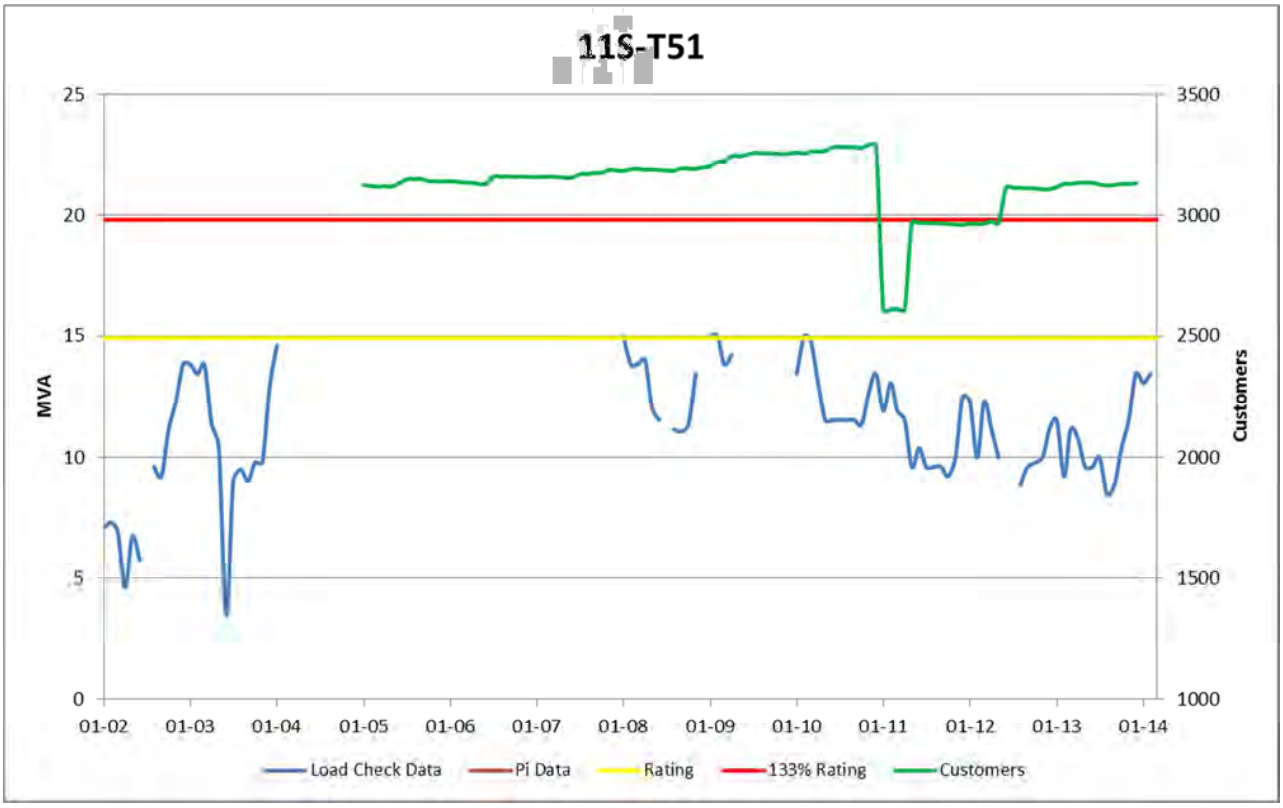


Figure 52 11S-T51 Load History

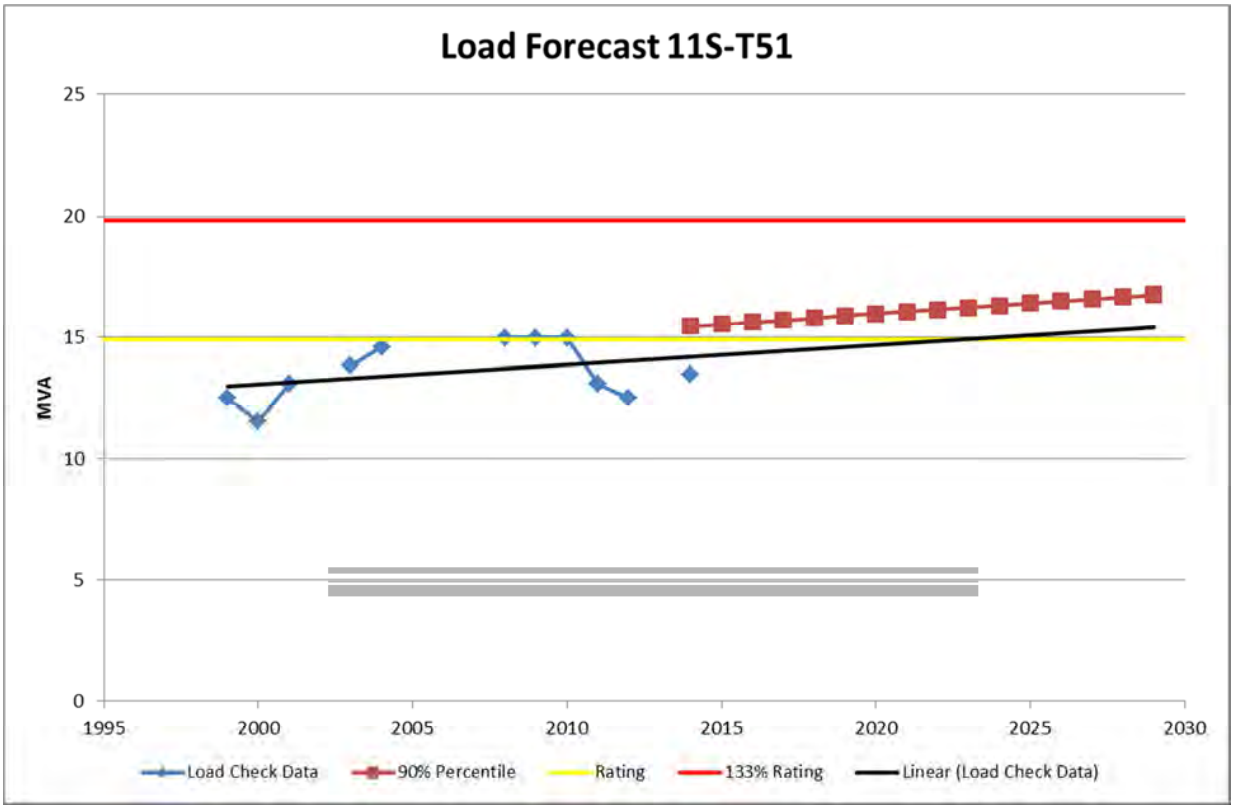


Figure 53 11S-T51 Load History

Load Growth 0.51%

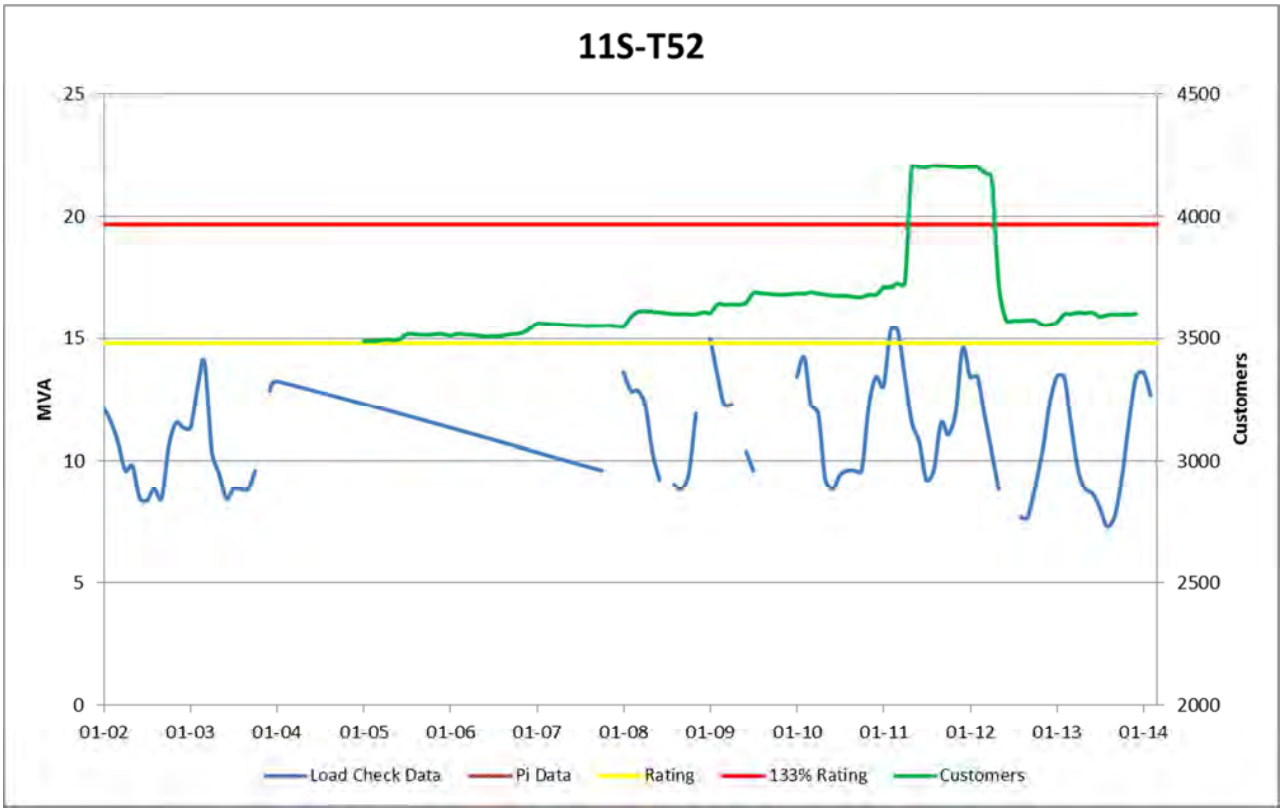


Figure 54 11S-T52 Load History

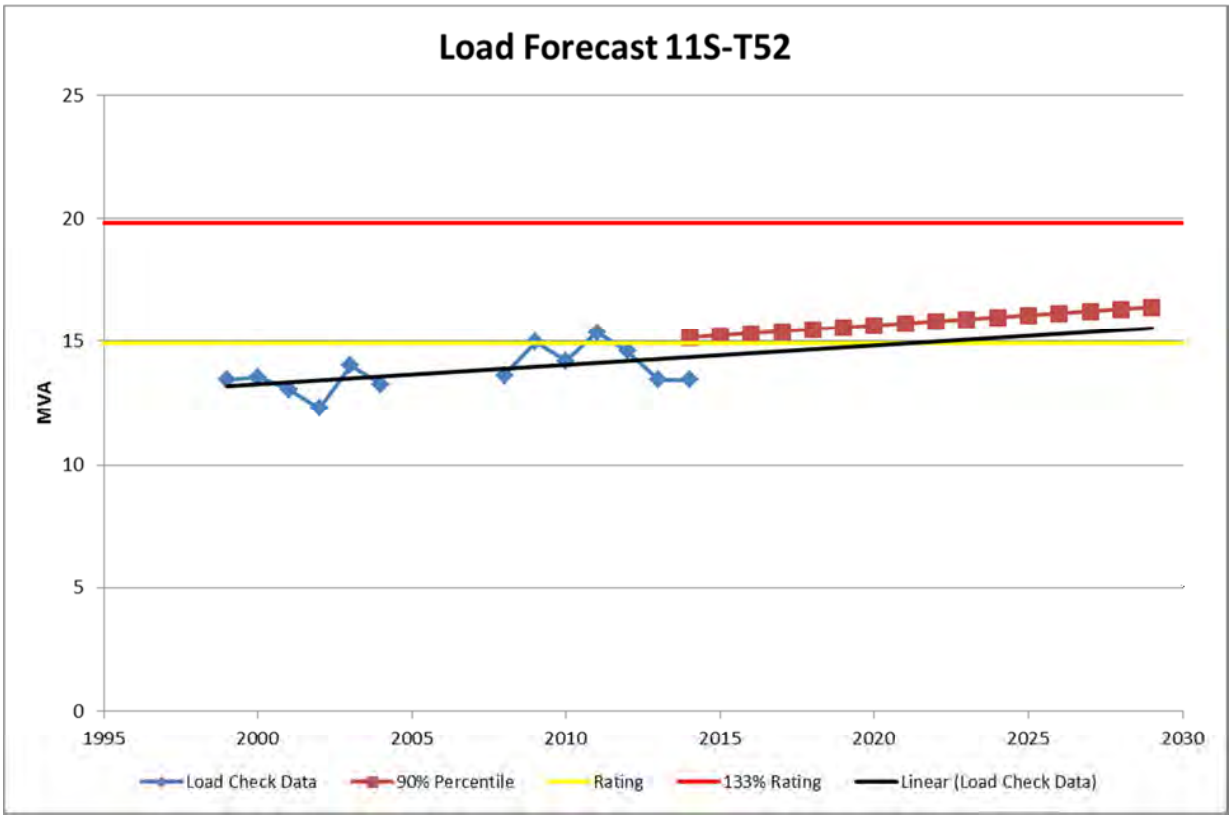


Figure 55 11S-T52 Load Forecast

Load Growth 0.49%

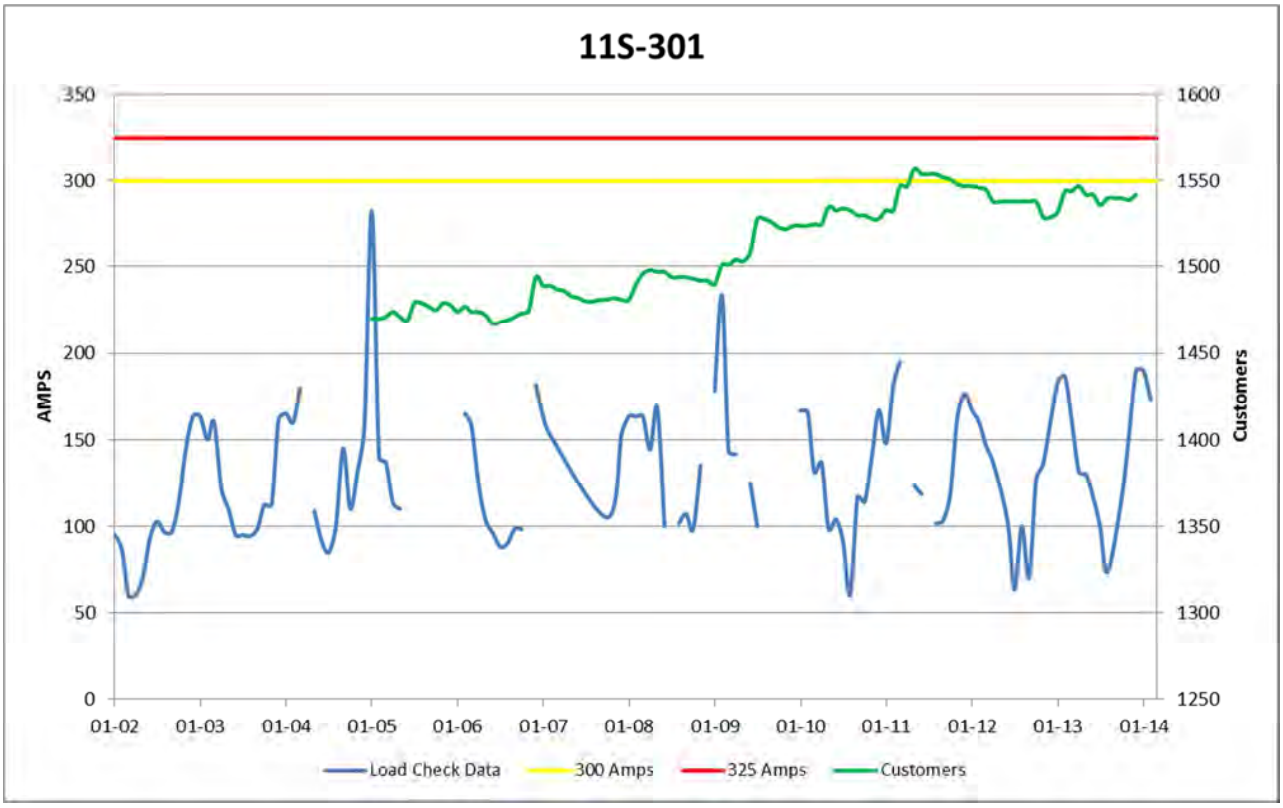


Figure 56 11S-301 Load History

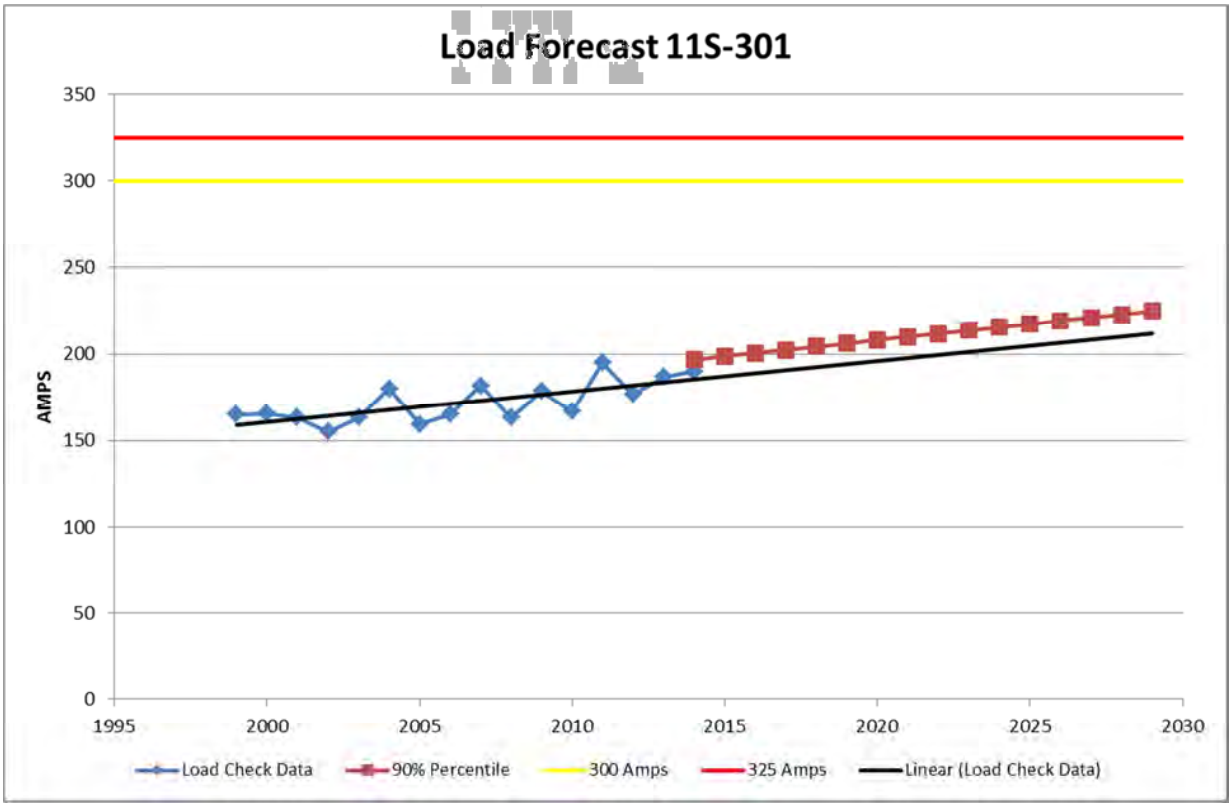


Figure 57 11S-301 Load Forecast

Load Growth 0.83%

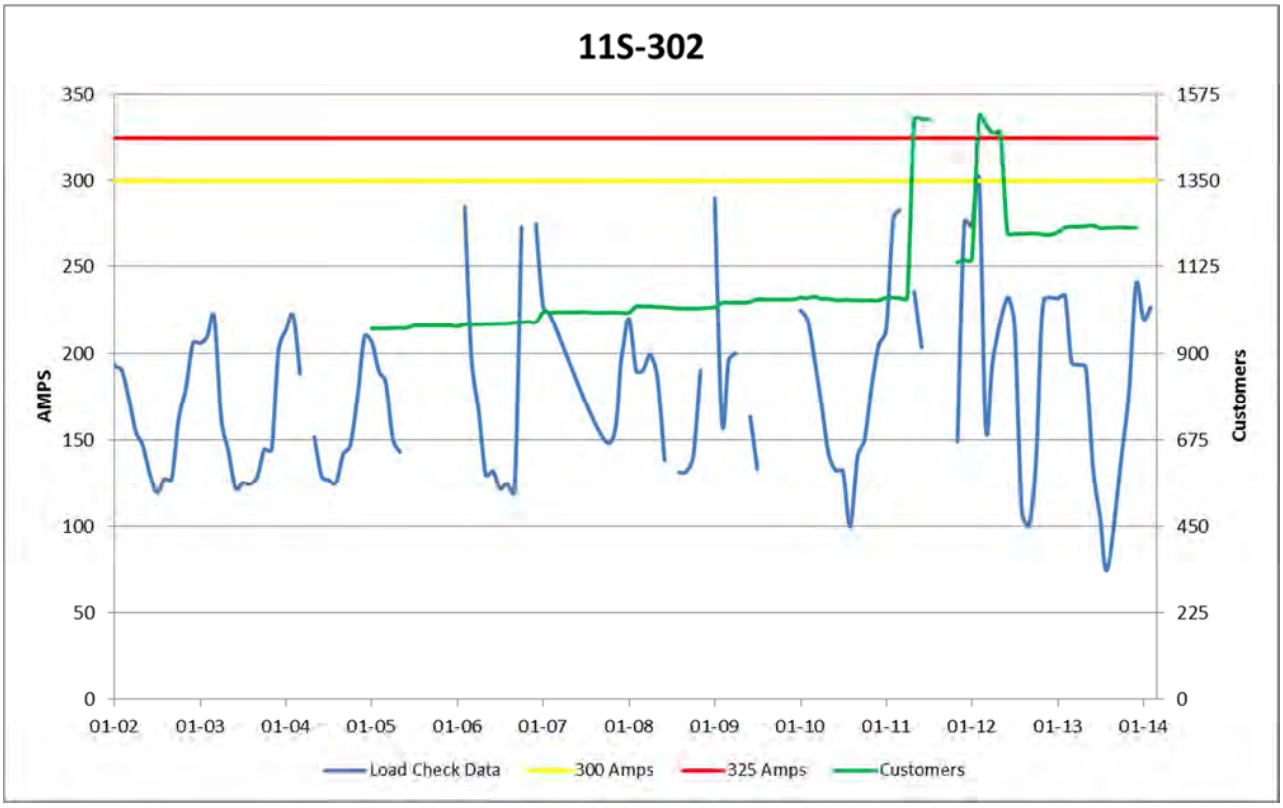


Figure 58 11S-302 Load History

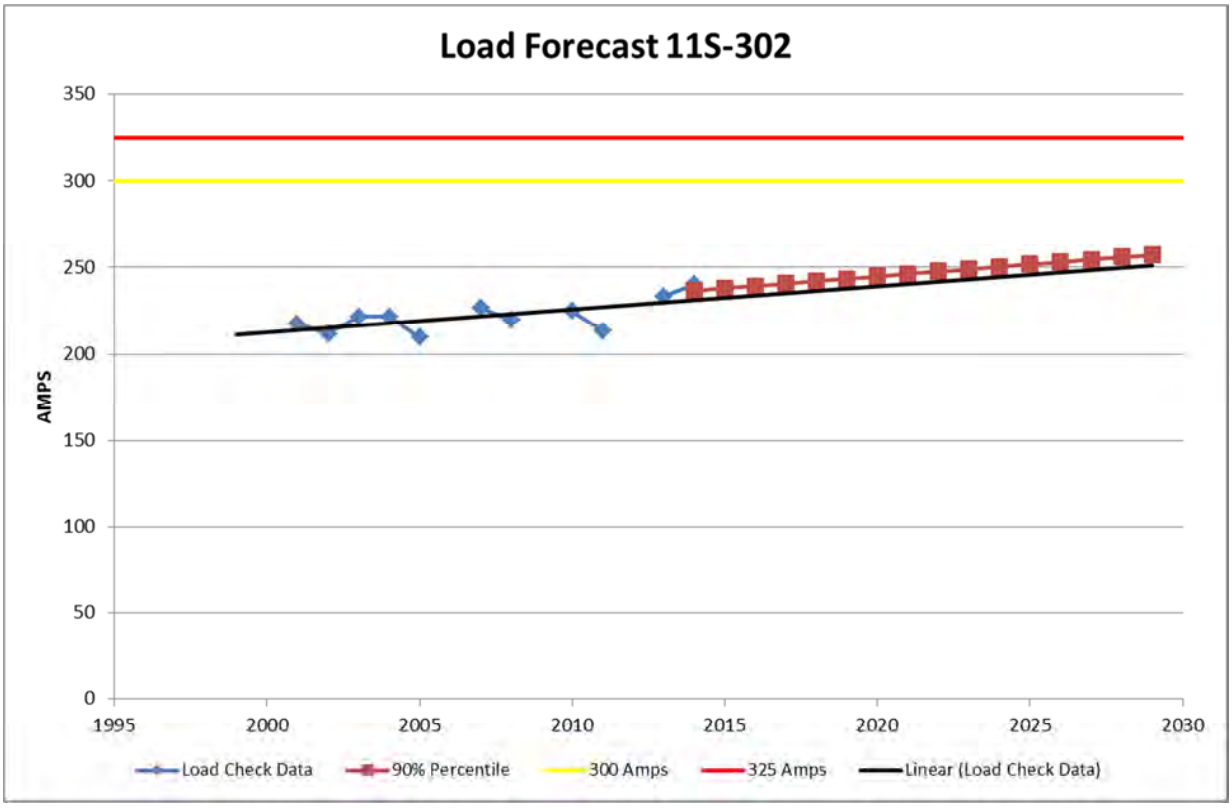


Figure 59 11S-302 Load Forecast

Load Growth 0.52%

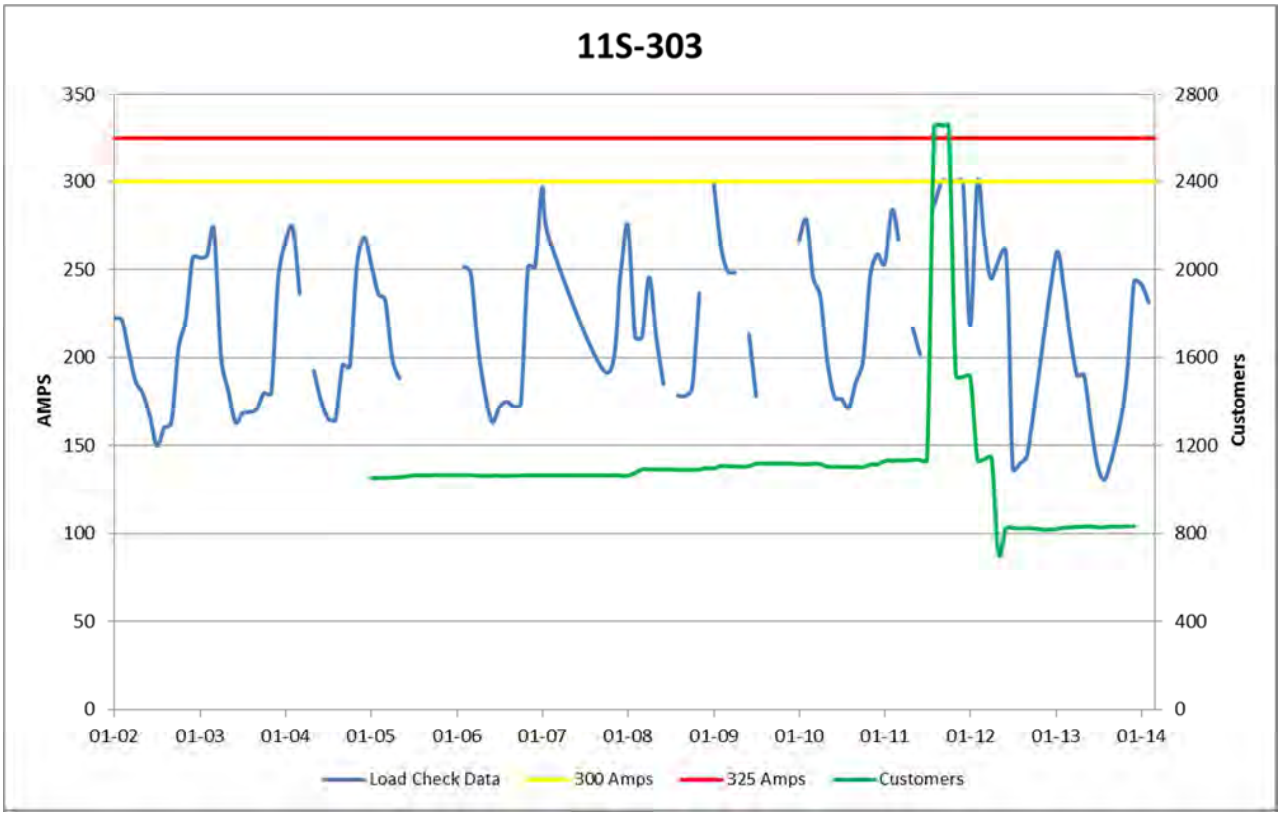


Figure 60 11S-303 Load History

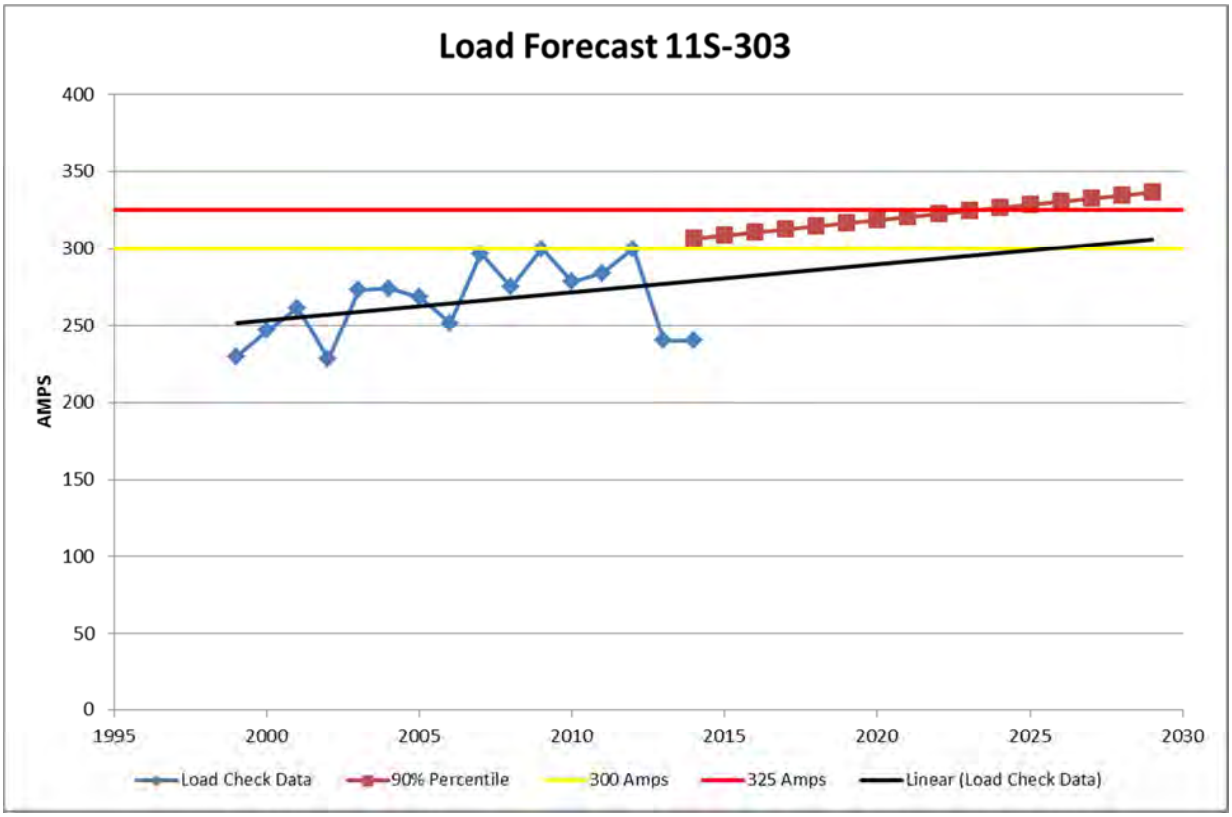


Figure 61 11S-303 Load Forecast

Load Growth 0.57%

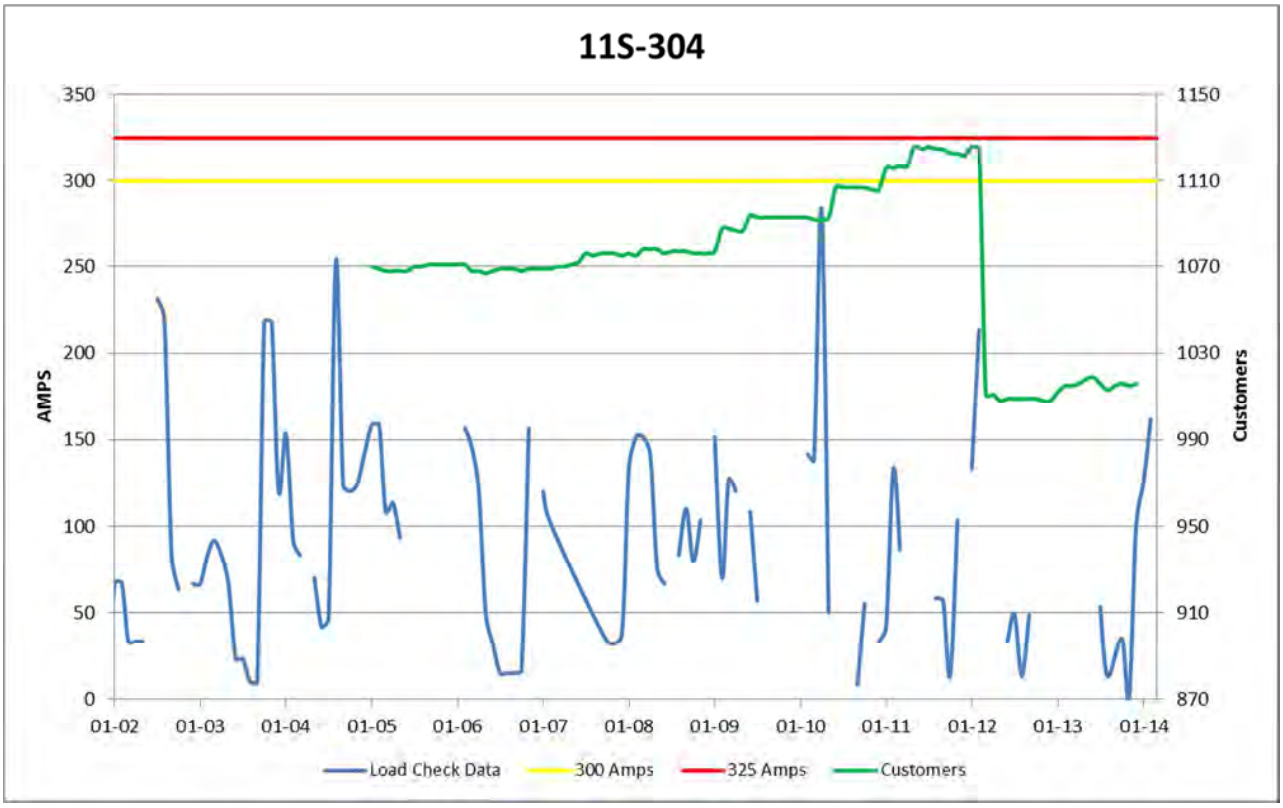


Figure 62 11S-304 Load History

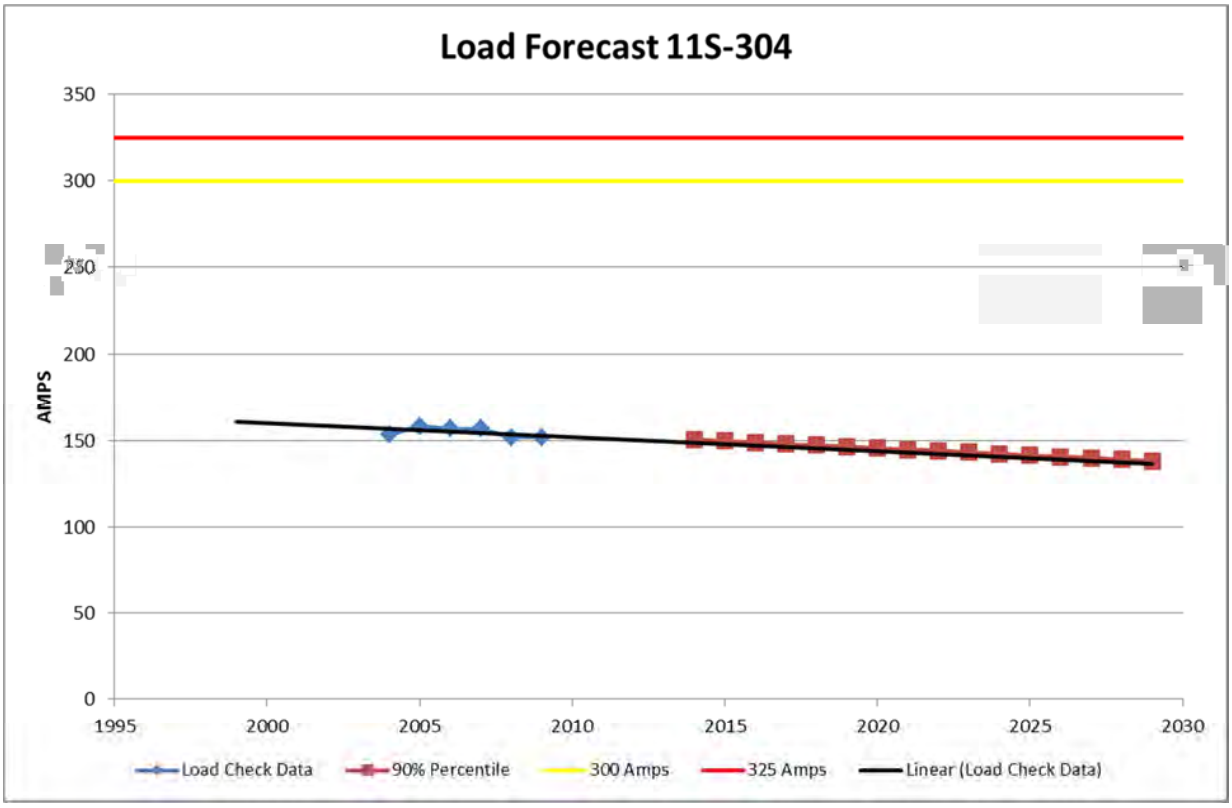


Figure 63 11S-304 Load Forecast

Load Growth -0.53%

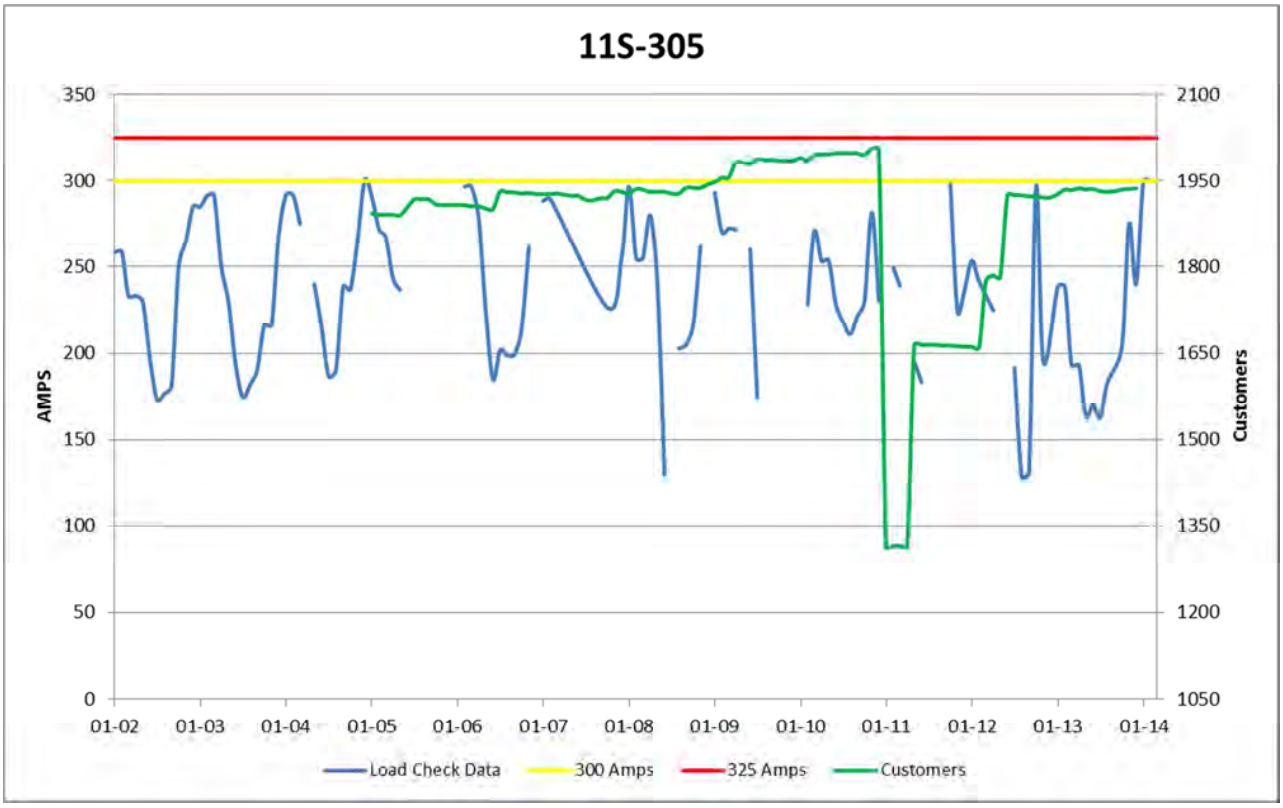


Figure 64 11S-305 Load History

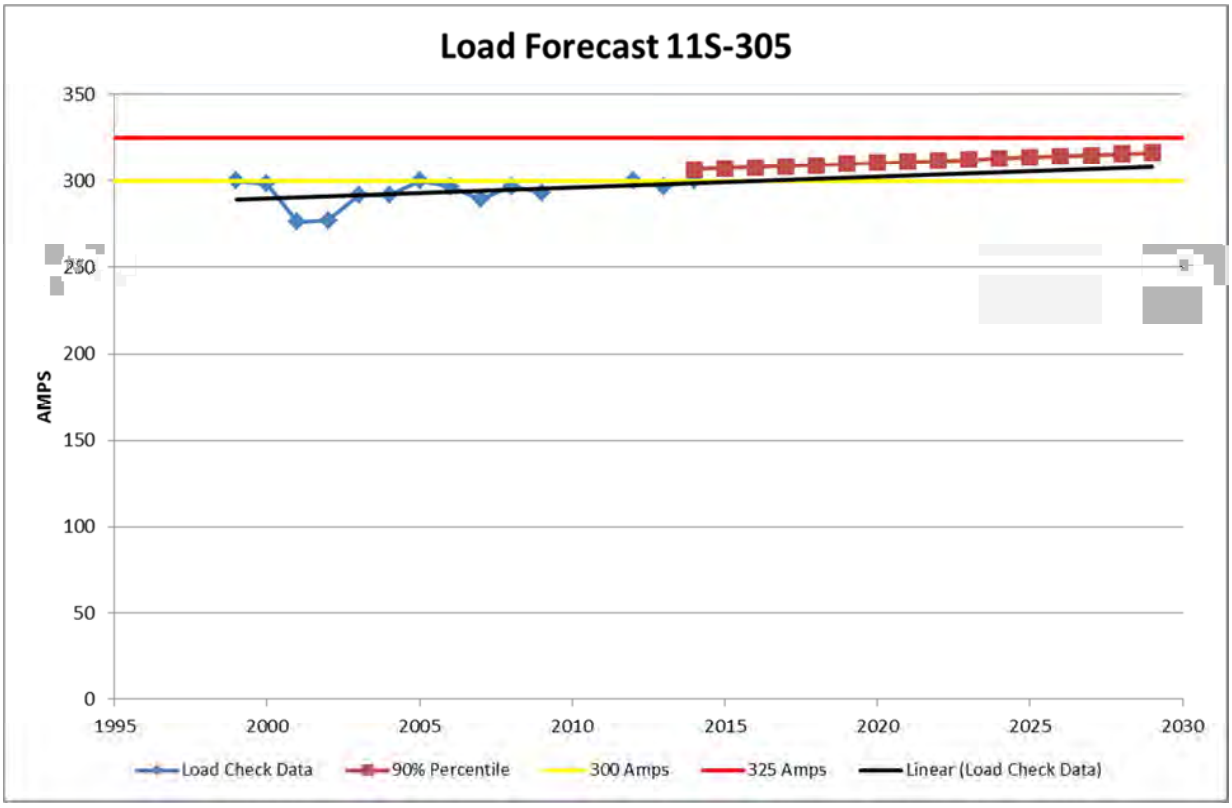


Figure 65 11S-305 Load Forecast

Load Growth 0.21%

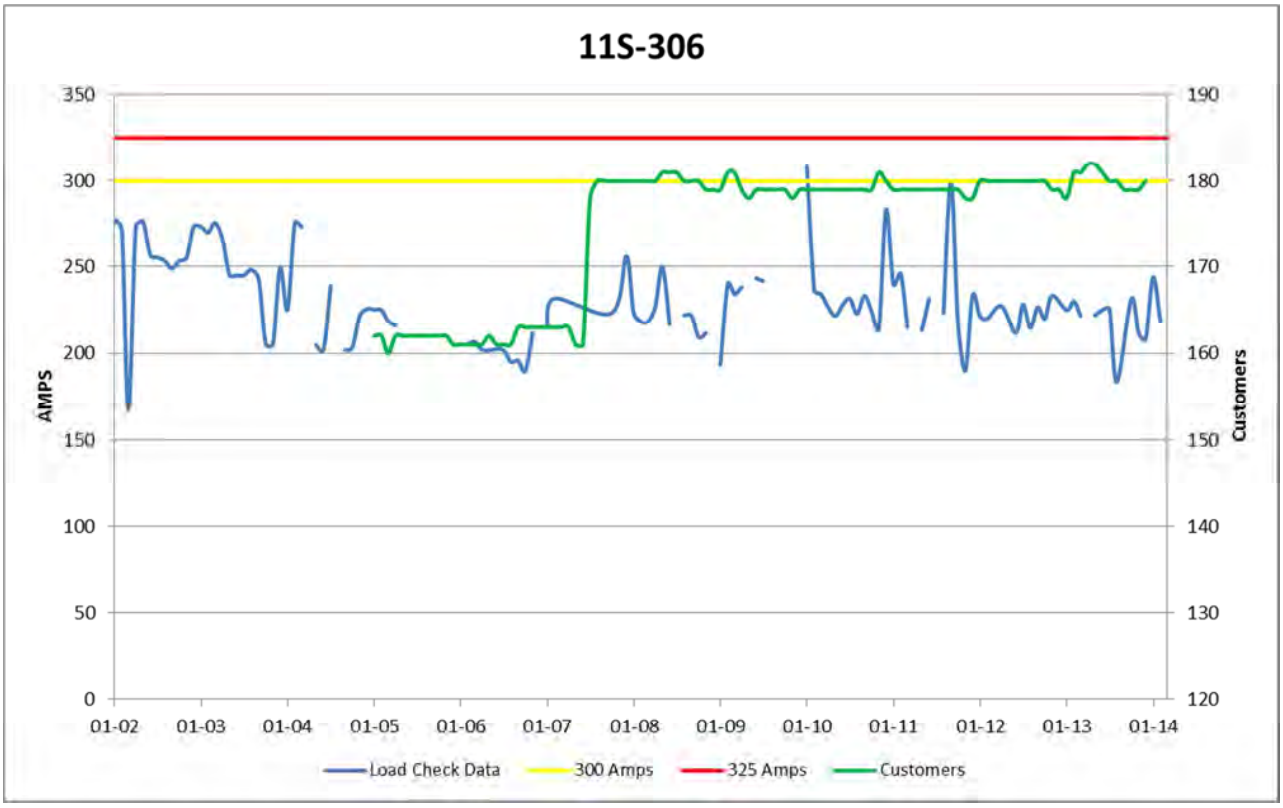


Figure 66 11S-306 Load History

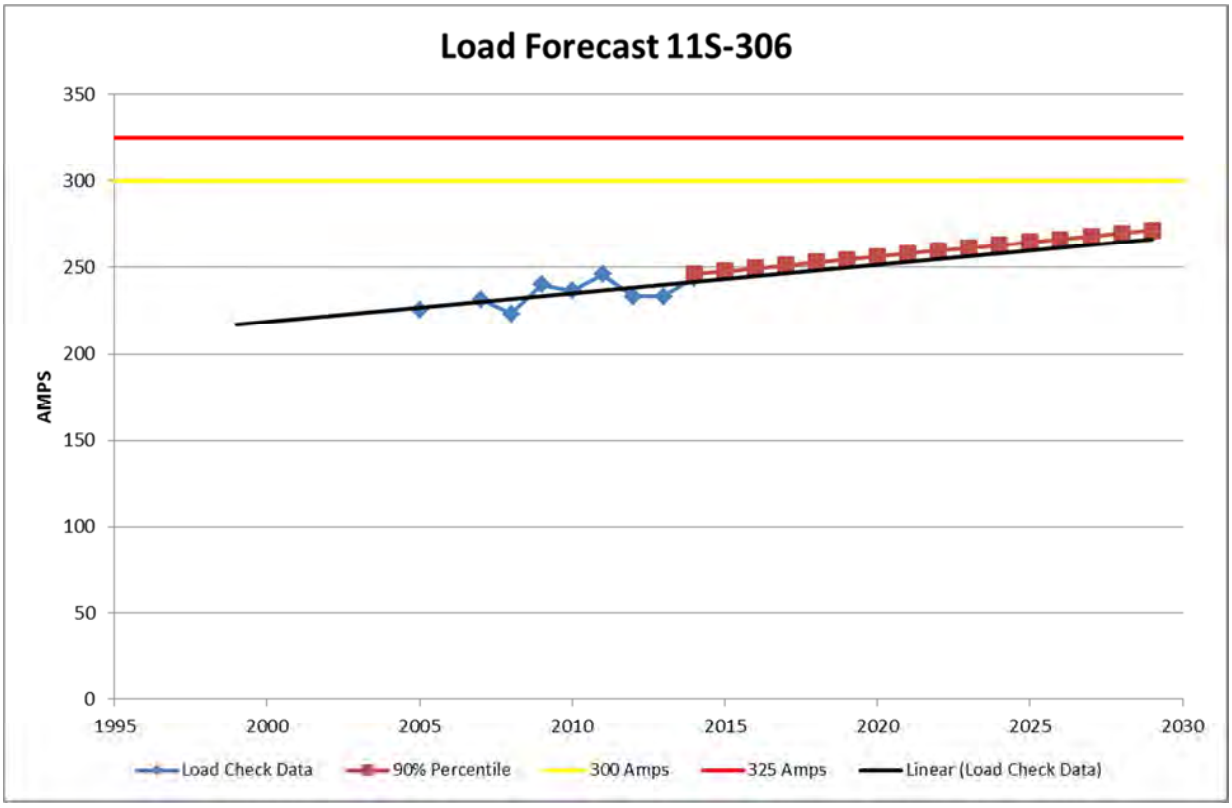


Figure 67 11S-306 Load Forecast

Load Growth 0.61%

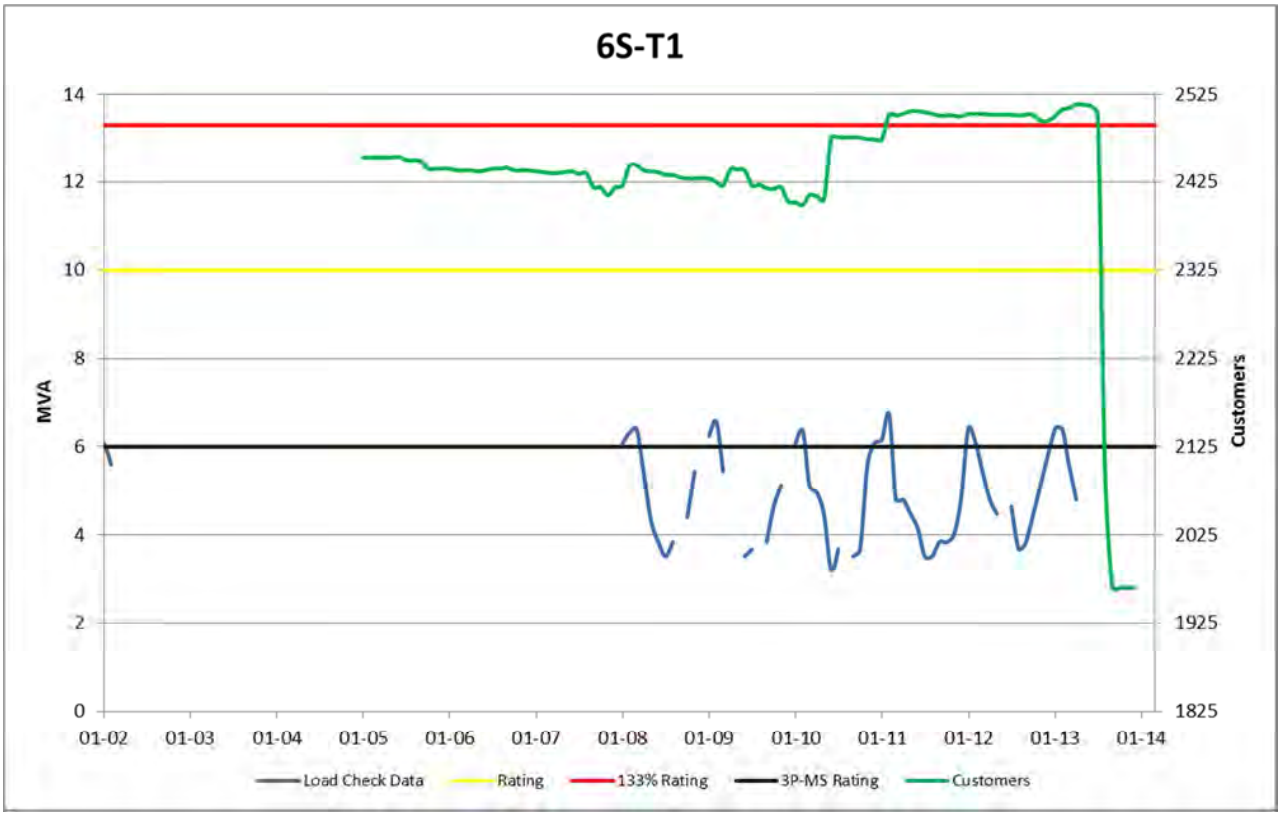


Figure 68 6S-T1 Load History

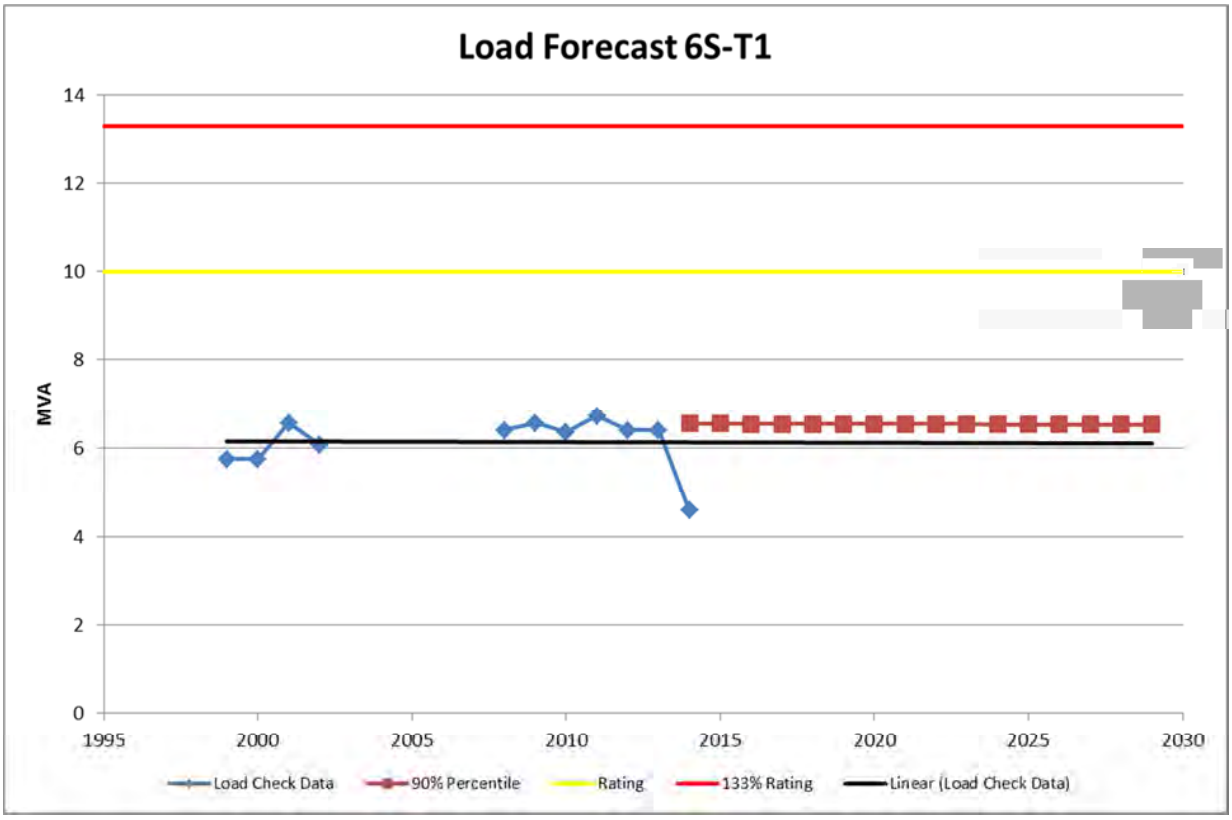


Figure 69 6S-T1 Load Forecast

Load Growth 0.02%

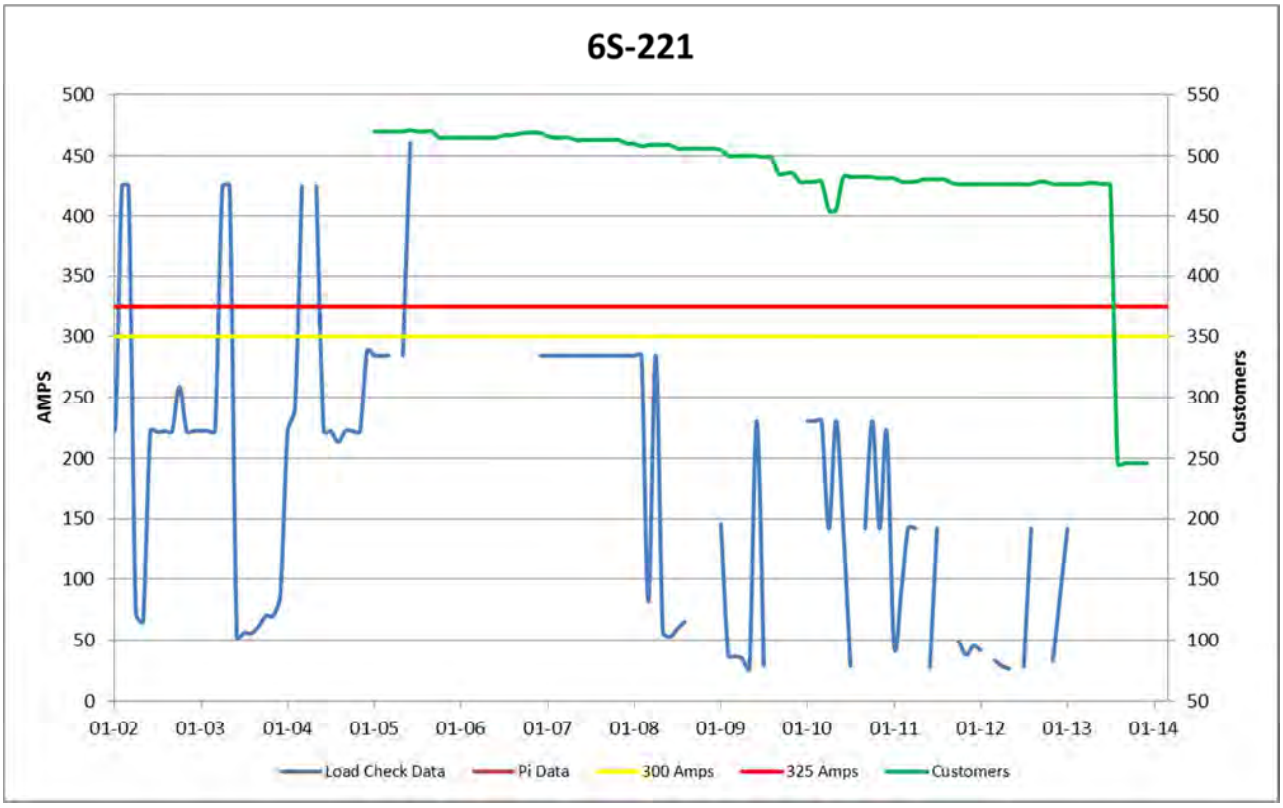


Figure 70 6S-221 Load History

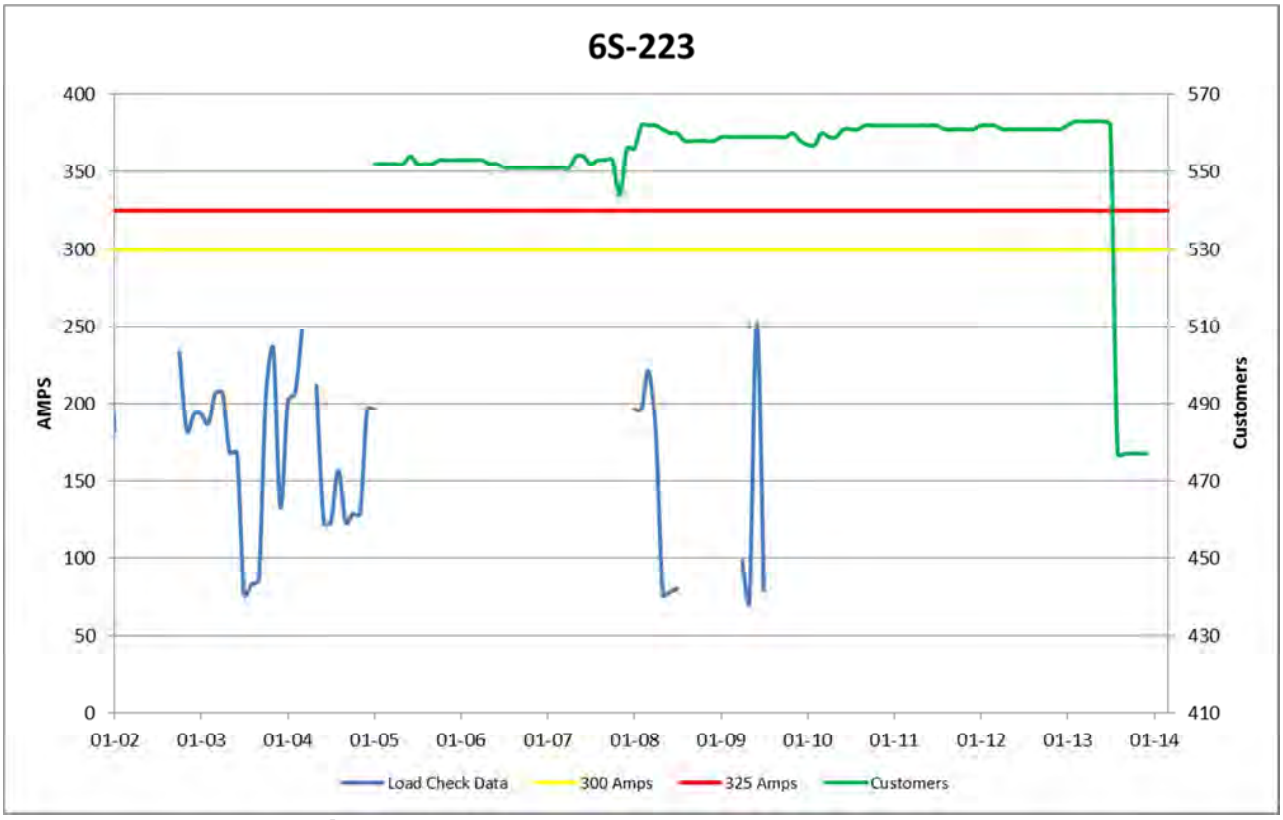


Figure 71 6S-223 Load History

Due to the ability to transfer 4kV load at 6S-Terrace Street, only the transformer forecast (6S-T1) will be presented.

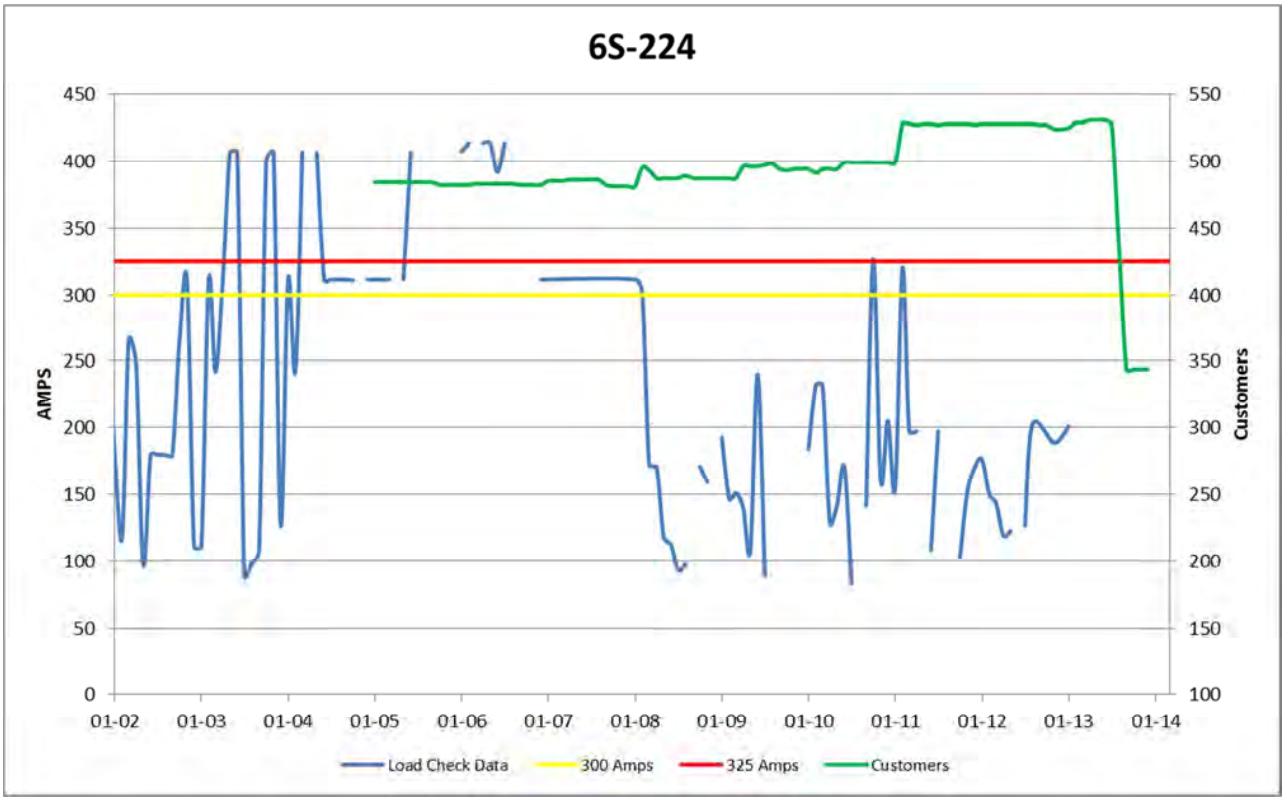


Figure 72 6S-224 Load History

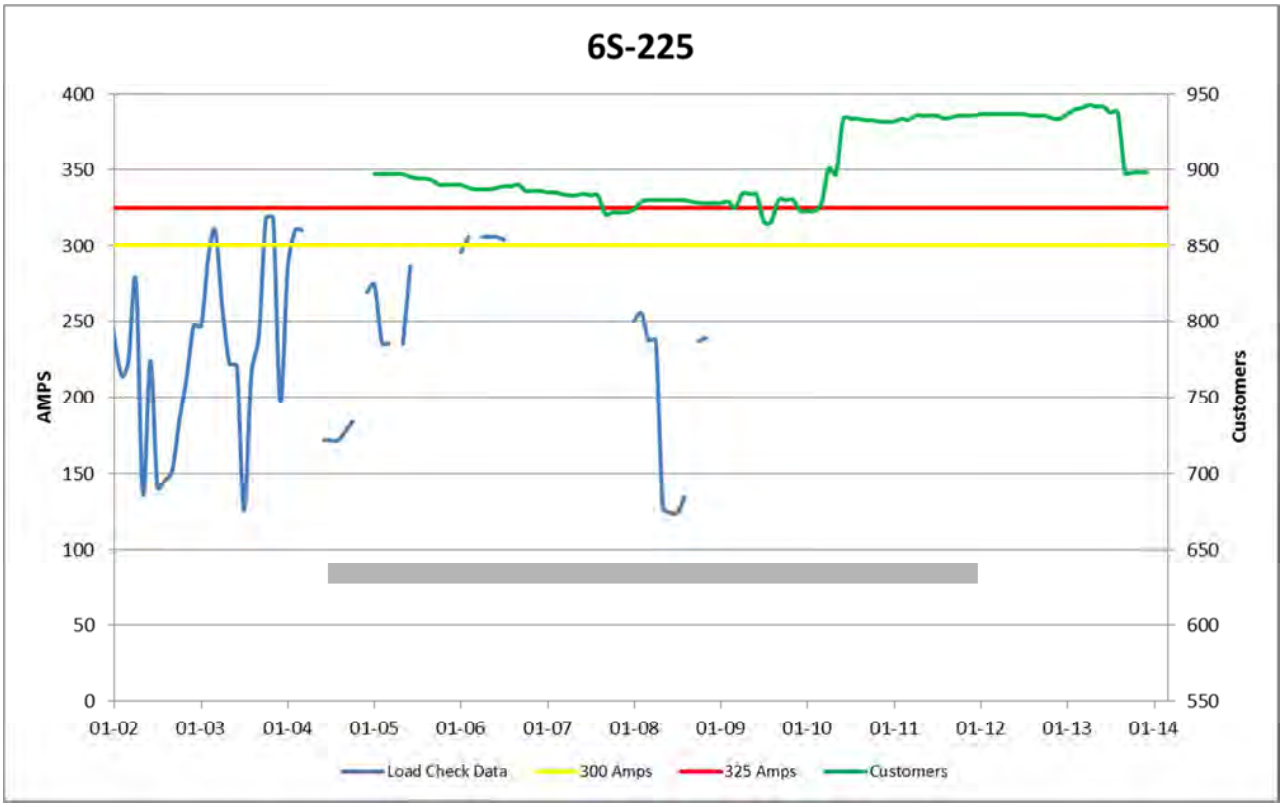


Figure 73 6S-225 Load History

APPENDIX C

Economic Analysis

533S-Mason Street Conversion and 6S-Terrace Street Retirement

Summary of Alternatives

Sydney 4kV Conversions
Summary of Alternatives

Nova Scotia POWER An Emera Company

Division :		Date :	23-Jul-13
Department :	Distribution Planning	CI Number:	
Originator :	James MacQueen	Project No. :	

	Alternative	After Tax WACC	PV of EVA / NPV	Rank	IRR	Disc Pay
A	533S-B 6S-A; Convert and Retire 6S-Terrace Street by 2016	6.48%	-2,074,838	3	-7.86%	0.0 years
B	533S-B 6S-B; Convert and Retire 6S-Terrace Street by 2018	6.48%	-2,029,860	2	-7.97%	0.0 years
C	533S-B 6S-C; Convert and Retire 6S-Terrace Streert by 2021	6.48%	-2,010,029	1	-8.28%	0.0 years
	0	NA	NA	NA	#NUM!	0.0 years

Recommendation :

This Economic Assessment recommends the following:
1. Conversion of 533S-Mason Street, from 4 to 12kV, supplied via Bentinck Street
2. Conversion of 4kV load supplied by 6S-Terrace Street to 12kV, over an 8 year period
3. Retirement of 6S-Terrace Street substation in 2021

Notes/Comments :

533S-B 6S-A; Convert and Retire 6S-Terrace Street by 2016

2013: Conversion of 533S-Mason Street stepdown
Conversion at 6S-Terrace Street to reduce overall loading for the installation of mobile substation
Replacement of 4kV breakers and related equipment at 6S-Terrace Street
2014-2015: Continued conversion of 6S-Terrace Street load to 12kV
2016: Retirement of 6S-Terrace Street substation

533S-B 6S-B; Convert and Retire 6S-Terrace Street by 2018

2013: Conversion of 533S-Mason Street stepdown
Conversion at 6S-Terrace Street to reduce overall loading for the installation of mobile substation
Replacement of 4kV breakers and related equipment at 6S-Terrace Street
2014-2017: Continued conversion of 6S-Terrace Street load to 12kV
2018: Retirement of 6S-Terrace Street substation

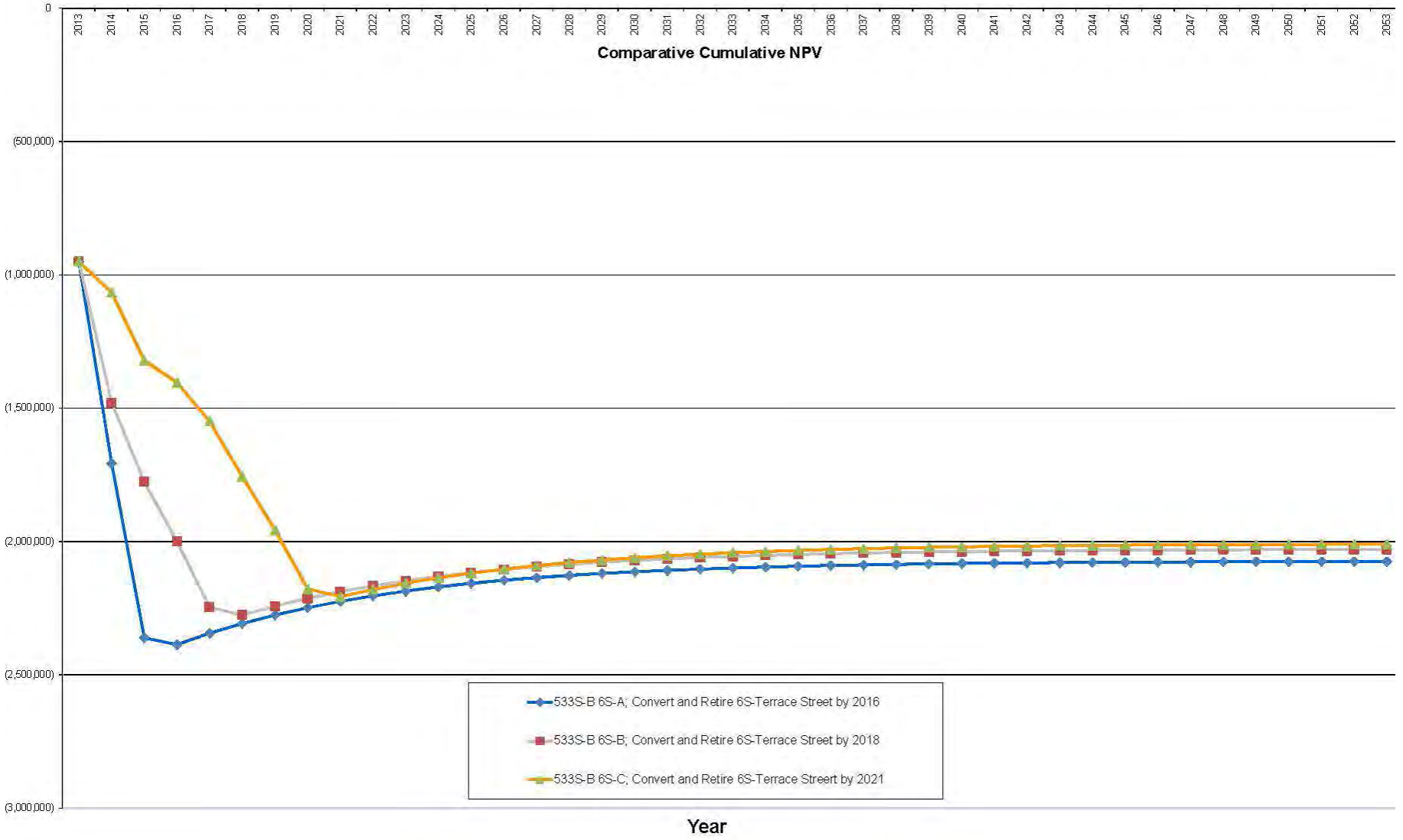
533S-B 6S-C; Convert and Retire 6S-Terrace Streert by 2021

2013: Conversion of 533S-Mason Street stepdown
Conversion at 6S-Terrace Street to reduce overall loading for the installation of mobile substation
Replacement of 4kV breakers and related equipment at 6S-Terrace Street
2014-2020: Continued conversion of 6S-Terrace Street load to 12kV
2018: Maintain 6S-T1, as part of maintenance cycle
2021: Retirement of 6S-Terrace Street substation

0

2013 Sydney 4kV Conversion EAM 7/23/2013

NPV Comparison



Alternative A- 533S-B and 6S-A: Convert and Retire 6S-Terrace Street by 2016

Sydney 4kV Conversions
533S-B 6S-A; Convert and Retire 6S-Terrace Street by

Go to: Working Capital | Capital Expenses | Revenue

Add Operating Item

Project Description

Select:
In-Service Month: January
In-Service Year: 2014

Capital Invested

	Description	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
1.	Shipyard Reconfigure	35,042									
2.	533S-Msaon Street Conversion	274,188									
3.	Bentinck Street Reconfigure		102,510								
4.	Membertou Feeder Tie		35,228								
5.	Cabot Street Conversion	104,080									
6.	Rockdale Avenue Conversion	134,835									
7.	6S-Terrace Street Upgrade	401,500									
8.	Birch Hill Drive Conversion		211,271								
9.	Harold Street Conversion		315,355								
10.	Townsend Street Conversion		164,201								
11.	High Street Conversion			313,381							
12.	Terrace Street Conversion			358,471							
13.	Bernard Lind Conversion			132,214							
14.	6S-Terrace Street Retirement				90,203						
15.											
16.											
17.											
18.											
19.											
20.											
	Total Direct Capital Invested by Year	949,645	828,564	804,066	90,203						
	AFUDC (entered as a positive value)										
	AO (entered as a positive value)										
	Total Indirect Capital Invested by Year										
	Total Capital Invested by Year	**949,645**	**828,564**	**804,066**	**90,203**						

Alternative B- 533S-B and 6S-B: Convert and Retire 6S-Terrace Street by 2018

Sydney 4kV Conversions
533S-B 6S-B; Convert and Retire 6S-Terrace Street by 2018

Go to: Working Capital | Capital Expenses | Revenue

Add Operating Item
Project Description

Select:
In-Service Month: January
In-Service Year: 2014

Capital Invested

	Description	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
1.	Shipyard Reconfigure	35,042									
2.	533S-Mason Street Conversion	274,188									
3.	Bentinck Street Reconfigure		102,510								
4.	Membertou Feeder Tie		35,228								
5.	Caobt Street Conversion	104,080									
6.	Rockdale Avenue Conversion	134,835									
7.	6S-Terrace Street Upgrades	401,500									
8.	Birch Hill Drive Conversion			215,496							
9.	Harold Street Conversion		315,355								
10.	Townsend Street Conversion			167,485							
11.	High Street Conversion				319,649						
12.	Terrace Street Conversion					372,953					
13.	Bernard Lind Conversion		129,622								
14.	6S-Terrace Street Retirement						93,847				
15.											
16.											
17.											
18.											
19.											
20.											
	Total Direct Capital Invested by Year	949,645	582,715	382,981	319,649	372,953	93,847				
	AFUDC (entered as a positive value)										
	AO (entered as a positive value)										
	Total Indirect Capital Invested by Year										
	Total Capital Invested by Year	**949,645**	**582,715**	**382,981**	**319,649**	**372,953**	**93,847**				

Alternative C- 533S-B and 6S-C: Convert and Retire 6S-Terrace Street, by 2021

Sydney 4kV Conversions
533S-B 6S-C; Convert and Retire 6S-Terrace Streert I

Go to: Working Capital | Capital | Expenses | Revenue

Add Operating Item
Project Description

Select:
In-Service Month: January
In-Service Year: 2014

Capital Invested

	Description	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
1.	Shipyard Reconfigure	35,042									
2.	533S-Mason Street Conversion	274,188									
3.	Bentinck Street Reconfigure		102,510								
4.	Membertou Feeder Tie		35,228								
5.	Cabot Street Conversion	104,080									
6.	Rockdale Avenue Conversion	134,835									
7.	6S-Terrace Street Upgrades	401,500									
8.	Birch Hill Drive Conversion					224,202					
9.	Harold Street Conversion			321,663							
10.	Townsend Street Conversion						177,736				
11.	High Street Conversion							339,214			
12.	Terrace Street Conversion								395,781		
13.	Bernard Lind Conversion				134,858						
14.	Maintain 6S-T1						150,000				
15.	6S-Terrace Street Retirement									99,591	
16.											
17.											
18.											
19.											
20.											
	Total Direct Capital Invested by Year	949,645	137,738	321,663	134,858	224,202	327,736	339,214	395,781	99,591	
	AFUDC (entered as a positive value)										
	AO (entered as a positive value)										
	Total Indirect Capital Invested by Year										
	Total Capital Invested by Year	949,645	137,738	321,663	134,858	224,202	327,736	339,214	395,781	99,591	

APPENDIX D

Economic Analysis

Membertou Load Growth

Summary of Alternatives

Membertou Load Growth
Summary of Alternatives

Division :	
Department :	Distribution Planning
Originator :	James MacQueen
Date :	25-Mar-14
CI Number:	
Project No. :	

	Alternative	After Tax WACC	PV of EVA / NPV	Rank	IRR	Disc Pay
A	New George Street Substation, 138kV-12kV	6.48%	-3,585,299	2	-8.15%	0.0 years
B	New Alexandra Street Substation, 138kV-25kV	6.48%	-4,175,037	4	-8.17%	0.0 years
C	6S-Terrace Street Replacement, 69kV - 12kV	6.48%	-3,920,697	3	-8.25%	0.0 years
D	George Street Pad-Mounted Substation 138kV - 12kV	6.48%	-3,098,378	1	-9.04%	0.0 years

Recommendation :

This economic assessment recommends the construction of a pad-mounted substation, near George Street, as outlined in the Distribution Planning Study.

An expansion of the pad-mounted substation will be required, as load materializes and has been accounted for in this EAM.

Notes/Comments :

New George Street Substation, 138kV-12kV

2014-2015: Construction of new 138-12kV sustation off of George Street

New Alexandra Street Substation, 138kV-25kV

2014-2015: Construction of new 138-25kV sustation off of Alexandra Street, with 15/20/25MVA initial transformation
2015: Conversion of 11S-305G from 12 to 25kV
2015: Conversion of Membertou from 12 to 25kV
2016: Conversion of remaining 12kV in Sydney River to 25kV

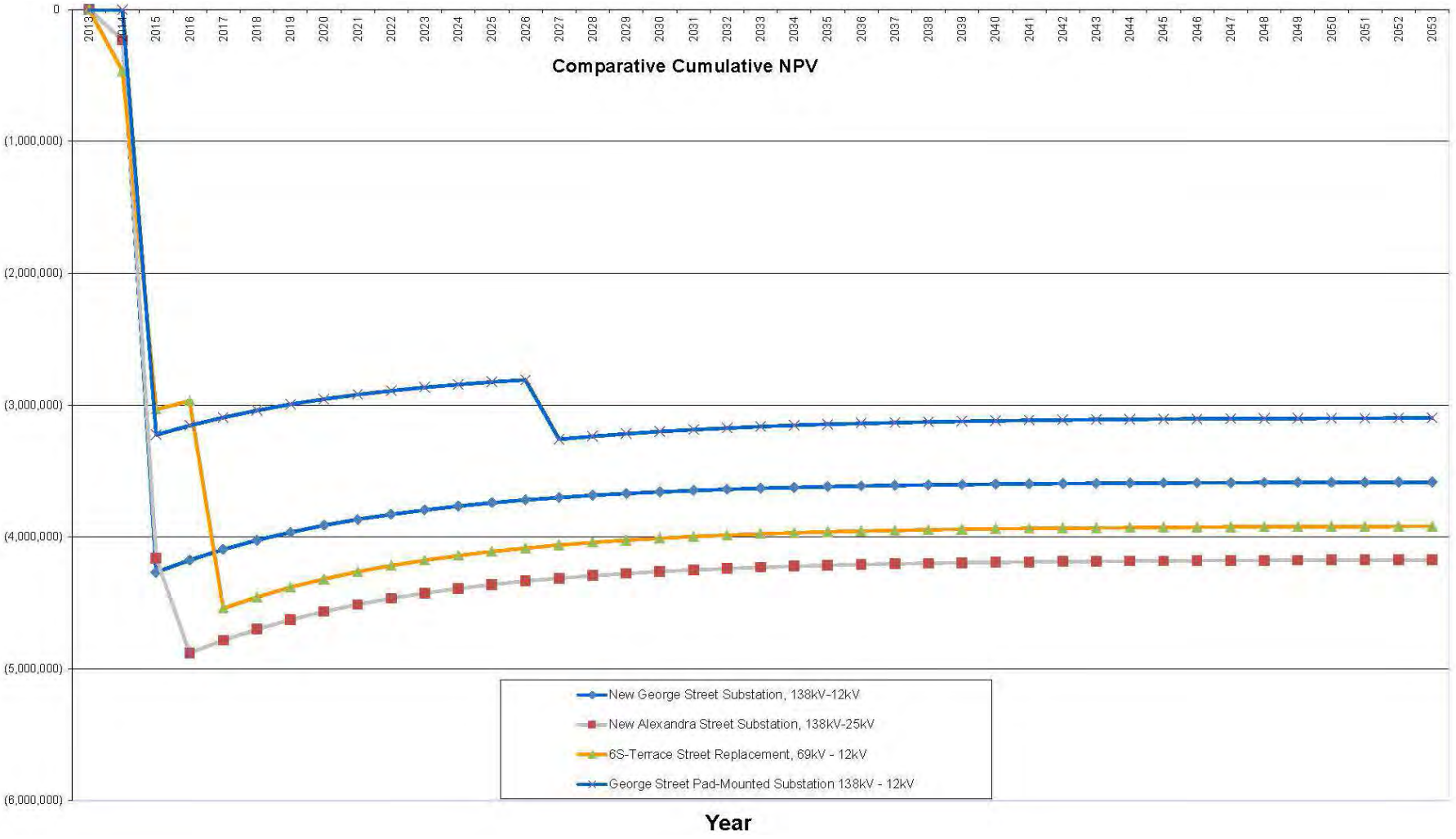
6S-Terrace Street Replacement, 69kV - 12kV

2014-2015: Installation of new 10/12/15MVA 69-12kV transformer at 6S-Terrace Street
2017: Installation of new pad-mounted substation to supply Membertou area

George Street Pad-Mounted Substation 138kV - 12kV

2015: Installation of new 15MVA 138-12kV pad-mounted substation near George Street
2027: Expansion of pad-mounted substation

NPV Comparison



Appendix C: Economic Analysis

Alternative Sub-A- New George Street Substation

Membertou Load Growth
New George Street Substation, 138kV-12kV

Go to: Working Capital | Capital Expenses | Revenue

Add Operating Item
Project Description

Select:
In-Service Month
In-Service Year

Capital Invested

	Description	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
1.	New George Street Substation, Part 1		250,000													
2.	New George Street Substation, Part 2			3,500,000												
3.	New George Street Substation Distribution Upgardes			1,200,000												
4.																
5.																
6.																
7.																
8.																
9.																
10.																
11.																
12.																
13.																
14.																
15.																
16.																
17.																
18.																
19.																
20.																
	Total Direct Capital Invested by Year		250,000	4,700,000												
	AFUDC (entered as a positive value)															
	AO (entered as a positive value)															
	Total Indirect Capital Invested by Year															
	Total Capital Invested by Year		250,000	4,700,000												

Appendix C: Economic Analysis

Alternative Sub-B- New Alexandra Street Substation

Membertou Load Growth
New Alexandra Street Substation, 138kV-25kV

Go to: Working Capital | Capital | Expenses | Revenue

Add Operating Item
Project Description

Select:
In-Service Month
In-Service Year

Capital Invested

	Description	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
1	New Alexandra Street Substation, Part 1		250,000													
2	New Alexandra Substation, Part 2			3,500,000												
3	11S-305G Conversion from 12.25kV			425,000												
4	Membertou Conversion from 12 to 25kV			650,250												
5	Sydney River Conversion from 12-25kV				1,002,842											
6																
7																
8																
9																
10																
11																
12																
13																
14																
15																
16																
17																
18																
19																
20																
	Total Direct Capital Invested by Year		250,000	4,575,250	1,002,842											
	AFUDC (entered as a positive value)															
	AO (entered as a positive value)															
	Total Indirect Capital Invested by Year															
	Total Capital Invested by Year		250,000	4,575,250	1,002,842											

Appendix C: Economic Analysis

Alternative Sub-C- 6S-Terrace Street Replacement, 69kV-12kV

Membertou Load Growth
6S-Terrace Street Replacement, 69kV - 12kV

Go to: Working Capital | Capital | Expenses | Revenue

Add Operating Item | Project Description

Select: In-Service Month: January | In-Service Year: 2014

Capital Invested

	Description	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
1.	6S-Terrace Street 69-12kV Preparation		500,000													
2.	6S-Terrace Street 69-12kV Completion			3,000,000												
3.	Pad-Mounted Substation, George Street					1,900,000										
4.	Pad-Mounted Substation Distribution Upgrades					250,000										
5.																
6.																
7.																
8.																
9.																
10.																
11.																
12.																
13.																
14.																
15.																
16.																
17.																
18.																
19.																
20.																
	Total Direct Capital Invested by Year		500,000	3,000,000		2,150,000										
	AFUDC (entered as a positive value)															
	AO (entered as a positive value)															
	Total Indirect Capital Invested by Year															
	Total Capital Invested by Year		500,000	3,000,000		2,150,000										

Appendix C: Economic Analysis

Alternative D- Sub-D George Street Pad-Mounted Substation, 138kV-12kV

Membertou Load Growth
George Street Pad-Mounted Substation 138kV - 12kV

Go to: Working Capital | Capital | Expenses | Revenue

Add Operating Item
Project Description

Select:
In-Service Month:
In-Service Year:

Capital Invested

	Description	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
1.	Pad-Mounted Substation, George Street			1,900,000												
2.	Pad-Mounted Substation Expansion															900,000
3.	New George Street Substation Distribution Upgrades			1,000,000												
4.	Spare Pad-Mounted substation equipment			850,000												
5.	Distribution Upgrades for Substation Expansion															250,000
6.																
7.																
8.																
9.																
10.																
11.																
12.																
13.																
14.																
15.																
16.																
17.																
18.																
19.																
20.																
	Total Direct Capital Invested by Year			3,750,000												1,150,000
	AFUDC (entered as a positive value)															
	AO (entered as a positive value)															
	Total Indirect Capital Invested by Year															
	Total Capital Invested by Year			3,750,000												1,150,000

Request IR-79:

With respect to D06 (CI 47766 – 70V-312 Centerlea Rebuild) and D09 (CI 47754 – 63V-313 Ward Rd Reconductor), the projects state they are rebuilding or reconductoring and reinsulating "like for like". Should these be included in Routines? If not, why not?

Response IR-79:

D06 (CI 47766 – 70V-312 Centerlea Rebuild) and D09 (CI 47754 – 63V-313 Ward Rd Reconductor) were not included as part of the D055 Planned Replacement of Distribution Equipment routine as the scope of these projects exceeded what was considered to be regular and repetitive capital replacements. Specifically, CI 47766 – 70V-312 Centerlea Rebuild involves upgrades to an existing, deteriorated feeder tie. CI 47754 – 63V-313 Ward Rd Reconductor will replace existing, non-standard framing with the current standard framing design.