

ECONOMIC ANALYSIS SUMMARY

Fort Churchill Unit 1

Boiler Design:

Babcock & Wilcox Gas/Oil

Parameter	Current Operation	NOx Control				
		LNB	LNB w/ FGR	LNB w/SNCR	ROFA w/Rotamix	LNB w/SCR
Case	1	2	3	4	5	6
NOx Emission Control System	None	LNB	LNB w/ FGR	LNB w/SNCR	ROFA w/Rotamix	LNB w/SCR
TOTAL INSTALLED CAPITAL COST (\$)	0	600,000	920,000	2,523,750	5,250,940	28,625,000
Including Other Owner Costs (\$)	0	1,050,000	1,610,000	4,416,563	9,189,145	35,781,250
FIRST YEAR O&M COST (\$)						
Operating Labor (\$)	0	11,300	16,950	22,600	22,600	28,250
Maintenance Material (\$)	0	22,600	33,900	45,200	45,200	56,500
Maintenance Labor (\$)	0	11,300	16,950	22,600	22,600	28,250
Administrative Labor (\$)	0	0	0	0	0	0
TOTAL FIXED O&M COST	0	45,200	67,800	90,400	90,400	113,000
Reagent Cost	0	0	0	309,158	327,132	296,328
SCR Catalyst / FF Bag Cost	0	0	0	0	0	169,500
Electric Power Cost	0	0	252,419	25,242	277,661	126,210
Makeup Water Cost	0	0	0	0	0	0
TOTAL VARIABLE O&M COST	0	0	252,419	334,400	604,793	592,037
TOTAL FIRST YEAR O&M COST	0	45,200	320,219	424,800	695,193	705,037
FIRST YEAR DEBT SERVICE (\$)	0	111,359	170,750	468,403	974,564	3,794,816
TOTAL FIRST YEAR COST (\$)	0	156,559	490,970	893,203	1,669,757	4,499,854
Power Consumption (MW)	0.0	0.0	1.1	0.1	1.2	0.6
Annual Power Usage (Million kW-Hr/Yr)	0.0	0.0	5.0	0.5	5.6	2.5
CONTROL COST (\$/Ton Removed)						
NOx Removal Rate (%)	0.0%	49.5%	56.7%	62.1%	65.7%	87.4%
NOx Removed (Tons/Yr)	0	739	847	928	982	1,305
First Year Average Control Cost (\$/Ton NOx Rem.)	0	212	580	963	1,701	3,448
Incremental Control Cost (\$/Ton NOx Removed)	0	212	3,100	4,972	14,399	8,746
		2-1	3-2	4-3	5-4	6-5

For the other owner costs a factor of 1.75 was used for everything except the SCR to represent balance of plant cost, electrical costs, AFUDC etc.

For the SCR a factor of 1.25 was used because the material cost of \$250/kW from the CH2M HILL database already included the balance of plant and a few other costs

INPUT CALCULATIONS

Fort Churchill Unit 1

Boiler Design:

Babcock & Wilcox Gas/Oil

Parameter	Current Operation	NOx Control					Comments
		LNB	LNB w/ FGR	LNB w/SNCR	ROFA w/Rotamix	LNB w/SCR	
Case	1	2	3	4	5	6	
NOx Emission Control System	None	LNB	LNB w/ FGR	LNB w/SNCR	ROFA w/Rotamix	LNB w/SCR	
Unit Design and Coal Characteristics							
Type of Unit	PC	PC	PC	PC	PC	PC	
Net Power Output (kW)	113,000	113,000	113,000	113,000	113,000	113,000	
Net Plant Heat Rate (Btu/kW-Hr)	10,683	10,683	10,683	10,683	10,683	10,683	
Boiler Fuel	No. 6 Fuel Oil	No. 6 Fuel Oil	No. 6 Fuel Oil	No. 6 Fuel Oil	No. 6 Fuel Oil	No. 6 Fuel Oil	
Fuel Heating Value (Btu/Lb)	19,300	19,300	19,300	19,300	19,300	19,300	
Fuel Sulfur Content (wt.%)	0.637%	0.637%	0.637%	0.637%	0.637%	0.637%	
Fuel Ash Content (wt.%)	0.038%	0.038%	0.038%	0.038%	0.038%	0.038%	
Boiler Heat Input, each (MMBtu/Hr)	1,207	1,207	1,207	1,207	1,207	1,207	
Fuel Flow Rate (Lb/Hr)	62,548	62,548	62,548	62,548	62,548	62,548	
(Ton/Yr)	139,720	139,720	139,720	139,720	139,720	139,720	
(MMBtu/Yr)	5,393,193	5,393,193	5,393,193	5,393,193	5,393,193	5,393,193	
Emissions							
Uncontrolled NOx (Lb/Hr)	669	669	669	669	669	669	
(Lb/MMBtu)	0.55	0.55	0.55	0.55	0.55	0.55	
(Lb Moles/Hr)	22.29	22.29	22.29	22.29	22.29	22.29	
(Tons/Yr)	1,494	1,494	1,494	1,494	1,494	1,494	
NOx Removal Rate (%)	0.0%	49.5%	56.7%	62.1%	65.7%	87.4%	
(Lb/Hr)	0	331	379	415	439	584	
(Lb Moles/Hr)	0.00	11.02	12.63	13.84	14.64	19.47	
(Ton/Yr)	0	739	847	928	982	1,305	
NOx Emission Rate (Lb/Hr)	669	338	290	254	229	85	
(Lb/MMBtu)	0.55	0.28	0.24	0.21	0.19	0.07	
(Ton/Yr)	1,494	755	647	566	512	189	
General Plant Data							
Annual Operation (Hours/Year)	4,468	4,468	4,468	4,468	4,468	4,468	
Annual On-Site Power Plant Capacity Factor	51%	0.51	0.51	0.51	0.51	0.51	
Economic Factors							
Interest Rate (%)	8.55%	8.55%	8.55%	8.55%	8.55%	8.55%	
Discount Rate (%)	9.00%	9.00%	9.00%	9.00%	9.00%	9.00%	
Plant Economic Life (Years)	20	20	20	20	20	20	
Installed Capital Costs (including owner costs)							
NOx Emission Control System (\$2007)	0	1,050,000	1,610,000	4,416,563	9,189,145	35,781,250	
Total Emission Control Systems (\$2007)	0	1,050,000	1,610,000	4,416,563	9,189,145	35,781,250	
NOx Emission Control System (\$/kW)	0	9	14	39	81	317	
Total Emission Control Systems (\$/kW)	0	9	14	39	81	317	
Total Fixed Operating & Maintenance Costs							
Operating Labor (\$)	0	11,300	16,950	22,600	22,600	28,250	
Maintenance Material (\$)	0	22,600	33,900	45,200	45,200	56,500	
Maintenance Labor (\$)	0	11,300	16,950	22,600	22,600	28,250	
Administrative Labor (\$)	0	0	0	0	0	0	
Total Fixed O&M Cost (\$)	0	45,200	67,800	90,400	90,400	113,000	
Annual Fixed O&M Cost Escalation Rate (%)	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	
Reagent Cost	None	None	None	Urea	Urea	Anhydrous NH3	
Unit Cost (\$/Ton)	0.00	0.00	370.00	370.00	370.00	400.00	
(\$/Lb)	0.000	0.000	0.185	0.185	0.185	0.200	
Molar Stoichiometry	0.00	0.00	0.00	0.45	0.45	1.00	
Reagent Purity (Wt.%)	100%	100%	100%	100%	100%	100%	
Reagent Usage (Lb/Hr)	0	0	0	374	396	332	
First Year Reagent Cost (\$)	0	0	0	309,158	327,132	296,328	
Annual Reagent Cost Escalation Rate (%)	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	
SCR Catalyst / FF Bag Replacement Cost						SCR Catalyst	
Annual SCR Catalyst (m3) / No. FF Bags	0	0	0	0	0	57	
SCR Catalyst (\$/m3) / Bag Cost (\$/ea.)	3,000	3,000	3,000	3,000	3,000	3,000	
First Year SCR Catalyst / Bag Replace. Cost (\$)	0	0	0	0	0	169,500	
Annual SCR Catalyst / Bag Cost Esc. Rate (%)	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	
Auxiliary Power Cost							
Auxiliary Power Requirement (% of Plant Output)	0.00%	0.00%	1.00%	0.10%	1.10%	0.50%	
(MW)	0.00	0.00	1.13	0.11	1.24	0.57	
Unit Cost (\$2007/MW-Hr)	50.00	50.00	50.00	50.00	50.00	50.00	
First Year Auxiliary Power Cost (\$)	0	0	252,419	25,242	277,661	126,210	
Annual Power Cost Escalation Rate (%)	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	

Economic factors as per Sierra Pacific 2008 Planning Guidelines

Interest Rate
Plant Life

Fort Churchill Unit 1										
Current Operation										
Year	Date	TOTAL FIXED O&M COST	Reagent Cost	SCR Catalyst / FF Bag Cost	Electric Power Cost	Makeup Water Cost	TOTAL VARIABLE O&M COST	DEBT SERVICE	TOTAL ANNUAL COST	Control Cost (\$/Ton Removed)
0	2013									
1	2014	-	-	-	-	-	-	-	-	-
2	2015	-	-	-	-	-	-	-	-	-
3	2016	-	-	-	-	-	-	-	-	-
4	2017	-	-	-	-	-	-	-	-	-
5	2018	-	-	-	-	-	-	-	-	-
6	2019	-	-	-	-	-	-	-	-	-
7	2020	-	-	-	-	-	-	-	-	-
8	2021	-	-	-	-	-	-	-	-	-
9	2022	-	-	-	-	-	-	-	-	-
10	2023	-	-	-	-	-	-	-	-	-
11	2024	-	-	-	-	-	-	-	-	-
12	2025	-	-	-	-	-	-	-	-	-
13	2026	-	-	-	-	-	-	-	-	-
14	2027	-	-	-	-	-	-	-	-	-
15	2028	-	-	-	-	-	-	-	-	-
16	2029	-	-	-	-	-	-	-	-	-
17	2030	-	-	-	-	-	-	-	-	-
18	2031	-	-	-	-	-	-	-	-	-
19	2032	-	-	-	-	-	-	-	-	-
20	2033	-	-	-	-	-	-	-	-	-

Fort Churchill Unit 1										
LNB										
Year	Date	TOTAL FIXED O&M COST	Reagent Cost	SCR Catalyst / FF Bag Cost	Electric Power Cost	Makeup Water Cost	TOTAL VARIABLE O&M COST	DEBT SERVICE	TOTAL ANNUAL COST	Control Cost (\$/Ton NOx Removed)
0	2013									
1	2014	45,200	-	-	-	-	-	111,359	156,559	212
2	2015	46,104	-	-	-	-	-	111,359	157,463	213
3	2016	47,026	-	-	-	-	-	111,359	158,385	214
4	2017	47,967	-	-	-	-	-	111,359	159,325	216
5	2018	48,926	-	-	-	-	-	111,359	160,285	217
6	2019	49,904	-	-	-	-	-	111,359	161,263	218
7	2020	50,903	-	-	-	-	-	111,359	162,261	220
8	2021	51,921	-	-	-	-	-	111,359	163,279	221
9	2022	52,959	-	-	-	-	-	111,359	164,318	222
10	2023	54,018	-	-	-	-	-	111,359	165,377	224
11	2024	55,099	-	-	-	-	-	111,359	166,457	225
12	2025	56,201	-	-	-	-	-	111,359	167,559	227
13	2026	57,325	-	-	-	-	-	111,359	168,683	228
14	2027	58,471	-	-	-	-	-	111,359	169,830	230
15	2028	59,640	-	-	-	-	-	111,359	170,999	231
16	2029	60,833	-	-	-	-	-	111,359	172,192	233
17	2030	62,050	-	-	-	-	-	111,359	173,409	235
18	2031	63,291	-	-	-	-	-	111,359	174,650	236
19	2032	64,557	-	-	-	-	-	111,359	175,916	238
20	2033	65,848	-	-	-	-	-	111,359	177,207	240

Fort Churchill Unit 1										
LNB w/ FGR										
Year	Date	TOTAL FIXED O&M COST	Reagent Cost	SCR Catalyst / FF Bag Cost	Electric Power Cost	Makeup Water Cost	TOTAL VARIABLE O&M COST	DEBT SERVICE	TOTAL ANNUAL COST	Control Cost (\$/Ton NOx Removed)
0	2013									
1	2014	67,800	-	-	252,419	-	252,419	170,750	490,970	580
2	2015	69,156	-	-	257,468	-	257,468	170,750	497,374	587
3	2016	70,539	-	-	262,617	-	262,617	170,750	503,906	595
4	2017	71,950	-	-	267,869	-	267,869	170,750	510,570	603
5	2018	73,389	-	-	273,227	-	273,227	170,750	517,366	611
6	2019	74,857	-	-	278,691	-	278,691	170,750	524,298	619
7	2020	76,354	-	-	284,265	-	284,265	170,750	531,369	628
8	2021	77,881	-	-	289,951	-	289,951	170,750	538,582	636
9	2022	79,439	-	-	295,750	-	295,750	170,750	545,938	645
10	2023	81,027	-	-	301,665	-	301,665	170,750	553,442	654
11	2024	82,648	-	-	307,698	-	307,698	170,750	561,096	663
12	2025	84,301	-	-	313,852	-	313,852	170,750	568,903	672
13	2026	85,987	-	-	320,129	-	320,129	170,750	576,866	681
14	2027	87,707	-	-	326,531	-	326,531	170,750	584,988	691
15	2028	89,461	-	-	333,062	-	333,062	170,750	593,273	701
16	2029	91,250	-	-	339,723	-	339,723	170,750	601,723	711
17	2030	93,075	-	-	346,518	-	346,518	170,750	610,343	721
18	2031	94,936	-	-	353,448	-	353,448	170,750	619,135	731
19	2032	96,835	-	-	360,517	-	360,517	170,750	628,102	742
20	2033	98,772	-	-	367,727	-	367,727	170,750	637,249	753

Fort Churchill Unit 1										
LNB w/SNCR										
Year	Date	TOTAL FIXED O&M COST	Reagent Cost	SCR Catalyst / FF Bag Cost	Electric Power Cost	Makeup Water Cost	TOTAL VARIABLE O&M COST	DEBT SERVICE	TOTAL ANNUAL COST	Control Cost (\$/Ton NOx Removed)
0	2013									
1	2014	90,400	309,158	-	25,242	-	334,400	468,403	893,203	963
2	2015	92,208	315,341	-	25,747	-	341,088	468,403	901,699	972
3	2016	94,052	321,648	-	26,262	-	347,910	468,403	910,365	981
4	2017	95,933	328,081	-	26,787	-	354,868	468,403	919,204	991
5	2018	97,852	334,642	-	27,323	-	361,965	468,403	928,220	1,001
6	2019	99,809	341,335	-	27,869	-	369,204	468,403	937,416	1,011
7	2020	101,805	348,162	-	28,427	-	376,588	468,403	946,797	1,021
8	2021	103,841	355,125	-	28,995	-	384,120	468,403	956,364	1,031
9	2022	105,918	362,228	-	29,575	-	391,803	468,403	966,124	1,041
10	2023	108,036	369,472	-	30,166	-	399,639	468,403	976,078	1,052
11	2024	110,197	376,862	-	30,770	-	407,631	468,403	986,232	1,063
12	2025	112,401	384,399	-	31,385	-	415,784	468,403	996,588	1,074
13	2026	114,649	392,087	-	32,013	-	424,100	468,403	1,007,152	1,086
14	2027	116,942	399,929	-	32,653	-	432,582	468,403	1,017,927	1,097
15	2028	119,281	407,927	-	33,306	-	441,233	468,403	1,028,917	1,109
16	2029	121,666	416,086	-	33,972	-	450,058	468,403	1,040,128	1,121
17	2030	124,100	424,407	-	34,652	-	459,059	468,403	1,051,562	1,134
18	2031	126,582	432,896	-	35,345	-	468,240	468,403	1,063,225	1,146
19	2032	129,113	441,554	-	36,052	-	477,605	468,403	1,075,122	1,159
20	2033	131,696	450,385	-	36,773	-	487,157	468,403	1,087,256	1,172

Fort Churchill Unit 1		ROFA w/Rotamix								
Year	Date	TOTAL FIXED O&M COST	Reagent Cost	SCR Catalyst / FF Bag Cost	Electric Power Cost	Makeup Water Cost	TOTAL VARIABLE O&M COST	DEBT SERVICE	TOTAL ANNUAL COST	Control Cost (\$/Ton NOx Removed)
0	2013									
1	2014	90,400	327,132	-	277,661	-	604,793	974,564	1,669,757	1,701
2	2015	92,208	333,675	-	283,215	-	616,889	974,564	1,683,661	1,715
3	2016	94,052	340,348	-	288,879	-	629,227	974,564	1,697,843	1,730
4	2017	95,933	347,155	-	294,656	-	641,812	974,564	1,712,309	1,744
5	2018	97,852	354,098	-	300,550	-	654,648	974,564	1,727,064	1,760
6	2019	99,809	361,180	-	306,561	-	667,741	974,564	1,742,114	1,775
7	2020	101,805	368,404	-	312,692	-	681,096	974,564	1,757,465	1,790
8	2021	103,841	375,772	-	318,946	-	694,718	974,564	1,773,123	1,806
9	2022	105,918	383,287	-	325,325	-	708,612	974,564	1,789,094	1,823
10	2023	108,036	390,953	-	331,831	-	722,784	974,564	1,805,385	1,839
11	2024	110,197	398,772	-	338,468	-	737,240	974,564	1,822,001	1,856
12	2025	112,401	406,748	-	345,237	-	751,985	974,564	1,838,950	1,873
13	2026	114,649	414,883	-	352,142	-	767,024	974,564	1,856,237	1,891
14	2027	116,942	423,180	-	359,185	-	782,365	974,564	1,873,871	1,909
15	2028	119,281	431,644	-	366,368	-	798,012	974,564	1,891,857	1,927
16	2029	121,666	440,277	-	373,696	-	813,972	974,564	1,910,203	1,946
17	2030	124,100	449,082	-	381,170	-	830,252	974,564	1,928,916	1,965
18	2031	126,582	458,064	-	388,793	-	846,857	974,564	1,948,003	1,985
19	2032	129,113	467,225	-	396,569	-	863,794	974,564	1,967,471	2,004
20	2033	131,696	476,570	-	404,500	-	881,070	974,564	1,987,330	2,025

Fort Churchill Unit 1		LNB w/SCR								
Year	Date	TOTAL FIXED O&M COST	Reagent Cost	SCR Catalyst / FF Bag Cost	Electric Power Cost	Makeup Water Cost	TOTAL VARIABLE O&M COST	DEBT SERVICE	TOTAL ANNUAL COST	Control Cost (\$/Ton NOx Removed)
0	2013									
1	2014	113,000	296,328	169,500	126,210	-	592,037	3,794,816	4,499,854	3,448
2	2015	115,260	302,254	172,890	128,734	-	603,878	3,794,816	4,513,954	3,459
3	2016	117,565	308,299	176,348	131,309	-	615,956	3,794,816	4,528,337	3,470
4	2017	119,917	314,465	179,875	133,935	-	628,275	3,794,816	4,543,008	3,481
5	2018	122,315	320,754	183,472	136,613	-	640,840	3,794,816	4,557,971	3,492
6	2019	124,761	327,170	187,142	139,346	-	653,657	3,794,816	4,573,234	3,504
7	2020	127,256	333,713	190,885	142,133	-	666,730	3,794,816	4,588,803	3,516
8	2021	129,801	340,387	194,702	144,975	-	680,065	3,794,816	4,604,683	3,528
9	2022	132,398	347,195	198,596	147,875	-	693,666	3,794,816	4,620,880	3,540
10	2023	135,045	354,139	202,568	150,832	-	707,539	3,794,816	4,637,401	3,553
11	2024	137,746	361,222	206,620	153,849	-	721,690	3,794,816	4,654,253	3,566
12	2025	140,501	368,446	210,752	156,926	-	736,124	3,794,816	4,671,442	3,579
13	2026	143,311	375,815	214,967	160,064	-	750,846	3,794,816	4,688,974	3,593
14	2027	146,178	383,331	219,266	163,266	-	765,863	3,794,816	4,706,857	3,606
15	2028	149,101	390,998	223,652	166,531	-	781,181	3,794,816	4,725,098	3,620
16	2029	152,083	398,818	228,125	169,862	-	796,804	3,794,816	4,743,704	3,635
17	2030	155,125	406,794	232,687	173,259	-	812,740	3,794,816	4,762,681	3,649
18	2031	158,227	414,930	237,341	176,724	-	828,995	3,794,816	4,782,039	3,664
19	2032	161,392	423,229	242,088	180,259	-	845,575	3,794,816	4,801,783	3,679
20	2033	164,620	431,693	246,929	183,864	-	862,486	3,794,816	4,821,922	3,695

ECONOMIC ANALYSIS SUMMARY

Fort Churchill Unit 1

Boiler Design:

Parameter	Current Operation	SO2 Control
		SDA
Case	1	7
SO2 Emission Control System	None	SDA
TOTAL INSTALLED CAPITAL COST (\$)	0	22,000,000
Including Other Owner Costs (\$)	0	---
FIRST YEAR O&M COST (\$)		
Operating Labor (\$)	0	56,500
Maintenance Material (\$)	0	113,000
Maintenance Labor (\$)	0	56,500
Administrative Labor (\$)	0	0
TOTAL FIXED O&M COST	0	226,000
Reagent Cost	0	173,511
SCR Catalyst / FF Bag Cost	0	0
Electric Power Cost	0	89,352
Makeup Water Cost	0	25,112
TOTAL VARIABLE O&M COST	0	287,975
TOTAL FIRST YEAR O&M COST	0	513,975
FIRST YEAR DEBT SERVICE (\$)	0	2,333,232
TOTAL FIRST YEAR COST (\$)	0	2,847,207
Power Consumption (MW)	0.0	0.4
Annual Power Usage (Million kW-Hr/Yr)	0.0	1.8
CONTROL COST (\$/Ton Removed)		
SO2 Removal Rate (%)	43.9%	84.8%
SO2 Removed (Tons/Yr)	0	1,508
First Year Average Control Cost (\$/Ton SO2 Rem.)	0	1,889
Incremental Control Cost (\$/Ton SO2 Removed)	Base	1,889
		7-1

INPUT CALCULATIONS		
Fort Churchill Unit 1		Boiler Design:
Parameter	Current Operation	SO2 Control
		SDA
Case	1	7
SO2 Emission Control System	None	SDA
Unit Design and Coal Characteristics		
Type of Unit	PC	PC
Net Power Output (kW)	113,000	113,000
Net Plant Heat Rate (Btu/kW-Hr)	10,683	10,683
Boiler Fuel	No. 6 Fuel Oil	No. 6 Fuel Oil
Fuel Heating Value (Btu/Lb)	19,300	19,300
Fuel Sulfur Content (wt.%)	0.637%	0.637%
Fuel Ash Content (wt.%)	0.038%	0.038%
Boiler Heat Input, each (MMBtu/Hr)	1,207	1,207
Fuel Flow Rate (Lb/Hr)	62,548	62,548
(Ton/Yr)	139,720	139,720
(MMBtu/Yr)	5,393,193	5,393,193
Emissions		
Uncontrolled SO2 (Lb/Hr)	796	796
(Lb/MMBtu)	0.659	0.659
(Lb Moles/Hr)	12.42	12.42
(Tons/Yr)	1,777	1,777
SO2 Removal Rate (%)	43.9%	84.8%
(Lb/Hr)	349	675
(Ton/Yr)	780	1,508
SO2 Emission Rate (Lb/Hr)	447	121
(Lb/MMBtu)	0.370	0.10
(Ton/Yr)	998	270
General Plant Data		
Annual Operation (Hours/Year)	4,468	4,468
Annual On-Site Power Plant Capacity Factor	51%	0.51
Economic Factors		
Interest Rate (%)	8.55%	8.55%
Discount Rate (%)	9.00%	9.00%
Plant Economic Life (Years)	20	20
Installed Capital Costs (including owner costs)		
SO2 Emission Control System (\$2007)	0	22,000,000
Total Emission Control Systems (\$2007)	0	22,000,000
SO2 Emission Control System (\$/kW)	0	195
Total Emission Control Systems (\$/kW)	0	195
Total Fixed Operating & Maintenance Costs		
Operating Labor (\$)	0	56,500
Maintenance Material (\$)	0	113,000
Maintenance Labor (\$)	0	56,500
Administrative Labor (\$)	0	0
Total Fixed O&M Cost (\$)	0	226,000
Annual Fixed O&M Cost Escalation Rate (%)	2.00%	2.00%
Reagent Cost		
Unit Cost (\$/Ton)	None	Lime
(\$/Lb)	0.00	91.25
Molar Stoichiometry	0.00	1.10
Reagent Purity (Wt.%)	100%	90%
Reagent Usage (Lb/Hr)	0	851
First Year Reagent Cost (\$)	0	173,511
Annual Reagent Cost Escalation Rate (%)	2.00%	2.00%
SCR Catalyst / FF Bag Replacement Cost		
Annual SCR Catalyst (m3) / No. FF Bags	0	0
SCR Catalyst (\$/m3) / Bag Cost (\$/ea.)	3,000	3,000
First Year SCR Catalyst / Bag Replace. Cost (\$)	0	0
Annual SCR Catalyst / Bag Cost Esc. Rate (%)	2.00%	2.00%
Auxiliary Power Cost		
Auxiliary Power Requirement (% of Plant Output)	0.00%	0.35%
(MW)	0.00	0.40
Unit Cost (\$2007/MW-Hr)	50.00	50.00
First Year Auxiliary Power Cost (\$)	0	89,352
Annual Power Cost Escalation Rate (%)	2.00%	2.00%
Water Cost		
Makeup Water Usage (Gpm)	0	77
Unit Price (\$/1000 Gallons)	1.22	1.22
First Year Water Cost (\$)	0	25,112
Annual Water Cost Escalation Rate (%)	2.00%	2.00%

Economic factors as per Sierra Pacific 2008 Planning Guidelines

Interest Rate
Plant Life

Fort Churchill Unit 1		Current Operation								
Year	Date	TOTAL FIXED O&M COST	Reagent Cost	SCR Catalyst / FF Bag Cost	Electric Power Cost	Makeup Water Cost	TOTAL VARIABLE O&M COST	DEBT SERVICE	TOTAL ANNUAL COST	Control Cost (\$/Ton Removed)
0	2013									
1	2014	-	-	-	-	-	-	-	-	-
2	2015	-	-	-	-	-	-	-	-	-
3	2016	-	-	-	-	-	-	-	-	-
4	2017	-	-	-	-	-	-	-	-	-
5	2018	-	-	-	-	-	-	-	-	-
6	2019	-	-	-	-	-	-	-	-	-
7	2020	-	-	-	-	-	-	-	-	-
8	2021	-	-	-	-	-	-	-	-	-
9	2022	-	-	-	-	-	-	-	-	-
10	2023	-	-	-	-	-	-	-	-	-
11	2024	-	-	-	-	-	-	-	-	-
12	2025	-	-	-	-	-	-	-	-	-
13	2026	-	-	-	-	-	-	-	-	-
14	2027	-	-	-	-	-	-	-	-	-
15	2028	-	-	-	-	-	-	-	-	-
16	2029	-	-	-	-	-	-	-	-	-
17	2030	-	-	-	-	-	-	-	-	-
18	2031	-	-	-	-	-	-	-	-	-
19	2032	-	-	-	-	-	-	-	-	-
20	2033	-	-	-	-	-	-	-	-	-

Fort Churchill Unit 1		SDA								
Year	Date	TOTAL FIXED O&M COST	Reagent Cost	SCR Catalyst / FF Bag Cost	Electric Power Cost	Makeup Water Cost	TOTAL VARIABLE O&M COST	DEBT SERVICE	TOTAL ANNUAL COST	Control Cost (\$/Ton Removed)
0	2013									
1	2014	226,000	173,511	-	89,352	25,112	287,975	2,333,232	2,847,207	1,888.58
2	2015	230,520	176,981	-	91,139	25,614	293,734	2,333,232	2,857,486	1,895.40
3	2016	235,130	180,520	-	92,962	26,127	299,609	2,333,232	2,867,971	1,902.35
4	2017	239,833	184,131	-	94,821	26,649	305,601	2,333,232	2,878,666	1,909.45
5	2018	244,630	187,813	-	96,717	27,182	311,713	2,333,232	2,889,575	1,916.68
6	2019	249,522	191,570	-	98,652	27,726	317,947	2,333,232	2,900,702	1,924.06
7	2020	254,513	195,401	-	100,625	28,280	324,306	2,333,232	2,912,051	1,931.59
8	2021	259,603	199,309	-	102,637	28,846	330,792	2,333,232	2,923,627	1,939.27
9	2022	264,795	203,295	-	104,690	29,423	337,408	2,333,232	2,935,435	1,947.10
10	2023	270,091	207,361	-	106,784	30,011	344,156	2,333,232	2,947,479	1,955.09
11	2024	275,493	211,508	-	108,920	30,612	351,040	2,333,232	2,959,764	1,963.24
12	2025	281,003	215,739	-	111,098	31,224	358,060	2,333,232	2,972,295	1,971.55
13	2026	286,623	220,053	-	113,320	31,848	365,222	2,333,232	2,985,076	1,980.03
14	2027	292,355	224,454	-	115,586	32,485	372,526	2,333,232	2,998,113	1,988.68
15	2028	298,202	228,944	-	117,898	33,135	379,976	2,333,232	3,011,411	1,997.50
16	2029	304,166	233,522	-	120,256	33,798	387,576	2,333,232	3,024,974	2,006.49
17	2030	310,250	238,193	-	122,661	34,474	395,327	2,333,232	3,038,809	2,015.67
18	2031	316,455	242,957	-	125,114	35,163	403,234	2,333,232	3,052,921	2,025.03
19	2032	322,784	247,816	-	127,617	35,866	411,299	2,333,232	3,067,314	2,034.58
20	2033	329,239	252,772	-	130,169	36,584	419,525	2,333,232	3,081,996	2,044.32

ECONOMIC ANALYSIS SUMMARY

Fort Churchill Unit 1

Boiler Design:

Parameter	Current Operation	PM Control
		Fabric Filter
Case	1	8
PM Emission Control System	None	Fabric Filter
TOTAL INSTALLED CAPITAL COST (\$)	0	22,000,000
Including Other Owner Costs (\$)	0	---
FIRST YEAR O&M COST (\$)		
Operating Labor (\$)	0	45,200
Maintenance Material (\$)	0	90,400
Maintenance Labor (\$)	0	45,200
Administrative Labor (\$)	0	0
TOTAL FIXED O&M COST	0	180,800
Reagent Cost	0	0
SCR Catalyst / FF Bag Cost	0	62,400
Electric Power Cost	0	89,352
Makeup Water Cost	0	0
TOTAL VARIABLE O&M COST	0	151,752
TOTAL FIRST YEAR O&M COST	0	332,552
FIRST YEAR DEBT SERVICE (\$)	0	2,333,232
TOTAL FIRST YEAR COST (\$)	0	2,665,784
Power Consumption (MW)	0.0	0.4
Annual Power Usage (Million kW-Hr/Yr)	0.0	1.8
CONTROL COST (\$/Ton Removed)		
PM Removal Rate (%)	0.00%	46.04%
PM Removed (Tons/Yr)	0	35
First Year Average Control Cost (\$/Ton PM Rem.)	0	77,232
Incremental Control Cost (\$/Ton PM Removed)	Base	77,232
		8-1

INPUT CALCULATIONS		
Fort Churchill Unit 1		Boiler Design:
Parameter	Current Operation	PM Control
		Fabric Filter
Case	1	8
PM Emission Control System	None	Fabric Filter
Unit Design and Coal Characteristics		
Type of Unit	PC	PC
Net Power Output (kW)	113,000	113,000
Net Plant Heat Rate (Btu/kW-Hr)	10,683	10,683
Boiler Fuel	No. 6 Fuel Oil	No. 6 Fuel Oil
Fuel Heating Value (Btu/Lb)	19,300	19,300
Fuel Sulfur Content (wt.%)	0.637%	0.637%
Fuel Ash Content (wt.%)	0.038%	0.038%
Boiler Heat Input, each (MMBtu/Hr)	1,207	1,207
Fuel Flow Rate (Lb/Hr)	62,548	62,548
(Ton/Yr)	139,720	139,720
(MMBtu/Yr)	5,393,193	5,393,193
Emissions		
Uncontrolled Fly Ash (Lb/Hr)	27	34
(Lb/MMBtu)	0.03	0.028
(Lb Moles/Hr)	0.9	1.1
(Tons/Yr)	60	75
Fly Ash Removal Rate (%)	0.00%	46.04%
(Lb/Hr)	-7	15
(Ton/Yr)	-15	35
Fly Ash Emission Rate (Lb/Hr)	34	18
(Lb/MMBtu)	0.028	0.015
(Ton/Yr)	75	40
General Plant Data		
Annual Operation (Hours/Year)	4,468	4,468
Annual On-Site Power Plant Capacity Factor	51%	0.51
Economic Factors		
Interest Rate (%)	8.55%	8.55%
Discount Rate (%)	9.00%	9.00%
Plant Economic Life (Years)	20	20
Installed Capital Costs (including owner costs)		
NOx Emission Control System (\$2007)	0	0
SO2 Emission Control System (\$2007)	0	0
PM Emission Control System (\$2007)	0	22,000,000
Total Emission Control Systems (\$2007)	0	22,000,000
NOx Emission Control System (\$/kW)	0	0
SO2 Emission Control System (\$/kW)	0	0
PM Emission Control System (\$/kW)	0	195
Total Emission Control Systems (\$/kW)	0	195
Total Fixed Operating & Maintenance Costs		
Operating Labor (\$)	0	45,200
Maintenance Material (\$)	0	90,400
Maintenance Labor (\$)	0	45,200
Administrative Labor (\$)	0	0
Total Fixed O&M Cost (\$)	0	180,800
Annual Fixed O&M Cost Escalation Rate (%)	2.00%	2.00%
Reagent Cost		
Unit Cost (\$/Ton)	0.00	0.00
(\$/Lb)	0.000	0.000
Molar Stoichiometry	0.00	0.00
Reagent Purity (Wt.%)	100%	100%
Reagent Usage (Lb/Hr)	0	0
First Year Reagent Cost (\$)	0	0
Annual Reagent Cost Escalation Rate (%)	2.00%	2.00%
SCR Catalyst / FF Bag Replacement Cost		
Annual SCR Catalyst (m3) / No. FF Bags	0	Bags 600
SCR Catalyst (\$/m3) / Bag Cost (\$/ea.)	3,000	104
First Year SCR Catalyst / Bag Replace. Cost (\$)	0	62,400
Annual SCR Catalyst / Bag Cost Esc. Rate (%)	2.00%	2.00%
Auxiliary Power Cost		
Auxiliary Power Requirement (% of Plant Output)	0.00%	0.35%
(MW)	0.00	0.40
Unit Cost (\$2007/MW-Hr)	50.00	50.00
First Year Auxiliary Power Cost (\$)	0	89,352
Annual Power Cost Escalation Rate (%)	2.00%	2.00%

Economic factors as per Sierra Pacific 2008 Planning Guidelines

Interest Rate
Plant Life

Fort Churchill Unit 1		Current Operation								
Year	Date	TOTAL FIXED O&M COST	Reagent Cost	SCR Catalyst / FF Bag Cost	Electric Power Cost	Makeup Water Cost	TOTAL VARIABLE O&M COST	DEBT SERVICE	TOTAL ANNUAL COST	Control Cost (\$/Ton Removed)
0	2013									
1	2014	-	-	-	-	-	-	-	-	-
2	2015	-	-	-	-	-	-	-	-	-
3	2016	-	-	-	-	-	-	-	-	-
4	2017	-	-	-	-	-	-	-	-	-
5	2018	-	-	-	-	-	-	-	-	-
6	2019	-	-	-	-	-	-	-	-	-
7	2020	-	-	-	-	-	-	-	-	-
8	2021	-	-	-	-	-	-	-	-	-
9	2022	-	-	-	-	-	-	-	-	-
10	2023	-	-	-	-	-	-	-	-	-
11	2024	-	-	-	-	-	-	-	-	-
12	2025	-	-	-	-	-	-	-	-	-
13	2026	-	-	-	-	-	-	-	-	-
14	2027	-	-	-	-	-	-	-	-	-
15	2028	-	-	-	-	-	-	-	-	-
16	2029	-	-	-	-	-	-	-	-	-
17	2030	-	-	-	-	-	-	-	-	-
18	2031	-	-	-	-	-	-	-	-	-
19	2032	-	-	-	-	-	-	-	-	-
20	2033	-	-	-	-	-	-	-	-	-

Fort Churchill Unit 1		Fabric Filter								
Year	Date	TOTAL FIXED O&M COST	Reagent Cost	SCR Catalyst / FF Bag Cost	Electric Power Cost	Makeup Water Cost	TOTAL VARIABLE O&M COST	DEBT SERVICE	TOTAL ANNUAL COST	Control Cost (\$/Ton Removed)
0	2013									
1	2014	180,800	-	62,400	89,352	-	151,752	2,333,232	2,665,784	77,232.31
2	2015	184,416	-	63,648	91,139	-	154,787	2,333,232	2,672,435	77,425.01
3	2016	188,104	-	64,921	92,962	-	157,883	2,333,232	2,679,219	77,621.55
4	2017	191,866	-	66,219	94,821	-	161,040	2,333,232	2,686,139	77,822.03
5	2018	195,704	-	67,544	96,717	-	164,261	2,333,232	2,693,197	78,026.51
6	2019	199,618	-	68,895	98,652	-	167,546	2,333,232	2,700,396	78,235.09
7	2020	203,610	-	70,273	100,625	-	170,897	2,333,232	2,707,740	78,447.84
8	2021	207,682	-	71,678	102,637	-	174,315	2,333,232	2,715,230	78,664.84
9	2022	211,836	-	73,112	104,690	-	177,802	2,333,232	2,722,870	78,886.18
10	2023	216,073	-	74,574	106,784	-	181,358	2,333,232	2,730,663	79,111.95
11	2024	220,394	-	76,065	108,920	-	184,985	2,333,232	2,738,611	79,342.24
12	2025	224,802	-	77,587	111,098	-	188,685	2,333,232	2,746,719	79,577.13
13	2026	229,298	-	79,138	113,320	-	192,458	2,333,232	2,754,988	79,816.72
14	2027	233,884	-	80,721	115,586	-	196,307	2,333,232	2,763,424	80,061.10
15	2028	238,562	-	82,335	117,898	-	200,234	2,333,232	2,772,027	80,310.36
16	2029	243,333	-	83,982	120,256	-	204,238	2,333,232	2,780,803	80,564.62
17	2030	248,200	-	85,662	122,661	-	208,323	2,333,232	2,789,755	80,823.95
18	2031	253,164	-	87,375	125,114	-	212,489	2,333,232	2,798,885	81,088.48
19	2032	258,227	-	89,123	127,617	-	216,739	2,333,232	2,808,198	81,358.29
20	2033	263,391	-	90,905	130,169	-	221,074	2,333,232	2,817,698	81,633.51