

SO2 Control Scenario	Boiler(s)	SO2 Emission Rate (lb/MMBtu)*	Output (@ 98 th Percentile Impact)	98 th Percentile Impact Improvement	98 th Percentile Improvement from Maximum	Cost Effectiveness
			(dv)	(Δ dv)	(%)	(\$/dv)
Max 24-hr SO ₂ rates	1	0.339	3.627	---	---	---
	2	0.402				
Dry FGD Upgrade	1	0.160*	3.540	0.09	2%	n/a
	2	0.160*	3.445	0.18	5%	n/a
Dry FGD Upgrade	1	0.130	3.525	0.10	3%	\$1,383,820
	2	0.130	3.422	0.21	6%	\$688,535
Additional Scrubber Module	1	0.100	3.505	0.12	3%	\$33,955,232
	2	0.100	3.395	0.23	6%	\$20,727,999
Additional Scrubber Module	1	0.070	3.485	0.14	4%	n/a
	2	0.070	3.367	0.26	7%	n/a
Combo	1	0.120	0.91	2.72	75%	n/a
	2	0.120				

SO2 Control Scenario	Boiler(s)	SO2 Emission Rate (lb/MMBtu)*	Class I Area Affected	3-year totals		Δ days	3-year totals		Δdays
				Pre-Control Days >0.5 dv	Post-Control Days >0.5 dv		Pre-Control Days >1.0 dv	Post-Control Days >1.0 dv	
Max 24-hr SO ₂ rates	1	0.339	Rocky Mountain National Park	236	---	---	155	---	---
	2	0.402							
Dry FGD Upgrade	1	0.160*		n/a	n/a	n/a	n/a	n/a	n/a
	2	0.160*		n/a	n/a	n/a	n/a	n/a	n/a
Dry FGD Upgrade	1	0.130		236	228	8	155	147	8
	2	0.130		236	224	12	155	143	12
Additional Scrubber Module	1	0.100		236	228	8	155	146	9
	2	0.100		236	223	13	155	143	12
Additional Scrubber Module	1	0.070		236	228	8	155	146	9
	2	0.070		236	223	13	155	142	13
Combo	1	0.070	236	57	179	155	6	149	
	2	0.070							

Baseline Emissions

	Average 2006 - 2008		Uncontrolled	
	(tons/year)	(lb/MMBtu)	(tons/year)	(lb/MMBtu)
Unit 1				
NOx	3750	0.415	8162.8	0.970
SO2	1172	0.131	6105.8	0.726
PM	96	0.011	95633.3	10.718 from APENs
PM10	88.0	0.010	88000.0	9.863 from APENs
Unit 2				
NOx	3743	0.320	5609.0	0.408
SO2	1469	0.127	7694.5	0.625
PM	119	0.011	118866.7	11.475 from APENs
PM10	109.3	0.011	109300.0	10.552 from APENs

Pre-Control

	1995	1996	1997
	8689	8473	7852.584 from CAMD
	7074	6202.8	6008.891 from CAMD
	5609	4880	4581.369 from CAMD
	8954	7781.8	7607.186 from CAMD

Heat Input (MMBtu/year)			
1995	1996	1997	Average
16827799	17266479	16379793	16824690

Used data from CAMD query

Heat Input (MMBtu/year)	2006	2007	2008 Average	
Unit 1	16323084.91	19129517.61	18081041.67	17844548.06
Unit 2	14196960.92	25125127.27	22829469.36	20717185.85

Unit 1				
Uncontrolled AP-42 Emission Factors	NOx	SO2	PM	PM10
	(lb/ton)	(lb/ton)	(lb/ton)	(lb/ton)
	22	18.6	95	21.9
convert to lb/MMBtu	0.991	0.838	4.278	4.278
Controlled (%)	54.1%	82.0%	99.7%	99.8%

Unit 2				
Uncontrolled AP-42 Emission Factors	NOx	SO2	PM	PM10
	(lb/ton)	(lb/ton)	(lb/ton)	(lb/ton)
	15	18.6	95	21.9
convert to lb/MMBtu	0.675	0.838	4.278	0.986
Controlled (%)	33.3%	79.6%	99.7%	98.9%

Table with multiple columns containing numerical data and identifiers. Includes a large block of redaction (XXXXXXXXXX) in the first column for rows 15-25. The table lists various identifiers (e.g., 24, 25, 26) and numerical values across multiple rows.

Heat Input Methodology

Unit 1 1159.895624 tons/year (using daily heat input from 2006 - 2008)
 Unit 2 1491.491378 tons/year (using daily heat input from 2006 - 2008)

Unit 1 Average Operating Hours (2006 - 2008)

8269 hours/year

Unit 2 Average Operating Hours (2006 - 2008)

7941 hours/year

HAYDEN 1 COST ANALYSIS

Alternative	Control Efficiency (%)	Resultant Emissions		
		Annual Emissions (tons/year)	Annual Average (lb/MMBtu)	30-day Rolling Average (lb/MMBtu)
Baseline	---	1,172	0.1306	
Dry FGD Upgrade - Additional Equipment and Maintenance	5.2%	1,111	0.1238	
Additional Scrubber Module	41.7%	684	0.0762	0.0800

HAYDEN 2 COST ANALYSIS

Alternative	Control Efficiency (%)	Resultant Emissions		
		Annual Emissions (tons/year)	Annual Average (lb/MMBtu)	30-day Rolling Average (lb/MMBtu)
Baseline	---	1,469	0.1272	
Dry FGD Upgrade - Additional Equipment and Maintenance	2.7%	1,430	0.1238	0.1300
Additional Scrubber Module	40.1%	880	0.0762	0.0800

HAYDEN 1 COST ANALYSIS

Alternative	Emissions Reduction (tpy)	Annualized Cost (\$)	Cost Effectiveness (\$/ton)	Incremental Cost (\$/ton)
Baseline	0	\$0	\$0	---
Dry FGD Upgrade - Additional Equipment and Maintenance	60.9	\$141,150	\$2,317	\$2,317
Additional Scrubber Module	488	\$4,142,538	\$8,490	\$9,370

HAYDEN 2 COST ANALYSIS

Alternative	Emissions Reduction (tpy)	Annualized Cost (\$)	Cost Effectiveness (\$/ton)	Incremental Cost (\$/ton)
Baseline	0	\$0	\$0	---
Dry FGD Upgrade - Additional Equipment and Maintenance	38.9	\$141,150	\$3,626	\$3,626
Additional Scrubber Module	589	\$4,808,896	\$8,164	\$8,485

CONTROL OPTION	Unit 1	Unit 2
Spare Atomizer Part	Emission Tightening \$330,000	Additional Scrubber Module
TOTAL CAPITAL COSTS	\$ 330,000	\$37,000,000
		\$43,000,000

O&M Costs

Operating Labor					
Maintenance Labor and Materials	\$	220,000			
Total O&M Costs	\$	220,000	\$650,000	\$750,000	
Capital Recovery Costs	\$	31,150	\$ 3,492,538	\$ 4,058,896	<i>assumed 7%, 20 years</i>
Original O&M Costs	\$	251,150	\$ 650,000	\$ 750,000	
Original Capital Recovery Costs	\$	31,150	\$ 3,492,538	\$ 4,058,896	
Original Annualized Costs	\$	282,299	\$ 4,142,538	\$ 4,808,896	
ANNUALIZED COST TOTAL	\$	282,299	\$ 4,142,538	\$ 4,808,896	
ANNUAL COST PER UNIT	\$	141,150			

	Unit(s)	Proposed Limit (@ 98 th Percentile Impact)	98 th Percentile Impact Improvement	98 th Percentile Improvement from Maximum	Cost Effectiveness
		(deciviews)	(deciviews)	(%)	(\$/deciview)
Max 24-hr SO ₂ rates	1	3.63	---	---	---
	2				
LSD @ 0.16 lb/MMBtu	1	3.54	0.09	2%	n/a
LSD @ 0.16 lb/MMBtu	2	3.47	0.16	4%	n/a
LSD @ 0.13 lb/MMBtu	1	3.53	0.10	3%	\$1,383,820
LSD @ 0.13 lb/MMBtu	2	3.42	0.21	6%	\$688,535
LSD @ 0.10 lb/MMBtu	1	3.51	0.12	3%	n/a
LSD @ 0.10 lb/MMBtu	2	3.40	0.23	6%	n/a
LSD @ 0.07 lb/MMBtu	1	3.49	0.14	4%	\$29,172,805
LSD @ 0.07 lb/MMBtu	2	3.37	0.26	7%	\$ 18,495,753
Combo	1&2	0.91	2.72	75%	n/a

SO ₂ BART Control Limit	Unit(s)	Class I Area Affected	3-year totals		Δdays	3-year totals		Δdays						
			Pre-Control Days >0.5 dv	Post-Control Days >0.5 dv		Pre-Control Days >1.0 dv	Post-Control Days >1.0 dv							
Max 24-hr SO ₂ rates	1	Mt. Zirkel Wilderness Area	236	---	---	155	---	---						
	2													
LSD @ 0.16 lb/MMBtu	1													
LSD @ 0.16 lb/MMBtu	2													
LSD @ 0.13 lb/MMBtu	1								236	228	8	155	147	8
LSD @ 0.13 lb/MMBtu	2								236	224	12	155	143	12
LSD @ 0.10 lb/MMBtu	1								236	228	8	155	146	9
LSD @ 0.10 lb/MMBtu	2								236	223	13	155	143	12
LSD @ 0.07 lb/MMBtu	1								236	228	8	155	146	9
LSD @ 0.07 lb/MMBtu	2								236	223	13	155	142	13
Combo	1&2								236	57	179	155	6	149

HAYDEN 1 COST ANALYSIS

Alternative	Control Efficiency (%)	Resultant Emissions		
		Annual Emissions (tons/year)	Annual Average (lb/MMBtu)	30-day Rolling Average (lb/MMBtu)
Baseline	---	3,750	0.415	
LNBs*	37.1	2,359	0.261	0.300
SNCR*	37.1	2,359	0.261	0.300
SCR**	83.2	630	0.070	0.080

*Determined based on difference between baseline and expected emission rates

**The Division calculated SCR reductions using a consistent baseline whereas PSCo uses an adjusted baseline depending on the control technology which results in different control costs

Alternative	Emissions Reduction (tpy)	Annualized Cost (\$)	Cost Effectiveness (\$/ton)	Incremental Cost (\$/ton)
Baseline	0	\$0	\$0	---
LNBs	1,391	\$572,010	\$411	\$411
SNCR	1,391	\$1,353,500	\$973	---
SCR	3,120	\$10,560,612	\$3,385	\$5,326

Capital Costs

	LNBs	SCR	SNCR
Direct Equipment Cost			
Direct Installation Cost		\$ 32,472,648	\$ 1,837,153
Indirect Costs		\$ 17,859,957	\$ 835,905
OWNER COSTS		\$ 8,028,775	\$ 856,088
Interest during Construction		\$ 2,239,656	\$ 143,468
Loss Generation (Outage)	\$ 4,897,649	\$ 1,337,131	\$ 107,228
TOTAL CAPITAL COSTS	\$ 4,897,649	\$ 61,938,167	\$ 3,779,842

O&M Costs

	LNBs	SCR	SNCR
Operating Labor	\$ 39,181	\$ 69,834	\$ 65,700
Maintenance Labor and Materials	\$ 58,772	\$ 2,113,969	\$ 48,363

Yearly Emissions Testing (twice per year)	\$	-	\$	-
Fly Ash Sampling/Analysis	\$	-	\$	-
Additional Deionized Water	\$	37,562	\$	569,145
Catalyst Activity Testing	\$	-	\$	-
Energy	\$	188,225	\$	4,918
Catalyst Waste Disposal	\$	1,842		
Lost Generation Revenue				
Anhydrous Ammonia/Urea	\$	296,939	\$	308,584
Catalyst Replacement	\$	11,754	\$	2,005,716
Total O&M Costs	\$	109,707	\$	4,714,087
Capital Recovery Costs	\$	462,303	\$	5,846,525
			\$	356,790
Original O&M Costs	\$	109,707	\$	4,714,087
Original Capital Recovery Costs	\$	462,303	\$	5,846,525
Original Annualized Costs	\$	572,010	\$	10,560,612
			\$	1,353,500
Revised O&M Costs	\$	109,707	\$	4,714,087
Revised Capital Recovery Costs	\$	462,303	\$	5,846,525
REVISED ANNUALIZED COSTS	\$	572,010	\$	10,560,612
			\$	1,353,500

Based on EPA's Four Corners Power Plant/Navajo Generating Station Proposed Rule, the Division compared annual costs to total capital investment on a percent basis.

ORIGINAL COMPARISON		11.7%	17.1%
\]			
SNCR ONLY			
O&M/Annualized	n/a	n/a	73.6%

HAYDEN 2 COST ANALYSIS

Alternative	Control Efficiency (%)	Resultant Emissions		
		Annual Emissions (tons/year)	Annual Average (lb/MMBtu)	30-day Rolling Average (lb/MMBtu)
Baseline	---	3,743	0.320	
LNBs*	34.8	2,441	0.209	0.240
SNCR*	43	2,134	0.183	0.210
SCR*	81	711	0.061	0.070

*Determined based on difference between baseline and expected emission rates

Alternative	Emissions Reduction (tpy)	Annualized Cost (\$)	Cost Effectiveness (\$/ton)	Incremental Cost (\$/ton)
Baseline	0	\$0	\$0	---
LNBs	1,303	\$992,729	\$762	\$762
SNCR	1,610	\$1,893,258	\$1,176	\$2,934
SCR	3,032.2	\$12,321,491	\$4,064	\$7,331

Capital Costs

	LNBs	SCR	SNCR
Direct Equipment Cost			
Direct Installation Cost		\$ 37,446,791	\$ 2,933,295
Indirect Costs		\$ 20,595,735	\$ 1,026,653
OWNER COSTS		\$ 9,617,655	\$ 359,036
Interest during Construction		\$ 2,582,725	\$ 176,206
Loss Generation (Outage)	\$ 8,499,902	\$ 1,537,947	\$ 124,189
TOTAL CAPITAL COSTS	\$ 8,499,902	\$ 71,780,853	\$ 4,619,379

O&M Costs

	LNBs	SCR	SNCR
Operating Labor	\$ 67,999	\$ 82,383	\$ 65,700
Maintenance Labor and Materials	\$ 101,999	\$ 2,437,786	\$ 59,399
Yearly Emissions Testing (twice per year)		\$ -	\$ -

Fly Ash Sampling/Analysis		\$	-	\$	-	
Additional Deionized Water		\$	34,714	\$	762,600	
Catalyst Activity Testing		\$	-	\$	-	
Energy		\$	216,198	\$	284,761	
Catalyst Waste Disposal		\$	2,294			
Lost Generation Revenue						
Anhydrous Ammonia/Urea		\$	274,457	\$	284,761	
Catalyst Replacement	\$	20,400	\$	2,498,054	\$	-
Total O&M Costs	\$	190,398	\$	5,545,886	\$	1,457,221
Capital Recovery Costs	\$	802,331	\$	6,775,605	\$	436,037
Original O&M Costs	\$	190,398	\$	5,545,886	\$	1,457,221
Original Capital Recovery Costs	\$	802,331	\$	6,775,605	\$	436,037
Original Annualized Costs	\$	992,729	\$	12,321,491	\$	1,893,258
Revised O&M Costs	\$	190,398	\$	5,545,886	\$	1,457,221
Revised Capital Recovery Costs	\$	802,331	\$	6,775,605	\$	436,037
REVISED ANNUALIZED COSTS	\$	992,729	\$	12,321,491	\$	1,893,258

Based on EPA's Four Corners Power Plant/Navajo Generating Station Proposed Rule, the Division compared annual costs to total capital investment on a percent basis.

ORIGINAL COMPARISON		11.7%	17.2%	41.0%
SNCR ONLY				
O&M/Annualized	n/a	n/a		77.0%

Unit	2006			2007			2008			Average		
	Fuel Heating Value	% Sulfur	% Ash	Fuel Heating Value	% Sulfur	% Ash	Fuel Heating Value	% Sulfur	% Ash	Fuel Heating Value	% Sulfur	% Ash
1	10993.1	0.53	13.07	11062.5	0.53	12.29	11255.1	0.49	10.49	11104	0.52	11.95
2	10993.1	0.53	13.07	11062.5	0.53	12.29	11255.1	0.49	10.49	11104	0.52	11.95

NOx Control Scenario	Boiler(s)	NOx Emission Rate (lb/MMBtu)*	Proposed Limit (@ 98 th Percentile Impact)	98 th Percentile Impact Improvement	98 th Percentile Improvement from Maximum	Cost Effectiveness
			(deciviews)	(deciviews)	(%)	(\$/deciview)
Max 24-hr NOx rates	1	0.610	3.63	---	---	---
	2	0.367				
NOx Scenario	1	0.390	3.13	0.50	14%	n/a
	2	0.280	3.42	0.20	6%	n/a
NOx Scenario	1	0.300	3.02	0.60	17%	n/a
	2	0.210	3.23	0.40	11%	n/a
LNB	1	0.261*	2.94	0.69	19%	\$832,621
	2	0.209*	3.23	0.40	11%	\$2,500,576
SNCR	1	0.261*	2.94	0.69	19%	\$1,970,161
	2	0.183*	3.15	0.48	13%	\$3,969,094
SCR	1	0.070	2.51	1.12	31%	\$9,462,914
	2	0.070	2.77	0.85	24%	\$ 14,427,975
Combo	1	0.070	0.91	2.72	75%	n/a
	2	0.070				

NOx Control Scenario	Boiler(s)	NOx Emission Rate (lb/MMBtu)*	Class I Area Affected	3-year totals			3-year totals		
				Pre-Control Days >0.5 dv	Post-Control Days >0.5 dv	Δdays	Pre-Control Days >1.0 dv	Post-Control Days >1.0 dv	Δdays
Max 24-hr NOx rates	1	0.610	Mt. Zirkel Wilderness Area	236	---	---	155	---	---
	2	0.367							
NOx Scenario	1	0.390		236	227	9	155	131	24
	2	0.280		236	230	6	155	144	11
NOx Scenario	1	0.300		236	218	18	155	125	30
	2	0.210		236	226	10	155	137	18
LNB	1	0.261*		n/a	n/a	n/a	n/a	n/a	n/a
	2	0.209*		n/a	n/a	n/a	n/a	n/a	n/a
SNCR	1	0.261*		n/a	n/a	n/a	n/a	n/a	n/a
	2	0.183*		n/a	n/a	n/a	n/a	n/a	n/a
SCR	1	0.070		236	188	48	155	91	64
	2	0.070		236	213	23	155	116	39
Combo	1	0.070		236	57	179	155	6	149
	2	0.070							