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Industrial Environmental Research
Laboratory
Research Triangle Park NC 27711

January 1981

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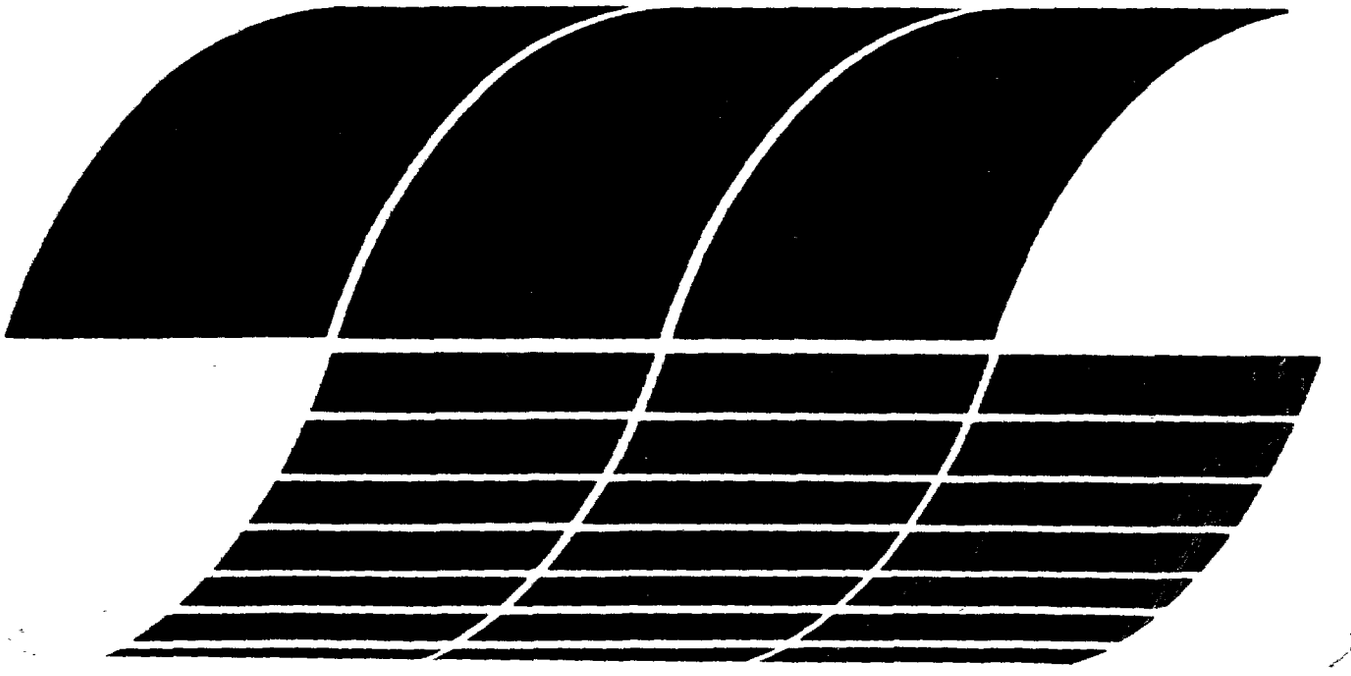
EPA Utility FGD Survey: October - December 1980

Volume II. Design and Performance Data for Operational FGD Systems

Interagency Energy/Environment R&D Program Report



EPA-600/7-81-012b

January 1981

EPA Utility FGD Survey: October - December 1980

Volume II. Design and Performance Data for Operational FGD Systems

by

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NOTICE

This report (prepared by PEDCo Environmental, Inc., Cincinnati, Ohio under EPA Contract No. 68-02-3173, Task No. 17) is provided as an information transfer document. Data in this report are supplied voluntarily by utility representatives; flue gas desulfurization (FGD) system designers and suppliers; regulatory personnel; and others. Neither EPA nor the designated contractor warrants the accuracy or completeness of information contained in this report.

Initial distribution of the report (generally one copy per company) is limited to organizations and individuals indicating a specific interest in the field of FGD technology. Additional copies of this report and preceding issues can be purchased from National Technical Information Service, Springfield, Virginia 22151.

This report presents a summary of the FGD system design and performance data stored in the Flue Gas Desulfurization Information System (FGDIS), a computerized data base from which it is generated. Plans are currently being formulated to allow access to the FGDIS by private users (subject to the limitations expressed in the first paragraph above). It is anticipated that this will be implemented during the first or second quarter, 1981, at which time the service will be available to the public through the National Technical Information Service for a usage charge (non-profit). Users will have the capability to access the additional design and performance data stored within the data base that cannot be conveniently printed in this report. Direct access to the data base will allow statistical analyses of the data (e.g., averages, maxima, minima, and standard deviation of various parameters) and tabulation of the data to fit the individual informational needs of the user. When this service becomes available, the current recipients of this report will be notified; and classes will be provided on the use of the system.

U.S. Environmental Protection Agency

USE OF THIS REPORT

This report is the first full compilation (not a supplement) since the October-December 1979 report (EPA-600/7-80-029a). Because the next three reports are to be supplements, this issue should be retained for reference throughout the year. Much of the design and performance data contained in this issue will not be published again until February 1982. Supplemental issues are cumulative in nature, so that it is necessary only to retain the latest issue and this report to have all the available information.

It should be noted that along with the design and performance data for operational FGD systems contained in Section 3, this report also contains a number of tables presenting tabulations of some of the key data. The Executive Summary contains the number and capacity of FGD systems as of the end of December 1980, future projections (December 1990) of controlled and uncontrolled generating capacity, and unit by unit summaries of status changes and performance during the period.

Appended to this report is a section containing reported and adjusted cost data for U.S. FGD systems in which operational systems are stressed (Appendix A). Also included in the appendices are definitions, a table of unit notation, and FGD process flow diagrams.

ABSTRACT

This report, which is generated by a computerized data base system, presents a survey of operational and planned domestic utility flue gas desulfurization (FGD) systems, operational domestic particle scrubbers, and Japanese coal-fired utility boiler FGD installations. It summarizes information contributed by the utility industry, system and equipment suppliers, system designers, research organizations, and regulatory agencies. It presents data on system design, fuel characteristics, operating history and actual performance. Unit by unit dependability parameters are included and problems and solutions associated with the boilers, scrubbers, and FGD systems are discussed.

The domestic FGD systems are tabulated alphabetically by development status (operational, under construction, or in the planning stages), utility company, system supplier, process, waste disposal practice, and regulatory class. FGD system economic data, definitions, and a glossary of terms are appended to the report. Current data for domestic FGD systems show 84 systems in operation, 34 systems under construction, and 105 planned systems. Projected 1990 FGD controlled capacity in the U.S. is 106,846 MW.

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EXECUTIVE SUMMARY

This report is prepared quarterly (every three months) by PEDCo Environmental, Inc., under contract to the Industrial Environmental Research Laboratory/Research Triangle Park and the Stationary Source Enforcement Division of the U.S. Environmental Protection Agency. It is generated by a computerized data base system, the structure of which is illustrated in Figure 1.

Table I summarizes the status of FGD systems in the United States at the end of December 1980. Table II lists the units that have changed status during the fourth quarter 1980, and Table III shows the performance of operating units during this period.

TABLE I. NUMBER AND TOTAL CAPACITY OF FGD SYSTEMS

Status	No. of units	Total controlled capacity, MW*	Equivalent scrubbed capacity, MW†
Operational	84	31,109	28,214
Under construction	34	14,888	14,285
Planned:			
Contract awarded	30	14,903	14,890
Letter of intent	10	7,515	7,515
Requesting/evaluating bids	16	8,735	8,735
Considering only FGD systems	49	29,696	29,360
TOTAL	223	106,846	102,999

* Total Controlled Capacity (TCC) is the summation of the gross unit capacities (MW) brought into compliance with FGD systems regardless of the percent of the flue gas scrubbed by the FGD system(s).

† Equivalent Scrubbed Capacity (ESC) is the summation of the effective scrubbed flue gas in equivalent MW based on the percent of flue gas scrubbed by the FGD system(s).

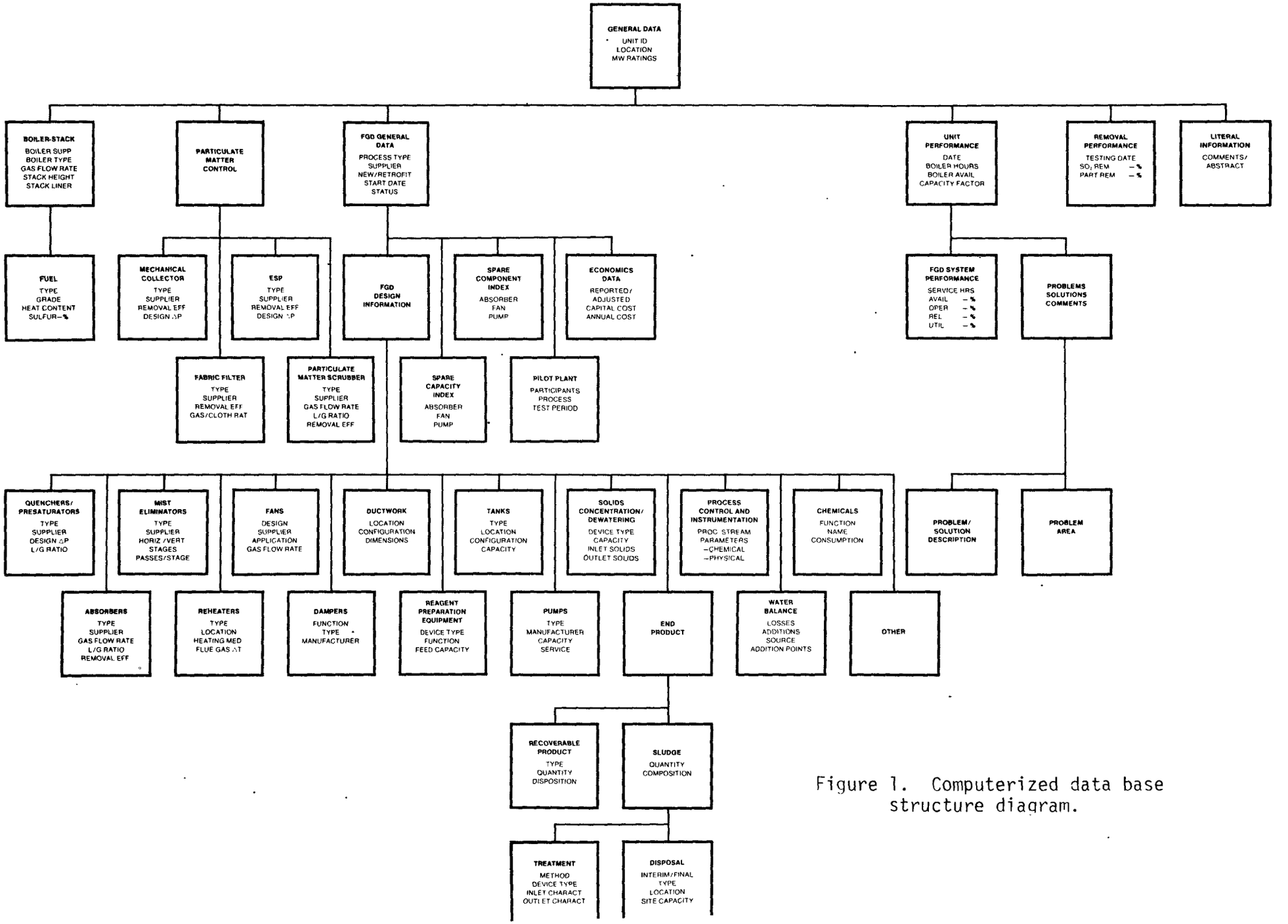

Figure 1. Computerized data base structure diagram.

TABLE II. SUMMARY OF CHANGES
OCTOBER - DECEMBER 1980

FGD status report September 30, 1980	Operational		Under construction		Contract awarded		Letter of intent		Requesting/ eval. bids		Considering FGD		Total	
	No. 76	MW[a] 25,832	No. 39	MW[a] 16,442	No. 30	MW[a] 14,164	No. 7	MW[a] 5,590	No. 18	MW[a] 9,696[b]	No. 38	MW[a] 23,000	No. 208	MW[a] 94,724[b]
Big Rivers Electric														
Green 2	+1	242	-1	242										
Cajun Electric Power Coop														
Chicot 1											+1	540	+1	540
Chicot 2											+1	540	+1	540
Chicot 3											+1	540	+1	540
Chicot 4											+1	540	+1	540
Oxbow 1									+1	540	-1	540		
Oxbow 2											+1	540	+1	540
Colorado Ute Electric Assn.														
Craig 1	+1	447	-1	447										
East Kentucky Power Coop														
J.K. Smith 1							+1	650			-1	650		
J.K. Smith 2							+1	650			-1	650		
Florida Power & Light														
Martin 3											+1	800	+1	800
Martin 4											+1	800	+1	800
General Public														
Coal 1									+1	625	-1	625		
Coho 1									-1	690			-1	690
Gulf Power														
Scholz 1	+1	20											+1	20
Houston Lighting & Power														
Limestone 1					+1	750			-1	750				
Limestone 2					+1	750			-1	750				

(continued)

TABLE II (continued)

FGD status report September 30, 1980	Operational		Under construction		Contract awarded		Letter of intent		Requesting/ eval. bids		Considering FGD		Total	
	No. 76	MW[a] 25,832	No. 39	MW[a] 16,442	No. 30	MW[a] 14,164	No. 7	MW[a] 5,590	No. 18	MW[a] 9,696[b]	No. 38	MW[a] 23,000	No. 208	MW[a] 94,724[b]
Kentucky Utilities														
Hancock 1											+1	650	+1	650
Hancock 2											+1	650	+1	650
Louisville Gas & Electric														
Mill Creek 1	+1	358	-1	358										
Lower Colorado River Authority														
Fayette Pwr Project 3											+1	435	+1	435
Marquette Board of Light & Pwr														
Shiras 3					+1	31			-1	31				
Michigan So. Central Pwr Agency														
Project 1			+1	55	-1	55								
Monongahela Power														
Pleasants 2	+1	618	-1	618										
New York State Electric & Gas														
Somerset 1							+1	625	-1	625				
Northern States Power														
Metro coal 1											+1	200	+1	200
Riverside 6, 7	+1	110	-1	110										
Sherburne 3											+1	850	+1	850
Wisconsin coal 1											+1	670	+1	670
Philadelphia Electric														
Cromby 1			+1	150	-1	150								
Soyland Power Coop														
Soyland 1											+1	500	+1	500

(continued)

TABLE II (continued)

FGD status report September 30, 1980	Operational		Under construction		Contract awarded		Letter of intent		Requesting/ eval. bids		Considering FGD		Total	
	No.	MW[a]	No.	MW[a]	No.	MW[a]	No.	MW[a]	No.	MW[a]	No.	MW[a]	No.	MW[a]
	76	25,832	39	16,442	30	14,164	7	5,590	18	9,696[b]	38	23,000	208	94,724[b]
Springfield Water, Light & Pwr														
Dallman 3	+1	205	-1	205										
Tennessee Valley Authority														
Johnsonville 1-10					-1	600							-1	600
Texas Power & Light														
Sandow 4	+1	382	-1	382										
Washington Water Power														
Creston Coal 1											+1	570	+1	570
West Texas Utilities														
Oklaunion 1									+1	720	-1	720		
Oklaunion 2											+1	720	+1	720
Total	84	28,214	34	14,285	30	14,890	10	7,515	16	8,735	49	29,360	223	102,999

[a]Equivalent scrubbed capacity.

[b]This value was modified slightly due to a MW correction.

TABLE III. PERFORMANCE OF OPERATIONAL UNITS
OCTOBER - DECEMBER 1980

Plant	FGD system capacity, MW[a]	Flue gas % scrubbed	FGD capacity on line during period, MW[a,b]	No information for this period, MW[a]	Shut down throughout period, MW[a]	October 1980 Dependability %[c,e]				November 1980 Dependability %[c,e]				December 1980 Dependability %[c,e]			
						AVL	OPR	REL	UTL	AVL	OPR	REL	UTL	AVL	OPR	REL	UTL
Tombigbee 2	179	70	179			50	0		0	50	37	37	8	81	77	77	73
Tombigbee 3	179	70	179			97	63	63	63	99	86	86	86	100	77	77	77
Apache 2	98	50	98			93	88	99	82	20	22	40	7	100	100	100	100
Apache 3	98	50	98			76	88	97	68	100	96	96	96	100	99	100	97
Cholla 1	119	100		119													
Cholla 2	264	100		264													
Four Corners 1	175	100		175													
Four Corners 2	175	100		175													
Four Corners 3	229	100		229													
Laramie River 1	570	100	570			100	100	100	96	100	98	100	79	100	100	100	93
Green 1	242	100		242													
Green 2	242	100	242														
Duck Creek 1	416	100	416			73	72	75	72	97	89	99	68	92	91	94	91
Newton 1	617	100	617			76	36	46	16	99	85	100	85	74	70	85	69
Craig 1	447	100	447											63	57	79	55
Craig 2	400	87	400			100	91	95	12	71	74	79	33	52	68	70	51
Conesville 5	411	100	411			91	79	82	77	83	50	52	44	92	88	87	81
Conesville 6	411	100	411			92	80	81	72	99	87	86	52	87	80	80	80
Powerton 51	450	100			450		0		0		0		0		0		0
Coal Creek 1	327	60	327				46		9		43		43		47		46
Coal Creek 2	327	60	327				68		68		61		43		55		54
Delaware City 1	60	100	60			66	66	66	66	94	96	96	94	34	56	56	31
Delaware City 2	60	100	60			60	60	60	60	98	98	98	98	100	100	100	100
Delaware City 3	60	100	60			44	44	44	44	0	0	0	0	82	79	79	79
Elrama 1-4	510	100	510			100	97	100	97	100	99	99	99				
Phillips 1-6	408	100	408			72	70	71	70	85	84	85	84				
Scholz 1	20	N/A[d]	20														76
Petersburg 3	532	100		532													
Hawthorn 3	90	100	90			100	100	100	33	80	100	100	40	58	100	100	25
Hawthorn 4	90	100	90			100	100	100	68	72	100	100	66	92	100	100	59
La Cygne 1	820	100	820			100	0		0	99	87	86	8	99	94	98	65
Jeffrey 1	540	75	540			100	100	100	37	100	100	100	87	100	100	100	99
Jeffrey 2	490	70	490			100	100	100	100	100	100	100	56	100	100	100	63
Lawrence 4	125	100	125			100	100	100	100	100	100	100	90	100	100	100	98
Lawrence 5	420	100	420			100	100	100	65	100	100	100	100	100	100	100	100
Green River 1-3	64	100			64	100			0	100			0	100			0

TABLE III (continued)

Plant	FGD system capacity, MW[a]	Flue gas % scrubbed	FGD capacity on line during period, MW[a,b]	No information for this period, MW[a]	Shut down throughout period, MW[a]	October 1980 Dependability %[c,e]				November 1980 Dependability %[c,e]				December 1980 Dependability %[c,e]			
						AVL	OPR	REL	UTL	AVL	OPR	REL	UTL	AVL	OPR	REL	UTL
Cane Run 4	188	100	188			100	100	100	82	72	53	53	35	100	100	100	77
Cane Run 5	200	100	200			100	100	100	10	100	100	100	25	100	100	100	100
Cane Run 6	299	100	299			100	100	100	100	85	97	97	55	60	6	6	2
Mill Creek 1	358	100	358											45	99	99	45
Mill Creek 3	442	100	442			100	97	97	97	57	49	49	42	100	100	100	61
Paddy's Run 6	72	100			72	0	0		0	0	0		0	0	0		0
Clay Boswell 4	475	85	475				51	100	37	100	69	100	63	100	88	100	84
Milton R. Young 2	185	42	185			100	85	87	76	100	95	99	91	72	63	67	61
Pleasants 1	618	100	618						0								
Pleasants 2	618	100	618														
Colstrip 1	360	100		360													
Colstrip 2	360	100		360													
Reid Gardner 1	125	100	125			98	98	98	93	100	100	100	36	81	77	75	53
Reid Gardner 2	125	100	125			100	0		0	95	94	92	62	100	99	100	98
Reid Gardner 3	125	100	125			85	84	84	81	95	100	95	95	100	96	100	71
Dean H. Mitchell 11	115	99	115			97	90	90	75	100	94	94	86	93	63	63	50
Riverside 6, 7	110	N/A[d]	110														
Sherburne 1	740	100	740			100	100	100	72	100	0		0	100	100	100	81
Sherburne 2	740	100	740			100	100	100	100	100	100	100	100	100	100	100	100
Jim Bridger 4	550	100	550						0					95	77	93	69
Bruce Mansfield 1	917	100	917			98	100		28	100			0	100			0
Bruce Mansfield 2	917	100	917			97	100		90	97	100		83	98	100		68
Bruce Mansfield 3	917	100	917			89	100		74	90	100		63	91	100		68
San Juan 1	361	100	361			51	73	74	51	96	86	96	78	100	90	99	88
San Juan 2	350	100	350			11	25	27	10	82	60	60	38	86	52	100	42
San Juan 3	534	100	534														
Coronado 1	280	80		280													
Coronado 2	280	80		280													
Winyah 2	280	100	280			14	93	93	14	100	100	100	100	99	99	99	99
Winyah 3	280	100	280			92	94	91	90	73	73	73	73	95	97	97	95
R.D. Morrow, Sr. 1	124	62	124			63	94	94	25	25	42	42	11	100	99	99	64
R.D. Morrow, Sr. 2	124	62	124			80	99	99	80	80	95	95	75	50	93	93	50
Marion 4	173	100	173			100	100	100	58	90	0	0	0	80	78	78	72
A.B. Brown 1	265	100	265			99	96	96	96	98	84	85	55	99	96	96	93
Southwest 1	194	100	194			0	0	0	0	0	0	0	0	43	6	8	4

TABLE III (continued)

Plant	FGD system capacity, MW[a]	Flue gas % scrubbed	FGD Capacity on line during period, MW[a,b]	No information for this period, MW[a]	Shut down throughout perigd, MW[a]	October 1980 Dependability %[c,e]				November 1980 Dependability %[c,e]				December 1980 Dependability %[c,e]			
						AVL	OPR	REL	UTL	AVL	OPR	REL	UTL	AVL	OPR	REL	UTL
Dallman 3	205	100	205														
G.F. Weaton 1	60	N/A[d]	60						38				14				25
Shawnee 10A	10	N/A[d]	10					97	86			98	87				
Shawnee 10B	10	N/A[d]	10					99	88			100	64				
Widows Creek 8	550	100		550													
Sandow 4	382	70	382														
Martin Lake 1	595	75	595														
Martin Lake 2	595	75	595														
Martin Lake 3	595	75	595														
Monticello 3	800	100	800														
Hunter 1	360	90	360				100		97		80		76		97		96
Hunter 2	360	90	360				100		70		100		98		100		100
Huntington 1	366	85	366				100		98		100		100		100		100
TOTAL	28,214		24,062	3,566	586												

[a] Equivalent scrubbed capacity.
[b] This category includes the flue gas capacity being handled by the FGD system at least part of the time during the report period.
[c] The percent figures listed are average values for all system scrubbing trains during the period.
[d] Flue gas % scrubbed for prototype and demonstration units is not applicable unless the system is designed to bring a unit into compliance with SO_2 emission standard.
[e] Availability, operability, reliability, and utilization as defined in Appendix C of this report.

Current projections indicate that the total power generating capacity of the U.S. electric utility industry will be approximately 833 GW by the end of 1990.[a] (This value reflects the annual loss resulting from the retirement of older units, which is considered to be 0.4 percent of the average generating capacity at the end of each year.[b]) Approximately 370 GW or 44 percent of the 1990 total will come from coal-fired units. The distribution of power generation sources, both present (December 1979) and future (December 1990) is as follows:[a]

	Coal	Nuclear	Oil	Hydro	Gas	Other	GW (total)
December 1979	39%	9%	25%	13%	13%	1%	603
December 1990	44%	14%	20%	11%	10%	1%	833

Based on the known commitments to FGD by utilities as presented in Table I, the percentage of electrical generating capacity controlled by FGD for both the present (December 1980) and the future (December 1990) is as follows:

	Coal-fired generating capacity, %	Total generating capacity, %
December 1980*	13.2	5.2
December 1990	29.2	12.8

In light of the revised New Source Performance Standards, actual FGD control is expected to be greater than what is reflected by the figures above. For example, about 40 to 50 systems representing approximately 20,000 to 25,000 MW of generating capacity presently fall into the uncommitted category. These are systems that cannot be included in the committed group at this time because information regarding their status is not ready for public release.

In an effort to show general FGD usage and projected usage trends, the table below gives a current (December 1980) and a projected (December 1990) breakdown of throwaway product systems versus salable product systems as a percent of the total known commitments to FGD as of the end of the fourth quarter 1980:

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* The number of committed FGD systems is as of December 1980; however, the figure used for the total generating capacity and coal-fired generating capacity is based on the available December 1979 figures.

		Percent of total MW	
		December 1980	December 1990
Throwaway product process			
°Wet systems			
Lime		40.5	21.0
Limestone		45.9	36.5
Dual alkali		4.2	2.0
Sodium carbonate		3.3	3.1
N/A[a]		-	6.5
°Dry systems			
Lime		0.5	2.9
Sodium carbonate		-	0.4
Salable product process			
°Process	°Byproduct		
Aqueous carbonate/ spray drying	Elemental sulfur	-	0.1
Citrate	Elemental sulfur	0.2	0.1
Lime	Gypsum	-	0.1
Limestone	Gypsum	-	0.2
Lime/limestone	Gypsum	-	0.5
Magnesium oxide	Sulfuric acid	-	0.7
Wellman Lord	Sulfuric acid	2.5	1.2
Wellman Lord	Elemental sulfur	2.9	0.7
Process undecided		-	24.0
Total		100.0	100.0

[a]NA - Not available (these systems are committed to a throwaway product process; however, the actual process is unknown at this time).

HIGHLIGHTS: OCTOBER - DECEMBER 1980

The following paragraphs highlight FGD system developments during the fourth quarter 1980.

Alabama Electric Cooperative reported that the Tombigbee 3 FGD system achieved availabilities of 97%, 99%, and 100% for the months of October, November, and December, respectively. The utility reported that no major problems occurred during this period.

The limestone FGD system installed at the Laramie River unit of Basin Electric Power Cooperative achieved 100% availability during the months of October, November, and December. The only problems reported for this period were boiler related.

Big Rivers Electric announced that initial FGD operations at Green 2 commenced in November 1980. The 242 MW (gross) boiler fires bituminous coal with an average sulfur content of 3.75%. The FGD system was supplied by American Air Filter and consists of two lime spray towers designed to remove 90% of the inlet SO_2. The system is preceded by a cold side ESP for primary particulate matter removal. The unit is currently in the start-up phase of operation; compliance testing is scheduled for the week of January 18.

Cajun Electric Power Cooperative announced during November 1980 that bids were being requested for a dry scrubbing process to control SO_2 emissions from Oxbow 1 (formerly Big Cajun III 1). Also included in the bid request is an option for five additional dry scrubbing systems to be installed at the Oxbow 2 and Chicot 1-4 units. Oxbow 2 is to be located next to Oxbow 1 in De Soto Parish, Louisiana. Each Oxbow unit will be rated at 540 MW (gross) and will fire lignite with an average sulfur content of 0.6%. Oxbow 1 is scheduled for operation in 1985. No start up date has been set for Unit 2. The Chicot 1-4 units are planned to be constructed in Shreveport, Louisiana. Each 540 MW (gross) unit will fire lignite with an average sulfur content of 1.7%. The Chicot units are scheduled to commence operations in 1986, 1988, 1992, and 1994, respectively.

Initial FGD operations began at Craig 1 of Colorado Ute Electric during October 1980. The unit is rated at 447 MW (gross) and fires subbituminous coal with an average sulfur content of 0.45%. The FGD system, supplied by Peabody Process Systems, utilizes four magnesium promoted limestone spray towers for 85% SO_2 removal. A hot side ESP precedes the system for primary particulate matter control. The stabilized sludge is disposed of in an off site minefill operation. Some FGD system equipment problems made it necessary to operate the unit at approximately 50 to 60% of capacity during November; however, the problems were corrected and the unit returned to full load during the last week of December.

Duquesne Light reported that the Elrama FGD system achieved 100% availability for the months of October and November, respectively. Some absorber module liner repairs were performed during the two month period but no major problems were encountered. Information for the month of December was not available.

East Kentucky Power Cooperative announced that a letter of intent was signed in April 1980 with Babcock and Wilcox for the installation of wet lime FGD systems to control SO_2 emissions from the J.R. Smith units 1 and 2. The units will be rated at 650 MW

(gross) each and will fire bituminous coal with an average sulfur content of 1.5%. The FGD systems are scheduled to commence operations in 1985 and 1987, respectively.

Florida Power and Light announced that FGD has been selected as the SO_2 emission control strategy to be used at the Martin units 3 and 4. Each unit will be rated at 800 MW (gross). Projected start-up is 1987 for unit 3 and 1989 for unit 4.

The dual alkali FGD system originally operated in 1975-1976 at the Scholz station of Gulf Power was reactivated in August 1980 by Combustion Equipment Associates and Arthur D. Little. The system is being utilized for an EPA sponsored test program aimed at determining the feasibility of utilizing limestone rather than lime as the source of calcium for the regeneration reactions. The reactor system configuration was changed to a four stage system with an increased residence time; however, no other major system modifications were required. The system was operated in the limestone mode for approximately 70% of December and exhibited SO_2 removal efficiencies reportedly in excess of 90%.

Houston Lighting and Power announced that a contract was awarded to Combustion Engineering for wet limestone FGD systems to control SO_2 emissions from the new Limestone units 1 and 2. Each unit will be rated at 750 MW (gross) and will fire coal with an average sulfur content of 1.08%. A cold side ESP will be used for primary particulate matter control. Scheduled start-up dates are 1984 and 1985 for units 1 and 2, respectively.

Kansas City Power and Light reported that the limestone FGD systems at the La Cygne generating station achieved availabilities of 100%, 99%, and 99% during October, November, and December, respectively. A fire in the "D" module was the only major problem encountered during the quarter.

The FGD systems at Jeffrey 1 and 2 of Kansas Power and Light achieved 100% availability for the fourth quarter 1980. The limestone systems operated with no major problems being reported during this period.

Kansas Power and Light also reported FGD system availabilities of 100% for the Lawrence 4 and 5 FGD systems during the months of October, November, and December, respectively.

Kentucky Utilities announced plans to construct two new units, Hancock 1 and 2, to be located in Hawsville, Kentucky. The units are to be rated at 708 MW (gross) each and will fire a Western Kentucky coal with an average sulfur content of 3.5%. The utility is considering a wet limestone scrubbing system along with an ESP to control SO_2 and particulate matter emissions. Operations are scheduled to commence in 1988 and 1994 for units 1 and 2, respectively.

Louisville Gas and Electric reported that the lime scrubbing system at the Cane Run 5 unit achieved 100% availability for the months of October, November, and December. No operational problems were reported for this period.

Initial operation of the FGD system at Mill Creek 1 of Louisville Gas and Electric commenced during December 1980. The 358 MW (gross) unit fires pulverized coal with an average sulfur content of 3.75%. The retrofitted wet lime scrubbing process was supplied by Combustion Engineering and is designed to remove 85% of the inlet SO_2.

Lower Colorado River Authority has announced plans to construct Fayette Power Project 3 in La Grange, Texas. The 435 MW (gross) unit will fire lignite with an average sulfur content of 1.7%. SO_2 emissions from this unit will be controlled by a FGD system designed for 90% SO_2 removal efficiency. The system is scheduled to commence operation in 1988.

Marquette Board of Light and Power announced that a contract has been awarded to Buell Division, Envirotech for a lime/spray drying system to be installed on the Shiras 3 unit. The system will include a fabric filter that will serve the dual function of primary particulate matter control and spent reagent collection. Initial FGD operations are scheduled to begin in October 1982.

Michigan South Central Power Agency announced that construction on the Project 1 FGD system began in November 1980. This 55 MW (gross) unit is being constructed in Litchfield, Michigan, and will burn coal with an average sulfur content of 2.25%. The wet limestone FGD system is being supplied by Babcock and Wilcox and is expected to begin operation in June 1982.

FGD operations began during October 1980 at the Pleasants 2 unit of Monongahela Power. This unit, which is rated at 618 MW (gross) fires bituminous coal with an average sulfur content of 4.5%. The lime FGD system was supplied by Babcock and Wilcox and consists of four spray tower absorbers. For primary particulate matter removal, an ESP precedes the FGD system. No initial start-up problems were reported to have been encountered during the October through December period.

Reid Gardner 2 of Nevada Power achieved availabilities of 100%, 95%, and 100% for the months of October, November, and December, respectively. No major problems were reported during this period.

New York State Electric and Gas announced that a letter of intent was signed with Peabody Process Systems for a wet limestone FGD system to be installed on the Somerset 1 unit. The system, which will be preceded by a cold side ESP for primary particulate matter control, will be designed for 90% SO_2 removal. Initial start-up of the system is expected in 1984.

Northern Indiana Public Service reported that the Dean H. Mitchell 11 Wellman Lord FGD system achieved availabilities of 97%, 100%, and 93% for the October, November, and December period, respectively. Minor problems were encountered with the SO_2 reduction unit; however, no major problems were reported.

Northern States Power has announced plans to construct Metro Coal 1. This 200 MW (gross) unit will fire a Montana coal with an average sulfur content of approximately 1%. The utility is considering a lime/spray drying process for SO_2 emission control. The expected start up is in 1990.

Initial operation of the demonstration lime/spray drying FGD system installed at the Riverside station of Northern States Power began during November 1980. The 110 MW (gross) system, which was supplied by Joy Manufacturing/Niro Atomizer, consists of a spray dryer followed by a baghouse. The spent absorbent is disposed of in both on and off site landfills. The system operated in a shakedown/debugging phase during November and December.

Northern States Power reported that the limestone/alkaline flyash systems installed at Sherburne 1 and 2 achieved 100% availabilities for the fourth quarter 1980. Unit 1 was out of service in November due to an annual boiler/turbine inspection.

Northern States Power has reaffirmed plans for a third unit, Sherburne 3, to be located along with units 1 and 2 in Becker, Minnesota. Current plans call for joint ownership of the facility with the Southern Minnesota Municipal Power Agency and the United Minnesota Municipal Power Agency. The 850 MW (gross unit will fire a Montana coal with a sulfur content of approximately 1%. The unit will utilize a lime/spray drying process for control of SO_2 emissions and is scheduled to start operations in 1985.

Northern States Power also announced plans to construct a unit, Wisconsin Coal 1, to be located in Durand, Wisconsin. The unit will be rated at 670 MW (gross) and will fire coal with a sulfur content of approximately 1%. The utility is considering controlling SO_2 emissions from this unit by utilizing a lime/spray drying process. The unit is scheduled to commence operations in 1991.

Philadelphia Electric announced that construction began in September 1980 on the retrofit magnesium oxide FGD system being supplied by United Engineers for the Cromby 1 unit. The 150 MW (gross) unit fires coal with an average sulfur content of 3.0%. Start-up of the FGD system is expected in May 1983.

The dual alkali scrubbing system at the A.B. Brown 1 station of Southern Indiana Gas and Electric achieved availabilities of 99%, 98%, and 99% during October, November, and December, respectively. Other than some recurring water balance problems, no major problems were reported for the three month period.

Soyland Power Cooperative has announced plans to construct Soyland 1 in Illinois. The 500 MW (gross) unit will fire an Illinois coal with an average sulfur content of 3.0%. The utility is currently considering FGD as a SO_2 control strategy. Operations are scheduled to commence in 1987.

Initial FGD operations began at Dallman 3 of Springfield Water, Light, and Power in October 1980. The unit is rated at 205 MW (gross) and fires coal with an average sulfur content of 3.3%. The limestone FGD system is preceded by a hot side ESP and includes one horizontal chevron mist eliminator per module. The sludge is trucked off site to a landfill. No major initial start-up problems were reported.

Tennessee Valley Authority has announced that low sulfur coal will be burned at the Johnsonville 1-10 units. As a result, plans for the installation of a magnesium oxide FGD system have been cancelled.

Texas Power and Light announced that initial FGD operations at the Sandow 4 unit began in December 1980. The 545 MW (gross) unit fires lignite with an average sulfur content of 1.6%. The three limestone spray towers supplied by Combustion Engineering will be designed for a SO_2 removal efficiency of 75%. Primary particulate matter removal is provided by a cold side ESP. The system operated in a shakedown mode through the end of December.

Washington Water Power has announced plans to construct Creston Coal 1 in Creston, Washington. The 570 MW (gross) unit is the first of four coal fired units planned for this site. The utility is considering a wet limestone scrubbing system for SO_2 emission control. Construction at this site is scheduled to commence in 1983 with initial operations expected to begin in 1987.

West Texas Utilities has announced that bids are being requested for a FGD system to be installed at the Oklaunion 1 unit. The 720 MW (gross) unit is to be located in Oklaunion, Texas and will fire a subbituminous Wyoming coal with an average sulfur content of 0.34%. The system will operate with a closed water loop. Initial operations are scheduled for 1986.

West Texas Utilities also announced plans to construct a second unit, Oklaunion 2. This unit will be similar in design to Unit 1 with startup expected in 1990.

REFERENCES

a. U.S. Department of Energy. Energy Information Administration. Office of Coal and Electric Power Statistics. Electric Power Statistics Division. Inventory of Power Plants in the United States, December 1979. Publ. No. DOE/EIA-0095 (79).

b. Rittenhouse, R.C. New Generating Capacity: When, Where, and by Whom. Power Engineering 82(4):57. April 1978.

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	ALABAMA ELECTRIC COOP	
PLANT NAME	TOMBIGBEE	
UNIT NUMBER	2	
CITY	LEROY	
STATE	ALABAMA	
REGULATORY CLASSIFICATION	B	
PARTICULATE EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	516.	(1.200 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	525	
GROSS UNIT GENERATING CAPACITY - MW	255	
NET UNIT GENERATING CAPACITY W/FGD - MW	235	
NET UNIT GENERATING CAPACITY WO/FGD - MW	243	
EQUIVALENT SCRUBBED CAPACITY - MW	179	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	RILEY STOKER	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	449.72	(953000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	143.9	(291 F)
STACK HEIGHT - M	122.	(400 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	*******	(***** FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	BITUMINOUS	
AVERAGE HEAT CONTENT - J/G	26749.	(11500 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		11000-12000
AVERAGE ASH CONTENT - %	14.00	
RANGE ASH CONTENT - %	10-16	
AVERAGE MOISTURE CONTENT - %	7.00	
RANGE MOISTURE CONTENT - %	3.0-20.0	
AVERAGE SULFUR CONTENT - %	1.15	
RANGE SULFUR CONTENT - %	0.8-1.5	
AVERAGE CHLORIDE CONTENT - %	.04	
RANGE CHLORIDE CONTENT - %	******	
*** PARTICLE CONTROL		
** ESP		
NUMBER	1	
TYPE	HOT SIDE	
SUPPLIER	RESEARCH-COTTRELL	
INLET FLUE GAS CAPACITY - CU.M/S	449.7	(953000 ACFM)
INLET FLUE GAS TEMPERATURE - C	143.9	(291 F)
PARTICLE REMOVAL EFFICENCY - %	99.3	
** PARTICLE SCRUBBER		
GENERIC TYPE	NONE	
SPECIFIC TYPE	N/A	
*** FGD SYSTEM		
** GENERAL DATA		
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT	
SO2 REMOVAL MODE	WET SCRUBBING	
PROCESS TYPE	LIMESTONE	
PROCESS ADDITIVES	NONE	
SYSTEM SUPPLIER	PEABODY PROCESS SYSTEMS	
A-E FIRM	BURNS & MCDONNELL	
DEVELOPMENT LEVEL	FULL SCALE	
NEW/RETROFIT	NEW	
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.30	
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	59.50	
CURRENT STATUS	1	
COMMERCIAL START-UP	9/78	
INITIAL START-UP	9/78	

ALABAMA ELECTRIC COOP: TOMBIGBEE 2 (CONT.)

CONTRACT AWARDED	8/75	

** DESIGN AND OPERATING PARAMETERS

** ABSORBER		
NUMBER	2	
GENERIC TYPE	SPRAY TOWER	
SPECIFIC TYPE	OPEN COUNTERCURRENT SPRAY	
SUPPLIER	PEABODY PROCESS SYSTEMS	
DIMENSIONS - FT	24 DIA X 90 HIGH	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	AISI 1110	
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A	
LINER GENERIC MATERIAL	ORGANIC	
LINER SPECIFIC MATERIAL	NATURAL RUBBER	
LINER MATERIAL TRADE NAME/COMMON TYPE	BLACK NATURAL RUBBER	
GAS CONTACTING DEVICE TYPE	NONE	
NUMBER OF CONTACTING ZONES	6	
LIQUID RECIRCULATION RATE - LITER/S	1259.	(19980 GPM)
L/G RATIO - L/CU.M	9.4	(70.0 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	1.0	(4.0 IN-H2O)
SUPERFICAL GAS VELOCITY - M/SEC	3.0	(10.0 FT/S)
INLET GAS FLOW - CU. M/S	127.41	(270000 ACFM)
INLET GAS TEMPERATURE - C	54.4	(130 F)
SO2 REMOVAL EFFICIENCY - %	85.0	
** MIST ELIMINATOR		
PRE-MIST ELIMINATOR/MIST ELIMINATOR	MIST ELIMINATOR	
NUMBER PER SYSTEM	2	
GENERIC TYPE	IMPINGEMENT	
SPECIFIC TYPE	BAFFLE	
TRADE NAME/COMMON TYPE	CHEVRON VANE	
CONFIGURATION	HORIZONTAL	
NUMBER OF STAGES	1	
NUMBER OF PASSES PER STAGE	1	
PRESSURE DROP - KPA	.1	(.5 IN-H2O)
SUPERFICAL GAS VELOCITY - M/S	3.0	(10.0 FT/S)
CONSTRUCTION MATERIAL GENERIC TYPE	PLASTIC	
WASH WATER SOURCE	COOLING TOWER BLOWDOWN	
** REHEATER		
NUMBER	1	
GENERIC TYPE	BYPASS	
SPECIFIC TYPE	COLD SIDE	
TRADE NAME/COMMON TYPE	N/A	
PERCENT GAS BYPASSED - AVG	30.0	
TEMPERATURE INCREASE - C	8.9	(48 F)
INLET FLUE GAS FLOW RATE - CU. M/S	129.77	(275000 ACFM)
INLET FLUE GAS TEMPERATURE - C	143.9	(291 F)
NUMBER OF TUBES PER BUNDLE	0	
CONSTRUCTION MATERIAL GENERIC TYPE	N/A	
** FANS		
NUMBER	2	
DESIGN	CENTRIFUGAL	
SUPPLIER	ZURN AIR SYSTEMS	
FUNCTION	UNIT	
APPLICATION	FORCED DRAFT	
SERVICE	DRY	
FLUE GAS FLOW RATE - CU.M/S	225.10	(477000 ACFM)
FLUE GAS TEMPERATURE - C	143.9	(291 F)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	
** DUCTWORK		
LOCATION	SCRUBBER INLET	
SHELL GENERIC MATERIAL TYPE	CARBON STEEL	
LINER GENERIC MATERIAL TYPE	NONE	
** DUCTWORK		
LOCATION	SCRUBBER OUTLET TO STACK	
SHELL GENERIC MATERIAL TYPE	CARBON STEEL	

ALABAMA ELECTRIC COOP: TOMBIGBEE 2 (CONT.)

LINER GENERIC MATERIAL TYPE	CXL 2000
** REAGENT PREPARATION EQUIPMENT	
FUNCTION	LIMESTONE GRINDING
DEVICE	BALL MILL
NUMBER	1
FULL LOAD DRY FEED CAPACITY - M.TONS/HR	9.1 (10 TPH)
PRODUCT QUALITY - % SOLIDS	35.0
** TANKS	
SERVICE	NUMBER
RECYCLE	1
LIMESTONE SLURRY	1
WASH WATER	1
** PUMPS	
SERVICE	NUMBER
ABSORBER RECIRCULATION	6
LIMESTONE MILL SLURRY RECIRCULATION	2
LIMESTONE SLURRY FEED	2
MIST ELIMINATOR WASH	3
WASTE SLURRY	2
SUPERNATE RETURN	1
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	THICKENER
NUMBER	1
*** SLUDGE	
** TREATMENT	
** DISPOSAL	
NATURE	FINAL
TYPE	LINED POND
LOCATION	ON SITE
SITE TRANSPORTATION METHOD	PUMPED
SITE SERVICE LIFE - YRS	20
** PROCESS CONTROL AND INSTRUMENTATION	
CHEMICAL PARAMETERS	PH, SOLIDS
PROCESS CONTROL MANNER	AUTOMATIC
** WATER BALANCE	
WATER LOOP TYPE	CLOSED
EVAPORATION WATER LOSS - LITER/S	8.2 (130 GPM)
POND SEEPAGE/RUNOFF WATER LOSS - LITERS/S	0
MAKEUP WATER ADDITION - LITERS/S	8.8 (140 GPM)
** CHEMICALS AND CONSUMPTION	
FUNCTION	ABSORBENT
NAME	LIMESTONE
CONSUMPTION	1.1 MOL/MOL SO2
** FGD SPARE CAPACITY INDICES	
ABSORBER - %	.0
** FGD SPARE COMPONENT INDICES	
ABSORBER	.0

ALABAMA ELECTRIC COOP: TOMBIGBEE 2 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
9/78	A		81.4		20.7						
	B		63.9		16.3						
	SYSTEM	81.4	72.7		18.5			720	183	133	

** PROBLEMS/SOLUTIONS/COMMENTS

INITIAL OPERATION OF THE FGD SYSTEM BEGAN ON SEPTEMBER 23. THE SCRUBBER MODULES WERE FORCED OUT OF SERVICE 34 HOURS WHEN, AFTER CLOSING THE SYSTEM ISOLATION DAMPERS THE UTILITY WAS UNABLE TO OPEN THEM AGAIN.

10/78	A		57.0		45.7						
	B		57.7		46.2						
	SYSTEM	66.3	57.4		46.0			744	596	342	

** PROBLEMS/SOLUTIONS/COMMENTS

BOILER SHUTDOWN.

ON OCTOBER 18 THE SUPERNATE LINE STARTED LEAKING. REPAIRS WERE MADE TO THE FIBERGLASS PIPING.

11/78	A		32.4		78.2						
	B		49.3		46.8						
	SYSTEM	88.9	65.9		62.5			720	684	450	

** PROBLEMS/SOLUTIONS/COMMENTS

IN LATE OCTOBER AND EARLY NOVEMBER A FIBERGLASS ELBOW IN THE WASTE SLURRY PIPE RUPTURED AND HAD TO BE REPLACED.

THE WASTE SLURRY AND SUPERNATE PIPING FAILURES WERE CORRECTED BY THE ARCHITECT-ENGINEER.

12/78	A		97.6		91.8						
	B		93.2		87.6						
	SYSTEM	97.8	95.4		89.7			744	700	668	

** PROBLEMS/SOLUTIONS/COMMENTS

DOWNTIME DURING DECEMBER WAS NOT ATTRIBUTABLE TO THE FGD SYSTEM.

1/79	A		75.3		75.1						
	B		65.8		65.6						
	SYSTEM	89.2	70.6		70.4			744	742	524	

** PROBLEMS/SOLUTIONS/COMMENTS

SOME PLUGGING WAS ENCOUNTERED IN THE MIST ELIMINATOR DUE TO AN ESP OUTAGE. THE SYSTEM WAS DOWN FOR 75 HOURS SO THAT THE MIST ELIMINATORS COULD BE CLEANED.

2/79	A		95.0		42.0						
	B		96.3		42.6						
	SYSTEM	98.4	95.7		42.3			672	297	284	
3/79	A		93.1		92.2						
	B		94.4		93.6						
	SYSTEM	94.5	93.8		92.9			744	737	691	
4/79	A		100.0		40.6						
	B		100.0		40.6						
	SYSTEM	100.0	100.0		40.6			720	292	292	

ALABAMA ELECTRIC COOP: TOMBIGBEE 2 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
			THE UTILITY HAS REPORTED THAT NO UNUSUAL PROBLEMS HAVE OCCURRED.								
5/79	A		48.8		47.6						
	B		58.9		57.4						
	SYSTEM	92.7	53.9		52.5			744	725	391	
6/79	A		1.8		1.0						
	B		95.4		51.8						
	SYSTEM	98.3	48.6		26.4			720	391	190	
	** PROBLEMS/SOLUTIONS/COMMENTS										
			THE UTILITY REPORTED THAT THE FGD SYSTEM OPERATED WELL DURING MAY AND JUNE WITH THE EXCEPTION OF DOWN TIME REQUIRED TO REPLACE THE MIST ELIMINATORS. THE MIST ELIMINATORS WERE DEFORMED DURING A TEMPERATURE EXCURSION.								
7/79	A		21.0		16.5						
	B		70.9		55.9						
	SYSTEM	93.0	46.0		36.2			744	587	270	
8/79	A		88.9		67.6						
	B		24.9		19.0						
	SYSTEM	99.2	56.9		43.3			744	566	322	
	** PROBLEMS/SOLUTIONS/COMMENTS										
			THE SCRUBBER WAS NOT OPERATED FOR ABOUT 6 HOURS DUE TO A NECESSARY ADJUSTMENT TO THE MODICON CONTROLLER.								
			THE SCRUBBER WAS BYPASSED FOR ABOUT 37 HOURS DUE TO AN ESP OUTAGE.								
9/79	A		83.3		68.3						
	B		21.8		17.9						
	SYSTEM	100.0	52.6		43.1			720	591	311	
	** PROBLEMS/SOLUTIONS/COMMENTS										
			THE UTILITY REPORTED THAT THE SYSTEM WAS AVAILABLE AT ALL TIMES DURING SEPTEMBER.								
10/79	SYSTEM	100.0			.0			744	0	0	
	** PROBLEMS/SOLUTIONS/COMMENTS										
			THE UNIT NO. 2 GENERATOR WAS DOWN THE ENTIRE MONTH OF OCTOBER.								
11/79	SYSTEM	100.0			.0			720	0	0	
	** PROBLEMS/SOLUTIONS/COMMENTS										
			THE GENERATOR REMAINED DOWN THROUGH NOVEMBER.								
12/79	A		22.6		4.0						
	B		6.0		1.1						
	SYSTEM	96.7	14.3		2.6			744	133	19	
	** PROBLEMS/SOLUTIONS/COMMENTS										
			THE OPERABILITY OF THE FGD UNIT WAS LOW DUE TO THE START-UP OF THE BOILER.								
			THE FGD SYSTEM WAS NOT AVAILABLE FOR 24 HOURS DUE TO A RUPTURED WASTE								

ALABAMA ELECTRIC COOP: TOMBIGBEE 2 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
			SLURRY LINE.								
1/80	A		35.8		21.1						
	B		56.7		33.5						
	SYSTEM	90.7	46.3		27.3			744	439	203	
	** PROBLEMS/SOLUTIONS/COMMENTS										
			DURING JANUARY UNIT 2 WAS UNAVAILABLE 69 HOURS DUE TO REPAIRS NEEDED ON AN ABRADED EXPANSION JOINT AND A RUPTURED WASTE SLURRY LINE.								
2/80	A		84.3		84.3						
	B		74.7		74.7						
	SYSTEM	99.3	79.5		79.5			696	696	554	
	** PROBLEMS/SOLUTIONS/COMMENTS										
			THE UNIT 2 FGD SYSTEM OPERATED ALL BUT 5 HOURS DURING FEBRUARY, IN WHICH TIME THE BOILER WAS BEING BROUGHT ON-LINE.								
3/80	A		81.6		75.0						
	B		79.4		73.0						
	SYSTEM	100.0	80.5		74.0			744	684	551	
	** PROBLEMS/SOLUTIONS/COMMENTS										
			NO FGD SYSTEM PROBLEMS WERE ENCOUNTERED DURING MARCH. THE FGD SYSTEM WAS AVAILABLE 100% OF THE TIME.								
4/80	A		61.3		61.3						
	B		86.6		86.5						
	SYSTEM	100.0	74.0		73.9			720	719	532	
	** PROBLEMS/SOLUTIONS/COMMENTS										
			THE UTILITY REPORTED THAT FOR THE MONTH OF APRIL THE SYSTEM WAS AVAILABLE 100% OF THE TIME.								
5/80	A		34.9		34.7						
	B		92.8		92.2						
	SYSTEM	100.0	63.9		63.5			744	739	472	
	** PROBLEMS/SOLUTIONS/COMMENTS										
			THE FGD SYSTEM WAS AVAILABLE 100% OF THE MONTH OF MAY.								
6/80	A	100.0	38.0	100.0	11.0						
	B	.0	.0	.0	.0						
	SYSTEM	50.0	44.0	50.0	5.5			720	90	40	7.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
			MODULE B WAS OUT OF SERVICE THE ENTIRE MONTH OF JUNE DUE TO A DAMAGED DAMPER DRIVE MOTOR.								
			MODULE A WAS AVAILABLE FOR OPERATION THE ENTIRE MONTH, BUT WAS NEEDED ONLY 79 HOURS.								
7/80	A	100.0	97.6	100.0	54.5						
	B	.0	.0	.0	.0						
	SYSTEM	50.0	48.8	50.0	27.3			744	415	203	26.7

ALABAMA ELECTRIC COOP: TOMBIGBEE 2 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE B-MODULE REMAINED OUT OF SERVICE THROUGH JULY DUE TO THE DAMAGED DAMPER DRIVE MOTOR.									
		THE A-MODULE OPERATED ON AN AS NEEDED BASIS WITH NO PROBLEMS.									
8/80	A	100.0	84.0	84.0	18.3						
	B	.0	.0	.0	.0						
	SYSTEM	50.0	42.0	42.0	9.2			744	162	68	14.9
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING AUGUST MODULE B REMAINED OUT OF SERVICE DUE TO DAMAGED DAMPER OPERATOR MOTORS.									
9/80	A	100.0	78.4	78.4	45.4						
	B	.0	.0	.0	.0						
	SYSTEM	50.0	39.2	39.2	22.7			720	417	164	42.8
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING SEPTEMBER MODULE B DID NOT OPERATE DUE TO A BURNED-UP DAMPER DRIVE MOTOR.									
10/80	A	100.0	.0		.0						
	B	.0	.0		.0						
	SYSTEM	50.0	.0		.0			744	0	0	.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING OCTOBER THE UNIT WAS OUT OF SERVICE FOR A TURBINE/GENERATOR INSPECTION.									
		REPAIR ON MODULE B DAMPER MOTOR DRIVE CONTINUED THROUGHOUT THE MONTH.									
11/80	A	100.0	74.3	74.3	15.5						
	B	.0	.0	.0	.0						
	SYSTEM	50.0	37.2	37.2	7.8			720	150	56	10.0
12/80	A	100.0	90.5	90.5	86.4						
	B	62.4	62.9	62.9	60.1						
	SYSTEM	81.2	76.7	76.7	73.2			744	710	545	45.9
	** PROBLEMS/SOLUTIONS/COMMENTS										
		MODULE B DAMPER REPAIRS WERE COMPLETED BY MID-DECEMBER. THE UTILITY REPORTED THAT NO OTHER MAJOR PROBLEMS WERE ENCOUNTERED DURING THE FOURTH QUARTER 1980.									

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	ALABAMA ELECTRIC COOP	
PLANT NAME	TOMBIGBEE	
UNIT NUMBER	3	
CITY	LEROY	
STATE	ALABAMA	
REGULATORY CLASSIFICATION	B	
PARTICULATE EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	516.	(1.200 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	*****	
GROSS UNIT GENERATING CAPACITY - MW	255	
NET UNIT GENERATING CAPACITY W/FGD - MW	235	
NET UNIT GENERATING CAPACITY WO/FGD - MW	243	
EQUIVALENT SCRUBBED CAPACITY - MW	179	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	RILEY STOKER	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	449.72	(953000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	143.9	(291 F)
STACK HEIGHT - M	122.	(400 FT)
STACK SHELL	******	
STACK TOP DIAMETER - M	*******	(***** FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	BITUMINOUS	
AVERAGE HEAT CONTENT - J/G	26749.	(11500 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		11000-12000
AVERAGE ASH CONTENT - %	14.00	
RANGE ASH CONTENT - %	10-16	
AVERAGE MOISTURE CONTENT - %	7.00	
RANGE MOISTURE CONTENT - %	3.0-20.0	
AVERAGE SULFUR CONTENT - %	1.15	
RANGE SULFUR CONTENT - %	0.8-1.5	
AVERAGE CHLORIDE CONTENT - %	.04	
RANGE CHLORIDE CONTENT - %	******	
*** PARTICLE CONTROL		
** ESP		
NUMBER	1	
TYPE	HOT SIDE	
SUPPLIER	RESEARCH-COTTRELL	
INLET FLUE GAS CAPACITY - CU.M/S	449.7	(953000 ACFM)
INLET FLUE GAS TEMPERATURE - C	143.9	(291 F)
PARTICLE REMOVAL EFFICENCY - %	99.3	
** PARTICLE SCRUBBER		
GENERIC TYPE	NONE	
SPECIFIC TYPE	N/A	
*** FGD SYSTEM		
** GENERAL DATA		
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT	
SO2 REMOVAL MODE	WET SCRUBBING	
PROCESS TYPE	LIMESTONE	
PROCESS ADDITIVES	NONE	
SYSTEM SUPPLIER	PEABODY PROCESS SYSTEMS	
A-E FIRM	BURNS & MCDONNELL	
DEVELOPMENT LEVEL	FULL SCALE	
NEW/RETROFIT	NEW	
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.30	
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	59.50	
CURRENT STATUS	1	
COMMERCIAL START-UP	6/79	
INITIAL START-UP	6/79	

ALABAMA ELECTRIC COOP: TOMBIGBEE 3 (CONT.)

CONTRACT AWARDED	8/75	
** DESIGN AND OPERATING PARAMETERS		
** ABSORBER		
NUMBER	2	
GENERIC TYPE	SPRAY TOWER	
SPECIFIC TYPE	OPEN COUNTERCURRENT SPRAY	
SUPPLIER	PEABODY PROCESS SYSTEMS	
DIMENSIONS - FT	24 DIA X 90 HIGH	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	AISI 1110	
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A	
LINER GENERIC MATERIAL	ORGANIC	
LINER SPECIFIC MATERIAL	NATURAL RUBBER	
LINER MATERIAL TRADE NAME/COMMON TYPE	BLACK NATURAL RUBBER	
GAS CONTACTING DEVICE TYPE	NONE	
NUMBER OF CONTACTING ZONES	6	
LIQUID RECIRCULATION RATE - LITER/S	1259.	(19980 GPM)
L/G RATIO - L/CU.M	9.4	(70.0 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	1.0	(4.0 IN-H2O)
SUPERFICAL GAS VELOCITY - M/SEC	3.0	(10.0 FT/S)
INLET GAS FLOW - CU. M/S	127.41	(270000 ACFM)
INLET GAS TEMPERATURE - C	54.4	(130 F)
SO2 REMOVAL EFFICIENCY - %	85.0	
** MIST ELIMINATOR		
PRE-MIST ELIMINATOR/MIST ELIMINATOR	MIST ELIMINATOR	
NUMBER PER SYSTEM	2	
GENERIC TYPE	IMPINGEMENT	
SPECIFIC TYPE	BAFFLE	
TRADE NAME/COMMON TYPE	CHEVRON VANE	
CONFIGURATION	HORIZONTAL	
NUMBER OF STAGES	1	
NUMBER OF PASSES PER STAGE	1	
PRESSURE DROP - KPA	.1	(.5 IN-H2O)
SUPERFICAL GAS VELOCITY - M/S	3.0	(10.0 FT/S)
WASH WATER SOURCE	COOLING TOWER BLOWDOWN	
** REHEATER		
NUMBER	1	
GENERIC TYPE	BYPASS	
SPECIFIC TYPE	COLD SIDE	
TRADE NAME/COMMON TYPE	N/A	
PERCENT GAS BYPASSED - AVG	30.0	
TEMPERATURE INCREASE - C	8.9	(48 F)
INLET FLUE GAS FLOW RATE - CU. M/S	129.30	(274000 ACFM)
INLET FLUE GAS TEMPERATURE - C	143.9	(291 F)
NUMBER OF TUBES PER BUNDLE	0	
CONSTRUCTION MATERIAL GENERIC TYPE	N/A	
** FANS		
NUMBER	2	
DESIGN	CENTRIFUGAL	
SUPPLIER	ZURN AIR SYSTEMS	
FUNCTION	UNIT	
APPLICATION	FORCED DRAFT	
SERVICE	DRY	
FLUE GAS FLOW RATE - CU.M/S	225.10	(477000 ACFM)
FLUE GAS TEMPERATURE - C	143.9	(291 F)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	
** DUCTWORK		
LOCATION	SCRUBBER INLET	
SHELL GENERIC MATERIAL TYPE	CARBON STEEL	
LINER GENERIC MATERIAL TYPE	NONE	
** DUCTWORK		
LOCATION	SCRUBBER OUTLET TO STACK	
SHELL GENERIC MATERIAL TYPE	CARBON STEEL	
LINER GENERIC MATERIAL TYPE	CXL 2000	

ALABAMA ELECTRIC COOP: TOMBIGBEE 3 (CONT.)

** REAGENT PREPARATION EQUIPMENT

FUNCTION	LIMESTONE GRINDING	
DEVICE	BALL MILL	
NUMBER	1	
FULL LOAD DRY FEED CAPACITY - M.TONS/HR	9.1	(10 TPH)
PRODUCT QUALITY - % SOLIDS	35.0	

** TANKS

SERVICE	NUMBER
RECYCLE	1
LIMESTONE SLURRY	1
WASH WATER	1

** PUMPS

SERVICE	NUMBER
ABSORBER RECIRCULATION	6
MILL RECIRCULATION	2
SLURRY FEED	2
MIST ELIMINATOR WASH	3
WASTE SLURRY	2
SUPERNATE RETURN	1

** SOLIDS CONCENTRATING/DEWATERING

DEVICE	THICKENER
NUMBER	1

*** SLUDGE

** TREATMENT

** DISPOSAL

NATURE	FINAL
TYPE	LINED POND
LOCATION	ON SITE
SITE TRANSPORTATION METHOD	PUMPED
SITE SERVICE LIFE - YRS	20

** PROCESS CONTROL AND INSTRUMENTATION

CHEMICAL PARAMETERS	PH, SOLIDS
PROCESS CONTROL MANNER	AUTOMATIC

** WATER BALANCE

WATER LOOP TYPE	CLOSED	
EVAPORATION WATER LOSS - LITER/S	8.2	(130 GPM)
POND SEEPAGE/RUNOFF WATER LOSS - LITERS/S	0	
MAKEUP WATER ADDITION - LITERS/S	8.8	(140 GPM)

** CHEMICALS AND CONSUMPTION

FUNCTION	ABSORBENT
NAME	LIMESTONE
CONSUMPTION	1.1 MOL/MOL SO2

** FGD SPARE CAPACITY INDICES

ABSORBER - %	.0

** FGD SPARE COMPONENT INDICES

ABSORBER	.0

ALABAMA ELECTRIC COOP: TOMBIGBEE 3 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
7/79	A		23.7		9.4						
	B		27.8		11.0						
	SYSTEM	72.7	25.8		10.2			744	295	76	

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM IS CURRENTLY UNDERGOING SHAKEDOWN/DEBUGGING OPERATIONS.

8/79	A		59.4		39.1						
	B		44.5		29.3						
	SYSTEM	99.7	52.0		34.2			744	490	255	

** PROBLEMS/SOLUTIONS/COMMENTS

AN ADJUSTMENT TO THE MODICON CONTROLLER CAUSED A SCRUBBER OUTAGE OF ABOUT TWO HOURS.

THE SCRUBBER WAS DOWN DURING AN ESP OUTAGE FOR APPROXIMATELY 34 HOURS.

9/79	A		73.0		13.9						
	B		11.0		2.1						
	SYSTEM	100.0	42.0		8.0			720	137	58	

** PROBLEMS/SOLUTIONS/COMMENTS

CONTINUING GENERATOR PROBLEMS RESULTED IN LOW FGD SYSTEM UTILIZATION DURING SEPTEMBER.

10/79	A		82.7		82.7						
	B		90.9		90.9						
	SYSTEM	99.5	86.8		86.8			744	744	646	

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS SHUT DOWN FOR 37 HOURS FOR BOILER START-UPS AND ESP TESTS.

PROBLEMS WITH THE LIMESTONE BALL MILL LUBRICATION SYSTEM, WHICH CAUSED A SHORTAGE OF REAGENT SLURRY, KEPT THE FGD SYSTEM OFF LINE FOR 4 HOURS.

11/79	A		78.6		78.6						
	B		89.3		89.3						
	SYSTEM	96.7	84.0		84.0			720	720	605	

** PROBLEMS/SOLUTIONS/COMMENTS

DURING NOVEMBER THE FGD UNIT WAS DOWN 23 HOURS BECAUSE THE ESP FLYASH HANDLING SYSTEM JAMMED AND THE ESP WAS SHUT DOWN.

THE WASTE SLURRY LINE RUPTURED, FORCING THE UNIT OUT OF SERVICE FOR 24 HOURS.

12/79	A		78.4		68.7						
	B		87.6		76.8						
	SYSTEM	100.0	83.0		72.8			744	652	541	

** PROBLEMS/SOLUTIONS/COMMENTS

NO FGD SYSTEM PROBLEMS WERE ENCOUNTERED DURING DECEMBER. THE FGD SYSTEM WAS AVAILABLE FOR THE ENTIRE MONTH.

1/80	A		69.2		30.5						

ALABAMA ELECTRIC COOP: TOMBIGBEE 3 (CONT.)

PERIOD	MODULE	PERFORMANCE DATA AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	B		45.4		20.0						
	SYSTEM	100.0	57.3		25.3			744	328	188	

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JANUARY UNIT 3 WAS AVAILABLE THE ENTIRE MONTH.

2/80	A		33.3		1.2						
	B		100.0		3.5						
	SYSTEM	100.0	66.7		2.4			696	24	16	

** PROBLEMS/SOLUTIONS/COMMENTS

DURING FEBRUARY THE UNIT 3 BOILER AND FGD SYSTEM OPERATED ONLY 24 HOURS. THE FGD SYSTEM WAS AVAILABLE THE ENTIRE MONTH.

3/80	SYSTEM	100.0			.0			744	0	0	.0

** PROBLEMS/SOLUTIONS/COMMENTS

DURING MARCH THE UNIT 3 GENERATOR WAS KEPT OUT OF SERVICE. THE FGD SYSTEM WAS AVAILABLE THE ENTIRE MONTH.

4/80	SYSTEM				.0			720	0	0	.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT DURING APRIL THE BOILER DID NOT OPERATE.

5/80	A		8.3		.7						
	B		.0		.0						
	SYSTEM	95.8	4.2		.3			744	60	5	

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS AVAILABLE 713 HOURS DURING MAY; HOWEVER, THE BOILER ONLY OPERATED 60 HOURS DUE TO BOILER RELATED PROBLEMS.

THE B MODULE WAS OUT FOR 31 HOURS WHEN THE INLET DAMPER SWITCH FAILED CAUSING THE DRIVE MOTOR TO BURN OUT.

6/80	A	100.0	59.1	100.0	52.8						
	B	100.0	58.6	100.0	52.4						
	SYSTEM	100.0	58.9	100.0	52.6			720	643	379	52.0

** PROBLEMS/SOLUTIONS/COMMENTS

NO FGD SYSTEM-RELATED PROBLEMS WERE ENCOUNTERED DURING JUNE.

7/80	A	100.0	45.5	100.0	39.7						
	B	100.0	90.0	100.0	78.6						
	SYSTEM	100.0	67.8	100.0	59.2			744	650	440	47.8

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS AVAILABLE FOR OPERATION THE ENTIRE MONTH OF JULY. THE MODULES ARE UTILIZED ON AN AS NEEDED BASIS.

8/80	A	100.0	95.7	100.0	75.8						
	B	100.0	91.6	100.0	72.6						
	SYSTEM	100.0	93.7	100.0	74.2			744	590	552	63.4

ALABAMA ELECTRIC COOP: TOMBIGBEE 3 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
		NO FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE MONTH OF AUGUST.									
9/80	A	90.6	91.4	91.4	46.8						
	B	90.6	73.7	73.7	37.8						
	SYSTEM	90.6	82.4	82.4	42.2			720	369	304	32.4
10/80	A	97.4	68.4	68.4	68.4						
	B	97.4	60.9	60.9	60.9						
	SYSTEM	97.4	63.4	63.4	63.4			744	744	472	69.4
11/80	A	99.3	83.6	83.6	83.6						
	B	99.3	87.9	87.9	87.9						
	SYSTEM	99.3	85.7	85.7	85.7			720	720	617	55.4
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING SEPTEMBER THROUGH NOVEMBER PROBLEMS WERE ENCOUNTERED WITH THE PROGRAMABLE CONTROLLER. THE UTILITY REPLACED THE CENTRAL PROCESSING UNIT IN OCTOBER AND IN NOVEMBER A NEW PROGRAM WAS RUN. THE UTILITY REPORTED THAT NO OTHER MAJOR FGD-RELATED PROBLEMS WERE EXPERIENCED DURING THIS TIME.									
12/80	A	100.0	88.8	88.8	88.8						
	B	100.0	66.0	66.0	66.0						
	SYSTEM	100.0	77.4	77.4	77.4			744	744	576	41.2
	** PROBLEMS/SOLUTIONS/COMMENTS										
		NO PROBLEMS WERE ENCOUNTERED WITH THE UNIT OR THE FGD SYSTEM DURING DECEMBER.									

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	ARIZONA ELECTRIC POWER COOP	
PLANT NAME	APACHE	
UNIT NUMBER	2	
CITY	COCHISE	
STATE	ARIZONA	
REGULATORY CLASSIFICATION	D	
PARTICULATE EMISSION LIMITATION - NG/J	43.	(.100 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	344.	(.800 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	530	
GROSS UNIT GENERATING CAPACITY - MW	195	
NET UNIT GENERATING CAPACITY W/FGD - MW	175	
NET UNIT GENERATING CAPACITY WO/FGD - MW	183	
EQUIVALENT SCRUBBED CAPACITY - MW	98	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	RILEY STOKER	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	346.85	(735000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	118.3	(245 F)
STACK HEIGHT - M	122.	(400 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	4.9	(16.2 FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	BITUMINOUS	
AVERAGE HEAT CONTENT - J/G	23260.	(10000 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		10000-11000
AVERAGE ASH CONTENT - %	17.00	
RANGE ASH CONTENT - %	16.8-17.2	
AVERAGE MOISTURE CONTENT - %	12.00	
RANGE MOISTURE CONTENT - %	9.0-15.0	
AVERAGE SULFUR CONTENT - %	.50	
RANGE SULFUR CONTENT - %	.4-.6	
AVERAGE CHLORIDE CONTENT - %	.00	
RANGE CHLORIDE CONTENT - %	.00-.03	
*** PARTICLE CONTROL		
** ESP		
NUMBER	1	
TYPE	HOT SIDE	
SUPPLIER	AIR CORRECTION DIVISION, UOP	
INLET FLUE GAS CAPACITY - CU.M/S	94.4	(200000 ACFM)
INLET FLUE GAS TEMPERATURE - C	371.1	(700 F)
PRESSURE DROP - KPA	.0	(0. IN-H2O)
PARTICLE REMOVAL EFFICENCY - %	99.6	
** PARTICLE SCRUBBER		
GENERIC TYPE	NONE	
SPECIFIC TYPE	N/A	
*** FGD SYSTEM		
** GENERAL DATA		
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT	
SO2 REMOVAL MODE	WET SCRUBBING	
PROCESS TYPE	LIMESTONE	
PROCESS ADDITIVES	NONE	
SYSTEM SUPPLIER	RESEARCH-COTTRELL	
A-E FIRM	BURNS & MCDONNELL	
DEVELOPMENT LEVEL	FULL SCALE	
NEW/RETROFIT	NEW	
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.50	
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	42.50	
CURRENT STATUS	1	
COMMERCIAL START-UP	1/79	

ARIZONA ELECTRIC POWER COOP: APACHE 2 (CONT.)

INITIAL START-UP	8/78	
CONTRACT AWARDED	7/74	

** DESIGN AND OPERATING PARAMETERS

** ABSORBER

NUMBER	2	
NUMBER OF SPARES	1	
GENERIC TYPE	COMBINATION	
SPECIFIC TYPE	SPRAY/PACKED	
SUPPLIER	RESEARCH-COTTRELL	
DIMENSIONS - FT	30 DIA. X 80 HT.	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	AISI 1110	
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A	
LINER GENERIC MATERIAL	ORGANIC	
LINER MATERIAL TRADE NAME/COMMON TYPE	GLASS-FLEX	
GAS CONTACTING DEVICE TYPE	MUNTERS PACKING	
NUMBER OF CONTACTING ZONES	1	
DISTANCE BETWEEN GAS CONTACTING ZONES - CM	121.9	(48.0IN)
LIQUID RECIRCULATION RATE - LITER/S	1260.	(20000 GPM)
L/G RATIO - L/CU.M	2.8	(20.6 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	1.5	(6.0 IN-H2O)
INLET GAS FLOW - CU. M/S	188.76	(400000 ACFM)
INLET GAS TEMPERATURE - C	132.2	(270 F)
SO2 REMOVAL EFFICIENCY - %	97.0	

** MIST ELIMINATOR

PRE-MIST ELIMINATOR/MIST ELIMINATOR	MIST ELIMINATOR	
NUMBER PER SYSTEM	4	
GENERIC TYPE	IMPINGEMENT	
SPECIFIC TYPE	BAFFLE	
TRADE NAME/COMMON TYPE	CHEVRON VANE	
CONFIGURATION	HORIZONTAL	
NUMBER OF STAGES	2	
NUMBER OF PASSES PER STAGE	3	
DISTANCE BETWEEN VANES - CM	10.2	(4.00 IN)
VANE ANGLES - DEGREES	45	
CONSTRUCTION MATERIAL GENERIC TYPE	POLYPROPYLENE	
WASH WATER SOURCE	FRESH WATER	

** REHEATER

NUMBER	0	
GENERIC TYPE	NONE	
SPECIFIC TYPE	N/A	
TRADE NAME/COMMON TYPE	N/A	

** FANS

NUMBER	2	
NUMBER OF SPARES	0	
DESIGN	CENTRIFUGAL	
SUPPLIER	ALLIS CHALMERS	
FUNCTION	UNIT	
APPLICATION	FORCED DRAFT	
SERVICE	DRY	
FLUE GAS FLOW RATE - CU.M/S	94.38	(200000 ACFM)
FLUE GAS TEMPERATURE - C	132.2	(270 F)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	

** DUCTWORK

LOCATION	SCRUBBER INLET	
DIMENSIONS	12 X 16	
SHELL GENERIC MATERIAL TYPE	CARBON STEEL	
LINER GENERIC MATERIAL TYPE	NONE	

** DUCTWORK

LOCATION	SCRUBBER OUTLET	
DIMENSIONS	12 X 16	
SHELL GENERIC MATERIAL TYPE	CARBON STEEL	
LINER GENERIC MATERIAL TYPE	CXL 100	

ARIZONA ELECTRIC POWER COOP: APACHE 2 (CONT.)

** REAGENT PREPARATION EQUIPMENT

FUNCTION	LIMESTONE GRINDING	
DEVICE	BALL MILL	
MANUFACTURER	KENNEDY VAN SAUN	
NUMBER	1	
FULL LOAD DRY FEED CAPACITY - M.TONS/HR	4.5	(5 TPH)
PRODUCT QUALITY - % SOLIDS	48.0	

** TANKS

SERVICE	NUMBER
ABSORBER FEED	1

** PUMPS

SERVICE	NUMBER
PACKING	3
QUENCHER	4
SLURRY SUMP	2

*** SLUDGE

** DISPOSAL

NATURE	FINAL	
TYPE	POND	
LOCATION	ON SITE	
SITE TRANSPORTATION METHOD	PUMPED	
SITE DIMENSIONS	85 ACRES X 18 FT DEEP	
SITE CAPACITY - CU.M	484308	(396.0 ACRE-FT)
SITE SERVICE LIFE - YRS	30	

** WATER BALANCE

WATER LOOP TYPE	OPEN	
MAKEUP WATER ADDITION - LITERS/S	115.9	(1840 GPM)

** FGD SPARE CAPACITY INDICES

ABSORBER - %	100.0

** FGD SPARE COMPONENT INDICES

ABSORBER	1.0

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
8/78	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

INITIAL OPERATIONS BEGAN IN AUGUST WITH THE BOILER AND SCRUBBER SYSTEM FOR TESTING PURPOSES.

9/78	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

SCRUBBER AND BOILER TESTING CONTINUED THROUGH SEPTEMBER. FINAL FACILITY CONSTRUCTION SHOULD BE COMPLETE BY OCTOBER.

10/78	SYSTEM							744	303		59.5

ARIZONA ELECTRIC POWER COOP: APACHE 2 (CONT.)

PERIOD	MODULE	PERFORMANCE DATA: AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UNIT WAS SHUTDOWN IN EARLY OCTOBER TO MAKE ADDITIONAL BOILER MODIFICATIONS. NO PROBLEMS WERE REPORTED FOR THE FGD SYSTEM. COMPLIANCE TESTING IS SCHEDULED FOR EARLY NOVEMBER. THE UTILITY HAS DECIDED THAT IN APPROXIMATELY A YEAR THE SCRUBBER INLET DUCTWORK WILL BE CHANGED FROM CARBON STEEL TO STAINLESS STEEL.									
11/78	A		24.8		16.8						
	B		43.7		29.6						
	SYSTEM		68.5		46.4			720	488	334	82.8
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE SO2 STACK MONITORS HAVE NEVER BEEN OPERABLE. THE MONITORS HAVE BEEN SENT BACK TO THE FACTORY AND ARE NOT EXPECTED BACK ON SITE UNTIL LATE DECEMBER.									
		THE LIMESTONE CRUSHER HAS BEEN UNABLE TO OPERATE AT DESIGN CAPACITY.									
		A COMPLIANCE TEST WAS COMPLETED BUT THE RESULTS ARE NOT YET AVAILABLE. THE ACCEPTANCE IS SCHEDULED FOR THE BEGINNING OF 1979.									
12/78	SYSTEM		.0		.0			744	512	0	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		RESULTS OF THE RECENT COMPLIANCE TEST INDICATED THAT SO2 EMISSIONS WERE BETWEEN 1.2 LB/MM BTU, THE FEDERAL APPLICABLE STANDARD; AND 0.8 LB/MM BTU, THE STATE STANDARD, WITHOUT THE FGD SYSTEM. THE UTILITY IS CURRENTLY BURNING LOW SULFUR COAL (0.6% S). IT IS BELIEVED THAT THE STATE STANDARD COULD BE MET WITHOUT FGD SYSTEM OPERATION WHEN THE FURNACE IS "FINE TUNED".									
		A 30 HOUR OUTAGE OCCURRED DUE TO A RUPTURE IN THE REAGENT FEED LINE.									
1/79	SYSTEM		.0		.0			744	662	0	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		SHAKEDOWN/DEBUGGING OPERATION CONTINUED THROUGH JANUARY.									
		COMMERCIAL OPERATIONS BEGAN ON JANUARY 15.									
2/79	SYSTEM		.0		.0			672	504	0	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE FGD SYSTEM WAS NOT IN SERVICE DURING DECEMBER, JANUARY, OR FEBRUARY DUE TO VARIOUS SHAKEDOWN/DEBUGGING PROBLEMS ESPECIALLY IN MAINTAINING RECYCLE PUMP OPERATION.									
3/79	SYSTEM		.0		.0			744	372	0	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		A BOILER EXPLOSION AT THE BURNER FACE CAUSED THE UNIT TO BE DOWN FROM THE LAST WEEK IN FEBRUARY THROUGH THE MIDDLE OF MARCH.									
4/79	SYSTEM							720	720		

ARIZONA ELECTRIC POWER COOP: APACHE 2 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
		COMPLIANCE TESTS WERE RUN ON THIS UNIT LAST NOVEMBER AND THE UNIT WAS DECLARED COMMERCIAL IN FEBRUARY. THE FGD SYSTEM OPERATES ONLY ABOUT 50 % OF THE BOILER HOURS BECAUSE THE UNIT OPERATES AT SUCH A LOW RATING 50% OF THE TIME THAT THE FGD SYSTEM IS NOT NEEDED.									
5/79	SYSTEM							744			
6/79	SYSTEM							720			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		IN GENERAL THE FGD SYSTEM AND BOILER OPERATED WELL THROUGH MAY AND JUNE.									
		THE FRP REAGENT FEED PIPING HAS BEEN A CONTINUAL PROBLEM AREA. THE FRP HAS BEEN RUPTURING PARTICULARLY AT PIPING CONNECTIONS. THE UTILITY IS IN THE PROCESS OF REPLACING THE FRP PIPING WITH CARBON STEEL PIPING.									
		THE BALL MILL APPEARS TO HAVE BEEN UNDERDESIGNED. THE MILL PRODUCES 4 TONS/HOUR OF GROUND LIMESTONE AT BEST ALTHOUGH IT WAS RATED AT 5 TON/HOUR CAPACITY.									
7/79	SYSTEM							744			
8/79	SYSTEM							744			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UTILITY REPORTED HAVING EXTENSIVE PROBLEMS WITH THE REAGENT HANDLING SYSTEM PARTICULARLY WITH RESPECT TO FEED LINE FAILURES, PIPING PLUGGING AND GRINDING OPERATIONS. THE REAGENT HANDLING SYSTEM ACCOMODATES BOTH UNITS 2 AND 3.									
9/79	SYSTEM							720			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING THE THIRD QUARTER OF 1979 THE BOILER AND FGD SYSTEM ONLY OPERATED ABOUT 25% OF THE TIME BECAUSE OF CONTINUING PROBLEMS WITH THE REAGENT FEED LINE. THE FRP SECTION FROM THE GRINDER TO THE SCRUBBERS FAILED. THE LINE WAS REPAIRED AT THE END OF SEPTEMBER.									
		ON NOVEMBER 3 THE UNIT WILL BE SHUT DOWN FOR A FOUR TO SIX WEEK SCHEDULED OUTAGE.									
10/79	SYSTEM	.0	.0	.0				744		0	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UTILITY IS IN THE PROCESS OF REPLACING THE REAGENT HANDLING SYSTEM; THEREFORE, THE FGD SYSTEM DID NOT OPERATE DURING OCTOBER.									
11/79	SYSTEM	100.0	100.0	100.0	6.3			720	41	41	2.9
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UNIT WAS OUT OF SERVICE FOR MOST OF NOVEMBER FOR AN ANNUAL INSPECTION.									
12/79	SYSTEM	100.0	.0	.0	.0			744	130	0	5.7

ARIZONA ELECTRIC POWER COOP: APACHE 2 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
		PERFORMANCE DATA									
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE EXTENSIVE PROBLEMS ENCOUNTERED EARLIER WITH THE REAGENT HANDLING SYSTEM HAVE BEEN RESOLVED. THE SYSTEM REPLACEMENT WAS COMPLETED IN DECEMBER.									
		DURING DECEMBER THE BOILER OPERATED 130 HOURS FOR WHICH THE SCRUBBER WAS AVAILABLE 100% OF THE TIME.									
		THE BOILER ENCOUNTERED DAMPER PROBLLMS THAT ACCOUNTED FOR MOST OF THE DECEMBER DOWN TIME.									
1/80	SYSTEM	91.0	58.3	88.8	57.3	97.40		744	731	426	56.1
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING JANUARY SOME OUTAGE TIME WAS DUE TO A PUMP MALFUNCTION.									
		OUTAGE TIME WAS ALSO CAUSED BY A BROKEN FEED BELT TO THE LIMESTONE BALL MILL.									
2/80	SYSTEM	92.8	96.7	92.8	92.8	97.40		696	668	646	87.4
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING FEBRUARY OUTAGE TIME RESULTED FROM AN ESP FAILURE.									
		FORCED OUTAGE TIME WAS ALSO CAUSED BY A PUMP MALFUNCTION.									
3/80	SYSTEM	99.1	99.1	99.0	99.1	97.40		744	744	738	74.1
	** PROBLEMS/SOLUTIONS/COMMENTS										
		SOME OF THE OUTAGE TIME DURING MARCH OCCURRED BECAUSE OF PUMP FAILURES.									
		OUTAGE TIME RESULTED FROM STICKING VALVES AND LIMESTONE FEED-BELT PROBLEMS.									
4/80	SYSTEM	67.2	65.2	65.2	61.4			720	678	442	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING APRIL THE FGD SYSTEM WAS FORCED DOWN DUE TO PUMP FAILURES AND A RUPTURE IN THE SLURRY RECIRCULATION LINE.									
5/80	SYSTEM	90.5	90.5	90.5	90.5			744	744	673	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING MAY THE UNIT WAS FORCED OFF LINE WHEN THE LIMESTONE CRUSHER MALFUNCTIONED.									
		THE UNIT WAS ALSO FORCED OUT DUE TO PUMP AND VALVE FAILURES.									
6/80	SYSTEM							720			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UTILITY REPORTED THAT THE DATA FOR THE MONTH OF JUNE HAS BEEN MISPLACED.									
7/80	202	100.0	.0		.0						
	203	85.0	85.7	85.7	85.0						
	SYSTEM	100.0	85.7	85.7	85.0			744	738	633	77.8

ARIZONA ELECTRIC POWER COOP: APACHE 2 (CONT.)

PERIOD	MODULE	PERFORMANCE DATA: AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
8/80	202	.0	.0		.0						
	203	96.8	66.0	95.2	63.3						
	SYSTEM	96.8	66.0	95.2	63.3			744	714	471	61.0

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE 202 WAS AVAILABLE THE ENTIRE MONTH, BUT WAS NOT OPERATED.

THE FGD SYSTEM WAS DOWN IN JULY BECAUSE OF A CIRCUIT BREAKER MALFUNCTION.

FAILURE OF BOTH THE BYPASS DAMPER AND THE PACKING PUMP ALSO CAUSED OUTAGE TIME DURING THE MONTH.

8/80	202	.0	.0		.0						
	203	96.8	66.0	95.2	63.3						
	SYSTEM	96.8	66.0	95.2	63.3			744	714	471	61.0

** PROBLEMS/SOLUTIONS/COMMENTS

TOWER 202 WAS UNAVAILABLE IN AUGUST BECAUSE OF THE LINER BEING REPLACED.

A SAMPLE LINE FAILURE CAUSED TOWER 203 TO GO DOWN FOR 24 HOURS.

THE OPERATION OF THE FGD SYSTEM WAS REDUCED BECAUSE OF LOW LOAD CAPACITY.

9/80	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

NO INFORMATION WAS AVAILABLE FOR SEPTEMBER 1980.

10/80	202	.0	.0		.0						
	203	92.6	87.7	98.6	82.4						
	SYSTEM	92.7	87.7	98.6	82.4	97.40		744	699	613	62.4

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE 202 WAS NOT OPERATED DURING THE MONTH OF OCTOBER DUE TO A SCHEDULED ANNUAL OVERHAUL.

DURING OCTOBER FORCED OUTAGES OCCURRED AS A RESULT OF PH INSTABILITY IN THE SYSTEM.

THE LOSS OF OPERATION TIME ON MODULE 203 WAS PRIMARILY DUE TO REDUCED LOAD CAPACITY DURING OCTOBER.

11/80	202	20.0	22.4	40.0	6.7						
	203	.0	.0		.0						
	SYSTEM	20.0	22.4	40.0	6.7			720	214	48	25.1

** PROBLEMS/SOLUTIONS/COMMENTS

DURING NOVEMBER THE BOILER WAS NOT IN SERVICE THE FIRST 21 DAYS. THE BOILER WAS OPERATED AT REDUCED LOAD FOR THE FIRST 96 HOURS AFTER STARTUP UNTIL THE FGD SYSTEM WAS ON-LINE.

FAILURE OF THE LIMESTONE BALLMILL ACCOUNTED FOR 72 HOURS OF OUTAGE TIME.

12/80	202	100.0	100.0	100.0	99.9						
	203	.0	.0		.0						
	SYSTEM	100.0	100.0	100.0	99.9			744	743	743	87.2

** PROBLEMS/SOLUTIONS/COMMENTS

NO FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE MONTH OF DECEMBER.

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	ARIZONA ELECTRIC POWER COOP	
PLANT NAME	APACHE	
UNIT NUMBER	3	
CITY	COCHISE	
STATE	ARIZONA	
REGULATORY CLASSIFICATION	D	
PARTICULATE EMISSION LIMITATION - NG/J	43.	(.100 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	344.	(.800 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	530	
GROSS UNIT GENERATING CAPACITY - MW	195	
NET UNIT GENERATING CAPACITY W/FGD - MW	175	
NET UNIT GENERATING CAPACITY WO/FGD - MW	183	
EQUIVALENT SCRUBBED CAPACITY - MW	98	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	RILEY STOKER	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	346.85	(735000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	118.3	(245 F)
STACK HEIGHT - M	122.	(400 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	4.9	(16.2 FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	BITUMINOUS	
AVERAGE HEAT CONTENT - J/G	23260.	(10000 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		10000-11000
AVERAGE ASH CONTENT - %	17.00	
RANGE ASH CONTENT - %	16.8-17.2	
AVERAGE MOISTURE CONTENT - %	12.00	
RANGE MOISTURE CONTENT - %	9.0-15.0	
AVERAGE SULFUR CONTENT - %	.50	
RANGE SULFUR CONTENT - %	.4-.6	
AVERAGE CHLORIDE CONTENT - %	.00	
RANGE CHLORIDE CONTENT - %	.00-.03	
*** PARTICLE CONTROL		
** ESP		
NUMBER	1	
TYPE	HOT SIDE	
SUPPLIER	AIR CORRECTION DIVISION, UOP	
INLET FLUE GAS CAPACITY - CU.M/S	94.4	(200000 ACFM)
INLET FLUE GAS TEMPERATURE - C	371.1	(700 F)
PRESSURE DROP - KPA	.0	(0. IN-H2O)
PARTICLE REMOVAL EFFICENCY - %	99.6	
** PARTICLE SCRUBBER		
GENERIC TYPE	NONE	
SPECIFIC TYPE	N/A	
*** FGD SYSTEM		
** GENERAL DATA		
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT	
SO2 REMOVAL MODE	WET SCRUBBING	
PROCESS TYPE	LIMESTONE	
PROCESS ADDITIVES	NONE	
SYSTEM SUPPLIER	RESEARCH-COTTRELL	
A-E FIRM	BURNS & MCDONNELL	
DEVELOPMENT LEVEL	FULL SCALE	
NEW/RETROFIT	NEW	
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.50	
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	42.50	
CURRENT STATUS	1	
COMMERCIAL START-UP	4/79	

ARIZONA ELECTRIC POWER COOP: APACHE 3 (CONT.)

INITIAL START-UP	6/79	
CONTRACT AWARDED	8/74	

** DESIGN AND OPERATING PARAMETERS

** ABSORBER

NUMBER	2	
NUMBER OF SPARES	1	
GENERIC TYPE	COMBINATION	
SPECIFIC TYPE	SPRAY/PACKED	
SUPPLIER	RESEARCH-COTTRELL	
DIMENSIONS - FT	30 DIA. X 80 HT.	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	AISI 1110	
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A	
LINER GENERIC MATERIAL	ORGANIC	
LINER MATERIAL TRADE NAME/COMMON TYPE	GLASS-FLEX	
GAS CONTACTING DEVICE TYPE	MUNTERS PACKING	
NUMBER OF CONTACTING ZONES	1	
DISTANCE BETWEEN GAS CONTACTING ZONES - CM	121.9	(48.0IN)
LIQUID RECIRCULATION RATE - LITER/S	1260.	(20000 GPM)
L/G RATIO - L/CU.M	2.8	(20.6 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	1.5	(6.0 IN-H2O)
INLET GAS FLOW - CU. M/S	188.76	(400000 ACFM)
INLET GAS TEMPERATURE - C	132.2	(270 F)
SO2 REMOVAL EFFICIENCY - %	97.0	

** MIST ELIMINATOR

PRE-MIST ELIMINATOR/MIST ELIMINATOR	MIST ELIMINATOR	
NUMBER PER SYSTEM	4	
GENERIC TYPE	IMPINGEMENT	
SPECIFIC TYPE	BAFFLE	
TRADE NAME/COMMON TYPE	CHEVRON VANE	
CONFIGURATION	HORIZONTAL	
NUMBER OF STAGES	2	
NUMBER OF PASSES PER STAGE	3	
DISTANCE BETWEEN VANES - CM	10.2	(4.00 IN)
VANE ANGLES - DEGREES	45	
CONSTRUCTION MATERIAL GENERIC TYPE	POLYPROPYLENE	
WASH WATER SOURCE	FRESH WATER	

** REHEATER

NUMBER	0	
GENERIC TYPE	NONE	
SPECIFIC TYPE	N/A	
TRADE NAME/COMMON TYPE	N/A	

** FANS

NUMBER	2	
NUMBER OF SPARES	0	
DESIGN	CENTRIFUGAL	
SUPPLIER	ALLIS CHALMERS	
FUNCTION	UNIT	
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	

** DUCTWORK

LOCATION	SCRUBBER INLET	
DIMENSIONS	12 X 16	
SHELL GENERIC MATERIAL TYPE	CABON STEEL	
LINER GENERIC MATERIAL TYPE	NONE	

** DUCTWORK

LOCATION	SCRUBBER OUTLET	
DIMENSIONS	12 X 16	
SHELL GENERIC MATERIAL TYPE	CARBON STEEL	
LINER GENERIC MATERIAL TYPE	CXL 100	

** REAGENT PREPARATION EQUIPMENT

FUNCTION	LIMESTONE GRINDING	
DEVICE	BALL MILL	
MANUFACTURER	KENNEDY VAN SAUN	

ARIZONA ELECTRIC POWER COOP: APACHE 3 (CONT.)

NUMBER	1	
FULL LOAD DRY FEED CAPACITY - M.TONS/HR	4.5	(5 TPH)
PRODUCT QUALITY - % SOLIDS	48.0	

** TANKS

SERVICE	NUMBER
ABSORBER FEED	1

** PUMPS

SERVICE	NUMBER
PACKING	3
QUENCHER	4
SLURRY SUMP	2

*** SLUDGE

** DISPOSAL

NATURE	FINAL
TYPE	POND
LOCATION	ON SITE
SITE TRANSPORTATION METHOD	PUMPED
SITE DIMENSIONS	85 ACRES X 18 FT DEEP
SITE CAPACITY - CU.M	484308 (396.0 ACRE-FT)
SITE SERVICE LIFE - YRS	30

** WATER BALANCE

WATER LOOP TYPE	OPEN	
MAKEUP WATER ADDITION - LITERS/S	115.9	(1840 GPM)

** FGD SPARE CAPACITY INDICES

ABSORBER - %	100.0

** FGD SPARE COMPONENT INDICES

ABSORBER	1.0

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
6/79	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

THE APACHE 3 BOILER AND FGD SYSTEM BEGAN OPERATIONS DURING JUNE. THE UTILITY REPORTED THAT THE START-UP WAS TYPICAL WITH NUMEROUS MINOR SHAKEDOWN PROBLEMS.

7/79	SYSTEM							744			
8/79	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT EXTENSIVE PROBLEMS WITH THE REAGENT HANDLING SYSTEM ARE CONTINUING PARTICULARLY WITH RESPECT TO FEED LINE FAILURES, PIPING PLUGGING AND GRINDING OPERATIONS. THE REAGENT HANDLING SYSTEM ACCOMODATES BOTH UNITS 2 AND 3.

9/79	SYSTEM							720			

ARIZONA ELECTRIC POWER COOP: APACHE 3 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING THE THIRD QUARTER OF 1979 THE BOILER AND FGD SYSTEM ONLY OPERATED ABOUT 25% OF THE TIME BECAUSE OF CONTINUING PROBLEMS WITH THE REAGENT FEED LINE. THE FRP SECTION FROM THE GRINDER TO THE SCRUBBERS FAILED. THE LINE WAS REPAIRED AT THE END OF SEPTEMBER.									
		COMMERCIAL OPERATIONS AT APACHE 3 BEGAN ON SEPTEMBER 1.									
10/79	SYSTEM	.0	.0		.0			744		0	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UTILITY IS IN THE PROCESS OF REPLACING THE REAGENT HANDLING SYSTEM; THEREFORE, THE FGD SYSTEM DID NOT OPERATE DURING OCTOBER.									
11/79	A	89.4	39.8	39.4	39.4						
	B	89.4	50.5	50.0	50.0						
	SYSTEM	100.0	90.3	89.4	89.4			720	713	644	92.7
12/79	SYSTEM	99.5	99.5	99.5	99.5			744	744	741	95.4
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE REAGENT HANDLING SYSTEM REPLACEMENT WAS COMPLETED IN DECEMBER.									
		THE OUTAGE TIME DURING DECEMBER WAS CAUSED BY A FAULTY BOILER FLUE DAMPER.									
1/80	SYSTEM	91.7	91.7	91.7	91.7	97.40		744	744	682	89.7
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING JANUARY SOME OUTAGE TIME WAS DUE TO A PUMP MALFUNCTION.									
		OUTAGE TIME WAS ALSO CAUSED BY A BROKEN FEED BELT TO THE LIMESTONE BALL MILL.									
2/80	SYSTEM	95.6	74.1	96.0	71.4	97.40		696	671	497	83.5
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING FEBRUARY OUTAGE TIME RESULTED FROM AN ESP FAILURE.									
		FORCED OUTAGE TIME WAS ALSO CAUSED BY A PUMP MALFUNCTION.									
3/80	SYSTEM	90.9	90.9	90.9	90.9			744	744	677	91.1
	** PROBLEMS/SOLUTIONS/COMMENTS										
		SOME OF THE OUTAGE TIME DURING MARCH OCCURRED BECAUSE OF PUMP FAILURES.									
		OUTAGE TIME RESULTED FROM STICKING VALVES AND LIMESTONE FEED-BELT PROBLEMS.									
4/80	SYSTEM	99.0	96.9	96.9	30.6			720	227	220	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING APRIL THE FGD SYSTEM WAS FORCED DOWN DUE TO PUMP FAILURES AND A RUPTURE IN THE SLURRY RECIRCULATION LINE.									
5/80	SYSTEM	.0	.0		.0			744	39	0	

ARIZONA ELECTRIC POWER COOP: APACHE 3 (CONT.)

PERIOD	MODULE	PERFORMANCE DATA AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE BOILER AND FGD SYSTEM WERE DOWN FOR A SCHEDULED OVERHAUL. THE LINERS IN THE ABSORBER QUENCHER HAD TO BE REPAIRED. THE BOILER RETURNED TO SERVICE BEFORE REPAIR WORK FOR THE FGD SYSTEM WAS COMPLETE. THE FGD SYSTEM WAS UNAVAILABLE IN MAY BECAUSE OF THIS OVERHAUL.									
6/80	SYSTEM							720			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UTILITY REPORTED THAT THE DATA FOR THE MONTH OF JUNE HAS BEEN MISPLACED.									
7/80	302	29.0	30.0	90.0	29.0						
	303	.0	.0		.0						
	SYSTEM	29.0	30.0	90.0	29.0			744	721	216	49.3
	** PROBLEMS/SOLUTIONS/COMMENTS										
		BOTH MODULES WERE UNAVAILABLE BECAUSE OF REPLACEMENT OF THE ABSORBER LINER. MODULE 302 WAS OUT OF SERVICE FOR 22 DAYS, WHILE MODULE 303 WAS OUT OF SERVICE DURING ALL OF JULY.									
		A PACKING PUMP FAILURE CAUSED THE FGD SYSTEM TO GO DOWN.									
8/80	302	98.5	47.8	96.3	38.4						
	303	98.5	19.3	91.3	15.5						
	SYSTEM	98.5	67.1	94.8	54.0			744	599	402	41.5
	** PROBLEMS/SOLUTIONS/COMMENTS										
		TOWER 302 WAS UNAVAILABLE DURING PART OF AUGUST BECAUSE OF A QUENCHER PUMP FAILURE.									
		DUE TO A SAMPLING LINE FAILURE IN AUGUST, TOWER 303 WAS SHUT DOWN FOR PART OF THE MONTH.									
		THE REDUCED RATE OF FGD OPERATION IN AUGUST WAS A RESULT OF BOILER UNIT PROBLEMS AND REDUCED LOAD CAPACITY.									
9/80	SYSTEM							720			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		NO INFORMATION WAS AVAILABLE FOR SEPTEMBER 1980.									
10/80	302	76.2	87.7	97.1	68.1						
	303	.0	.0		.0						
	SYSTEM	76.2	87.7	97.1	68.1			744	567	507	52.5
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE BOILER WAS OPERATED AT A REDUCED LOAD FOR 60 HOURS AND WAS TAKEN OFF LINE FOR SIX DAYS DURING OCTOBER.									
		UNAVAILABLE FGD SYSTEM TIME WAS DUE TO A QUENCHER PUMP FAILURE AND PH INSTABILITY.									
11/80	302	78.4	78.1	95.4	77.8						
	303	100.0	17.8	100.0	17.8						
	SYSTEM	100.0	96.0	96.3	95.6			744	717	688	99.6

ARIZONA ELECTRIC POWER COOP: APACHE 3 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING NOVEMBER THE FGD SYSTEM WAS FORCED OUT OF SERVICE DUE TO FAILURE OF THE QUENCHER PUMPS, SAMPLE LINE AND TRANSFORMER.									
		THE BOILER UNIT TRIPPED CAUSING APPROXIMATELY FIVE HOURS OF OUTAGE TIME DURING THE MONTH.									
12/80	302	.0	.0		.0						
	303	100.0	98.6	100.0	96.6						
	SYSTEM	100.0	98.6	100.0	96.6			744	729	719	86.2
	** PROBLEMS/SOLUTIONS/COMMENTS										
		NO FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE MONTH OF DECEMBER.									

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	ARIZONA PUBLIC SERVICE	
PLANT NAME	CHOLLA	
UNIT NUMBER	1	
CITY	JOSEPH CITY	
STATE	ARIZONA	
REGULATORY CLASSIFICATION	C	
PARTICULATE EMISSION LIMITATION - NG/J	85.	(.198 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	430.	(1.000 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	615	
GROSS UNIT GENERATING CAPACITY - MW	119	
NET UNIT GENERATING CAPACITY W/FGD - MW	115	
NET UNIT GENERATING CAPACITY WO/FGD - MW	119	
EQUIVALENT SCRUBBED CAPACITY - MW	119	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	COMBUSTION ENGINEERING	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	245.39	(520000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	136.7	(278 F)
STACK HEIGHT - M	78.	(256 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	3.7	(12.0 FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	BITUMINOUS	
AVERAGE HEAT CONTENT - J/G	23609.	(10150 BTU/LB)
RANGE HEAT CONTENT - BTU/LB	9650-10600	
AVERAGE ASH CONTENT - %	13.50	
RANGE ASH CONTENT - %	9.7-22.5	
AVERAGE MOISTURE CONTENT - %	15.00	
RANGE MOISTURE CONTENT - %	******	
AVERAGE SULFUR CONTENT - %	.50	
RANGE SULFUR CONTENT - %	0.44-1.0	
AVERAGE CHLORIDE CONTENT - %	.02	
RANGE CHLORIDE CONTENT - %	0.01-0.04	
*** PARTICLE CONTROL		
** MECHANICAL COLLECTOR		
TYPE	CYCLONES	
SUPPLIER	RESEARCH-COTTRELL	
PARTICLE REMOVAL EFFICENCY -%	75.0	
** PARTICLE SCRUBBER		
NUMBER	2	
GENERIC TYPE	VENTURI TOWER	
SPECIFIC TYPE	VARIABLE-THROAT/BOTTOM-ENTRY LIQUID DISTRIBUTION	
SUPPLIER	RESEARCH-COTTRELL	
DIMENSIONS - FT	6 DIA X 45 HIGH	
SHELL GENERIC MATERIAL	STAINLESS STEEL	
SHELL SPECIFIC MATERIAL	AUSTENITIC	
LINER GENERIC MATERIAL	ORGANIC	
LINER SPECIFIC MATERIAL	GLASS FLAKE-FILLED POLYESTER	
NUMBER OF CONTACTING ZONES	1	
LIQUID RECIRCULATION RATE - LITER/S	136.7	(2170 GPM)
L/G RATIO - LITER/CU.M	1.4	(10.1 GAL/1000ACF)
PRESSURE DROP - KPA	3.7	(15.0 IN-H2O)
INLET GAS FLOW RATE - CU.M/S	99.1	(210100 ACFM)
INLET GAS TEMPERATURE - C	136.7	(278 F)
PARTICLE REMOVAL EFFICIENCY - %	99.2	
*** FGD SYSTEM		
** GENERAL DATA		
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT	
SO2 REMOVAL MODE	WET SCRUBBING	

ARIZONA PUBLIC SERVICE: CHOLLA 1 (CONT.)

PROCESS TYPE	LIMESTONE	
PROCESS ADDITIVES	NONE	
SYSTEM SUPPLIER	RESEARCH-COTTRELL	
A-E FIRM	EBASCO	
DEVELOPMENT LEVEL	FULL SCALE	
NEW/RETROFIT	RETROFIT	
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	80.00	
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	58.50	
CURRENT STATUS	1	
COMMERCIAL START-UP	12/73	
INITIAL START-UP	10/73	
CONTRACT AWARDED	7/71	

** DESIGN AND OPERATING PARAMETERS

** ABSORBER

NUMBER	1	
GENERIC TYPE	COMBINATION	
SPECIFIC TYPE	SPRAY/PACKED	
SUPPLIER	RESEARCH-COTTRELL	
DIMENSIONS - FT	22 DIA X 70 HIGH	
SHELL GENERIC MATERIAL	STAINLESS STEEL	
SHELL SPECIFIC MATERIAL	AUSTENITIC	
SHELL MATERIAL TRADE NAME/COMMON TYPE	TYPE 316L	
LINER GENERIC MATERIAL	NONE	
LINER SPECIFIC MATERIAL	N/A	
LINER MATERIAL TRADE NAME/COMMON TYPE	N/A	
GAS CONTACTING DEVICE TYPE	MUNTERS T 2-81 (POLYPROPYLENE)	
NUMBER OF CONTACTING ZONES	1	
DISTANCE BETWEEN GAS CONTACTING ZONES - CM	61.0	(24.0IN)
LIQUID RECIRCULATION RATE - LITER/S	630.	(10000 GPM)
L/G RATIO - L/CU.M	6.5	(48.9 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	.1	(.5 IN-H2O)
SUPERFICAL GAS VELOCITY - M/SEC	2.1	(6.9 FT/S)
INLET GAS FLOW - CU. M/S	113.26	(240000 ACFM)
INLET GAS TEMPERATURE - C	135.6	(276 F)
SO2 REMOVAL EFFICIENCY - %	92.0	
PARTICLE REMOVAL EFFICENCY - %	99.7	

** ABSORBER

NUMBER	1	
GENERIC TYPE	SPRAY TOWER	
SPECIFIC TYPE	OPEN COUNTERCURRENT SPRAY	
SUPPLIER	RESEARCH-COTTRELL	
DIMENSIONS - FT	22 DIA X 70 HIGH	
SHELL GENERIC MATERIAL	STAINLESS STEEL	
SHELL SPECIFIC MATERIAL	AUSTENITIC	
SHELL MATERIAL TRADE NAME/COMMON TYPE	TYPE 316L	
LINER GENERIC MATERIAL	NONE	
LINER SPECIFIC MATERIAL	N/A	
LINER MATERIAL TRADE NAME/COMMON TYPE	N/A	
GAS CONTACTING DEVICE TYPE	NONE	
NUMBER OF CONTACTING ZONES	1	
LIQUID RECIRCULATION RATE - LITER/S	630.	(10000 GPM)
L/G RATIO - L/CU.M	6.5	(48.9 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	.1	(.5 IN-H2O)
SUPERFICAL GAS VELOCITY - M/SEC	2.1	(6.9 FT/S)
INLET GAS FLOW - CU. M/S	113.26	(240000 ACFM)
INLET GAS TEMPERATURE - C	135.6	(276 F)
SO2 REMOVAL EFFICIENCY - %	25.0	

** MIST ELIMINATOR

PRE-MIST ELIMINATOR/MIST ELIMINATOR	MIST ELIMINATOR	
NUMBER PER SYSTEM	4	
GENERIC TYPE	IMPINGEMENT	
SPECIFIC TYPE	BAFFLE	
TRADE NAME/COMMON TYPE	CHEVRON VANE	
CONFIGURATION	HORIZONTAL	
NUMBER OF STAGES	2	
NUMBER OF PASSES PER STAGE	2	
FREEBOARD DISTANCE - M	4.11	(13.5 FT)

ARIZONA PUBLIC SERVICE: CHOLLA 1 (CONT.)

DISTANCE BETWEEN STAGES - CM	2.54	(1.0 IN)
DISTANCE BETWEEN VANES - CM	3.8	(1.50 IN)
VANE ANGLES - DEGREES	45	
PRESSURE DROP - KPA	.1	(.5 IN-H2O)
CONSTRUCTION MATERIAL GENERIC TYPE	POLYPROPYLENE	
WASH WATER SOURCE	MAKEUP WATER FROM WELL	

** REHEATER

NUMBER	2	
GENERIC TYPE	IN-LINE	
SPECIFIC TYPE	STEAM	
TEMPERATURE INCREASE - C	4.4	(40 F)
INLET FLUE GAS FLOW RATE - CU. M/S	115.62	(245000 ACFM)
INLET FLUE GAS TEMPERATURE - C	48.9	(120 F)
CONSTRUCTION MATERIAL GENERIC TYPE	316L SS	

** FANS

NUMBER	2	
DESIGN	CENTRIFUGAL	
SUPPLIER	STURTEVANT DIV., WESTINGHOUSE	
FUNCTION	BOOSTER	
APPLICATION	FORCED DRAFT	
SERVICE	DRY	
FLUE GAS FLOW RATE - CU.M/S	113.26	(240000 ACFM)
FLUE GAS TEMPERATURE - C	135.6	(276 F)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	

** DUCTWORK

LOCATION	SCRUBBER INLET	
SHELL GENERIC MATERIAL TYPE	CARBON STEEL	
LINER GENERIC MATERIAL TYPE	PLASITE	

** DUCTWORK

LOCATION	SCRUBBER OUTLET TO STACK	
SHELL GENERIC MATERIAL TYPE	CARBON STEEL	
LINER GENERIC MATERIAL TYPE	PLASITE	

** REAGENT PREPARATION EQUIPMENT

FUNCTION	LIMESTONE GRINDING	
DEVICE	BALL MILL	
NUMBER	1	

** TANKS

SERVICE	NUMBER
SCRUBBER RECYCLE	1
SLUDGE HOLDUP	2
ABSORBER TOWER HOLDUP	1
LIMESTONE SLURRY MAKEUP	2

** PUMPS

SERVICE	NUMBER
SCRUBBER RECIRCULATION	2
ABSORBER RECIRCULATION	2

*** SLUDGE

** DISPOSAL

NATURE	FINAL	
TYPE	POND	
SITE TRANSPORTATION METHOD	PUMPED	
SITE DIMENSIONS	70-100 ACRES X 6 FT DEEP	
SITE CAPACITY - CU.M	623730	(510.0 ACRE-FT)

** PROCESS CONTROL AND INSTRUMENTATION

PROCESS CONTROL MANNER	MANUAL	

ARIZONA PUBLIC SERVICE: CHOLLA 1 (CONT.)

** WATER BALANCE

WATER LOOP TYPE	OPEN	
MAKEUP WATER ADDITION - LITERS/S	7.6	(120 GPM)

** FGD SPARE CAPACITY INDICES

ABSORBER - %	.0

** FGD SPARE COMPONENT INDICES

ABSORBER	.0

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
10/73	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

INITIAL TESTING OF THE FGD SYSTEM BEGAN ON OCTOBER 2, 1973. THE SYSTEM OPERATED UNTIL THE SCHEDULED SHUTDOWN DATE OF OCTOBER 21. DURING THE THREE WEEK TEST PERIOD, PARTICULATE MATTER AND SO2 REMOVAL EFFICIENCIES, MIST CARRYOVER FROM THE TOWERS, MAXIMUM PROCESS GAS FLOW RATES, AND BYPASS GAS LEAKAGE RATES WERE DETERMINED.

THE DATA COLLECTED INCLUDED THE FOLLOWING:

FLOODED DISC SCRUBBER SO2 REMOVAL EFFICIENCY (MODULE A): 92%
SPRAY TOWER SCRUBBER SO2 REMOVAL EFFICIENCY (MODULE B): 25%
UNIT OVERALL SO2 REMOVAL EFFICIENCY: 58.5%
MIST CARRYOVER FROM MODULES A AND B: 0%
SOLIDS CARRYOVER FROM MODULE A: 0.005 GR/SCF
AIR LEAKAGE INTO SYSTEM DOWNSTREAM OF SCRUBBERS: 18,400 ACFM
CHLORIDE ION CONCENTRATION IN FLOODED DISC SCRUBBER RECIRCULATION: 1600 PPM
CHLORIDE ION CONCENTRATION IN SPRAY TOWER RECIRCULATION: 575 PPM
CHLORIDE ION CONCENTRATION IN SCRUBBER MAKEUP WATER (COOLING TOWER BLOWDOWN): 933 PPM
CHLORIDE LEVELS ARE SUFFICIENT TO CAUSE PITTING CORROSION IN LOCALIZED AREAS WHEN TEMPERATURES ARE GREATER THAN 140F AND PH IS LESS THAN 3.0.

11/73	SYSTEM							720			
12/73	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

THE CONSTRUCTION AND INITIAL TESTING OF THE SYSTEM WERE COMPLETED ON DECEMBER 3. COMMERCIAL OPERATIONS BEGAN ON DECEMBER 14.

BECAUSE OF A DIFFERENCE IN THE SIZE OF THE MAIN DUCT AND REHEATED TRANSITION DUCT, THE GAS FLOW PRODUCES HARMONIC VIBRATIONS IN THE REHEATER. THE VIBRATIONS WERE PARTIALLY DAMPENED BY INSTALLATION OF BAFFLES.

ONE OF THE REHEATER BUNDLES WAS BADLY CORRODED BY ACID THAT CONDENSED IN THE UNINSULATED DUCT UPSTREAM OF THE REHEATERS. THE TUBE BUNDLE WAS REPLACED AND A BAFFLE WAS INSTALLED TO DIVERT CONDENSED ACID FROM REHEATER TUBES.

THE DUCT UPSTREAM OF THE REHEATER WAS INSULATED. THE ACID CONDENSATION OCCURRED ONLY IN THE B-MODULE WHICH CONTAINS NO INTERNAL PACKING AND CONSEQUENTLY HAS A LOWER DEGREE OF SULFUR DIOXIDE REMOVAL (25%).

SOME LINES PLUGGED, PARTICULARLY WHEN THE SYSTEM OPERATED AT LOW FLOW RATES

SOLIDS SETTLED OUT IN STANDBY PUMPS, AND EXCESSIVE FAN VIBRATIONS OCCURRED BECAUSE OF ACCUMULATION OF SCALE BUILDUP WHEN THE UNIT WAS IDLE. TO SOLVE THESE PROBLEMS THE PACKING GLAND POSITION WAS REVERSED (INSTALLED

ARIZONA PUBLIC SERVICE: CHOLLA 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
				PERFORMANCE DATA							
		UPSIDE DOWN). THE FAN WAS SANDBLASTED. THE PIPING WAS MODIFIED TO ELIMINATE STAGNANT POCKETS, AND PUMPS WERE FLUSHED IMMEDIATELY AFTER REMOVAL FROM SERVICE.									
		THE UTILITY EXPERIENCED SOLIDS BUILDUP IN THE FDS STUFFING GLAND BOX AND ON TOP OF THE SPRAY DOME.									
1/74	A			97.0							
	B			90.0							
	SYSTEM			93.5				744			
2/74	A			100.0							
	B			94.0							
	SYSTEM			97.0				672			
3/74	A			100.0							
	B			66.0							
	SYSTEM			83.0				744			
4/74	A			66.0							
	B			57.0							
	SYSTEM			61.5				720			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE FGD SYSTEM PERFORMED SATISFACTORILY FROM DECEMBER 15, 1973 TO APRIL 15, 1974. ALTHOUGH SEVERAL UPSETS CAUSED SHUTDOWN OF ONE OR BOTH MODULES FOR SHORT PERIODS SYSTEM AVAILABILITY AVERAGED 92.6% DURING THAT PERIOD.									
		THE SCRUBBER MODULES WERE SHUTDOWN FOR SHORT PERIODS IN APRIL TO REPLACE CORRODED COR-TEN STEEL EXPANSION JOINTS ON THE REHEATER BUNDLES. MODULE A WAS DOWN APRIL 17 THROUGH 27. MODULE B WAS DOWN APRIL 15 THROUGH 28.									
5/74	A			98.0							
	B			99.0							
	SYSTEM			98.5				744	744		
6/74	A			100.0							
	B			100.0							
	SYSTEM			100.0				720			
7/74	A		97.5	97.0	97.5						
	B		98.5	92.0	98.5						
	SYSTEM		98.0	94.5	98.0			744	744	729	
8/74	A		94.5	97.0	94.5						
	B	100.0	100.0	100.0	100.0						
	SYSTEM		97.3	98.5	97.3			744	744	724	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		EACH MODULE WAS OUT OF SERVICE ONE DAY OVER THE MONTH FOR THE INSTALLATION OF BAFFLE PLATES IN THE INLET DUCT OF EACH REHEATER. THE BAFFLE INSTALLATIONS WERE PARTLY SUCCESSFUL IN STOPPING REHEATER VIBRATION PROBLEMS.									
9/74	A			95.0							
	B			99.0							
	SYSTEM			97.0				720			
10/74	A			83.0							
	B			68.0							
	SYSTEM			75.5				744			

ARIZONA PUBLIC SERVICE: CHOLLA 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE SYSTEM WAS SHUT DOWN IN LATE OCTOBER FOR AN ANNUAL BOILER AND FGD SYSTEM OVERHAUL.									
		DURING THE OUTAGE SEVERAL INSTANCES OF PITTING CORROSION WERE DISCOVERED IN THE 316L SS FLOODED DICS SCRUBBER WALLS.									
		REHEATER TUBE LEAKS WERE DISCOVERED IN THE B-SIDE REHEATER DURING THE OUTAGE.									
11/74	A		100.0								
	B		98.0								
	SYSTEM		99.0					720			
12/74	A		100.0								
	B		100.0								
	SYSTEM		100.0					744			
1/75	A	97.7	97.7	97.7							
	B	98.7	98.7	98.7							
	SYSTEM	98.2	98.2	98.2				744	744	730	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		OPERATION OF THE SYSTEM THROUGHOUT 1975 AND 1976 WAS ACCOMPANIED BY A NUMBER OF MINOR PROBLEM AREAS INCLUDING: SIGNIFICANT CORROSION ATTACK IN THE VESSEL WALLS OF THE VENTURI FLOODED-DISC PARTICULATE SCRUBBER MODULE; ACID CORROSION IN THE B-SIDE REHEATER HOUSING; SCALE BUILDUP IN THE PIPE OUTLET AT THE SLUDGE/FLYASH EVAPORATION POND; PLUGGING IN THE SCRUBBER TOWER PACKING AND MIST ELIMINATOR; EROSION IN THE PUMPS; CORROSION IN THE BOILER EXHAUST ELBOW OF THE DUCTWORK LEADING FROM THE SCRUBBERS TO THE STACK.									
		DURING JANUARY THE BYPASS SYSTEM EXPERIENCED CONTROL PROBLEMS. NO SOLUTION HAS YET BEEN FOUND.									
		A LEAK IN THE B-SIDE ABSORBER TOWER WAS WELDED IN JANUARY.									
		SOME LEAKS WERE DISCOVERED OVER THE MOUTH ON THE A-SIDE VENTURI THROATS. THE LEAKS WERE ATTRIBUTED TO NORMAL WEAR.									
		LEAKS WERE DISCOVERED IN THE B-SIDE REHEATER DUCTS IN JAUNARY.									
2/75	A	95.5	95.5	95.5							
	B	91.4	91.4	91.4							
	SYSTEM	93.5	93.5	93.5				672	672	628	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UTILITY REPORTED THAT PROBLEMS WITH VESSAL LEAKS CONTINUED THROUGH FEBRUARY.									
		SOME OUTAGE TIME WAS REQUIRED FOR RECYCLE PUMP REPAIRS OVER THE MONTH.									
		THE UTILITY DISCOVERED SOME ADDITIONAL EROSION/CORROSION PROBLEMS IN THE FGD SYSTEM IN FEBRUARY.									
3/75	SYSTEM							744			

ARIZONA PUBLIC SERVICE: CHOLLA 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UTILITY REPORTED THAT BUILDUP OF SEDIMENT HAS OCCURRED SEVERAL TIMES SINCE STARTUP IN DEAD SPACES, IN PIPE LINES, AND VALVES OF IDLE PUMPS AS WELL AS IN PROCESS LINES DURING PERIODS OF REDUCED OPERATING RATE.									
		SOME PIPE LINERS HAVE EXPERIENCED EROSION SINCE STARTUP. THE EROSION WAS DUE IN SOME CASES TO UNSATISFACTORY LINER MATERIALS AND IN OTHER CASES TO HIGH VELOCITIES THROUGH PIPES AND FITTINGS. PIPING MODIFICATIONS HELPED TO REDUCE THE EROSION PROBLEM. CRACKING OF THE RUBBER LINING IN SOME PIPES WAS DUE TO DEFECTS IN FABRICATION.									
		SOME FLOODED DISC SCRUBBER PACKING PLUGGING HAS OCCURRED. IT APPEARS THAT THIS IS A RESULT OF THE GRADE OF COAL BURNED. THE "WETTED FILM CONTACTOR" PACKING LIFE HAS BEEN REDUCED.									
4/75	A		88.5	88.5	82.4						
	B		65.2	65.2	60.7						
	SYSTEM		76.9	76.9	71.6			720	670	515	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UTILITY REPORTED THAT THERE ARE STILL PROBLEMS WITH THE BYPASS SYSTEM CONTROLS.									
		SOME DOWN TIME WAS REQUIRED TO REPAIR VALVES AND PIPING AND TO UNPLUG SECTIONS OF THE A MODULE TOWER PACKING (MUNTERS).									
		THE REHEATER SECTION WAS AGAIN PATCHED WITH CEILCOTE DURING APRIL.									
5/75	A		47.5	47.5	47.5						
	B		39.9	39.9	39.9						
	SYSTEM		43.7	43.7	43.7			744	744	325	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		BOTH MODULES WERE OUT OF SERVICE FOR MOST OF THE MONTH SO THAT SCHEDULED REPAIRS AND CLEANING COULD BE UNDERTAKEN.									
6/75	A	100.0	100.0	100.0	100.0						
	B	100.0	100.0	100.0	100.0						
	SYSTEM	100.0	100.0	100.0	100.0			720	720	720	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		A SUBSTANTIAL AMOUNT OF PLUGGING WAS OBSERVED IN THE MODULE A ABSORBER TOWER PACKING.									
		PLUGGING OCCURRED IN MIST ELIMINATORS.									
		NO MAJOR PROBLEMS WERE ENCOUNTERED DURING THE PERIOD.									
7/75	A		97.5	97.5	97.5						
	B		98.5	98.5	98.5						
	SYSTEM		98.0	98.0	98.0			744	744	729	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		MODULES WERE SHUT DOWN TO CLEAN FLOW RESTRICTIONS IN FLOODED-DISC RECIRCULATION LINES.									
8/75	A		94.5	94.5	94.5						

ARIZONA PUBLIC SERVICE: CHOLLA 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	B	100.0	100.0	100.0	100.0						
	SYSTEM		97.3	97.3	97.3			744	744	724	

** PROBLEMS/SOLUTIONS/COMMENTS

THE A-SIDE WAS SHUT DOWN FOR INSPECTION.

9/75	A		64.5	97.6	64.5						
	B		93.0	97.4	93.0						
	SYSTEM		78.8	97.5	78.8			720	720	567	

** PROBLEMS/SOLUTIONS/COMMENTS

MINOR OUTAGE RESULTED FROM PLUGGED FLOODED DISC SCRUBBER RECIRCULATION LINES.

10/75	A		78.0	84.0	56.4						
	B		24.6	54.8	17.8						
	SYSTEM		51.3	69.4	37.1			744	538	276	

** PROBLEMS/SOLUTIONS/COMMENTS

OUTAGES RESULTED FROM SCHEDULED EQUIPMENT OVERHAULS AND RECOATING OF VESSELS.

11/75	A		100.0	100.0	100.0						
	B		71.4	80.0	71.4						
	SYSTEM		85.7	90.0	85.7			720	720	617	

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR OUTAGES OR PROBLEMS OCCURRED DURING THE REPORT PERIOD.

12/75	A		100.0	100.0	100.0						
	B		100.0	100.0	100.0						
	SYSTEM		100.0	100.0	100.0			744	744	744	

** PROBLEMS/SOLUTIONS/COMMENTS

MINOR PROBLEMS ENCOUNTERED REQUIRED RECYCLE PUMP REBUILDING.

THE B-SIDE REHEATER COIL MALFUNCTIONED BUT NO OUTAGE TIME WAS REQUIRED.

1/76	A		96.0	98.9	96.0						
	B		87.9	98.6	89.9						
	SYSTEM		92.0	98.8	92.0			744	744	684	

** PROBLEMS/SOLUTIONS/COMMENTS

MINOR VALVE PLUGGING OCCURRED.

MINOR RECIRCULATION LINE PLUGGING OCCURRED.

MODULE B OPERATING HOURS WERE LOWER BECAUSE OF REDUCED SYSTEM REQUIREMENTS

2/76	SYSTEM							696			
3/76	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

INFORMATION WAS UNAVAILABLE FOR THE MONTHS OF FEBRUARY AND MARCH.

4/76	A			99.0							

ARIZONA PUBLIC SERVICE: CHOLLA 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	B			97.4							
	SYSTEM			98.2				720			

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM IS CURRENTLY EXPERIENCEING COATING FAILURES IN THE ELBOW OF THE SCRUBBER EXHAUST DUCT LEADING TO THE STACK.

THE UTILITY PERFORMED SOME MINOR REPAIRS TO THE HOUSING OF THE B-SIDE REHEATER.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
5/76	A			76.4							
	B			99.6							
	SYSTEM			88.0				744			

** PROBLEMS/SOLUTIONS/COMMENTS

CORROSION AND PLUGGING PROBLEMS OCCURRED ON THE A-SIDE REHEATER TUBES.

THE UTILITY REPORTED THAT PLUGGING OCCURRED IN THE FLOODED DISC SCRUBBER RECIRCULATION LINES.

PLUGGING OCCURRED IN THE FLOODED DISC SCRUBBER PACKING.

PLUGGING OCCURRED IN THE MIST ELIMINATORS.

HEAVY PUMP MAINTENANCE WAS REQUIRED IN MAY. THE UTILITY NOW CONSIDERS HEAVY PUMP MAINTENANCE NORMAL FOR THE CHOLLA 1 SCRUBBER.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
6/76	A			64.1							
	B			39.4							
	SYSTEM			51.8				720			

** PROBLEMS/SOLUTIONS/COMMENTS

LOW RELIABILITY FACTORS FOR THE MONTH OF JUNE RESULTED FROM A SCHEDULED MID-YEAR SCRUBBER SHUTDOWN FOR MAINTENANCE, INSPECTION AND REPAIRS.

SOME SCALING AND CORROSION PROBLEMS WERE UNCOVERED IN THE SCRUBBING SYSTEM RECYCLE TANKS.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
7/76	A			100.0							
	B			97.5							
	SYSTEM			98.8				744			
8/76	A			100.0							
	B			100.0							
	SYSTEM			100.0				744			

** PROBLEMS/SOLUTIONS/COMMENTS

REPAIRS TO THE COATING IN THE ELBOW OF THE SCRUBBER EXHAUST DUCT WERE COMPLETED OVER THE JULY-AUGUST PERIOD.

A MALFUNCTIONING SOLENOID VALVE IN THE B-SIDE MIST ELIMINATOR WASH SYSTEM PREVENTING ADEQUATE WASHING, RESULTED IN A MINOR SCRUBBER OUTAGE DURING THE JULY-AUGUST PERIOD.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
9/76	A	100.0	100.0	100.0	100.0						
	B		93.9	100.0	93.9						
	SYSTEM		97.0	100.0	97.0			720	720	698	

ARIZONA PUBLIC SERVICE: CHOLLA 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE BOILER WAS IN SERVICE THE ENTIRE MONTH. NO SIGNIFICANT SCRUBBER PROBLEMS WERE REPORTED.									
10/76	A	99.5	56.0	55.8							
	B	66.4	56.0	37.2							
	SYSTEM	83.0	56.0	46.5				744	417	346	
11/76	A	94.8	95.8	94.8							
	B	77.2	97.6	77.2							
	SYSTEM	86.1	96.7	86.1				720	720	619	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		TWO MINOR FORCED SCRUBBER OUTAGES OCCURRED DURING THE PERIOD.									
		A REHEATER STEAM LEAK CAUSED A MINOR FORCED OUTAGE.									
		AN INLET GAS DAMPER ADJUSTMENT PROBLEM IN BOTH THE A-SIDE AND B-SIDE SCRUBBING TRAINS CAUSED A MINOR OUTAGE.									
12/76	A	99.8	99.7	99.8							
	B	67.0	100.0	67.0							
	SYSTEM	99.9	99.0	83.4				744	744	620	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		ONE OUTAGE WAS REPORTED. THE OUTAGE WAS THE RESULT OF AN ADDITIONAL ADJUSTMENT TO THE A-SIDE GAS INLET DAMPER.									
1/77	A	71.6	72.3	71.6							
	B	91.9	93.4	91.9							
	SYSTEM	81.8	82.9	81.8				744	744	608	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE PERFORMANCE INDEX VALUES CONTAINED IN THESE TABLES ARE BASED UPON THE MODULE ACTUAL SERVICE TIME FOR THE PERIOD VERSUS THE NUMBER OF HOURS THE MODULES ARE CALLED UPON TO OPERATE FOR THE SAME PERIOD. THE MODULES OPERATE ON A DEMAND-ONLY BASIS. FLUE GAS IS BYPASSED AROUND THE MODULES WHEN THEY ARE NOT REQUIRED FOR SERVICE.									
		THE MUNTERS PACKING IN THE A-SIDE TOWER WAS REPLACED IN JANUARY.									
BAD C3/71 ****											
		MINOR CORROSION OCCURRED IN THE SYSTEM.									
		MINOR PLUGGING OF SCRUBBER INTERNALS OCCURRED. THE TOWERS WERE CLEANED.									
		SOME PROBLEMS OCCURRED WITH THE LIQUID PIPING.									
		AVERAGE SO2 INLET AND OUTLET CONCENTRATIONS DURING JANUARY WERE 350 PPM AND 175 PPM RESPECTIVELY.									
2/77	A	96.5	98.8	96.5							
	B	88.0	99.6	88.0							
	SYSTEM	92.2	99.2	92.2				672	672	620	

ARIZONA PUBLIC SERVICE: CHOLLA 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
			THERE WERE MECHANICAL DIFFICULTIES WITH THE BY-PASS DAMPERS.								
			AVERAGE SO2 INLET AND OUTLET VALUES DURING FEBRUARY WERE 350 PPM AND 175 PPM RESPECTIVELY.								
3/77	A		71.6	72.3	71.6						
	B		91.9	93.4	91.9						
	SYSTEM		81.8	82.9	81.8			744	744	608	
	** PROBLEMS/SOLUTIONS/COMMENTS										
			THE A-SIDE TOWER PACKING WAS REPLACED DURING MARCH.								
			BOTH MODULES WERE OUT OF SERVICE FOR CLEANING OF AREAS OF PLUGGING IN THE SCRUBBER INTERNALS DURING THE MONTH.								
4/77	A		99.6	100.0	88.2						
	B		98.6	100.0	87.3						
	SYSTEM		99.1	100.0	87.8			720	638	632	
	** PROBLEMS/SOLUTIONS/COMMENTS										
			THE UTILITY REPORTED NO MAJOR PROBLEMS OCCURRED DURING APRIL.								
5/77	A		100.0	87.0	86.7						
	B		100.0	87.0	86.7						
	SYSTEM		100.0	87.0	86.7			744	645	645	
	** PROBLEMS/SOLUTIONS/COMMENTS										
			OUTAGE TIME FOR THE BOILER AND FGD SYSTEM WAS A RESULT OF THE SCHEDULED MID-YEAR SCRUBBER CLEANOUT.								
			DURING MAY RESEARCH-COTTRELL PERSONNEL CONDUCTED FORCED OXIDATION TESTS BY BLOWING AIR INTO THE FLOODED DISC SCRUBBER AND CONVERTING ALL CASO3 TO CASO4 YIELDING SUPERIOR SLUDGE DEWATERING HANDLING AND SCALE-FREE OPERATION.								
6/77	A	100.0	100.0	100.0	100.0						
	B	100.0	100.0	100.0	100.0						
	SYSTEM	100.0	100.0	100.0	100.0			720	720	720	
	** PROBLEMS/SOLUTIONS/COMMENTS										
			THE JTILITY REPORTED NO MAJOR PROBLEMS FOR THE MONTH OF JUNE.								
7/77	A			97.0							
	B			99.0							
	SYSTEM			98.0				744	744		
	** PROBLEMS/SOLUTIONS/COMMENTS										
			A MINOR LEAK OCCURRED IN THE LIMESTONE SLURRY TANK.								
			A MINOR LEAK OCCURRED IN THE B-SIDE RETURN LINE FROM THE FLOODED DISC SCRUBBER TO THE SCRUBBER TANK.								
			RESEARCH-COTTRELL PERSONNEL ARE STILL ON THE PLANT SITE CONTINUING FORCEDD OXIDATION STUDIES.								
8/77	A		97.2	97.2	97.2						

ARIZONA PUBLIC SERVICE: CHOLLA 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	B		98.6	98.6	98.6						
	SYSTEM		97.9	97.9	97.9			744	744	729	

** PROBLEMS/SOLUTIONS/COMMENTS

DOWN TIME WAS REQUIRED TO REPAIR LEAKS IN THE SLURRY DISPOSAL TANK AND THE FLOODED DISC SCRUBBER RETURN LINE BETWEEN THE TOWER AND THE SCRUBBER RECYCLE TANK.

9/77	A	100.0	99.7	100.0	99.7						
	B	100.0	99.7	100.0	99.7						
	SYSTEM	100.0	99.7	100.0	99.7			720	720	718	

** PROBLEMS/SOLUTIONS/COMMENTS

ONLY ROUTINE MAINTENANCE WAS REQUIRED FOR THE SCRUBBING SYSTEM DURING SEPTEMBER.

10/77	A	100.0	99.9	100.0	99.9						
	B	100.0	99.9	100.0	99.9						
	SYSTEM	100.0	92.1	98.7	99.9			744	744	743	

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED NO MAJOR PROBLEMS FOR OCTOBER.

11/77	A	100.0	99.7	100.0	23.3						
	B	97.4	84.5	97.4	19.7						
	SYSTEM	98.7	92.0	99.0	21.5			720	169	155	

** PROBLEMS/SOLUTIONS/COMMENTS

THE B-SIDE OUTAGE WAS DUE TO LEAKS IN THE VENTURI SECTION OF THE SCRUBBER AND AN EXPANSION JOINT FAILURE IN A RECYCLE PUMP.

THE BOILER OPERATED ONLY 168.5 HOURS BECAUSE OF A SHUTDOWN FOR OVERHAUL IN THE LAST HALF OF NOVEMBER. THE UNIT IS SCHEDULED TO START UP IN MID-DECEMBER.

12/77	SYSTEM	.0			.0			744		0	

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER AND SCRUBBING SYSTEM WERE OUT OF SERVICE THROUGH DECEMBER AS THE OVERHAUL PERIOD CONTINUED.

OVER THE PAST YEAR EVIDENCE OF CHLORIDE ATTACK WAS NOTED IN THE LIQUID-GAS CENTRIFUGAL SEPARATOR SHELL BELOW THE ABSORBER. THE INTERIOR OF THE VESSEL WAS COATED WITH AN EPOXY MATERIAL BY THE SYSTEM SUPPLIER AS A REMEDY BUT THIS ERODED IN SPOTS AND HAD TO BE REPAIRED. THE EPOXY MATERIAL ALSO ERODED AND DISBONDED BELOW THE SCRUBBER DISC.

DURING 1977 EVIDENCE OF ADDITIONAL CHLORIDE ATTACK WAS NOTED ON THE MODULE B REHEATER TUBES. THE SPRAY DISTRIBUTION DEFLECTOR ABOVE THE FLOODED DISC FAILED BECAUSE OF STRESS-CORROSION CRACKING. THE DEFLECTOR WAS REDESIGNED BY THE SYSTEM SUPPLIER.

EXTENSIVE CORROSION WAS RECENTLY DISCOVERED IN THE DUCTWORK LEADING FROM THE MODULE B ABSORBER TOWER EXHAUST ELBOW TO THE REHEAT TUBE BUNDLE. THE UTILITY HAS RECOATED THE ELBOW SEVERAL TIMES WITH A CEILCOTE LINER. AN APPLICATION PROBLEM CAUSED REPEATED FAILURE OF THE LINER. THIS PROBLEM HAS NOT BEEN FULLY RESOLVED.

1/78	A		97.0	97.0	17.6						

ARIZONA PUBLIC SERVICE: CHOLLA 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	B		90.9	96.9	16.5						
	SYSTEM		94.0	97.0	17.1			744	135	127	

** PROBLEMS/SOLUTIONS/COMMENTS

THE FLOODED DISC SCRUBBER TANK HEADER FOR THE LIMESTONE SLURRY WAS REPAIRED AFTER BEING DAMAGED DURING THE OVERHAUL.

THE BOILER AND SCRUBBER WERE OUT OF SERVICE MOST OF JANUARY AS THE SCHEDULED OVERHAUL CONTINUED.

2/78	A		99.1	100.0	94.7						
	B		87.9	100.0	84.0						
	SYSTEM		93.5	100.0	89.4			672	642	600	

** PROBLEMS/SOLUTIONS/COMMENTS

SOME MINOR LEAK REPAIRS WERE REQUIRED DURING FEBRUARY AFTER THE TWO MONTH OVERHAUL/CLEANING WAS COMPLETED IN JANUARY.

3/78	A		100.0	74.4	100.0						
	B		98.8	74.4	98.8						
	SYSTEM		99.4	74.4	99.4			744	744	739	

** PROBLEMS/SOLUTIONS/COMMENTS

ONE FORCED SHUTDOWN OCCURRED ON THE A-SIDE SCRUBBING TRAIN.

4/78	A		92.7	99.9	92.7						
	B	100.0	100.0	100.0	100.0						
	SYSTEM		96.4	100.0	96.4			720	720	694	

** PROBLEMS/SOLUTIONS/COMMENTS

A MINOR LEAK REPAIR WAS NECESSARY AGAIN AFTER THE NOVEMBER-JANUARY OVERHAUL/CLEANING.

5/78	A		86.7	86.7	86.7						
	B		96.2	98.1	96.2						
	SYSTEM		91.5	92.4	91.5			744	744	680	

** PROBLEMS/SOLUTIONS/COMMENTS

THERE WERE NO SIGNIFICANT PROBLEMS REPORTED. ONLY GENERAL MAINTENANCE WAS PERFORMED ON THE SYSTEM DURING MAY.

6/78	A	100.0	100.0	100.0	100.0						
	B		99.2	100.0	99.2						
	SYSTEM		99.6	100.0	99.6			720	720	717	

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED NO MAJOR PROBLEMS FOR THE MONTH OF JUNE.

7/78	A		99.4	99.4	99.4						
	B	100.0	100.0	100.0	100.0						
	SYSTEM		99.7	99.7	99.7			744	744	742	

** PROBLEMS/SOLUTIONS/COMMENTS

ONLY ROUTINE MAINTENANCE WAS REQUIRED ON THE SCRUBBER FOR JULY.

8/78	A	100.0	100.0	100.0	100.0						

ARIZONA PUBLIC SERVICE: CHOLLA 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	B		95.1	95.1	95.1						
	SYSTEM		97.6	97.6	97.6			744	744	726	

** PROBLEMS/SOLUTIONS/COMMENTS

REPAIRS WERE NECESSARY TO PLUGGED B-SIDE REHEAT COILS. THE COILS WERE REPLACED.

9/78	A	100.0	100.0	100.0	100.0						
	B		97.8	100.0	97.8						
	SYSTEM		98.9	100.0	98.9			720	720	712	

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED NO MAJOR PROBLEMS FOR THE MONTH OF SEPTEMBER.

10/78	A		100.0	100.0	58.4						
	B		95.9	100.0	56.0						
	SYSTEM		98.0	100.0	57.2			744	434	425	

** PROBLEMS/SOLUTIONS/COMMENTS

ONLY ROUTINE MAINTENANCE WAS REQUIRED ON THE SCRUBBER IN OCTOBER.

11/78	A	100.0	100.0	100.0	100.0						
	B		91.3	100.0	91.3						
	SYSTEM		95.7	100.0	95.7			720	720	688	

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED NO MAJOR PROBLEMS FOR THE MONTH OF NOVEMBER.

12/78	A		88.1	88.1	88.1						
	B		85.6	88.3	85.6						
	SYSTEM		86.9	88.2	86.9			744	744	646	

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY HAS REPORTED THAT THE FGD SYSTEM EXPERIENCED CONTROL PROBLEMS DURING DECEMBER.

1/79	A		99.1	99.1	99.1						
	B	100.0	100.0	100.0	100.0						
	SYSTEM		99.6	99.6	99.6			744	744	741	
2/79	A	100.0	100.0	100.0	100.0						
	B	100.0	100.0	100.0	100.0						
	SYSTEM	100.0	100.0	100.0	100.0			672	672	672	

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED NO MAJOR PROBLEMS FOR THE MONTH OF FEBRUARY.

3/79	A		95.2	95.0	95.2						
	B	100.0	100.0	100.0	100.0						
	SYSTEM		97.6	97.5	97.6			744	744	726	

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY HAS EXPERIENCED PLUGGED REHEAT TUBES. THE OLD TUBES, IN UNSECTIONALIZED BUNDLES, WERE REPLACED WITH NEW TUBES OF SPLIT COIL CONSTRUCTION AND MADE OF 316L SS. THE NEW TYPE OF TUBES ALONG WITH BETTER MAINTENANCE PROCEDURES HAS ADDED TO THE REHEAT TUBE LIFE AND REHEATER AVAILABILITY.

ARIZONA PUBLIC SERVICE: CHOLLA 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
4/79	A	100.0	100.0	100.0	100.0						
	B	100.0	100.0	100.0	100.0						
	SYSTEM	100.0	100.0	100.0	100.0			720	720	720	

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED NO PROBLEMS FOR THE MONTH OF APRIL.

5/79	A		99.1	99.4	99.1						
	B		44.1	44.1	44.1						
	SYSTEM		71.6	71.8	71.6			744	744	533	

** PROBLEMS/SOLUTIONS/COMMENTS

CORRODED DUCTWORK ON MODULE B FROM THE TOWER TO THE STACK WAS REPLACED DURING MAY.

REPAIRS WERE MADE TO THE MODULE B SCRUBBER LINING AND THE PACKING WAS REPLACED.

6/79	A		78.2	78.0	78.2						
	B	100.0	100.0	100.0	100.0						
	SYSTEM		89.1	89.0	89.1			720	720	642	

** PROBLEMS/SOLUTIONS/COMMENTS

THE MODULE A ABSORBER TOWER MUNTERS PACKING WAS REPLACED DURING JUNE.

EMERGENCY MAINTENANCE WAS PERFORMED JUNE 23 ON THE MODULE A COMMON DISCHARGE HEADER.

7/79	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

NO INFORMATION WAS AVAILABLE FOR THE MONTH OF JULY.

8/79	A		95.7	95.6	95.7						
	B		95.7	95.7	95.7						
	SYSTEM		95.7	95.7	95.7			744	744	712	

** PROBLEMS/SOLUTIONS/COMMENTS

DURING AUGUST GENERAL MAINTENANCE WAS PERFORMED ON THE FLOODED DISC SCRUBBER.

9/79	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

INFORMATION WAS NOT AVAILABLE FOR THE MONTH OF SEPTEMBER.

10/79	A		97.8	100.0	45.0						
	B		94.3	98.0	43.3						
	SYSTEM		96.1	99.0	44.2			744	342	328	

** PROBLEMS/SOLUTIONS/COMMENTS

DURING OCTOBER ROUTINE MAINTENANCE WAS PERFORMED ON THE FGD SYSTEM.

11/79	A		77.0		77.0						
	B		98.5		98.5						
	SYSTEM		87.8		87.8			720	720	632	

ARIZONA PUBLIC SERVICE: CHOLLA 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
12/79	A		94.0		94.0						
	B		86.7		86.7						
	SYSTEM		90.4		90.4			744	744	672	
1/80	A		95.5		95.5						
	B		99.1		99.1						
	SYSTEM		97.3		97.3			744	744	724	91.7
2/80	A	100.0	100.0	100.0	100.0						
	B		99.4		99.4						
	SYSTEM		99.7		99.7			696	696	694	92.1
3/80	A		99.1		99.1						
	B		93.1		93.1						
	SYSTEM		96.1		96.1			744	744	715	88.6

** PROBLEMS/SOLUTIONS/COMMENTS

NO FORCED OUTAGES WERE REPORTED BY THE UTILITY FOR THE FIVE MONTH PERIOD OF NOVEMBER 1979 THROUGH MARCH 1980. SOME SCHEDULED OUTAGE TIME WAS REQUIRED FOR REPAIR OF THE REHEATER DUCTWORK.

4/80	A	100.0	100.0	100.0	100.0						
	B	100.0	100.0	100.0	100.0						
	SYSTEM	100.0	100.0	100.0	100.0			720	720	720	82.8

** PROBLEMS/SOLUTIONS/COMMENTS

NO FGD-RELATED PROBLEMS WERE REPORTED FOR THE MONTH OF APRIL.

5/80	A	100.0	100.0	100.0	100.0						
	B	99.2	99.2	99.2	99.2						
	SYSTEM	99.6	99.6	99.6	99.6			744	744	741	87.6

** PROBLEMS/SOLUTIONS/COMMENTS

THE B-MODULE OUTAGE TIME IN MAY WAS CAUSED BY PROBLEMS WITH THE BOOSTER FAN.

6/80	A	100.0	80.7	100.0	68.7						
	B	99.3	87.7	99.1	74.6						
	SYSTEM	99.7	84.2	99.6	71.7			720	613	516	67.5

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JUNE SCHEDULED MAINTENANCE WAS PERFORMED ON THE BOILER. THE SCHEDULED OUTAGE TIME WAS NECESSARY TO ACID WASH THE CONDENSERS.

THE ONLY FGD-RELATED OUTAGE OCCURRED WHEN A BLOCK VALVE MALFUNCTIONED. THE B-MODULE WAS OUT OF SERVICE FOR FIVE HOURS.

7/80	A	100.0	100.0	100.0	100.0						
	B	100.0	98.6	100.0	98.6						
	SYSTEM	100.0	99.3	100.0	99.3			744	744	739	95.8

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS AVAILABLE 100% OF THE TIME IN JULY. MODULE B WAS NOT UTILIZED FOR PART OF THE MONTH DUE TO LOW BOILER LOAD.

8/80	SYSTEM							744			
9/80	SYSTEM							720			

ARIZONA PUBLIC SERVICE: CHOLLA 1 (CONT.)

PERIOD	MODULE	PERFORMANCE DATA: AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR

** PROBLEMS/SOLUTIONS/COMMENTS

DATA FOR THE AUGUST AND SEPTEMBER MONTHS WERE NOT AVAILABLE DUE TO PERSONNEL CHANGES.

10/80	SYSTEM							744			
11/80	SYSTEM							720			
12/80	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY HAS REPORTED THAT THE AVAILABILITY FIGURES FOR AUGUST THROUGH DECEMBER ARE NOT AVAILABLE AT THIS TIME.

DURING THE FOURTH QUARTER THE DUCTWORK DOWNSTREAM OF THE B TRAIN SCRUBBERS HAD TO BE REPLACED.

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	ARIZONA PUBLIC SERVICE	
PLANT NAME	CHOLLA	
UNIT NUMBER	2	
CITY	JOSEPH CITY	
STATE	ARIZONA	
REGULATORY CLASSIFICATION	C	
PARTICULATE EMISSION LIMITATION - NG/J	72.	(.167 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	344.	(.800 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	615	
GROSS UNIT GENERATING CAPACITY - MW	264	
NET UNIT GENERATING CAPACITY W/FGD - MW	235	
NET UNIT GENERATING CAPACITY WO/FGD - MW	*****	
EQUIVALENT SCRUBBED CAPACITY - MW	264	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	COMBUSTION ENGINEERING	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	********	(******* ACFM)
BOILER FLUE GAS TEMPERATURE - C	*******	(**** F)
STACK HEIGHT - M	168.	(550 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	4.5	(14.7 FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	BITUMINOUS	
AVERAGE HEAT CONTENT - J/G	23609.	(10150 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		9650-10600
AVERAGE ASH CONTENT - %	13.50	
RANGE ASH CONTENT - %	9.7-22.5	
AVERAGE MOISTURE CONTENT - %	15.00	
RANGE MOISTURE CONTENT - %	******	
AVERAGE SULFUR CONTENT - %	.50	
RANGE SULFUR CONTENT - %	0.44-1.0	
AVERAGE CHLORIDE CONTENT - %	.02	
RANGE CHLORIDE CONTENT - %	0.01-0.04	
*** PARTICLE CONTROL		
** MECHANICAL COLLECTOR		
PARTICLE REMOVAL EFFICENCY -%	75.0	
** PARTICLE SCRUBBER		
NUMBER	4	
GENERIC TYPE	VENTURI TOWER	
SPECIFIC TYPE	VARIABLE-THROAT/BOTTOM-ENTRY LIQUID DISTRIBUTION	
SUPPLIER	RESEARCH-COTTRELL	
DIMENSIONS - FT	6 (DIA) X 45	
SHELL GENERIC MATERIAL	STAINLESS STEEL	
SHELL SPECIFIC MATERIAL	AUSTENITIC	
LINER GENERIC MATERIAL	ORGANIC	
LINER SPECIFIC MATERIAL	GLASS FLAKE-FILLED POLYESTER	
L/G RATIO - LITER/CU.M	1.4	(10.1 GAL/1000ACF)
PRESSURE DROP - KPA	3.7	(15.0 IN-H2O)
INLET GAS FLOW RATE - CU.M/S	185.0	(392000 ACFM)
INLET GAS TEMPERATURE - C	50.0	(122 F)
*** FGD SYSTEM		
** GENERAL DATA		
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT	
SO2 REMOVAL MODE	WET SCRUBBING	
PROCESS TYPE	LIMESTONE	
PROCESS ADDITIVES	NONE	
SYSTEM SUPPLIER	RESEARCH-COTTRELL	
A-E FIRM	EBASCO	
DEVELOPMENT LEVEL	FULL SCALE	

ARIZONA PUBLIC SERVICE: CHOLLA 2 (CONT.)

NEW/RETROFIT	NEW	
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.70	
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	75.00	
CURRENT STATUS	1	
COMMERCIAL START-UP	6/78	
INITIAL START-UP	4/78	
CONTRACT AWARDED	12/74	

** DESIGN AND OPERATING PARAMETERS

** ABSORBER

NUMBER	4	
NUMBER OF SPARES	1	
GENERIC TYPE	COMBINATION	
SPECIFIC TYPE	SPRAY/PACKED	
SUPPLIER	RESEARCH-COTTRELL	
DIMENSIONS - FT	22 (DIA) X 70	
SHELL GENERIC MATERIAL	STAINLESS STEEL	
SHELL SPECIFIC MATERIAL	AUSTENITIC	
SHELL MATERIAL TRADE NAME/COMMON TYPE	TYPE 316L	
LINER GENERIC MATERIAL	NONE	
LINER SPECIFIC MATERIAL	N/A	
LINER MATERIAL TRADE NAME/COMMON TYPE	N/A	
L/G RATIO - L/CU.M	6.5	(48.9 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	.1	(.5 IN-H2O)
INLET GAS FLOW - CU. M/S	184.98	(392000 ACFM)
INLET GAS TEMPERATURE - C	50.0	(122 F)
SO2 REMOVAL EFFICIENCY - %	85.0	

** MIST ELIMINATOR

PRE-MIST ELIMINATOR/MIST ELIMINATOR	MIST ELIMINATOR	
GENERIC TYPE	IMPINGEMENT	
SPECIFIC TYPE	BAFFLE	
TRADE NAME/COMMON TYPE	CHEVRON VANE	

** REHEATER

GENERIC TYPE	IN-LINE	
SPECIFIC TYPE	STEAM	
TEMPERATURE INCREASE - C	4.4	(40 F)
CONSTRUCTION MATERIAL GENERIC TYPE	INCONEL 625	

** FANS

DESIGN	CENTRIFUGAL	
FUNCTION	BOOSTER	
APPLICATION	FORCED DRAFT	
SERVICE	DRY	
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	

** REAGENT PREPARATION EQUIPMENT

FUNCTION	LIMESTONE GRINDING	
DEVICE	BALL MILL	
NUMBER	2	
FULL LOAD DRY FEED CAPACITY - M.TONS/HR	6.4	(7 TPH)

*** SLUDGE

** DISPOSAL

NATURE	FINAL	
TYPE	UNLINED POND	
LOCATION	ON SITE	

** WATER BALANCE

WATER LOOP TYPE	OPEN	
MAKEUP WATER ADDITION - LITERS/S	7.6	(120 GPM)

** FGD SPARE CAPACITY INDICES

ABSORBER - %	33.0	

EPA UTILITY FGD SURVEY: OCTOBER - DECEMBER 1980

ARIZONA PUBLIC SERVICE: CHOLLA 2 (CONT.)

** FGD SPARE COMPONENT INDICES
ABSORBER 1.0

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
4/78	SYSTEM							720			
5/78	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

INITIAL SCRUBBING OPERATIONS BEGAN IN APRIL 1978. THE SCRUBBER REPORTEDLY OPERATES MOST OF THE TIME, HOWEVER, SOME PROBLEMS HAVE OCCURRED WITH VIBRATIONS THROUGHOUT THE SYSTEM.

THE EPA HAS RECENTLY GRANTED THE UTILITY AN EXTENSION FOR COMPLIANCE. FULL COMMERCIAL OPERATIONS ARE EXPECTED TO BEGIN SOMETIME AFTER MID-AUGUST. THE COMPLIANCE TEST WILL BE COMPLETED BY AUGUST 15. THE UTILITY EXPECTS TO HAVE THE FGD SYSTEM SHAKEDOWN PROBLEMS CLEARED UP BY THEN.

6/78	SYSTEM							720			
7/78	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

SHAKEDOWN/DEBUGGING OPERATIONS ARE CONTINUING.

THE SLURRY RECYCLE PIPING HAS EXPERIENCED CONTINUAL VIBRATION PROBLEMS. THE CONTRACTOR HAS BEEN INJECTING NITROGEN GAS INTO THE LINES TO DAMPEN THE VIBRATIONS (AIR WAS NOT USED BECAUSE THE SULFITE WOULD BE OXIDIZED TO SULFATE AND RESULT IN SCALE FORMATION).

THE CORROSION RESISTANT COATING IN THE DOWNCOMER AREA IN ONE OF THE ABSORBER MODULES HAS BEEN PEELING AWAY.

8/78	SYSTEM							744			
9/78	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

THE SLURRY RECYCLE SYSTEM COMPONENTS ARE STILL EXPERIENCING RESONANT VIBRATIONS.

THE COMPLIANCE TEST WAS PERFORMED THE WEEK OF AUGUST 7. ALTHOUGH OFFICIAL WORD HAS NOT BEEN RECEIVED BY THE UTILITY IT APPEARS THAT THE UNIT IS IN COMPLIANCE WITH RESPECT TO SO2, PARTICULATE MATTER, OPACITY AND NOX.

SHAKEDOWN/DEBUGGING OPERATIONS ARE CONTINUING.

10/78	SYSTEM							744			
11/78	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

SHAKEDOWN DEBUGGING OPERATIONS ARE CONTINUING. SOME SCRUBBER COMPONENTS ARE STILL MANNED BY BECHTEL STAFF, ARIZONA PUBLIC SERVICE PERSONNEL ARE OPERATING MOST OF THE SYSTEM AT THIS TIME.

12/78	SYSTEM							744			
1/79	SYSTEM							744			

ARIZONA PUBLIC SERVICE: CHOLLA 2 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
		PERFORMANCE DATA									
	** PROBLEMS/SOLUTIONS/COMMENTS										
	DECEMBER-JANUARY INFORMATION IS UNAVAILABLE AT THIS TIME FOR CHOLLA 2. THE UTILITY REPORTED THAT IT WOULD SOON BE KEEPING PERFORMANCE RECORDS.										
2/79	SYSTEM							672			
3/79	SYSTEM							744			
4/79	SYSTEM							720			
5/79	SYSTEM							744			
6/79	SYSTEM							720			
	** PROBLEMS/SOLUTIONS/COMMENTS										
	OPERATION PARAMATERS ARE STILL UNAVAILABLE FOR THIS UNIT.										
7/79	SYSTEM							744			
8/79	SYSTEM							744			
9/79	SYSTEM							720			
	** PROBLEMS/SOLUTIONS/COMMENTS										
	NO INFORMATION WAS AVAILABLE FROM THE UTILITY FOR THIS PERIOD. THE UTILITY INDICATED THAT DATA WOULD BE AVAILABLE FOR THE FOURTH QUARTER REPORT.										
10/79	SYSTEM							744			
11/79	SYSTEM							720			
12/79	SYSTEM							744			
	** PROBLEMS/SOLUTIONS/COMMENTS										
	NO INFORMATION WAS AVAILABLE FOR THE FOURTH QUARTER OF 1979.										
1/80	SYSTEM							744			
2/80	SYSTEM							696			
3/80	SYSTEM							744			
	** PROBLEMS/SOLUTIONS/COMMENTS										
	NO INFORMATION IS AVAILABLE AS OF YET WITH RESPECT TO THE CHOLLA 2 FGD OPERATIONS.										
4/80	SYSTEM							720			
5/80	SYSTEM							744			
6/80	SYSTEM							720			
	** PROBLEMS/SOLUTIONS/COMMENTS										
	THE FGD SYSTEM PERFORMANCE DATA FOR THE APRIL-JUNE PERIOD ARE NOT AVAILABLE AT THIS TIME.										
7/80	SYSTEM							744			

ARIZONA PUBLIC SERVICE: CHOLLA 2 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
				PERFORMANCE DATA							
8/80	SYSTEM							744			
9/80	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

THE THIRD QUARTER UPDATE INFORMATION IS NOT AVAILABLE FOR RELEASE AT THIS TIME.

10/80	SYSTEM							744			
11/80	SYSTEM							720			
12/80	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

PERFORMANCE DATA FOR THIS UNIT IS NOT AVAILABLE FOR PUBLICATION AT THIS TIME.

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	ARIZONA PUBLIC SERVICE	
PLANT NAME	FOUR CORNERS	
UNIT NUMBER	1	
CITY	FARMINGTON	
STATE	NEW MEXICO	
REGULATORY CLASSIFICATION	C	
PARTICULATE EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	258.	(.600 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	2089	
GROSS UNIT GENERATING CAPACITY - MW	175	
NET UNIT GENERATING CAPACITY W/FGD - MW	175	
NET UNIT GENERATING CAPACITY WO/FGD - MW	*****	
EQUIVALENT SCRUBBED CAPACITY - MW	175	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	RILEY STOKER	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	384.13	(814000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	171.1	(340 F)
STACK HEIGHT - M	******	(**** FT)
STACK SHELL	******	
STACK TOP DIAMETER - M	*******	(***** FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	SUBBITUMINOUS	
AVERAGE HEAT CONTENT - J/G	20004.	(8600 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		8300-9000
AVERAGE ASH CONTENT - %	22.00	
RANGE ASH CONTENT - %	******	
AVERAGE MOISTURE CONTENT - %	12.30	
RANGE MOISTURE CONTENT - %	******	
AVERAGE SULFUR CONTENT - %	.75	
RANGE SULFUR CONTENT - %	******	
AVERAGE CHLORIDE CONTENT - %	.07	
RANGE CHLORIDE CONTENT - %	******	
*** PARTICLE CONTROL		
** PARTICLE SCRUBBER		
NUMBER	2	
GENERIC TYPE	VENTURI TOWER	
SUPPLIER	CHEMICO	
SO2 REMOVAL EFFICENCY - %	30.0	
*** FGD SYSTEM		
** GENERAL DATA		
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT	
SO2 REMOVAL MODE	WET SCRUBBING	
PROCESS TYPE	LIME/ALKALINE FLYASH	
SYSTEM SUPPLIER	CHEMICO DIVISION, ENVIROTECH	
A-E FIRM	IN-HOUSE	
DEVELOPMENT LEVEL	FULL SCALE	
NEW/RETROFIT	RETROFIT	
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.00	
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	80.00	
CURRENT STATUS	1	
INITIAL START-UP	11/79	
** DESIGN AND OPERATING PARAMETERS		
** ABSORBER		
NUMBER	2	
GENERIC TYPE	VENTURI TOWER	
SPECIFIC TYPE	VARIABLE-THROAT/TOP-ENTRY PLUMB BOB	
SHELL GENERIC MATERIAL	CARBON STEEL	

ARIZONA PUBLIC SERVICE: FOUR CORNERS 1 (CONT.)

SHELL SPECIFIC MATERIAL	AISI 1110
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A
SO2 REMOVAL EFFICIENCY - %	67.5

** REHEATER

GENERIC TYPE	NONE
SPECIFIC TYPE	N/A
TRADE NAME/COMMON TYPE	N/A

** FANS

DESIGN	CENTRIFUGAL
SERVICE	WET

** SOLIDS CONCENTRATING/DEWATERING

DEVICE	THICKENER
NUMBER	1

** FGD SPARE CAPACITY INDICES

ABSORBER - %	.0

** FGD SPARE COMPONENT INDICES

ABSORBER	.0

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
11/79	SYSTEM							720			
12/79	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

INITIAL OPERATIONS STARTED IN NOVEMBER 1979.

1/80	SYSTEM							744			
2/80	SYSTEM							696			
3/80	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT IS PRESENTLY IN THE SHAKEDOWN/DEBUGGING PHASE OF OPERATION.

4/80	SYSTEM							720			
5/80	SYSTEM							744			
6/80	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

ALTHOUGH THE FGD SYSTEM PERFORMANCE DATA ARE BEING LOGGED, THE UTILITY REPORTED THAT IT IS UNAVAILABLE FOR RELEASE AT THIS TIME.

7/80	SYSTEM							744			
8/80	SYSTEM							744			
9/80	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

THE THIRD QUARTER UPDATE INFORMATION IS NOT YET AVAILABLE.

10/80	SYSTEM							744			
11/80	SYSTEM							720			

ARIZONA PUBLIC SERVICE: FOUR CORNERS 1 (CONT.)

PERIOD	MODULE	PERFORMANCE DATA: AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
12/80	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

PERFORMANCE DATA FOR THIS UNIT IS NOT AVAILABLE FOR PUBLICATION AT THIS TIME.

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	ARIZONA PUBLIC SERVICE	
PLANT NAME	FOUR CORNERS	
UNIT NUMBER	2	
CITY	FARMINGTON	
STATE	NEW MEXICO	
REGULATORY CLASSIFICATION	C	
PARTICULATE EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	258.	(.600 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	2089	
GROSS UNIT GENERATING CAPACITY - MW	175	
NET UNIT GENERATING CAPACITY W/FGD - MW	175	
NET UNIT GENERATING CAPACITY WO/FGD - MW	*****	
EQUIVALENT SCRUBBED CAPACITY - MW	175	

** UNIT DATA - BOILER AND STACK

BOILER SUPPLIER	RILEY STOKER	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	384.13	(814000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	171.1	(340 F)
STACK HEIGHT - M	******	(**** FT)
STACK SHELL	******	
STACK TOP DIAMETER - M	*******	(***** FT)

** FUEL DATA

FUEL TYPE	COAL	
FUEL GRADE	SUBBITUMINOUS	
AVERAGE HEAT CONTENT - J/G	20004.	(8600 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		8300-9000
AVERAGE ASH CONTENT - %	22.00	
RANGE ASH CONTENT - %	******	
AVERAGE MOISTURE CONTENT - %	12.30	
RANGE MOISTURE CONTENT - %	******	
AVERAGE SULFUR CONTENT - %	.75	
RANGE SULFUR CONTENT - %	******	
AVERAGE CHLORIDE CONTENT - %	.07	
RANGE CHLORIDE CONTENT - %	******	

*** PARTICLE CONTROL

** PARTICLE SCRUBBER

NUMBER	2
GENERIC TYPE	VENTURI TOWER
SUPPLIER	CHEMICO
SO2 REMOVAL EFFICENCY - %	30.0

*** FGD SYSTEM

** GENERAL DATA

SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT
SO2 REMOVAL MODE	WET SCRUBBING
PROCESS TYPE	LIME/ALKALINE FLYASH
SYSTEM SUPPLIER	CHEMICO DIVISION, ENVIROTECH
A-E FIRM	IN-HOUSE
DEVELOPMENT LEVEL	FULL SCALE
NEW/RETROFIT	RETROFIT
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.00
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	80.00
CURRENT STATUS	1
INITIAL START-UP	11/79

** DESIGN AND OPERATING PARAMETERS

** ABSORBER

NUMBER	2
GENERIC TYPE	VENTURI TOWER
SPECIFIC TYPE	VARIABLE-THROAT/TOP-ENTRY PLUMB BOB
SHELL GENERIC MATERIAL	CARBON STEEL

ARIZONA PUBLIC SERVICE: FOUR CORNERS 2 (CONT.)

SHELL SPECIFIC MATERIAL	AISI 1110
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A
SO2 REMOVAL EFFICIENCY - %	67.5

** REHEATER

GENERIC TYPE	NONE
SPECIFIC TYPE	N/A
TRADE NAME/COMMON TYPE	N/A

** FANS

DESIGN	CENTRIFUGAL
SERVICE	WET

** SOLIDS CONCENTRATING/DEWATERING

DEVICE	THICKENER
NUMBER	1

** FGD SPARE CAPACITY INDICES

ABSORBER - %	.0

** FGD SPARE COMPONENT INDICES

ABSORBER	.0

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
11/79	SYSTEM							720			
12/79	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

INITIAL OPERATIONS STARTED IN NOVEMBER 1979.

1/80	SYSTEM							744			
2/80	SYSTEM							696			
3/80	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT IS PRESENTLY IN THE SHAKEDOWN/DEBUGGING PHASE OF OPERATION.

4/80	SYSTEM							720			
5/80	SYSTEM							744			
6/80	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

ALTHOUGH THE FGD SYSTEM PERFORMANCE DATA ARE BEING LOGGED, THE UTILITY REPORTED THAT IT IS UNAVAILABLE FOR RELEASE AT THIS TIME.

7/80	SYSTEM							744			
8/80	SYSTEM							744			
9/80	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

THE THIRD QUARTER UPDATE INFORMATION IS NOT YET AVAILABLE.

10/80	SYSTEM							744			
11/80	SYSTEM							720			

ARIZONA PUBLIC SERVICE: FOUR CORNERS 2 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
		PERFORMANCE DATA									
12/80	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

PERFORMANCE DATA FOR THIS UNIT IS NOT AVAILABLE FOR PUBLICATION AT THIS TIME.

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	ARIZONA PUBLIC SERVICE	
PLANT NAME	FOUR CORNERS	
UNIT NUMBER	3	
CITY	FARMINGTON	
STATE	NEW MEXICO	
REGULATORY CLASSIFICATION	C	
PARTICULATE EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	258.	(.600 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	2089	
GROSS UNIT GENERATING CAPACITY - MW	229	
NET UNIT GENERATING CAPACITY W/FGD - MW	229	
NET UNIT GENERATING CAPACITY WO/FGD - MW	*****	
EQUIVALENT SCRUBBED CAPACITY - MW	229	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	FOSTER WHEELER	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	486.06	(1030000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	171.1	(340 F)
STACK HEIGHT - M	******	(**** FT)
STACK SHELL	******	
STACK TOP DIAMETER - M	*******	(***** FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	SUBBITUMINOUS	
AVERAGE HEAT CONTENT - J/G	20004.	(8600 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		8300-9000
AVERAGE ASH CONTENT - %	22.00	
RANGE ASH CONTENT - %	******	
AVERAGE MOISTURE CONTENT - %	12.30	
RANGE MOISTURE CONTENT - %	******	
AVERAGE SULFUR CONTENT - %	.75	
RANGE SULFUR CONTENT - %	******	
AVERAGE CHLORIDE CONTENT - %	.07	
RANGE CHLORIDE CONTENT - %	******	
*** PARTICLE CONTROL		
** PARTICLE SCRUBBER		
NUMBER	2	
GENERIC TYPE	VENTURI TOWER	
SUPPLIER	CHEMICO	
SO2 REMOVAL EFFICENCY - %	30.0	
*** FGD SYSTEM		
** GENERAL DATA		
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT	
SO2 REMOVAL MODE	WET SCRUBBING	
PROCESS TYPE	LIME/ALKALINE FLYASH	
SYSTEM SUPPLIER	CHEMICO DIVISION, ENVIROTECH	
A-E FIRM	IN-HOUSE	
DEVELOPMENT LEVEL	FULL SCALE	
NEW/RETROFIT	RETROFIT	
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.00	
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	80.00	
CURRENT STATUS	1	
INITIAL START-UP	11/79	
** DESIGN AND OPERATING PARAMETERS		
** ABSORBER		
NUMBER	2	
GENERIC TYPE	VENTURI TOWER	
SPECIFIC TYPE	VARIABLE-THROAT/TOP-ENTRY PLUMB BOB	
SHELL GENERIC MATERIAL	CARBON STEEL	

ARIZONA PUBLIC SERVICE: FOUR CORNERS 3 (CONT.)

SHELL SPECIFIC MATERIAL	AISI 1110
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A
SO2 REMOVAL EFFICIENCY - %	67.5

** REHEATER

GENERIC TYPE	NONE
SPECIFIC TYPE	N/A
TRADE NAME/COMMON TYPE	N/A

** FANS

DESIGN	CENTRIFUGAL
SERVICE	WET

** SOLIDS CONCENTRATING/DEWATERING

DEVICE	THICKENER
NUMBER	1

** FGD SPARE CAPACITY INDICES

ABSORBER - %	.0

** FGD SPARE COMPONENT INDICES

ABSORBER	.0

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
11/79	SYSTEM							720			
12/79	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

INITIAL OPERATIONS STARTED IN NOVEMBER 1979.

1/80	SYSTEM							744			
2/80	SYSTEM							696			
3/80	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT IS PRESENTLY IN THE SHAKEDOWN/DEBUGGING PHASE OF OPERATION.

4/80	SYSTEM							720			
5/80	SYSTEM							744			
6/80	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

ALTHOUGH THE FGD SYSTEM PERFORMANCE DATA ARE BEING LOGGED, THE UTILITY REPORTED THAT IT IS UNAVAILABLE FOR RELEASE AT THIS TIME.

7/80	SYSTEM							744			
8/80	SYSTEM							744			
9/80	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

NO INFORMATION WAS AVAILABLE FOR THE THIRD QUARTER 1980.

10/80	SYSTEM							744			
11/80	SYSTEM							720			

ARIZONA PUBLIC SERVICE: FOUR CORNERS 3 (CONT.)

PERIOD	MODULE	PERFORMANCE DATA AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
12/80	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

PERFORMANCE DATA FOR THIS UNIT IS NOT AVAILABLE FOR PUBLICATION AT THIS TIME.

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	BASIN ELECTRIC POWER COOP	
PLANT NAME	LARAMIE RIVER	
UNIT NUMBER	1	
CITY	WHEATLAND	
STATE	WYOMING	
REGULATORY CLASSIFICATION	C	
PARTICULATE EMISSION LIMITATION - NG/J	43.	(.100 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	86.	(.200 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	1500	
GROSS UNIT GENERATING CAPACITY - MW	570	
NET UNIT GENERATING CAPACITY W/FGD - MW	550	
NET UNIT GENERATING CAPACITY WO/FGD - MW	550	
EQUIVALENT SCRUBBED CAPACITY - MW	570	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	BABCOCK & WILCOX	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	1321.32	(2800000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	56.1	(133 F)
STACK HEIGHT - M	183.	(600 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	8.7	(28.6 FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	SUBBITUMINOUS	
AVERAGE HEAT CONTENT - J/G	18931.	(8139 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		******
AVERAGE ASH CONTENT - %	7.89	
RANGE ASH CONTENT - %	******	
AVERAGE MOISTURE CONTENT - %	28.92	
RANGE MOISTURE CONTENT - %	******	
AVERAGE SULFUR CONTENT - %	.81	
RANGE SULFUR CONTENT - %	.15-.81	
AVERAGE CHLORIDE CONTENT - %	.04	
RANGE CHLORIDE CONTENT - %	******	
*** PARTICLE CONTROL		
** ESP		
NUMBER	1	
TYPE	COLD SIDE	
SUPPLIER	BABCOCK & WILCOX	
INLET FLUE GAS CAPACITY - CU.M/S	1085.4	(2300000 ACFM)
INLET FLUE GAS TEMPERATURE - C	141.1	(286 F)
PRESSURE DROP - KPA	.8	(3. IN-H2O)
PARTICLE REMOVAL EFFICENCY - %	99.6	
** PARTICLE SCRUBBER		
GENERIC TYPE	NONE	
SPECIFIC TYPE	N/A	
*** FGD SYSTEM		
** GENERAL DATA		
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT	
SO2 REMOVAL MODE	WET SCRUBBING	
PROCESS TYPE	LIMESTONE	
SYSTEM SUPPLIER	RESEARCH-COTTRELL	
A-E FIRM	BURNS & MCDONNELL	
DEVELOPMENT LEVEL	FULL SCALE	
NEW/RETROFIT	NEW	
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.60	
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	90.00	
CURRENT STATUS	1	
COMMERCIAL START-UP	7/80	
INITIAL START-UP	7/80	

BASIN ELECTRIC POWER COOP: LARAMIE RIVER 1 (CONT.)

CONTRACT AWARDED	1/77	
** DESIGN AND OPERATING PARAMETERS		
** ABSORBER		
NUMBER	5	
GENERIC TYPE	COMBINATION	
SPECIFIC TYPE	SPRAY/PACKED	
SUPPLIER	RESEARCH-COTTRELL	
DIMENSIONS - FT	30 X 30 X 88	
SHELL GENERIC MATERIAL	STAINLESS STEEL,HIGH ALLOY	
SHELL SPECIFIC MATERIAL	AUSTENITIC	
SHELL MATERIAL TRADE NAME/COMMON TYPE	TIPE 316L,UDDEHOLM 904L	
LINER GENERIC MATERIAL	NONE	
LINER SPECIFIC MATERIAL	N/A	
LINER MATERIAL TRADE NAME/COMMON TYPE	N/A	
GAS CONTACTING DEVICE TYPE	POLYPROPYLENE HONEYCOMB TYPE	
DISTANCE BETWEEN GAS CONTACTING ZONES - CM	61.0	(24.0IN)
L/G RATIO - L/CU.M	8.0	(60.0 GAL/1000 ACF)
SUPERFICAL GAS VELOCITY - M/SEC	3.0	(10.0 FT/S)
INLET GAS FLOW - CU. M/S	1085.37	(2300000 ACFM)
INLET GAS TEMPERATURE - C	141.1	(286 F)
SO2 REMOVAL EFFICIENCY - %	90.0	
PARTICLE REMOVAL EFFICENCY - %	.0	
** MIST ELIMINATOR		
PRE-MIST ELIMINATOR/MIST ELIMINATOR	MIST ELIMINATOR	
GENERIC TYPE	IMPINGEMENT	
SPECIFIC TYPE	BAFFLE	
TRADE NAME/COMMON TYPE	CHEVRON VANE	
CONFIGURATION	VERTICAL	
NUMBER OF STAGES	1	
NUMBER OF PASSES PER STAGE	1	
** REHEATER		
GENERIC TYPE	NONE	
SPECIFIC TYPE	N/A	
TRADE NAME/COMMON TYPE	N/A	
** FANS		
NUMBER	2	
DESIGN	CENTRIFUGAL	
SUPPLIER	BABCOCK & WILCOX	
FUNCTION	UNIT	
APPLICATION	FORCED DRAFT	
SERVICE	DRY	
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	
** REAGENT PREPARATION EQUIPMENT		
FUNCTION	LIMESTONE GRINDING	
DEVICE	BALL MILL	
NUMBER	2	
FULL LOAD DRY FEED CAPACITY - M.TONS/HR	13.6	(15 TPH)
PRODUCT QUALITY - % SOLIDS	30.0	
** SOLIDS CONCENTRATING/DEWATERING		
DEVICE	THICKENER	
NUMBER	3	
NUMBER OF SPARES	1	
DIMENSIONS - FT	110 (DIA) X 10 (DEPTH)	
SHELL GENERIC MATERIAL TYPE	CONCRETE	
** SOLIDS CONCENTRATING/DEWATERING		
DEVICE	CENTRIFUGE	
NUMBER	1	
FEED STREAM CHARACTERISTICS	35% SOLIDS	
OUTLET STREAM CHARACTERISTICS	60% SOLIDS	

*** SALEABLE BYPRODUCTS

BASIN ELECTRIC POWER COOP: LARAMIE RIVER 1 (CONT.)

*** SLUDGE

** TREATMENT

METHOD	FORCED OXIDATION

** DISPOSAL

NATURE	FINAL
TYPE	LANDFILL
LOCATION	ON SITE
SITE TRANSPORTATION METHOD	CONVEYOR BELT
SITE SERVICE LIFE - YRS	35

** PROCESS CONTROL AND INSTRUMENTATION

CHEMICAL PARAMETERS	PH, SOLIDS, SO2 INLET, ACFM, SO2 OUTLET
PROCESS CONTROL MANNER	AUTOMATIC

** WATER BALANCE

WATER LOOP TYPE	CLOSED
MAKEUP WATER ADDITION - LITERS/S	16.9 (269 GPM)

** FGD SPARE CAPACITY INDICES

ABSORBER - %	25.0

** FGD SPARE COMPONENT INDICES

ABSORBER	1.0

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
7/80	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT BEGAN INITIAL AND COMMERCIAL OPERATIONS ON JULY 1, 1980. NO MAJOR PROBLEMS WERE REPORTED DURING STARTUP.

8/80	SYSTEM							744			
9/80	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT IS STILL IN THE STARTUP PHASE OF OPERATIONS. NO PERFORMANCE DATA ARE CURRENTLY AVAILABLE.

10/80	A	100.0	99.7	100.0	95.0						
	B	100.0	99.6	100.0	94.9						
	C	100.0	99.7	100.0	95.0						
	D	21.5	22.6	100.0	21.5						
	E	100.0	81.4	100.0	77.5						
	SYSTEM	100.0	100.0	100.0	96.0	92.00	99.70	744	709	715	85.8

** PROBLEMS/SOLUTIONS/COMMENTS

DURING OCTOBER MODULE D WAS DOWN FOR MAINTENANCE ON WELDS IN THE QUENCHER SECTION DUE TO CORROSION OF THE UDDEHOLM 904L. THE OUTAGE LASTED 584 HOURS.

11/80	A	100.0	57.8	100.0	46.4						
	B	100.0	96.2	100.0	77.2						
	C	100.0	72.5	100.0	58.2						
	D	1.9	2.3	100.0	1.9						
	E	100.0	98.3	100.0	78.9						
	SYSTEM	100.0	98.2	100.0	78.9			720	578	568	67.1

BASIN E_ECTRIC POWER COOP: LARAMIE RIVER 1 (CONT.)

PERIOD	MODULE	PERFORMANCE DATA AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING NOVEMBER THE BOILER WAS OUT OF SERVICE APPROXIMATELY 120 HOURS DUE TO REPAIRS.									
		DURING THE MONTH MODULE D WAS OFF LINE 30 DAYS FOR REPAIRS.									
12/80	A	19.6	21.1	100.0	19.6						
	B	100.0	94.4	100.0	87.9						
	C	100.0	96.7	100.0	90.0						
	D	75.7	81.2	100.0	75.7						
	E	100.0	100.0	100.0	93.0						
	SYSTEM	100.0	100.0	100.0	93.0			744	693	692	87.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING DECEMBER MODULES A AND D WERE OUT OF SERVICE FOR MAINTENANCE ON THE WELDS IN THE QUENCHER SECTION DUE TO CORROSION OF UDDEHOLM 904L.									

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	BIG RIVERS ELECTRIC	
PLANT NAME	GREEN	
UNIT NUMBER	1	
CITY	SEBREE	
STATE	KENTUCKY	
REGULATORY CLASSIFICATION	B	
PARTICULATE EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	516.	(1.200 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	484	
GROSS UNIT GENERATING CAPACITY - MW	242	
NET UNIT GENERATING CAPACITY W/FGD - MW	200	
NET UNIT GENERATING CAPACITY WO/FGD - MW	*****	
EQUIVALENT SCRUBBED CAPACITY - MW	242	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	BABCOCK & WILCOX	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	471.90	(1000000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	148.9	(300 F)
STACK HEIGHT - M	107.	(350 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	*******	(***** FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	BITUMINOUS	
AVERAGE HEAT CONTENT - J/G	22678.	(9750 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		9000-10500
AVERAGE ASH CONTENT - %	20.00	
RANGE ASH CONTENT - %	15-25	
AVERAGE MOISTURE CONTENT - %	11.00	
RANGE MOISTURE CONTENT - %	8-14	
AVERAGE SULFUR CONTENT - %	3.75	
RANGE SULFUR CONTENT - %	3.4-4.0	
AVERAGE CHLORIDE CONTENT - %	.05	
RANGE CHLORIDE CONTENT - %	******	
*** PARTICLE CONTROL		
** ESP		
NUMBER	2	
TYPE	COLD SIDE	
SUPPLIER	AMERICAN AIR FILTER	
INLET FLUE GAS CAPACITY - CU.M/S	471.9	(1000000 ACFM)
INLET FLUE GAS TEMPERATURE - C	148.9	(300 F)
PARTICLE REMOVAL EFFICENCY - %	99.6	
** PARTICLE SCRUBBER		
GENERIC TYPE	NONE	
SPECIFIC TYPE	N/A	
*** FGD SYSTEM		
** GENERAL DATA		
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT	
SO2 REMOVAL MODE	WET SCRUBBING	
PROCESS TYPE	LIME	
PROCESS ADDITIVES	MG PROMOTED	
SYSTEM SUPPLIER	AMERICAN AIR FILTER	
A-E FIRM	BURNS & ROE	
DEVELOPMENT LEVEL	FULL SCALE	
NEW/RETROFIT	NEW	
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.00	
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	90.00	
CURRENT STATUS	1	
COMMERCIAL START-UP	12/79	
INITIAL START-UP	12/79	

BIG RIVERS ELECTRIC: GREEN 1 (CONT.)

CONTRACT AWARDED	10/76
** DESIGN AND OPERATING PARAMETERS	
** ABSORBER	
NUMBER	2
GENERIC TYPE	SPRAY TOWER
SPECIFIC TYPE	OPEN COUNTERCURRENT SPRAY
SUPPLIER	AMERICAN AIR FILTER
SHELL GENERIC MATERIAL	CARBON STEEL
SHELL SPECIFIC MATERIAL	AISI 1110
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A
LINER GENERIC MATERIAL	INORGANIC
LINER SPECIFIC MATERIAL	HYDRAULICALLY-BONDED CEMENT
LINER MATERIAL TRADE NAME/COMMON TYPE	CALCIUM ALUMINATE CEMENT
L/G RATIO - L/CU.M	6.0 (45.0 GAL/1000 ACF)
INLET GAS FLOW - CU. M/S	471.90 (1000000 ACFM)
INLET GAS TEMPERATURE - C	148.9 (300 F)
SO2 REMOVAL EFFICIENCY - %	90.0
** MIST ELIMINATOR	
PRE-MIST ELIMINATOR/MIST ELIMINATOR	MIST ELIMINATOR
NUMBER PER SYSTEM	2
GENERIC TYPE	IMPINGEMENT
SPECIFIC TYPE	BAFFLE
TRADE NAME/COMMON TYPE	CHEVRON VANE
** REHEATER	
GENERIC TYPE	INDIRECT HOT AIR
SPECIFIC TYPE	EXTERNAL HEAT EXCHANGER
TRADE NAME/COMMON TYPE	STEAM TUBE BUNDLES
TEMPERATURE INCREASE - C	-3.9 (25 F)
** FANS	
NUMBER	2
DESIGN	CENTRIFUGAL
SUPPLIER	WESTINGHOUSE ELECTRIC CORP.
FUNCTION	UNIT
APPLICATION	FORCED DRAFT
SERVICE	DRY
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL
** FANS	
NUMBER	2
DESIGN	CENTRIFUGAL
SUPPLIER	WESTINGHOUSE ELECTRIC CORP.
FUNCTION	UNIT
APPLICATION	INDUCED DRAFT
SERVICE	DRY
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL
** DUCTWORK	
LOCATION	REHEATER
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
LINER GENERIC MATERIAL TYPE	GUNITE
** REAGENT PREPARATION EQUIPMENT	
FUNCTION	LIME SLAKING
DEVICE	SLAKER
MANUFACTURER	PENNWALT
NUMBER	4

** TANKS

SERVICE	NUMBER
THICKENER OVERFLOW	****
REACTION	2
SCREEN	2

BIG RIVERS ELECTRIC: GREEN 1 (CONT.)

** PUMPS

SERVICE	NUMBER
SLURRY RECIRCULATION	3
SLURRY BLEED	4
THICKENER UNDERFLOW	4
VACUUM FILTER	3
THICKENER RETURN	****
SLURRY	****

** SOLIDS CONCENTRATING/DEWATERING

DEVICE	VACUUM FILTER
NUMBER	3

** SOLIDS CONCENTRATING/DEWATERING

DEVICE	THICKENER
NUMBER	2
NUMBER OF SPARES	0

*** SALEABLE BYPRODUCTS

QUALITY - %	25.0

*** SLUDGE

** TREATMENT

METHOD	POZ-O-TEC

** DISPOSAL

NATURE	FINAL
TYPE	LANDFILL
LOCATION	ON SITE
SITE TRANSPORTATION METHOD	TRUCK

** WATER BALANCE

WATER LOOP TYPE	CLOSED

** FGD SPARE CAPACITY INDICES

ABSORBER - %	30.0

** FGD SPARE COMPONENT INDICES

ABSORBER	.4

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
12/79	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD OPERATION COMMENCED IN MID-DECEMBER 1979. THE UNIT OPERATED IN A STARTUP PHASE DURING THIS PERIOD.

1/80	SYSTEM							744			
2/80	SYSTEM							696			
3/80	SYSTEM							744			

BIG RIVERS ELECTRIC: GREEN 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
		NO INFORMATION WAS AVAILABLE FOR THE FIRST QUARTER, 1980.									
4/80	A	65.0	56.0	78.8	45.0						
	B	65.0	56.0	79.0	45.0						
	SYSTEM	65.0	56.0	79.0	45.0			720	576	324	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE FOLLOWING FIVE OUTAGES OCCURRED IN APRIL AND ACCOUNTED FOR THE LOW AVAILABILITY OF THE FGD SYSTEM. 1. LOW ADDITIVE IN TANK 2. INSTRUMENT TROUBLE 3. WATER IN THE PANEL 4. LOW ON LIME IN THE HOLDING TANKS 5. THE ESPS TRIPPED									
5/80	A	73.7	76.1	79.0	73.7						
	B	73.7	76.0	78.9	73.5						
	SYSTEM	73.7	76.1	79.0	73.7			744	720	548	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING MAY THE FGD SYSTEM WAS OFF LINE FOR APPROXIMATELY 548 HOURS DUE TO THE FOLLOWING PROBLEMS. 1. SULFUR OXIDES TOO HIGH 2. LOW LEVEL IN ADDITIVE TANK 3. INSTRUMENT TROUBLE 4. SCHEDULED MAINTENANCE OUTAGE 5. SOLIDS ON CARRY OVER 6. SOLID WASTE PROBLEM 7. UNIT TRIPPED 8. CONSTRUCTION WORK									
6/80	SYSTEM							720			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		INFORMATION WAS NOT AVAILABLE FOR THE MONTH OF JUNE.									
7/80	SYSTEM							744			
8/80	SYSTEM							744			
9/80	SYSTEM							720			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		NO INFORMATION WAS AVAILABLE FOR THE THIRD QUARTER 1980.									
10/80	SYSTEM							744			
11/80	SYSTEM							720			
12/80	SYSTEM							744			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		INFORMATION FOR THE FOURTH QUARTER 1980 IS NOT AVAILABLE AT THIS TIME.									

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	BIG RIVERS ELECTRIC	
PLANT NAME	GREEN	
UNIT NUMBER	2	
CITY	SEBREE	
STATE	KENTUCKY	
REGULATORY CLASSIFICATION	B	
PARTICULATE EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	516.	(1.200 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	484	
GROSS UNIT GENERATING CAPACITY - MW	242	
NET UNIT GENERATING CAPACITY W/FGD - MW	200	
NET UNIT GENERATING CAPACITY WO/FGD - MW	*****	
EQUIVALENT SCRUBBED CAPACITY - MW	242	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	BABCOCK & WILCOX	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	471.90	(1000000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	148.9	(300 F)
STACK HEIGHT - M	107.	(350 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	*******	(***** FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	BITUMINOUS	
AVERAGE HEAT CONTENT - J/G	22678.	(9750 BTU/LB)
RANGE HEAT CONTENT - BTU/LB	9000-10500	
AVERAGE ASH CONTENT - %	20.00	
RANGE ASH CONTENT - %	15-25	
AVERAGE MOISTURE CONTENT - %	11.00	
RANGE MOISTURE CONTENT - %	8-14	
AVERAGE SULFUR CONTENT - %	3.75	
RANGE SULFUR CONTENT - %	3.4-4.0	
AVERAGE CHLORIDE CONTENT - %	.05	
RANGE CHLORIDE CONTENT - %	******	
*** PARTICLE CONTROL		
** ESP		
NUMBER	2	
TYPE	COLD SIDE	
SUPPLIER	AMERICAN AIR FILTER	
INLET FLUE GAS CAPACITY - CU.M/S	471.9	(1000000 ACFM)
INLET FLUE GAS TEMPERATURE - C	148.9	(300 F)
PARTICLE REMOVAL EFFICENCY - %	99.6	
** PARTICLE SCRUBBER		
GENERIC TYPE	NONE	
SPECIFIC TYPE	N/A	
*** FGD SYSTEM		
** GENERAL DATA		
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT	
SO2 REMOVAL MODE	WET SCRUBBING	
PROCESS TYPE	LIME	
PROCESS ADDITIVES	MG PROMOTED	
SYSTEM SUPPLIER	AMERICAN AIR FILTER	
A-E FIRM	BURNS & ROE	
DEVELOPMENT LEVEL	FULL SCALE	
NEW/RETROFIT	NEW	
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.00	
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	90.00	
CURRENT STATUS	1	
COMMERCIAL START-UP	12/80	
INITIAL START-UP	11/80	

BIG RIVERS ELECTRIC: GREEN 2 (CONT.)

CONTRACT AWARDED	5/77

** DESIGN AND OPERATING PARAMETERS

**** ABSORBER**	
NUMBER	2
GENERIC TYPE	SPRAY TOWER
SPECIFIC TYPE	OPEN COUNTERCURRENT SPRAY
SUPPLIER	AMERICAN AIR FILTER
SHELL GENERIC MATERIAL	CARBON STEEL
SHELL SPECIFIC MATERIAL	AISI 1110
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A
LINER GENERIC MATERIAL	INORGANIC
LINER SPECIFIC MATERIAL	HYDRAULICALLY-BONDED CEMENT
LINER MATERIAL TRADE NAME/COMMON TYPE	CALCIUM ALUMINATE CEMENT
L/G RATIO - L/CU.M	6.0 (45.0 GAL/1000 ACF)
INLET GAS FLOW - CU. M/S	471.90 (1000000 ACFM)
INLET GAS TEMPERATURE - C	148.9 (300 F)
SO2 REMOVAL EFFICIENCY - %	90.0
**** MIST ELIMINATOR**	
PRE-MIST ELIMINATOR/MIST ELIMINATOR	MIST ELIMINATOR
NUMBER PER SYSTEM	2
GENERIC TYPE	IMPINGEMENT
SPECIFIC TYPE	BAFFLE
TRADE NAME/COMMON TYPE	CHEVRON VANE
**** REHEATER**	
GENERIC TYPE	INDIRECT HOT AIR
SPECIFIC TYPE	EXTERNAL HEAT EXCHANGER
TRADE NAME/COMMON TYPE	STEAM TUBE BUNDLES
TEMPERATURE INCREASE - C	-3.9 (25 F)
**** FANS**	
NUMBER	2
DESIGN	CENTRIFUGAL
SUPPLIER	WESTINGHOUSE ELECTRIC CORP.
FUNCTION	UNIT
APPLICATION	FORCED DRAFT
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL
**** FANS**	
NUMBER	2
DESIGN	CENTRIFUGAL
SUPPLIER	WESTINGHOUSE ELECTRIC CORP.
FUNCTION	UNIT
APPLICATION	INDUCED DRAFT
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL
**** DUCTWORK**	
LOCATION	REHEATER
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
LINER GENERIC MATERIAL TYPE	GUNITE
**** REAGENT PREPARATION EQUIPMENT**	
FUNCTION	LIME SLAKING
DEVICE	SLAKER
MANUFACTURER	PENNWALT
NUMBER	4
**** TANKS**	
SERVICE	NUMBER
-------	------
THICKENER OVERFLOW	****
REACTION	2
SCREEN	2

BIG RIVERS ELECTRIC: GREEN 2 (CONT.)

** PUMPS

SERVICE	NUMBER
SLURRY RECIRCULATION	3
SLURRY BLEED	4
THICKENER UNDERFLOW	4
VACUUM FILTER	3
SLURRY	****
THICKENER RETURN	****

** SOLIDS CONCENTRATING/DEWATERING

DEVICE	VACUUM FILTER
NUMBER	3

** SOLIDS CONCENTRATING/DEWATERING

DEVICE	THICKENER
NUMBER	2

*** SALEABLE BYPRODUCTS

QUALITY - %	25.0

*** SLUDGE

** TREATMENT

METHOD	POZ-O-TEC

** DISPOSAL

NATURE	FINAL
TYPE	LANDFILL
LOCATION	ON SITE
SITE TRANSPORTATION METHOD	TRUCK

** WATER BALANCE

WATER LOOP TYPE	CLOSED

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
11/80	SYSTEM							720			
12/80	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

OPERATION OF THE FGD SYSTEM COMMENCED IN NOVEMBER 1980. THE SYSTEM IS IN THE STARTUP PHASE OF OPERATION.

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	CENTRAL ILLINOIS LIGHT	
PLANT NAME	DUCK CREEK	
UNIT NUMBER	1	
CITY	CANTON	
STATE	ILLINOIS	
REGULATORY CLASSIFICATION	B	
PARTICULATE EMISSION LIMITATION - NG/J	43.	(.100 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	516.	(1.200 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	778	
GROSS UNIT GENERATING CAPACITY - MW	416	
NET UNIT GENERATING CAPACITY W/FGD - MW	378	
NET UNIT GENERATING CAPACITY WO/FGD - MW	390	
EQUIVALENT SCRUBBED CAPACITY - MW	416	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	RILEY STOKER	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	CYCLING	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	717.29	(1520000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	135.0	(275 F)
STACK HEIGHT - M	152.	(500 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	5.8	(19.0 FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	BITUMINOUS	
AVERAGE HEAT CONTENT - J/G	24181.	(10396 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		******
AVERAGE ASH CONTENT - %	9.77	
RANGE ASH CONTENT - %	******	
AVERAGE MOISTURE CONTENT - %	15.43	
RANGE MOISTURE CONTENT - %	23.	
AVERAGE SULFUR CONTENT - %	3.66	
RANGE SULFUR CONTENT - %	2.4-4.0	
AVERAGE CHLORIDE CONTENT - %	.06	
RANGE CHLORIDE CONTENT - %	.1	
*** PARTICLE CONTROL		
** ESP		
NUMBER	2	
TYPE	COLD SIDE	
SUPPLIER	POLLUTION CONTROL-WALTHER	
INLET FLUE GAS CAPACITY - CU.M/S	358.6	(760000 ACFM)
INLET FLUE GAS TEMPERATURE - C	135.0	(275 F)
PRESSURE DROP - KPA	.0	(0. IN-H2O)
PARTICLE REMOVAL EFFICENCY - %	99.8	
** PARTICLE SCRUBBER		
GENERIC TYPE	NONE	
SPECIFIC TYPE	N/A	
*** FGD SYSTEM		
** GENERAL DATA		
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT	
SO2 REMOVAL MODE	WET SCRUBBING	
PROCESS TYPE	LIMESTONE	
PROCESS ADDITIVES	NONE	
SYSTEM SUPPLIER	ENVIRONEERING, RILEY STOKER	
A-E FIRM	GILBERT/COMMONWEALTH ASSOCIATES	
DEVELOPMENT LEVEL	FULL SCALE	
NEW/RETROFIT	NEW	
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	85.00	
CURRENT STATUS	1	
COMMERCIAL START-UP	8/78	
INITIAL START-UP	7/76	

CENTRAL ILLINOIS LIGHT: DUCK CREEK 1 (CONT.)

CONTRACT AWARDED	8/73

** DESIGN AND OPERATING PARAMETERS

**** ABSORBER**		
NUMBER	4	
NUMBER OF SPARES	0	
GENERIC TYPE	PACKED TOWER	
SPECIFIC TYPE	ROD DECK	
TRADE NAME/COMMON TYPE	VENTRI-SORBER	
SUPPLIER	ENVIRONEERING, RILEY STOKER	
DIMENSIONS - FT	40 X 5 X 40	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	AISI 1110	
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A	
LINER GENERIC MATERIAL	HIGH ALLOY	
LINER SPECIFIC MATERIAL	NICKEL BASE/CHROMIUM-IRON-COPPER MOLYBDENUM	
LINER MATERIAL TRADE NAME/COMMON TYPE	HASTELLOY G	
GAS CONTACTING DEVICE TYPE	ROD DECKS	
NUMBER OF CONTACTING ZONES	7	
DISTANCE BETWEEN GAS CONTACTING ZONES - CM	2.5	(1.0IN)
LIQUID RECIRCULATION RATE - LITER/S	945.	(15000 GPM)
L/G RATIO - L/CU.M	6.7	(50.0 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	2.0	(8.0 IN-H2O)
SUPERFICAL GAS VELOCITY - M/SEC	4.0	(13.0 FT/S)
INLET GAS FLOW - CU. M/S	167.01	(353900 ACFM)
INLET GAS TEMPERATURE - C	135.0	(275 F)
SO2 REMOVAL EFFICIENCY - %	85.0	
**** MIST ELIMINATOR**		
PRE-MIST ELIMINATOR/MIST ELIMINATOR	MIST ELIMINATOR	
NUMBER PER SYSTEM	4	
GENERIC TYPE	IMPINGEMENT	
SPECIFIC TYPE	BAFFLE	
TRADE NAME/COMMON TYPE	CHEVRON VANE	
CONFIGURATION	VERTICAL	
NUMBER OF STAGES	2	
NUMBER OF PASSES PER STAGE	3	
FREEBOARD DISTANCE - M	3.66	(12.0 FT)
DISTANCE BETWEEN STAGES - CM	2.03	(.8 IN)
DISTANCE BETWEEN VANES - CM	6.3	(2.50 IN)
VANE ANGLES - DEGREES	90	
PRESSURE DROP - KPA	.2	(1.0 IN-H2O)
SUPERFICAL GAS VELOCITY - M/S	4.0	(13.0 FT/S)
CONSTRUCTION MATERIAL GENERIC TYPE	HASTALLOY G	
WASH WATER SOURCE	FRESH AND POND OVERFLOW	
WASH FREQUENCY	CONTINUOUS	
WASH RATE - L/S	102.8	(1630 GAL/MIN)
**** REHEATER**		
NUMBER	0	
GENERIC TYPE	NONE	
SPECIFIC TYPE	N/A	
TRADE NAME/COMMON TYPE	N/A	
**** FANS**		
NUMBER	4	
DESIGN	CENTRIFUGAL	
SUPPLIER	BUFFALO FORGE	
FUNCTION	UNIT	
APPLICATION	INDUCED DRAFT	
SERVICE	DRY	
FLUE GAS FLOW RATE - CU.M/S	205.28	(435000 ACFM)
FLUE GAS TEMPERATURE - C	148.9	(300 F)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	
**** DUCTWORK**		
LOCATION	SCRUBBER INLET	
SHELL GENERIC MATERIAL TYPE	CARBON STEEL	
LINER GENERIC MATERIAL TYPE	NONE	

CENTRAL ILLINOIS LIGHT: DUCK CREEK 1 (CONT.)

** DUCTWORK	
LOCATION	SCRUBBER OUTLET TO STACK
SHELL GENERIC MATERIAL TYPE	HASTALLOY G
LINER GENERIC MATERIAL TYPE	NONE
** REAGENT PREPARATION EQUIPMENT	
FUNCTION	LIMESTONE GRINDING
DEVICE	BALL MILL
MANUFACTURER	KENNEDY VAN SAUN
NUMBER	2
NUMBER OF SPARES	1
FULL LOAD DRY FEED CAPACITY - M.TONS/HR	36.3 (40 TPH)
PRODUCT QUALITY - % SOLIDS	65.0

** TANKS

SERVICE	NUMBER
RECYCLE	4
WASTE COLLECTION	1
LIMESTONE SLURRY	1
M.E. WASH	4

** PUMPS

SERVICE	NUMBER
POND RETURN	3
WASTE SLURRY	2
MIST ELIMINATOR WASH	8
ABSORBER RECIRCULATION	12
SLURRY TRANSFER	2

*** SLUDGE

** DISPOSAL	
NATURE	FINAL
TYPE	LINED POND
LOCATION	ON SITE
SITE TRANSPORTATION METHOD	PUMPED
SITE CAPACITY - CU.M	125969 (103.0 ACRE-FT)
** PROCESS CONTROL AND INSTRUMENTATION	
CHEMICAL PARAMETERS	PH, SOLIDS CONTENT OF SLURRY, LEVEL CONTROL
PROCESS CONTROL MANNER	AUTOMATIC
PROCESS CHEMISTRY MODE	FEEDBACK
** WATER BALANCE	
WATER LOOP TYPE	CLOSED
MAKEUP WATER ADDITION - LITERS/S	37.8 (600 GPM)
** FGD SPARE CAPACITY INDICES	
ABSORBER - %	.0
** FGD SPARE COMPONENT INDICES	
ABSORBER	.0

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
7/76	SYSTEM				1.1			744		8	

CENTRAL ILLINOIS LIGHT: DUCK CREEK 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
		CONSTRUCTION OF DUCK CREEK 1 BEGAN IN EARLY 1972 AND WAS VIRTUALLY COMPLETED BY SPRING 1976. COMMERCIAL OPERATION WAS INITIATED IN JUNE 1976 WITH THE ESP MODULES IN THE GAS PATH. THE FIRST MODULE OF THE 4-MODULE SCRUBBING SYSTEM WAS INSTALLED BY JUNE 1976 AND START-UP FOR SHAKEDOWN/DEBUGGING PURPOSES OCCURRED IN JULY 1976. THE REMAINING THREE MODULES WILL BE INSTALLED LATER WITH A 4-MODULE START-UP SCHEDULED FOR THE SUMMER OF 1978.									
		INITIAL OPERATION OF THE FIRST SCRUBBER MODULE FOR SHAKEDOWN AND DEBUGGING PURPOSES OCCURRED DURING THE MONTH. LIMITED SERVICE TIME RESULTED FROM PROBLEMS WITH BAD WELDS, FAULTY PIPE HANGERS, AND ABSORBER LEAKS.									
8/76	SYSTEM				2.4			744		18	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		LIMITED OPERATIONS CONTINUED THROUGHOUT AUGUST BECAUSE OF THE START-UP AND CONSTRUCTION PROBLEMS MENTIONED FOR JULY, 1976. THE MODULE WAS TAKEN OUT OF THE GAS PATH AT THIS POINT TO CONCENTRATE ON RESOLVING THESE PROBLEM AREAS.									
9/76	SYSTEM				50.0			744		360	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		MODULE RESTART OCCURRED ON SEPTEMBER 9. OPERATION CONTINUED THROUGHOUT THE REMAINDER OF THE MONTH ON AN INTERMITTANT BASIS. MAJOR PROBLEMS INCLUDED PIPE BREAKING, PUMP LINER FAILURES, PLUGGING AND SCALING OF MIST ELIMINATORS, AND SOME BOILER-RELATED PROBLEMS. THE MODULE REMAINED IN SERVICE FOR APPROXIMATELY 15 DAYS OF NON-CONTINUOUS OPERATION. THE ESP MODULES HAVE REMAINED IN SERVICE WITHOUT THE OCCURRENCE OF ANY MAJOR PROBLEMS.									
10/76	SYSTEM				51.8			744		385	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		TOTAL OPERATION TIME DURING THE MONTH WAS APPROXIMATELY 16 DAYS (NON-CONTINUOUS). THE MAJOR PROBLEM AREA WAS THE CONTINUATION OF MASSIVE SCALE DEVELOPMENT ON THE MIST ELIMINATORS, RESULTING IN PLUGGING OF THE PIPING AND NOZZLES TO THE COMPONENTS SPRAY SYSTEM.									
11/76	SYSTEM				3.3			720		24	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		SPORADIC OPERATION RESULTED FROM CONTINUED SCALING PROBLEMS IN THE MIST ELIMINATOR SECTION. RILEY AND CILCO INITIATED MODIFICATIONS TO THE DESIGN OF THE MODULE. SPECIFICALLY, A ROD DECK WAS CHANGED IN THE ABSORBER, PRESSURE DROP ACROSS THE ABSORBER WAS INCREASED, PIPING AND PUMP LINER MATERIALS WERE MODIFIED/REPLACED, AND A FRESH WATER WASH SYSTEM WAS INSTALLED FOR THE MIST ELIMINATOR.									
12/76	SYSTEM				.0			744		0	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE MODULE REMAINED OUT OF SERVICE THE ENTIRE MONTH. DURING THIS TIME, THE BOILER FIRED LOW SULFUR (0.6%) KENTUCKY COAL.									
1/77	SYSTEM				.0			744	0	0	.0

CENTRAL ILLINOIS LIGHT: DUCK CREEK 1 (CONT.)

PERIOD	MODULE	PERFORMANCE DATA AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
2/77	SYSTEM				.0			672	0	0	.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE NO. 1 UNIT WAS DOWN THROUGHOUT THE ENTIRE JANUARY-FEBRUARY PERIOD FOR TURBINE/BOILER OVERHAUL. DURING THE UNIT OUTAGE, A NUMBER OF MODIFICATIONS WERE MADE TO THE SCRUBBER.

3/77	SYSTEM				47.0			744		350	

** PROBLEMS/SOLUTIONS/COMMENTS

THE NO. 1 UNIT WAS RETURNED TO SERVICE IN MID-MARCH. THE SCRUBBER WAS PLACED IN SERVICE TO TEST THE MODIFICATIONS MADE DURING THE PRECEDING OUTAGE. THESE MODIFICATIONS INCLUDED:

THE MIST ELIMINATOR SPRAY WASH SYSTEM PIPING WAS CHANGED FROM PVC TO FRP MATERIALS. ALSO, AN ADDITIONAL SPRAY HEADER WAS ADDED.
THE SLURRY CIRCULATION SYSTEM WAS REVAMPED.
NEOPRENE PUMP LINERS HAVE REPLACED THE ORIGINAL RUBBER LINERS.
FLUSH/DRAIN SYSTEMS HAVE BEEN INCLUDED TO MINIMIZE SOLIDS BUILD UP.
PIPING VALVES MOVED CLOSER TO THE RECYCLE TANK.
SLURRY STORAGE TANKS EQUIPPED WITH FLUSH/DRAIN SYSTEMS.
ADDITIONAL MIXERS ADDED FOR GREATER AGITATION TO PROMOTE PROCESS CHEMISTRY.

DURING THE LAST PART OF MARCH THE MODULE REMAINED IN SERVICE ON A CONTINUAL BASIS WITH THE EXCEPTION OF A FEW MINOR BOILER OUTAGES. CILCO INTENDS TO CONTINUE EXPERIMENTAL OPERATIONS THROUGHOUT THE APRIL-MAY PERIOD, TESTING THE MECHANICAL MODIFICATIONS AND THE AUTOMATIC CONTROL LOOPS (SYSTEM CHEMISTRY WILL BE CONTROLLED BY INLET/OUTLET SO2 LOADING, SOLUTION PH, SOLUTION SOLIDS. OPERATION UP TO THIS POINT HAS PROCEEDED IN A MANUAL CONTROL MODE). CONTINUED OPERATION BEYOND THIS TIME FRAME WILL DEPEND UPON THE SUCCESS OF EXPERIMENTAL OPERATIONS. CILCO HAS THE OPTION OF FIRING LOW SULFUR COAL UNTIL THE ENTIRE 4-MODULE SCRUBBER PLANT IS READY FOR SERVICE IN AUGUST 1978.

4/77	SYSTEM				.0			720		0	
5/77	SYSTEM				.0			744		0	
6/77	SYSTEM				.0			720		0	
7/77	SYSTEM				.0			744		0	
8/77	SYSTEM				.0			744		0	
9/77	SYSTEM				.0			720		0	
10/77	SYSTEM				.0			744		0	
11/77	SYSTEM				.0			720		0	
12/77	SYSTEM				.0			744		0	
1/78	SYSTEM				.0			744		0	
2/78	SYSTEM				.0			672		0	
3/78	SYSTEM				.0			744		0	
4/78	SYSTEM				.0			720		0	
5/78	SYSTEM				.0			744		0	
6/78	SYSTEM				.0			720	0	0	.0

CENTRAL ILLINOIS LIGHT: DUCK CREEK 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UNIT CONTINUED TO FIRE LOW-SULFUR COLORADO COAL DURING THE REPORT PERIOD. THE RESTART OF SCRUBBER OPERATIONS CONTINUES TO BE SCHEDULED FOR AUGUST 1978.									
7/78	SYSTEM							720			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		ALL FOUR MODULES BECAME OPERATIONAL ON JULY 24.									
		MODIFICATIONS WERE MADE TO THE UNDER DESIGNED SLURRY TRANSFER TANK.									
		A PLUGGING PROBLEM CAUSED BY COAL FINES IN THE SLURRY WAS EXPERIENCED. THE FINES RESULTED FROM A COMMON COAL AND LIMESTONE HANDLING SYSTEM.									
8/78	SYSTEM	45.0	46.0	46.0	42.0			744	691	315	62.5
9/78	SYSTEM	46.0	46.0	46.0	44.0			720	691	317	62.5
	** PROBLEMS/SOLUTIONS/COMMENTS										
		SCREEN BASKETS WERE USED TO KEEP COAL PARTICLES FROM THE LIMESTONE. THE COAL PARTICLES RESULT FROM THE COMMON COAL-LIMESTONE HANDLING SYSTEM.									
		THE SLURRY TRANSFER SYSTEM PREVENTED PROPER SLURRY FLOW DUE TO UNDER DESIGN. THE OLD SYSTEM WAS REPLACED WITH A NEW PIPING SYSTEM.									
		PLUGGING OF THE RECYCLE PUMP SHUT-OFF VALVES OCCURED. THE VALVES ARE BEING REPLACED WITH PINCH VALVES.									
		THE SCRUBBER WASTE WATER SUMP PUMPS HAVE BEEN PLUGGING. NEW PUMPS ARE BEING INVESTIGATED.									
10/78	A	19.1	31.6	31.6	19.1						
	B	22.5	37.2	37.2	22.5						
	C	.8	1.3	1.3	.8						
	D	20.5	33.9	33.9	20.5						
	SYSTEM	15.7	26.0	26.0	15.7			744	449	117	32.9
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE MAJOR CAUSES FOR DOWNTIME OCCURRING IN OCTOBER WERE VALVE LEAKS AND SUBSEQUENT RECYCLE GLAND SEAL CONTAMINATION AND THE INSTALLATION OF A LIQUID/SOLID SEPARATOR.									
		A LEAKING VALVE RESULTED IN CONTAMINATION OF THE RECYCLE PUMP GLAND SEAL WATER SYSTEM WITH POND RETURN WATER CAUSING SCALING AND PLUGGING FORCING SHUTDOWN OF THE RECYCLE PUMPS. A NEW VALVE SYSTEM WAS INSTALLED AND THE OPERATING PRESSURES WERE CHANGED TO PREVENT RECURRANCE OF THE CONTAMINATION.									
		THE RECYCLE PUMPS WERE SHUT DOWN WHEN CONTAMINATION OF THE GLAND SEAL WATER SYSTEM CAUSED BY A FAULTY VALVE OCCURRED.									
		A FLOW CONTROL VALVE ON THE D-MODULE WAS REMOVED BECAUSE IT CAUSED ABRASION AND FAILURE OF THE RECYCLE HEADER. NONE OF THE MODULES NOW UTILIZE FLOW CONTROL VALVES.									
		THE MIST ELIMINATOR SPRAY NOZZLES PLUGGED BY COAL PARTICLES WERE CLEANED THE COAL PARTICLES RESULT FROM A COMMON COAL/LIMESTONE HANDLING SYSTEM.									

CENTRAL ILLINOIS LIGHT: DUCK CREEK 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER BOILER HOURS	FGD HOURS	CAP. FACTOR

A LIQUID/SOLID SEPARATOR HAS BEEN INSTALLED IN THE SLURRY SYSTEM TO PREVENT RECURRENCE.

EXCESSIVE LIMESTONE CARRYOVER TO THE MIST ELIMINATOR WAS NOTED. THE TOP ROD DECK WAS REMOVED TO IMPROVE GAS FLOW AND ELIMINATE THE CARRYOVER PROBLEM.

BLANK OFF PLATES WERE ADDED TO THE LOWER SEVEN ROD DECKS TO MAINTAIN PRESSURE DROP REQUIREMENTS. THIS HAS BEEN FOUND TO BE AN ACCEPTABLE SOLUTION AT OTHER ENVIRONEERING FGD SYSTEM INSTALLATIONS.

11/78	A	8.1	8.8	8.8	8.1					
	B	8.1	8.8	8.8	8.1					
	C	8.1	8.8	8.8	8.1					
	D	8.1	8.8	8.8	8.1					
	SYSTEM	8.1	8.8	8.8	8.1			720	661	59 63.6

** PROBLEMS/SOLUTIONS/COMMENTS

THE 1B SLURRY TANK PUMP LINER EXPERIENCED A FAILURE RESULTING IN SCRUBBING SYSTEM SHUTDOWN FOR 84 HOURS. THE LINER FAILED AFTER ONLY THREE MONTHS. THE SPARE PUMP WAS ALREADY OUT OF SERVICE FOR A MOTOR REPLACEMENT.

A SPARE SLURRY TANK PUMP WAS OUT OF SERVICE TO REPLACE THE ORIGINAL 50-HP MOTOR WITH A 75-HP MOTOR.

THE PINION BEARING ON THE BALL MILL DRIVE FAILED. THE FAILURE IS BEING INVESTIGATED. FGD SYSTEM OPERATION WAS HALTED DUE TO THE FAILURE. THIS ACCOUNTED FOR MOST OF THE NOVEMBER OUTAGE TIME.

THE LEVEL AND DENSITY INSTRUMENTS ON RECYCLE TANKS ARE BEING MODIFIED.

THE LEEDS & NORTHRUP LEVEL AND DENSITY TRANSMITTERS ARE BEING REPLACED WITH ROSEMOUNT TRANSMITTERS.

12/78	A	23.3	24.5	24.5	23.3					
	B	26.2	27.6	27.6	26.2					
	C	21.3	22.5	22.5	21.3					
	D	10.2	10.8	10.8	10.2					
	SYSTEM	20.3	21.4	21.4	20.3			744	706	151 70.3

** PROBLEMS/SOLUTIONS/COMMENTS

ISOLATION DAMPER FAILURES AND SLURRY RECYCLE DISCHARGE VALVE FAILURES OCCURRED DURING DECEMBER.

LIMESTONE MILL PROBLEMS AND A PLUGGED LIMESTONE FEEDER HAMPERED SCRUBBER OPERATIONS DURING DECEMBER.

THE SYSTEM EXPERIENCED FROZEN INSTRUMENT CONTROL LINES IN DECEMBER. THIS WAS THE MAJOR CAUSE OF THE DECEMBER SCRUBBER UNAVAILABILITY.

1/79	SYSTEM	.0	.0	.0	.0			744	738	0 77.0

** PROBLEMS/SOLUTIONS/COMMENTS

FROZEN INSTRUMENT CONTROL LINES, RECYCLE TANK SUCTION LINES, MAIN MODULE DRAIN LINES AND MIST ELIMINATOR DRAIN LINES WERE MAJOR PROBLEM AREAS DURING JANUARY.

SLURRY RECYCLE VALVE PLUGGING AND SLURRY TRANSFER PUMP FAILURE CONTRIBUTED TO THE SYSTEM OUTAGE TIME.

2/79	SYSTEM	.0	.0	.0	.0			672	533	0 63.8

CENTRAL ILLINOIS LIGHT: DUCK CREEK 1 (CONT.)

PERIOD	MODULE	PERFORMANCE DATA AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
		RECYCLE PUMP SUCTION VALVE FAILURES AND A SLURRY TRANSFER PUMP FAILURE CONTRIBUTED TO THE NON-OPERATION OF THE FGD SYSTEM.									
		FROZEN MIST ELIMINATOR DRAINS, ABSORBER DRAINS AND INSTRUMENT LINES WERE A MAJOR PROBLEM DURING FEBRUARY.									
3/79	A	33.7	31.1	31.1	31.1						
	B	6.7	6.7	6.7	6.7						
	C	.0	.0	.0	.0						
	D	.0	.0	.0	.0						
	SYSTEM	10.1	9.5	9.5	9.5			744	744	70	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		FREEZING PROBLEMS CONTINUED TO HAMPER FGD OPERATIONS DURING MARCH. THE C AND D MODULE WERE STILL NOT BACK IN SERVICE DUE TO MAJOR CLEAN-UP FROM THE FREEZING PROBLEMS.									
		BROKEN MIST ELIMINATOR SPRAY LINES AND PLUGGED MIST ELIMINATOR NOZZLES WERE PROBLEM AREAS DURING MARCH.									
		RECYCLE PUMP FAILURES AND WASTE WATER PUMP FAILURES WERE EXPERIENCED DURING MARCH.									
		PLUGGED SLURRY NOZZLES AND GENERAL INSTRUMENTATION PROBLEMS WERE REPORTED BY THE UTILITY.									
4/79	A	100.0	71.9	100.0	67.3						
	B	84.3	50.5	75.0	47.3						
	C	86.5	81.2	84.9	76.0						
	D	21.3	22.7	21.3	21.3						
	SYSTEM	73.0	56.6	70.3	53.0			720	674	380	55.9
	** PROBLEMS/SOLUTIONS/COMMENTS										
		INLET DAMPER MALFUNCTIONS HINDERED FGD OPERATION DURING APRIL.									
		PLUGGED MIST ELIMINATOR SPRAY NOZZLES DURING APRIL HINDERED FGD OPERATION.									
		SLURRY CONTROL VALVE MALFUNCTIONS WERE REPORTED BY THE UTILITY.									
		RECYCLE TANK MIXER FAILURES WERE EXPERIENCED DURING APRIL.									
		RECYCLE PUMP BELT AND BEARING FAILURES AND SLURRY SUPPLY LINE FAILURES WERE REPORTED BY THE UTILITY.									
5/79	A	95.7	37.4	69.7	9.9						
	B	95.7	44.2	73.2	11.7						
	C	94.7	41.8	71.1	11.1						
	D	1.3	5.0	1.3	1.3						
	SYSTEM	71.9	32.1	53.8	8.5			744	197	63	14.8
	** PROBLEMS/SOLUTIONS/COMMENTS										
		MIST ELIMINATOR PUMP MALFUNCTIONS WERE REPORTED DURING MAY. MODULE D WAS UNAVAILABLE DUE TO A MIST ELIMINATOR WASH LINE FAILURE.									
		MILL SHAKER BASKET DRIVE MOTOR FAILURES WERE ENCOUNTERED.									
		SLURRY SUPPLY LINE FAILURES OCCURRED DURING THE MONTH.									

CENTRAL ILLINOIS LIGHT: DUCK CREEK 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
				PERFORMANCE DATA							
		STACK LINER BLISTERING WAS DISCOVERED DURING A SPRING INSPECTION. REPAIRS WERE MADE. THE STACK WILL BE INSPECTED AGAIN IN MARCH 1980.									
6/79	A	81.9	76.9	79.6	70.6						
	B	89.2	86.9	88.1	79.8						
	C	86.6	83.0	85.1	76.2						
	D	92.0	90.0	91.1	82.7						
	SYSTEM	87.4	84.2	86.0	77.3			720	661	557	70.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING JUNE SOME PROBLEMS WITH THE MIST ELIMINATOR WERE ENCOUNTERED. THESE PROBLEMS INCLUDED PLUGGING IN THE MIST ELIMINATOR AND THE MIST ELIMINATOR LINES AND A BROKEN MIST ELIMINATOR RETURN LINE.									
		THE UTILITY REPORTED STORAGE PUMP LEAKS, RECYCLE PUMP FAILURES, SLURRY SUPPLY LINE PLUGGING AND DAMPER AND MILL SHAKER BASKET FAILURES.									
7/79	A	93.1	85.6	89.7	59.9						
	B	94.9	88.3	92.3	61.7						
	C	95.8	87.9	93.6	61.5						
	D	96.1	86.4	93.9	60.4						
	SYSTEM	95.0	87.1	92.4	60.9			744	520	453	48.7
	** PROBLEMS/SOLUTIONS/COMMENTS										
		IN JULY THE MIST ELIMINATOR PLUGGED CAUSING OPERATIONAL PROBLEMS.									
		RECYCLE PUMP FAILURES WERE ENCOUNTERED DURING THE PERIOD.									
8/79	A	3.0	4.0	3.0	3.0						
	B	26.1	31.4	24.0	23.4						
	C	13.6	18.3	13.6	13.6						
	D	9.5	12.7	9.5	9.5						
	SYSTEM	13.1	16.6	12.5	12.4			744	555	92	53.8
	** PROBLEMS/SOLUTIONS/COMMENTS										
		IN AUGUST THE MIST ELIMINATOR AND THE MIST ELIMINATOR DRAIN LINES PLUGGED CAUSING EXTENSIVE DOWNTIME FOR MODULE CLEANING.									
		FAILURES WITH THE LIMESTONE SLURRY FORWARDING PUMP AND THE RECYCLE PUMP WERE ENCOUNTERED.									
		DAMPER MALFUNCTIONS WERE REPORTED BY THE UTILITY.									
9/79	A	63.9	53.9	58.0	49.8						
	B	61.2	48.4	53.5	44.7						
	C	49.0	38.9	41.4	35.9						
	D	88.8	86.2	87.6	79.6						
	SYSTEM	65.7	56.9	60.1	52.5			720	665	378	69.1
	** PROBLEMS/SOLUTIONS/COMMENTS										
		PLUGGING IN THE MIST ELIMINATOR, MIST ELIMINATOR HEADER AND NOZZLES WERE ENCOUNTERED IN AUGUST CONTINUED IN SEPTEMBER.									
		THE DAMPER FAILED CAUSING A PROBLEM DURING SEPTEMBER.									
		THE UTILITY REPORTED MIST ELIMINATOR PUMP CAVITATION PROBLEMS RELATED TO MIST ELIMINATOR PROBLEMS ENCOUNTERED IN AUGUST.									
		PLUGGED SLURRY NOZZLES AND LIMESTONE CONVEYOR FAILURES CONTRIBUTED TO THE OUTAGES EXPERIENCED.									

CENTRAL ILLINOIS LIGHT: DUCK CREEK 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
		SCRUBBER UNAVAILABILITY WAS PRIMARILY A RESULT OF CARRY-OVER PLUGGING PROBLEMS FROM AUGUST AND SUBSEQUENT CLEAN-UP.									
10/79	A	84.8	82.3	89.2	82.3						
	B	93.7	86.2	92.4	86.2						
	C	91.7	75.8	90.5	75.8						
	D	93.5	91.9	93.4	91.9						
	SYSTEM	90.9	84.1	91.4	84.1			744	744	625	72.4

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE MONTH OF OCTOBER PROBLEMS WERE ENCOUNTERED WITH THE MIST ELIMINATOR SECTIONS. THE MIST ELIMINATOR PUMP MALFUNCTIONED, THE LINES PLUGGED AND A HEADER FLANGE GASKET FAILED.

OUTAGE TIME RESULTED FROM THE MODULE ISOLATION DAMPER FAILURE INCLUDING DAMPER MOTOR MALFUNCTION.

THE SLURRY SUPPLY LINE NEEDED REPAIRS.

11/79	A	43.1	52.1	52.1	42.2						
	B	12.4	15.3	18.8	12.4						
	C	22.4	22.6	24.9	18.3						
	D	51.0	61.9	62.0	50.1						
	SYSTEM	32.2	38.0	39.5	30.8			720	583	221	61.2

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE ISOLATION DAMPER PROBLEMS CONTINUED DURING NOVEMBER.

THE MIST ELIMINATOR AND THE MIST ELIMINATOR DRAIN PLUGGED CAUSING DOWN TIME.

ALL RECYCLE PUMP SUCTION VALVES WERE REPLACED DURING THE MONTH. THIS WAS THE PRIMARY CAUSE FOR THE LOW SYSTEM AVAILABILITY.

SLURRY SUPPLY LINES FAILED AGAIN, DURING NOVEMBER.

12/79	A	54.5	72.6	77.6	53.5						
	B	35.1	47.6	51.0	35.1						
	C	43.0	58.4	61.9	43.0						
	D	25.5	34.6	40.9	25.5						
	SYSTEM	39.5	53.3	57.9	39.3			744	548	292	60.8

** PROBLEMS/SOLUTIONS/COMMENTS

THE ISOLATION DAMPER FAILURES CONTINUED.

THE MIST ELIMINATOR PROBLEMS WITH PLUGGING AND HEADER RUPTURES OCCURRED DURING DECEMBER.

THE MODULE B AND D RECYCLE TANK LINERS WERE REPAIRED AND TANK COVERS WERE INSTALLED.

MIST ELIMINATOR PLUGGING AND RECYCLE TANK REPAIRS ACCOUNTED FOR MOST OF THE DECEMBER SCRUBBER OUTAGE TIME.

1/80	A	24.8	27.0	29.8	24.8						
	B	58.5	63.6	65.9	58.5						
	C	17.1	18.6	20.3	17.1						
	D	29.2	31.8	35.3	29.3						
	SYSTEM	32.4	35.3	37.8	32.4			744	684	241	81.6

CENTRAL ILLINOIS LIGHT: DUCK CREEK 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
		MOST OF THE JANUARY OUTAGE-TIME WAS REQUIRED FOR RECYCLE TANK COVERING WORK.									
		THE MIST ELIMINATOR SECTION PLUGGED ALONG WITH THE NOZZLES HINDERING SYSTEM OPERATIONS. THE MIST ELIMINATOR DRAIN LINE WAS MODIFIED ALSO CAUSING OUTAGE TIME.									
		OTHER PROBLEMS ENCOUNTERED DURING THE MONTH INCLUDED A PLUGGED LIMESTONE FEEDER, INLET DAMPER PROBLEMS, SLURRY SUPPLY HEADER LEAKS AND STORAGE PUMP DISCHARGE VALVE REPAIRS.									
2/80	A	11.8	11.8	12.5	11.8						
	B	72.7	72.7	73.5	72.7						
	C	70.7	70.7	71.5	70.7						
	D	41.3	41.3	47.9	41.3						
	SYSTEM	49.1	49.1	51.4	49.1			696	696	342	73.5
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING FEBRUARY SOME OUTAGE TIME WAS DUE TO MODULE D CLEANING AND THE CLEANING OF THE MODULE D MIST ELIMINATOR SECTION.									
		THE INLET DAMPER DRIVE WAS REPLACED DURING THE MONTH.									
		REPAIR OF THE FIBERGLASS ON THE SLURRY RECYCLE LINE HINDERED OPERATIONS DURING THIS MONTH.									
		THE MODULES A AND D RECYCLE DISCHARGE VALVE WERE REPLACED CAUSING EXTENSIVE DOWN TIME.									
3/80	A	52.9	62.5	64.7	52.9						
	B	73.2	86.6	86.9	73.2						
	C	51.0	60.3	60.5	51.0						
	D	34.0	40.2	45.9	34.0						
	SYSTEM	52.8	62.4	65.1	52.8			744	629	393	68.6
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING MARCH NEW RECYCLE PUMP DISCHARGE VALVES WERE INSTALLED IN ORDER TO ELIMINATE RESTRICTED FLOW OF THE OLD VALVES.									
		CARRIER BEARINGS ON THE INLET DAMPER WERE REPLACED IN ORDER TO MAINTAIN MODULE ISOLATION CAPABILITY.									
		THE MIST ELIMINATOR WASH SYSTEM WAS CONVERTED TO RETURN WATER IN ORDER TO ACHIEVE A HIGHER QUALITY ELIMINATION WASH WATER.									
		FIBERGLASS LINES ON THE RECYCLE PUMP DISCHARGE WERE ALSO REPAIRED DURING EXTENSIVE									
4/80	A	53.0	81.7	95.9	52.9						
	B	54.2	83.6	87.5	54.2						
	C	57.2	88.3	95.3	57.2						
	D	26.0	40.1	71.9	26.0						
	SYSTEM	47.6	73.4	89.2	47.6			720	466	342	35.3
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE MAJOR PROBLEM HINDERING SYSTEM OPERATIONS DURING APRIL WAS THE REBUILD OF THE RECYCLE TANK MIXER.									

CENTRAL ILLINOIS LIGHT: DUCK CREEK 1 (CONT.)

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
			MINOR PROBLEMS DURING THE MONTH WERE CAUSED BY THE INOPERABILITY OF THE LIMESTONE HANDLING SYSTEM.								
5/80	A	44.6	68.6	72.0	44.6						
	B	45.7	70.3	73.5	45.7						
	C	34.7	53.3	59.1	34.7						
	D	43.6	67.0	73.9	43.6						
	SYSTEM	42.1	64.8	69.7	42.1			744	484	314	49.4

*) PROBLEMS/SOLUTIONS/COMMENTS

DURING MAY REPAIRS WERE MADE TO THE RECYCLE TANK RUBBER LINER.

EXPANSION JOINT LEAKS WERE ALSO REPAIRED DURING THE MONTH.

OTHER OPERATIONAL PROBLEMS INCLUDED THE REPLACEMENT OF THE LIMESTONE STORAGE TANK MIXER MOTOR, MODIFICATION OF ROD DECKS TO REDUCE SYSTEM DIFFERENTIAL PRESSURE AND REPAIR OF THE LIMESTONE FEEDER SYSTEM.

6/80	A	87.6	82.3	87.1	82.1						
	B	86.8	82.6	86.0	82.3						
	C	84.5	81.4	84.3	81.1						
	D	80.0	73.1	75.8	72.9						
	SYSTEM	84.8	79.9	84.3	79.6			720	718	573	78.5

** PROBLEMS/SOLUTIONS/COMMENTS

A LEAK WAS REPAIRED IN THE SLURRY SUPPLY HEADER DURING JUNE.

WORK CONTINUED ON THE MODIFICATIONS BEING DONE ON THE ROD DECKS IN THE ABSORBER MODULES.

7/80	A	91.2	81.0	87.6	70.1						
	B	83.5	70.0	80.0	60.6						
	C	90.5	78.8	86.4	68.2						
	D	87.5	74.9	85.4	64.8						
	SYSTEM	88.2	76.2	84.9	65.9			744	644	490	67.4

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JULY FGD SYSTEM OUTAGE TIME RESULTED FROM THE NECESSARY REPAIR OF THE SLURRY SUPPLY LINE AND REPAIR OF THE MALFUNCTIONING CLUTCH IN THE MILL SYSTEM.

ADDITIONAL OUTAGE TIME OCCURRED SO REPAIRS TO THE 1B STORAGE TANK PUMP DISCHARGE VALVES AND THE STORAGE TANK MIXER MOTOR COULD BE COMPLETED.

8/80	A	88.6	85.4	92.7	81.9						
	B	91.4	86.3	90.8	82.7						
	C	91.3	84.6	88.9	81.0						
	D	90.6	85.1	90.1	81.6						
	SYSTEM	90.5	85.4	90.7	81.9			744	713	609	76.5

** PROBLEMS/SOLUTIONS/COMMENTS

THE SLURRY SUPPLY ISOLATION VALVE WAS REPAIRED IN AUGUST.

THE POND WATER RETURN LINE WAS ALSO REPAIRED DURING THE MONTH.

REPAIRS WERE MADE TO THE ELECTRICAL SYSTEM AFTER A POWER FAILURE IN THE WASTEWATER BUILDING.

9/80	A	43.1	39.2	41.5	39.2						

CENTRAL ILLINOIS LIGHT: DUCK CREEK 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	B	47.8	47.2	48.2	47.2						
	C	45.6	43.2	45.9	43.2						
	D	46.3	46.0	47.6	46.0						
	SYSTEM	45.6	43.9	45.9	43.9			720	720	316	81.3

** PROBLEMS/SOLUTIONS/COMMENTS

MAJOR PROBLEMS DURING SEPTEMBER INCLUDED REPAIR OF THE LIMESTONE BALL MILL. AFTER IT WAS REPAIRED, THE BALL MILL MOTOR BURNED OUT AND HAD TO BE REPLACED.

SLURRY CONTAMINATION OF THE MILL BEARING OIL AND REPAIR OF THE RECYCLE PUMP SUCTION SCREEN CAUSED THE FGD SYSTEM TO BE DOWN FOR SEVERAL HOURS DURING THE MONTH.

10/80	A	73.0	73.0	75.9	73.0						
	B	73.3	65.9	71.8	65.9						
	C	74.2	74.1	75.8	74.1						
	D	73.4	73.2	76.6	73.2						
	SYSTEM	72.8	71.5	75.1	71.6			744	744	532	64.6

** PROBLEMS/SOLUTIONS/COMMENTS

DURING OCTOBER THE FGD SYSTEM WAS DOWN APPROXIMATELY 168 HOURS DUE TO PROBLEMS WITH THE LIMESTONE BALL MILL MOTOR.

SOME OUTAGE TIME DURING THE MONTH WAS DUE TO NECESSARY REPAIRS TO THE RECYCLE TANK PUMP AND PROBLEMS WITH THE DISCHARGE VALVE ON THE STORAGE TANK PUMP.

11/80	A	98.9	92.3	100.0	70.3						
	B	96.2	88.1	97.2	67.1						
	C	99.2	91.8	99.6	69.9						
	D	95.4	82.7	100.0	62.9						
	SYSTEM	97.4	88.7	99.2	67.5			720	548	486	50.1

** PROBLEMS/SOLUTIONS/COMMENTS

DURING NOVEMBER THE FGD SYSTEM WAS OFF LINE FOR APPROXIMATELY 192 HOURS DUE TO A PLANT OUTAGE (BOILER RELATED).

THE FRESH WATER FLUSH VALVE IN THE MIST ELIMINATOR FAILED ADDING TO THE OUTAGE TIME DURING NOVEMBER.

REPAIRS WERE MADE TO THE RECYCLE TANK SUCTION SCREEN CAUSING SOME OUTAGE TIME.

12/80	A	93.5	92.6	94.1	92.2						
	B	94.9	93.9	95.9	93.5						
	C	87.2	86.0	90.7	85.6						
	D	94.0	93.0	96.0	92.6						
	SYSTEM	92.4	91.4	94.2	91.0			744	741	677	79.7

** PROBLEMS/SOLUTIONS/COMMENTS

MINOR PROBLEMS WERE REPORTED FOR DECEMBER, INCLUDING PLUGGING OF RECYCLE TANK PUMP SUCTION SCREENS. REPAIRS WERE MADE DURING THE MONTH TO THE "B" MODULE OUTLET DAMPER AND THE "C" MODULE INLET DAMPER.

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	CENTRAL ILLINOIS PUBLIC SERV	
PLANT NAME	NEWTON	
UNIT NUMBER	1	
CITY	NEWTON	
STATE	ILLINOIS	
REGULATORY CLASSIFICATION	B	
PARTICULATE EMISSION LIMITATION - NG/J	43.	(.100 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	516.	(1.200 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	575	
GROSS UNIT GENERATING CAPACITY - MW	617	
NET UNIT GENERATING CAPACITY W/FGD - MW	575	
NET UNIT GENERATING CAPACITY WO/FGD - MW	590	
EQUIVALENT SCRUBBED CAPACITY - MW	617	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	COMBUSTION ENGINEERING	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	1020.95	(2163480 ACFM)
BOILER FLUE GAS TEMPERATURE - C	163.9	(327 F)
STACK HEIGHT - M	162.	(530 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	*******	(***** FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	BITUMINOUS	
AVERAGE HEAT CONTENT - J/G	25353.	(10900 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		******
AVERAGE ASH CONTENT - %	12.70	
RANGE ASH CONTENT - %	******	
AVERAGE MOISTURE CONTENT - %	9.50	
RANGE MOISTURE CONTENT - %	******	
AVERAGE SULFUR CONTENT - %	2.25	
RANGE SULFUR CONTENT - %	2.0-2.5	
AVERAGE CHLORIDE CONTENT - %	.20	
RANGE CHLORIDE CONTENT - %	******	
*** PARTICLE CONTROL		
** MECHANICAL COLLECTOR		
NUMBER	0	
TYPE	NONE	
** FABRIC FILTER		
NUMBER	0	
TYPE	NONE	
** ESP		
NUMBER	1	
TYPE	COLD SIDE	
SUPPLIER	RESEARCH-COTTRELL	
INLET FLUE GAS CAPACITY - CU.M/S	1080.7	(2290000 ACFM)
INLET FLUE GAS TEMPERATURE - C	162.8	(325 F)
PRESSURE DROP - KPA	.0	(0. IN-H2O)
PARTICLE REMOVAL EFFICENCY - %	99.5	
** PARTICLE SCRUBBER		
GENERIC TYPE	NONE	
SPECIFIC TYPE	N/A	
*** FGD SYSTEM		
** GENERAL DATA		
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT	
SO2 REMOVAL MODE	WET SCRUBBING	
PROCESS TYPE	DUAL ALKALI	
SYSTEM SUPPLIER	BUELL DIVISION, ENVIROTECH	

CENTRAL ILLINOIS PUBLIC SERV: NEWTON 1 (CONT.)

A-E FIRM	BUELL DIVISION, ENVIROTECH	
DEVELOPMENT LEVEL	FULL SCALE	
NEW/RETROFIT	NEW	
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.50	
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	90.00	
CURRENT STATUS	1	
COMMERCIAL START-UP	12/79	
INITIAL START-UP	9/79	
CONTRACT AWARDED	8/75	

** DESIGN AND OPERATING PARAMETERS

** ABSORBER

NUMBER	4	
NUMBER OF SPARES	0	
GENERIC TYPE	PACKED TOWER	
SPECIFIC TYPE	MOBILE BED PACKING	
TRADE NAME/COMMON TYPE	POLYSPHERE SCRUBBER	
SUPPLIER	BUELL DIVISION, ENVIROTECH	
DIMENSIONS - FT	18 X 48 X 72	
SHELL GENERIC MATERIAL	MILD STEEL	
SHELL SPECIFIC MATERIAL	AISI 1110	
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A	
LINER GENERIC MATERIAL	ORGANIC	
LINER SPECIFIC MATERIAL	GLASS FLAKE-FILLED POLYESTER	
LINER MATERIAL TRADE NAME/COMMON TYPE	CEILCOTE	
GAS CONTACTING DEVICE TYPE	POLYSPHERE BALLS	
NUMBER OF CONTACTING ZONES	1	
DISTANCE BETWEEN GAS CONTACTING ZONES - CM	45.7	(18.0IN)
LIQUID RECIRCULATION RATE - LITER/S	148.	(2351 GPM)
L/G RATIO - L/CU.M	1.3	(10.0 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	1.5	(6.0 IN-H2O)
SUPERFICAL GAS VELOCITY - M/SEC	2.5	(8.3 FT/S)
SO2 REMOVAL EFFICIENCY - %	90.0	

** MIST ELIMINATOR

PRE-MIST ELIMINATOR/MIST ELIMINATOR	MIST ELIMINATOR
NUMBER PER SYSTEM	8
GENERIC TYPE	IMPINGEMENT
SPECIFIC TYPE	BAFFLE
TRADE NAME/COMMON TYPE	CHEVRON VANE
CONFIGURATION	VERTICAL

** REHEATER

NUMBER	1
GENERIC TYPE	BYPASS
SPECIFIC TYPE	COLD SIDE
TRADE NAME/COMMON TYPE	N/A

** FANS

NUMBER	4
DESIGN	CENTRIFUGAL
FUNCTION	BOOSTER
APPLICATION	FORCED DRAFT
SERVICE	DRY
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STELL

** SOLIDS CONCENTRATING/DEWATERING

DEVICE	VACUUM FILTER
NUMBER	1

** SOLIDS CONCENTRATING/DEWATERING

DEVICE	THICKENER
NUMBER	2
DIMENSIONS - FT	100 (DIA)
SHELL GENERIC MATERIAL TYPE	CONCRETE

** SOLIDS CONCENTRATING/DEWATERING

DEVICE	THICKENER
NUMBER	1
DIMENSIONS - FT	50 (DIA)

CENTRAL ILLINOIS PUBLIC SERV: NEWTON 1 (CONT.)

SHELL GENERIC MATERIAL TYPE — STEEL

*** SLUDGE

** TREATMENT
METHOD — POZ-O-TEC
PROPRIETARY PROCESS — IUCS

** WATER BALANCE
WATER LOOP TYPE — CLOSED

** FGD SPARE CAPACITY INDICES
ABSORBER - % — .0

** FGD SPARE COMPONENT INDICES
ABSORBER — .0

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
9/79	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

INITIAL OPERATIONS BEGAN AT THIS UNIT ON SEPTEMBER 1 WHEN FLUE GAS WAS PASSED THROUGH THE INDIVIDUAL FGD MODULES FOR TESTING PURPOSES. TESTING OF THE SYSTEM IN AN INTEGRATED MODE IS EXPECTED TO BEGIN IN DECEMBER.

10/79	SYSTEM							744			
11/79	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

TESTING OPERATIONS CONTINUED THROUGH OCTOBER AND NOVEMBER.

12/79	SYSTEM	75.3	60.1	74.1	59.0			744	730	439	

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT BEGAN BURNING HIGH SULFUR COAL ON NOVEMBER 18-19 AT WHICH TIME THE FGD SYSTEM BEGAN OPERATIONS IN AN INTEGRATED MODE FOR THE FIRST TIME.

INITIAL START UP PROBLEMS HAVE INCLUDED MIST ELIMINATOR PLUGGING.

LINING FAILURES HAVE ALSO BEEN ENCOUNTERED DURING START UP PHASE.

THE UNIT PASSED A COMPLIANCE TEST ON DECEMBER 5, 1979. IT WAS DETERMINED THAT THE FGD SYSTEM CONTROLLED SO2 EMISSIONS TO WELL BELOW THE ALLOWABLE 1.2 LB/MM BTU STANDARD.

1/80	A	68.3	57.1	63.5	55.5						
	B	66.4	60.6	64.9	58.9						
	C	52.2	48.8	60.5	47.4						
	D	21.0	19.1	26.3	18.5						
	SYSTEM	52.0	46.4	53.8	45.1			744	723	336	

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JANUARY TESTS WERE CONDUCTED TO CERTIFY THE GAS EMISSIONS MONITOR AT NEWTON.

PRESATURATOR CORROSION AND EXPANSION JOINT REPAIRS AND A DEPLETION OF THE FLYASH USED FOR SLUDGE STABILIZATION ACCOUNTED FOR THE LOW JANUARY DEPENDABILITY FIGURES.

CENTRAL ILLINOIS PUBLIC SERV: NEWTON 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
2/80	A	61.1	42.4	45.0	42.4						
	B	74.4	55.7	57.7	55.7						
	C	78.2	58.5	59.1	58.5						
	D	.0	.0	.0	.0						
	SYSTEM	53.4	39.2	40.4	39.2			696	696	273	

** PROBLEMS/SOLUTIONS/COMMENTS

DURING FEBRUARY THE D-MODULE WAS UNAVAILABLE DUE TO THE COLLAPSE OF THE PRECOOLER MIST ELIMINATORS CAUSED BY A TEMPERATURE EXCURSION.

REPAIR WORK ON THE PRESATURATOR CORROSION AND EXPANSION JOINTS AS WELL AS THE FLYASH DEPLETION PROBLEM CONTINUED TO YIELD LOW DEPENDABILITY FIGURES FOR FEBRUARY.

3/80	A	53.4	52.6	53.1	52.3						
	B	47.0	42.3	48.0	42.1						
	C	44.5	41.1	46.5	41.0						
	D	.0	.0	.0	.0						
	SYSTEM	36.2	34.0	36.9	33.9			744	740	252	

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE FIRST QUARTER, 1980, THE FOLLOWING PROBLEMS WERE ENCOUNTERED:
THE VALVES AND PIPING IN THE PRECOOLER LOOP EXPERIENCED CORROSION.
THE MIST ELIMINATOR ON THE D MODULE FAILED.
THE FLY ASH SUPPLIES DEPLETED.
RUBBER LINING AND DUCTWORK LINING FAILURES OCCURRED.
BOOSTER FAN EXPANSION JOINT FAILURE OCCURRED.
THE THICKENER EXPERIENCED PLUGGING.
THESE COMBINED PROBLEMS ACCOUNTED FOR THE LOW MARCH PERFORMANCE FIGURES. FOR THE QUARTER, THE TOTAL SYSTEM WAS AVAILABLE 47.2% AND WAS UTILIZED 39.4% OF THE TIME.

4/80	A	33.8	31.3	31.4	31.3						
	B	35.4	25.8	25.8	25.8						
	C	37.4	35.6	35.6	35.6						
	D	26.1	21.8	21.8	21.8						
	SYSTEM	33.2	28.6	28.6	28.6			720	720	206	

** PROBLEMS/SOLUTIONS/COMMENTS

THE NEWTON 1 FGD SYSTEM WAS OUT OF SERVICE DURING THE FIRST 12 DAYS OF APRIL FOR NECESSARY REPAIRS ON THE OUTLET DUCT LININGS. THE UTILITY INDICATED THAT THE LINING FAILURES MAY HAVE RESULTED FROM IMPROPER APPLICATION.

DURING THE LAST 18 DAYS OF APRIL MINOR PROBLEMS WERE EXPERIENCED WITH THE OCCURANCE OF PLUGGING IN THE SODIUM CARBONATE THICKENER AND CORROSION OF THE VALVES IN THE PRESATURATOR CIRCUIT.

5/80	A	.0	.0	.0	.0						
	B	9.7	9.6	9.6	6.2						
	C	9.7	9.6	9.6	6.2						
	D	.0	.0	.0	.0						
	SYSTEM	4.8	4.8	4.8	3.1			744	477	23	45.5

** PROBLEMS/SOLUTIONS/COMMENTS

DURING MAY, THE FGD SYSTEM WAS DOWN BECAUSE THE FLUIDIZING STONES WERE CAKED WITH FLY ASH. THIS WAS CAUSED BY IMPROPER WIRING OF THE HEATER WHICH BLOWS OVER THE STONES. THE HEATER WAS REWIRED AND THE FLUIDIZING STONES REPLACED. FLUIDIZING STONES ARE LOCATED IN THE FLYASH SILO. HEATED AIR PASSES THROUGH THESE POROUS STONES TO AERATE OR "FLUIDIZE" THE FLYASH SO

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER BOILER HOURS	FGD HOURS	CAP. FACTOR
		PERFORMANCE DATA								
		THAT IT CAN BE CONVEYED TO THE FLYASH/SLUDGE MIXER. WHEN THE FLYASH SUPPLY IS DEPLETED OR THE MATERIAL CANNOT BE DELIVERED TO THE MIXER THE SCRUBBING SYSTEM IS SHUT DOWN. THE SLUDGE MUST BE TREATED WITH FLYASH BEFORE DISPOSAL.								
6/80	A	.0	.0	.0	.0					
	B	40.3	40.3	40.3	40.3					
	C	40.4	40.4	40.4	40.4					
	D	.0	.0	.0	.0					
	SYSTEM	20.2	20.2	20.2	20.2			720	145	63.0
	** PROBLEMS/SOLUTIONS/COMMENTS									
		DURING JUNE THE A AND D MODULES WERE UNAVAILABLE FOR OPERATION BECAUSE THE MIST ELIMINATORS COLLAPSED.								
		THE SYSTEM WAS SHUTDOWN DURING THE FIRST HALF OF THE MONTH TO REPAIR THE DRY FLYASH COLLECTION SYSTEM WHICH ACCOUNTED FOR THE LOW B AND C MODULE FIGURES.								
7/80	A	3.5	3.7	3.7	3.5					
	B	3.6	3.9	3.9	3.6					
	C	.0	.0	.0	.0					
	D	.0	.0	.0	.0					
	SYSTEM	1.8	1.9	1.9	1.8			744	13	67.8
	** PROBLEMS/SOLUTIONS/COMMENTS									
		DURING JULY PROBLEMS WERE ENCOUNTERED WITH THE MIST ELIMINATORS.								
		SOME OF THE SYSTEM OUTAGE TIME RESULTED FROM REPAIRS MADE NECESSARY BY THE OCCURRENCE OF CORROSION IN THE PRESATURATOR.								
		SCRUBBER PLUGGING DURING JULY CONTRIBUTED TO THE LOW FGD SYSTEM __ AVAILABILITY.								
8/80	A	.0	.0	.0	.0					
	B	64.7	50.2	50.2	49.3					
	C	51.2	34.1	36.9	33.5					
	D	37.6	21.9	24.0	21.5					
	SYSTEM	53.8	36.4	39.9	35.8			744	266	68.2
	** PROBLEMS/SOLUTIONS/COMMENTS									
		PLUGGING PROBLEMS WITHIN THE FGD SYSTEM WERE THE CAUSE OF DOWN TIME IN AUGUST.								
		BECAUSE OF CHANGES IN SYSTEM OPERATIONS, ONLY 3 MODULES ARE NEEDED TO MEET CURRENT SO2 REGULATIONS.								
9/80	A	69.0	20.3	48.6	10.0					
	B	99.6	74.6	80.3	36.8					
	C	96.9	35.8	66.8	17.6					
	D	99.6	80.8	80.8	39.9					
	SYSTEM	99.1	67.8	82.5	33.4			720	241	33.2
	** PROBLEMS/SOLUTIONS/COMMENTS									
		THE BOILER WAS TAKEN OUT OF SERVICE ON SEPTEMBER 16, 1980 FOR A SCHEDULED MAINTENANCE OUTAGE.								
10/80	A	75.9	38.5	46.3	16.9					
	B	83.7	47.9	56.5	21.1					

CENTRAL ILLINOIS PUBLIC SERV: NEWTON 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	C	81.0	51.6	54.5	22.7						
	D	62.4	7.0	13.7	3.1						
	SYSTEM	75.8	36.3	46.3	16.0			744	328	119	30.4

** PROBLEMS/SOLUTIONS/COMMENTS

DURING OCTOBER THE FGD SYSTEM AVAILABILITY WAS LOW AS A RESULT OF LOW LIQUOR TEMPERATURES IN THE SCRUBBER FOLLOWING THE FOUR WEEK BOILER OUTAGE. THE LIQUOR WAS PREHEATED WITH STEAM TO PREVENT PLUGGING DUE TO THE "SALTING OUT" OF REAGENTS AT LOW TEMPERATURES.

11/80	A	93.6	69.9	98.2	69.9						
	B	79.6	59.9	100.0	59.9						
	C	89.4	58.8	97.2	58.8						
	D	79.6	70.1	99.0	70.0						
	SYSTEM	99.3	84.9	100.0	84.8			720	719	465	69.6

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR OUTAGES OCCURRED DURING NOVEMBER.

12/80	A	64.5	45.9	63.8	45.7						
	B	71.5	68.7	72.2	68.4						
	C	72.7	42.1	63.4	41.9						
	D	71.5	52.8	66.7	52.6						
	SYSTEM	74.1	69.5	84.8	69.3			744	741		70.7

** PROBLEMS/SOLUTIONS/COMMENTS

FGD SYSTEM AVAILABILITY WAS LOWERED DURING DECEMBER AS A RESULT OF THICKENER PLUGGING PROBLEMS.

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	COLORADO UTE ELECTRIC ASSN	
PLANT NAME	CRAIG	
UNIT NUMBER	1	
CITY	CRAIG	
STATE	COLORADO	
REGULATORY CLASSIFICATION	D	
PARTICULATE EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	900	
GROSS UNIT GENERATING CAPACITY - MW	447	
NET UNIT GENERATING CAPACITY W/FGD - MW	400	
NET UNIT GENERATING CAPACITY WO/FGD - MW	424	
EQUIVALENT SCRUBBED CAPACITY - MW	447	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	BABCOCK & WILCOX	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	722.29	(1530600 ACFM)
BOILER FLUE GAS TEMPERATURE - C	398.9	(750 F)
STACK HEIGHT - M	183.	(600 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	10.9	(35.8 FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	SUBBITUMINOUS	
AVERAGE HEAT CONTENT - J/G	23260.	(10000 BTU/LB)
RANGE HEAT CONTENT - BTU/LB	9100-10300	
AVERAGE ASH CONTENT - %	8.00	
RANGE ASH CONTENT - %	10-12	
AVERAGE MOISTURE CONTENT - %	16.00	
RANGE MOISTURE CONTENT - %	10-12	
AVERAGE SULFUR CONTENT - %	.45	
RANGE SULFUR CONTENT - %	.4-.5	
AVERAGE CHLORIDE CONTENT - %	.00	
RANGE CHLORIDE CONTENT - %	.0-.02	
*** PARTICLE CONTROL		
** ESP		
NUMBER	1	
TYPE	HOT SIDE	
SUPPLIER	BELCO	
INLET FLUE GAS CAPACITY - CU.M/S	1392.1	(2950000 ACFM)
INLET FLUE GAS TEMPERATURE - C	398.9	(750 F)
PRESSURE DROP - KPA	.7	(3. IN-H2O)
PARTICLE REMOVAL EFFICENCY - %	99.9	
** PARTICLE SCRUBBER		
GENERIC TYPE	NONE	
SPECIFIC TYPE	N/A	
*** FGD SYSTEM		
** GENERAL DATA		
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT	
SO2 REMOVAL MODE	WET SCRUBBING	
PROCESS TYPE	LIMESTONE	
SYSTEM SUPPLIER	PEABODY PROCESS SYSTEMS	
A-E FIRM	STEARNS-ROGER	
DEVELOPMENT LEVEL	FULL SCALE	
NEW/RETROFIT	NEW	
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.80	
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	85.00	
CURRENT STATUS	1	
COMMERCIAL START-UP	8/80	
INITIAL START-UP	10/80	

COLORADO UTE ELECTRIC ASSN: CRAIG 1 (CONT.)

CONTRACT AWARDED	5/77	
** DESIGN AND OPERATING PARAMETERS		
SPACE REQUIREMENTS - SQ M	12140.2	(130680 SQ FT)
OPER. & MAINT. REQUIREMENT - MANHR/DAY	264.0	
** ABSORBER		
NUMBER	4	
NUMBER OF SPARES	1	
GENERIC TYPE	SPRAY TOWER	
SPECIFIC TYPE	OPEN COUNTERCURRENT SPRAY	
SUPPLIER	PEABODY PROCESS SYSTEMS	
DIMENSIONS - FT	32 DIA X 52.5 HIGH	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	AISI 1110	
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A	
LINER GENERIC MATERIAL	ORGANIC	
LINER MATERIAL TRADE NAME/COMMON TYPE	RUBBER	
GAS CONTACTING DEVICE TYPE	SPRAY MIST	
NUMBER OF CONTACTING ZONES	1	
L/G RATIO - L/CU.M	6.7	(50.0 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	1.6	(6.5 IN-H2O)
SUPERFICAL GAS VELOCITY - M/SEC	3.0	(10.0 FT/S)
INLET GAS FLOW - CU. M/S	896.61	(1900000 ACFM)
INLET GAS TEMPERATURE - C	121.1	(250 F)
SO2 REMOVAL EFFICIENCY - %	85.0	
PARTICLE REMOVAL EFFICENCY - %	50.0	
** MIST ELIMINATOR		
PRE-MIST ELIMINATOR/MIST ELIMINATOR	MIST ELIMINATOR	
NUMBER PER SYSTEM	4	
GENERIC TYPE	IMPINGEMENT	
SPECIFIC TYPE	BAFFLE	
TRADE NAME/COMMON TYPE	CHEVRON VANE	
CONFIGURATION	HORIZONTAL	
NUMBER OF STAGES	1	
NUMBER OF PASSES PER STAGE	1	
FREEBOARD DISTANCE - M	1.52	(5.0 FT)
DISTANCE BETWEEN STAGES - CM	2.54	(1.0 IN)
DISTANCE BETWEEN VANES - CM	3.0	(1.20 IN)
VANE ANGLES - DEGREES	45	
PRESSURE DROP - KPA	.2	(1.0 IN-H2O)
SUPERFICAL GAS VELOCITY - M/S	3.0	(10.0 FT/S)
CONSTRUCTION MATERIAL GENERIC TYPE	NORYL PLASTIC	
WASH WATER SOURCE	RAW WATER	
WASH RATE - L/S	6.3	(100 GAL/MIN)
** REHEATER		
NUMBER	4	
GENERIC TYPE	BYPASS	
SPECIFIC TYPE	COLD SIDE	
TRADE NAME/COMMON TYPE	N/A	
TEMPERATURE INCREASE - C	10.0	(50 F)
INLET FLUE GAS FLOW RATE - CU. M/S	38.37	(81300 ACFM)
INLET FLUE GAS TEMPERATURE - C	121.1	(250 F)
NUMBER OF TUBES PER BUNDLE	422	
CONSTRUCTION MATERIAL GENERIC TYPE	316 STAINLESS STEEL	
** FANS		
NUMBER	4	
NUMBER OF SPARES	0	
SUPPLIER	BUFFALO FORGE	
FUNCTION	DIRECT REHEAT	
SERVICE	DRY	
FLUE GAS FLOW RATE - CU.M/S	46.03	(97545 ACFM)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	
** FANS		
NUMBER	4	
NUMBER OF SPARES	1	
DESIGN	AXIAL	

COLORADO UTE ELECTRIC ASSN: CRAIG 1 (CONT.)

SUPPLIER	BUFFALO FORGE
FUNCTION	BOOSTER
SERVICE	DRY
FLUE GAS FLOW RATE - CU.M/S	372.80 (790000 ACFM)
FLUE GAS TEMPERATURE - C	121.1 (250 F)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL

** DUCTWORK

LOCATION	INLET TO PLENUM
DIMENSIONS	23 X 13
SHELL GENERIC MATERIAL TYPE	.25 IN. CARBON STEEL PLATE
LINER GENERIC MATERIAL TYPE	NONE

** REAGENT PREPARATION EQUIPMENT

FUNCTION	LIMESTONE GRINDING
DEVICE	BALL MILL
MANUFACTURER	KENNEDY VAN SAUN
NUMBER	1
FULL LOAD DRY FEED CAPACITY - M.TONS/HR	9.1 (10 TPH)
PRODUCT QUALITY - % SOLIDS	35.0

** TANKS

SERVICE	NUMBER
RECIRCULATION	4
LIMESTONE SLURRY STORAGE	1
SUPERNATE	1
WASH SLURRY	4
POLYELECTROLYTE	1
WASTE SLURRY SUMP	1

** SOLIDS CONCENTRATING/DEWATERING

DEVICE	CENTRIFUGE
NUMBER	1
DIMENSIONS - FT	3 (DIA) X 6 (LENGTH)
CAPACITY	126 GPM
FEED STREAM CHARACTERISTICS	35% SOLIDS
OUTLET STREAM CHARACTERISTICS	60% SOLIDS

** SOLIDS CONCENTRATING/DEWATERING

DEVICE	THICKENER
NUMBER	1
NUMBER OF SPARES	0
CONFIGURATION	CENTER DRAW
DIMENSIONS - FT	75 (DIA) X 15 (DEPTH)
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
FEED STREAM CHARACTERISTICS	5% SOLIDS
OUTLET STREAM CHARACTERISTICS	35% SOLIDS

*** SALEABLE BYPRODUCTS

*** SLUDGE

** DISPOSAL

NATURE	FINAL
TYPE	MINEFILL
LOCATION	OFF SITE
SITE TRANSPORTATION METHOD	TRUCK
SITE SERVICE LIFE - YRS	35

** PROCESS CONTROL AND INSTRUMENTATION

CHEMICAL PARAMETERS	PH & DENSITY
CONTROL LEVELS	PH 5.6-6.1, SOLIDS 12-15%
MONITOR LOCATION	AT MODULE RECYCLE TANK
PROCESS CONTROL MANNER	AUTOMATIC
PROCESS CHEMISTRY MODE	FEEDBACK/FEED FORWARD

COLORADO UTE ELECTRIC ASSN: CRAIG 1 (CONT.)

** WATER BALANCE

WATER LOOP TYPE	CLOSED	
EVAPORATION WATER LOSS - LITER/S	19.7	(312 GPM)
MAKEUP WATER ADDITION - LITERS/S	19.9	(316 GPM)

** CHEMICALS AND CONSUMPTION

FUNCTION	ABSORBENT
NAME	LIMESTONE
PRINCIPAL CONSTITUENT	CACO3
CONSUMPTION	14162 LB/HR
POINT OF ADDITION	RECYCLE TANK

** FGD SPARE CAPACITY INDICES

ABSORBER - %	33.3

** FGD SPARE COMPONENT INDICES

ABSORBER	1.0

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
10/80	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM BEGAN INITIAL OPERATIONS ON OCTOBER 9, 1980 WHEN MODULE D CAME ON LINE. HOWEVER MODULE'S A THROUGH C ARE STILL UNDER CONSTRUCTION.

11/80	D	48.6	44.7	46.2	38.5						
	SYSTEM					46.00		720	619		47.3

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER OPERATED AT ABOUT 50 TO 60% LOAD CAPACITY DURING NOVEMBER. ONLY ONE MODULE IS REQUIRED FOR COMPLIANCE WHEN OPERATING UNDER THE REDUCED LOAD CONDITION.

12/80	A	.0	.0		.0						
	B	53.8	44.3	70.4	42.6						
	C	73.9	70.4	84.0	67.7						
	D	60.5	56.0	80.2	53.9						
	SYSTEM	62.7	56.8	78.7	54.7	56.50		744	716	407	63.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM EQUIPMENT CHECKOUT CONTINUED THROUGH DECEMBER. MODULE A NEEDED MECHANICAL PARTS FOR REPAIR. AS OF DECEMBER 23, THE PROBLEMS CAUSING LOAD RESTRICTION WERE CORRECTED AND THE UNIT INCREASED TO FULL LOAD.

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	COLORADO UTE ELECTRIC ASSN	
PLANT NAME	CRAIG	
UNIT NUMBER	2	
CITY	CRAIG	
STATE	COLORADO	
REGULATORY CLASSIFICATION	D	
PARTICULATE EMISSION LIMITATION - NG/J	43.	(.100 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	172.	(.400 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	301.	(.700 LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	900	
GROSS UNIT GENERATING CAPACITY - MW	455	
NET UNIT GENERATING CAPACITY W/FGD - MW	415	
NET UNIT GENERATING CAPACITY WO/FGD - MW	422	
EQUIVALENT SCRUBBED CAPACITY - MW	400	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	BABCOCK & WILCOX	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	722.29	(1530600 ACFM)
BOILER FLUE GAS TEMPERATURE - C	398.9	(750 F)
STACK HEIGHT - M	183.	(600 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	10.9	(35.8 FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	SUBBITUMINOUS	
AVERAGE HEAT CONTENT - J/G	23260.	(10000 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		9100-10300
AVERAGE ASH CONTENT - %	8.00	
RANGE ASH CONTENT - %	10-12	
AVERAGE MOISTURE CONTENT - %	16.00	
RANGE MOISTURE CONTENT - %	10-12	
AVERAGE SULFUR CONTENT - %	.45	
RANGE SULFUR CONTENT - %	.4-.5	
AVERAGE CHLORIDE CONTENT - %	.00	
RANGE CHLORIDE CONTENT - %	.0-.02	
*** PARTICLE CONTROL		
** ESP		
NUMBER	1	
TYPE	HOT SIDE	
SUPPLIER	BELCO	
INLET FLUE GAS CAPACITY - CU.M/S	1392.1	(2950000 ACFM)
INLET FLUE GAS TEMPERATURE - C	398.9	(750 F)
PRESSURE DROP - KPA	.1	(0. IN-H2O)
PARTICLE REMOVAL EFFICENCY - %	99.9	
** PARTICLE SCRUBBER		
GENERIC TYPE	NONE	
SPECIFIC TYPE	N/A	
*** FGD SYSTEM		
** GENERAL DATA		
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT	
SO2 REMOVAL MODE	WET SCRUBBING	
PROCESS TYPE	LIMESTONE	
SYSTEM SUPPLIER	PEABODY PROCESS SYSTEMS	
A-E FIRM	STEARNS-ROGER	
DEVELOPMENT LEVEL	FULL SCALE	
NEW/RETROFIT	NEW	
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.80	
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	85.00	
CURRENT STATUS	1	
COMMERCIAL START-UP	5/80	
INITIAL START-UP	12/79	

COLORADO UTE ELECTRIC ASSN: CRAIG 2 (CONT.)

CONTRACT AWARDED	5/77	
** DESIGN AND OPERATING PARAMETERS		
SPACE REQUIREMENTS - SQ M	12140.2	(130680 SQ FT)
OPER. & MAINT. REQUIREMENT - MANHR/DAY	360.0	
** ABSORBER		
NUMBER	4	
NUMBER OF SPARES	1	
GENERIC TYPE	SPRAY TOWER	
SPECIFIC TYPE	OPEN COUNTERCURRENT SPRAY	
SUPPLIER	PEABODY PROCESS SYSTEMS	
DIMENSIONS - FT	32 DIA X 52.5 HIGH	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	AISI 1110	
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A	
LINER GENERIC MATERIAL	ORGANIC	
LINER MATERIAL TRADE NAME/COMMON TYPE	RUBBER	
GAS CONTACTING DEVICE TYPE	SPRAY MIST	
NUMBER OF CONTACTING ZONES	1	
L/G RATIO - L/CU.M	6.7	(50.0 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	1.6	(6.5 IN-H2O)
SUPERFICAL GAS VELOCITY - M/SEC	3.0	(10.0 FT/S)
INLET GAS FLOW - CU. M/S	896.61	(1900000 ACFM)
INLET GAS TEMPERATURE - C	121.1	(250 F)
SO2 REMOVAL EFFICIENCY - %	85.0	
PARTICLE REMOVAL EFFICENCY - %	50.0	
** MIST ELIMINATOR		
PRE-MIST ELIMINATOR/MIST ELIMINATOR	MIST ELIMINATOR	
NUMBER PER SYSTEM	4	
GENERIC TYPE	IMPINGEMENT	
SPECIFIC TYPE	BAFFLE	
TRADE NAME/COMMON TYPE	CHEVRON VANE	
CONFIGURATION	HORIZONTAL	
NUMBER OF STAGES	1	
NUMBER OF PASSES PER STAGE	1	
FREEBOARD DISTANCE - M	1.52	(5.0 FT)
DISTANCE BETWEEN STAGES - CM	2.54	(1.0 IN)
DISTANCE BETWEEN VANES - CM	3.0	(1.20 IN)
VANE ANGLES - DEGREES	45	
PRESSURE DROP - KPA	.2	(1.0 IN-H2O)
SUPERFICAL GAS VELOCITY - M/S	3.0	(10.0 FT/S)
CONSTRUCTION MATERIAL GENERIC TYPE	NORYL PLASTIC	
WASH WATER SOURCE	RAW WATER	
WASH RATE - L/S	6.3	(100 GAL/MIN)
** REHEATER		
NUMBER	4	
GENERIC TYPE	BYPASS	
SPECIFIC TYPE	COLD SIDE	
TRADE NAME/COMMON TYPE	N/A	
PERCENT GAS BYPASSED - AVG	12.0	
TEMPERATURE INCREASE - C	10.0	(50 F)
INLET FLUE GAS FLOW RATE - CU. M/S	38.37	(81300 ACFM)
INLET FLUE GAS TEMPERATURE - C	121.1	(250 F)
NUMBER OF TUBES PER BUNDLE	422	
CONSTRUCTION MATERIAL GENERIC TYPE	316 STAINLESS ST^EEL	
** FANS		
NUMBER	4	
NUMBER OF SPARES	0	
SUPPLIER	BUFFALO FORGE	
FUNCTION	DIRECT REHEAT	
APPLICATION	DWDI CENTRIFUGAL	
SERVICE	DRY	
FLUE GAS FLOW RATE - CU.M/S	46.03	(97545 ACFM)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	

COLORADO UTE ELECTRIC ASSN: CRAIG 2 (CONT.)

** FANS	
NUMBER	4
NUMBER OF SPARES	1
DESIGN	AXIAL
SUPPLIER	BUFFALO FORGE
FUNCTION	BOOSTER
APPLICATION	FORCED DRAFT
SERVICE	DRY
FLUE GAS FLOW RATE - CU.M/S	372.80 (790000 ACFM)
FLUE GAS TEMPERATURE - C	121.1 (250 F)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL
** DUCTWORK	
LOCATION	INLET TO PLENUM
DIMENSIONS	23 X 13
SHELL GENERIC MATERIAL TYPE	.25 IN. CARBON STEEL PLATE
LINER GENERIC MATERIAL TYPE	NONE
** REAGENT PREPARATION EQUIPMENT	
FUNCTION	LIMESTONE GRINDING
DEVICE	BALL MILL
MANUFACTURER	KENNEDY VAN SAUN
NUMBER	1
FULL LOAD DRY FEED CAPACITY - M.TONS/HR	9.1 (10 TPH)
PRODUCT QUALITY - % SOLIDS	35.0

** TANKS	
SERVICE	NUMBER
-------	------
RECIRCULATION	4
LIMESTONE SLURRY STORAGE	1
SUPERNATE	1
WASH SLURRY	4
POLYELECTROLYTE	1
WASTE SLURRY SUMP	1

** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	CENTRIFUGE
NUMBER	1
DIMENSIONS - FT	3(DIA) X 6(LENGTH)
CAPACITY	126 GPM
FEED STREAM CHARACTERISTICS	35% SOLIDS
OUTLET STREAM CHARACTERISTICS	60% SOLIDS
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	THICKENER
NUMBER	1
NUMBER OF SPARES	0
CONFIGURATION	CENTER DRAW
DIMENSIONS - FT	75(DIA) X 15(DEPTH)
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
FEED STREAM CHARACTERISTICS	5% SOLIDS
OUTLET STREAM CHARACTERISTICS	35% SOLIDS

*** SLUDGE

** DISPOSAL	
NATURE	FINAL
TYPE	MINEFILL
LOCATION	OFF SITE
SITE TRANSPORTATION METHOD	TRUCK
SITE SERVICE LIFE - YRS	35
** PROCESS CONTROL AND INSTRUMENTATION	
CHEMICAL PARAMETERS	PH & DENSITY
CONTROL LEVELS	PH 5.6-6.1, SOLIDS 12-15%
MONITOR LOCATION	AT MODULE RECYCLE TANK
PROCESS CONTROL MANNER	AUTOMATIC

COLORADO UTE ELECTRIC ASSN: CRAIG 2 (CONT.)

PROCESS CHEMISTRY MODE	FEEDBACK/FEED FORWARD
** WATER BALANCE	
WATER LOOP TYPE	CLOSED
EVAPORATION WATER LOSS - LITER/S	19.7 (312 GPM)
MAKEUP WATER ADDITION - LITERS/S	19.9 (316 GPM)
** CHEMICALS AND CONSUMPTION	
FUNCTION	ABSORBENT
NAME	LIMESTONE
CONSUMPTION	14162 LB/HR
POINT OF ADDITION	RECYCLE TANK
** FGD SPARE CAPACITY INDICES	
ABSORBER - %	33.3
** FGD SPARE COMPONENT INDICES	
ABSORBER	1.0

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
7/79	SYSTEM							744			
8/79	SYSTEM							744			
9/79	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM AT CRAIG 2 WAS UNDERGOING TESTING IN JULY. INITIAL TESTING WITH THE SYSTEM OPERATING ON FLUE GAS TOOK PLACE IN AUGUST 1979. COMMERCIAL OPERATIONS ARE SCHEDULED FOR NOVEMBER 1979.

10/79	SYSTEM							744			
11/79	SYSTEM							720			
12/79	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

THE CRAIG 2 SCRUBBING SYSTEM COMMENCED INITIAL OPERATION OFFICIALLY IN DECEMBER 1979.

THE SYSTEM WAS TAKEN OUT OF SERVICE ON DECEMBER 3 FOR INSPECTION AND SCHEDULED MAINTENANCE. THE FINE SCREEN ON THE TURBINE THROTTLE VALVE WAS REMOVED AND CLEANED. THE BOILER WAS PUT BACK ON LINE ON DECEMBER 9 AT FULL LOAD. THE FGD SYSTEM WAS PUT BACK ON LINE ON DECEMBER 19. SHAKEDOWN OPERATIONS ARE CONTINUING.

1/80	SYSTEM							744			
2/80	SYSTEM							696			
3/80	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER WAS DOWN AT THE END OF THE PERIOD DUE TO TURBINE RELATED PROBLEMS.

WHEN FULL LOAD OPERATIONS WERE ATTEMPTED CONTROL PROBLEMS WERE ENCOUNTERED WITH THE SCRUBBER.

PROBLEMS WITH OPENING/CLOSING THE BYPASS DAMPER HAVE BEEN ENCOUNTERED. LARGER OPERATORS ARE BEING TESTED THAT MAY SOLVE THE PROBLEM.

COLORADO UTE ELECTRIC ASSN: CRAIG 2 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
4/80	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM IS STILL IN THE STARTUP PHASE OF OPERATIONS. TESTING IS BEING PERFORMED ON THE SYSTEM, BUT THERE HAS BEEN NO OPERATIONAL DATA REPORTED.

5/80	A	38.4	27.5	28.4	24.5						
	B	42.5	32.1	33.1	28.5						
	C	47.0	37.2	38.4	33.1						
	D	30.0	18.0	18.6	16.0						
	SYSTEM	52.6	38.3	39.5	34.0	64.70		640	661	253	76.8

** PROBLEMS/SOLUTIONS/COMMENTS

THE CRAIG 2 UNIT (BOILER AND SCRUBBER) COMMENCED COMMERCIAL OPERATION ON MAY 4, 1980.

NOTE: THIS SYSTEM EFFECTIVELY HAS ONE SPARE MODULE SO THAT ONLY THREE ARE CURRENTLY NEEDED AT FULL LOAD TO MAINTAIN COMPLIANCE WITH SO2 EMISSION REGULATIONS. WHEN THE CURRENT LOW SULFUR COAL SOURCE IS EXHAUSTED (SEVERAL YEARS FROM NOW) GREATER SCRUBBING CAPACITY WILL BE REQUIRED SO THAT THERE WILL NO LONGER BE AN ENTIRE MODULE SET ASIDE AS A SPARE DURING FULL LOAD BOILER OPERATIONS. THE "SYSTEM" DEPENDABILITY FACTORS WILL BE BASED ON THREE MODULES UNTIL THE CURRENT COAL SOURCE IS EXHAUSTED.

6/80	A	47.6	41.2	42.0	37.9						
	B	53.9	48.0	48.9	44.2						
	C	61.1	55.8	56.9	51.4						
	D	34.6	27.0	27.5	24.9						
	SYSTEM	65.7	57.3	58.4	52.8	65.70		720	663	380	68.5

** PROBLEMS/SOLUTIONS/COMMENTS

DURING MAY AND JUNE, PROBLEMS WERE ENCOUNTERED WITH PLUGGING OF THE ABSORBER SPRAY NOZZLES.

A PROBLEM WAS ALSO ENCOUNTERED DURING INITIATION OF COMMERCIAL OPERATION WITH A HIGH PH LEVEL IN THE THICKENER UNDERFLOW.

THE SCRUBBING SYSTEM IS STILL UNDERGOING SHAKEDOWN OPERATIONS.

7/80	A	59.1	51.0	51.7	43.8						
	B	61.8	54.1	54.9	46.5						
	C	37.6	26.0	26.3	22.3						
	D	43.7	33.0	33.5	28.4						
	SYSTEM	67.4	54.7	55.5	47.0	65.60		744	640	350	65.8

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JULY, FGD OUTAGE TIME WAS CAUSED BY PLUGGED ABSORBER SPRAY NOZZLES.

8/80	A	50.0	46.7	48.3	42.2						
	B	50.0	48.4	50.0	43.7						
	C	50.0	47.5	49.1	42.9						
	D	50.0	52.3	54.0	47.2						
	SYSTEM	66.7	65.0	67.1	58.7	65.60		744	672	327	75.6

COLORADO UTE ELECTRIC ASSN: CRAIG 2 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING AUGUST THE FGD SYSTEM EXPERIENCED ASSORTED MECHANICAL PROBLEMS.									
		SPRAY NOZZLE PLUGGING OCCURRED, CAUSING ADDITIONAL OUTAGE TIME WHICH ADDED TO THE LOW AVAILABILITY FACTOR DURING THE MONTH.									
9/80	A	48.6	47.5	48.4	47.1						
	B	58.2	58.8	59.9	58.2						
	C	61.1	59.6	60.7	59.0						
	D	67.4	66.2	67.4	65.6						
	SYSTEM	78.4	77.4	78.8	76.6	65.70		720	713	552	85.2
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE SPRAY NOZZLES IN THE ABSORBER MODULE CONTINUED TO PLUG UP DURING SEPTEMBER.									
10/80	A	99.5	89.4	93.7	11.9						
	B	99.5	91.5	95.8	12.2						
	C	99.5	88.4	92.6	11.8						
	D	99.5	92.5	96.8	12.4						
	SYSTEM	99.5	90.5	94.7	12.1			744	99	90	12.2
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE BOILER WAS TAKEN OFF LINE ON OCTOBER 5 FOR A FIVE WEEK SCHEDULED OUTAGE.									
		AN IN-LINE SPOT CHECK PERFORMED ON OCTOBER 4 INDICATED THAT THE FGD SYSTEM WAS ACHIEVING A 66.2% SO2 REMOVAL EFFICIENCY. THE STACK OPACITY WAS MEASURED AT 5.7%.									
11/80	A	69.4	61.7	66.0	27.5						
	B	.0	.0	.0	.0						
	C	70.8	71.0	76.0	31.6						
	D	72.2	89.7	96.0	40.0						
	SYSTEM	70.8	74.1	79.3	33.0	31.30		720	321		38.8
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE FGD SYSTEM WAS RETURNED TO SERVICE ON NOVEMBER 10 AFTER A FIVE WEEK SCHEDULED MAINTENANCE OUTAGE.									
		MODULE B WAS TAKEN OFF LINE DURING NOVEMBER DUE TO BOOSTER FAN PROBLEMS.									
12/80	A	43.0	57.5	58.7	42.6						
	B	.0	.0		.0						
	C	53.8	69.3	70.7	51.3						
	D	60.5	78.4	80.0	58.1						
	SYSTEM	52.4	68.4	69.8	50.7	62.70		744	551	377	54.6
	** PROBLEMS/SOLUTIONS/COMMENTS										
		MODULE B REMAINED OFF LINE DURING DECEMBER DUE TO BOOSTER FAN BLADE PITCH PROBLEMS.									

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	COLUMBUS & SOUTHERN OHIO ELEC	
PLANT NAME	CONESVILLE	
UNIT NUMBER	5	
CITY	CONESVILLE	
STATE	OHIO	
REGULATORY CLASSIFICATION	D	
PARTICULATE EMISSION LIMITATION - NG/J	43.	(.100 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	516.	(1.200 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	1950	
GROSS UNIT GENERATING CAPACITY - MW	411	
NET UNIT GENERATING CAPACITY W/FGD - MW	375	
NET UNIT GENERATING CAPACITY WO/FGD - MW	391	
EQUIVALENT SCRUBBED CAPACITY - MW	411	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	COMBUSTION ENGINEERING	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	CYCLING	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	657.78	(1393893 ACFM)
BOILER FLUE GAS TEMPERATURE - C	146.7	(296 F)
STACK HEIGHT - M	244.	(800 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	7.9	(26.0 FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	BITUMINOUS	
AVERAGE HEAT CONTENT - J/G	25237.	(10850 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		10000-12000
AVERAGE ASH CONTENT - %	15.10	
RANGE ASH CONTENT - %	10-24	
AVERAGE MOISTURE CONTENT - %	7.50	
RANGE MOISTURE CONTENT - %	5-18	
AVERAGE SULFUR CONTENT - %	4.67	
RANGE SULFUR CONTENT - %	4.2-5.1	
AVERAGE CHLORIDE CONTENT - %	.01	
RANGE CHLORIDE CONTENT - %	.01-.11	
*** PARTICLE CONTROL		
** ESP		
NUMBER	1	
TYPE	COLD SIDE	
SUPPLIER	RESEARCH-COTTRELL	
INLET FLUE GAS CAPACITY - CU.M/S	657.8	(1393893 ACFM)
INLET FLUE GAS TEMPERATURE - C	146.7	(296 F)
PARTICLE REMOVAL EFFICENCY - %	99.6	
** PARTICLE SCRUBBER		
GENERIC TYPE	NONE	
SPECIFIC TYPE	N/A	
*** FGD SYSTEM		
** GENERAL DATA		
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT	
SO2 REMOVAL MODE	WET SCRUBBING	
PROCESS TYPE	LIME	
PROCESS ADDITIVES	MG PROMOTED	
SYSTEM SUPPLIER	AIR CORRECTION DIVISION, UOP	
A-E FIRM	BLACK & VEATCH	
DEVELOPMENT LEVEL	FULL SCALE	
NEW/RETROFIT	NEW	
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	.00	
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	89.50	
CURRENT STATUS	1	
COMMERCIAL START-UP	2/77	
INITIAL START-UP	1/77	

COLUMBUS & SOUTHERN OHIO ELEC: CONESVILLE 5 (CONT.)

CONTRACT AWARDED	10/74	
** DESIGN AND OPERATING PARAMETERS		
OPER. & MAINT. REQUIREMENT - MANHR/DAY	84.0	
** QUENCHER/PRESATURATOR		
** ABSORBER		
NUMBER	1	
GENERIC TYPE	PACKED TOWER	
SPECIFIC TYPE	MOBILE BED PACKING	
TRADE NAME/COMMON TYPE	TURBULENT CONTACT ABSORBER	
SUPPLIER	AIR CORRECTION DIVISION, UOP	
DIMENSIONS - FT	45. X 17.5 X 79.5 (HT)	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	AISI 1110	
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A	
LINER GENERIC MATERIAL	ORGANIC	
LINER SPECIFIC MATERIAL	SYNTHETIC RUBBER	
LINER MATERIAL TRADE NAME/COMMON TYPE	CHLOROBUTYL	
GAS CONTACTING DEVICE TYPE	NITRILE RUBBER BALLS (1.5 IN. DIA.)	
NUMBER OF CONTACTING ZONES	4	
DISTANCE BETWEEN GAS CONTACTING ZONES - CM	17.8	(7.0IN)
LIQUID RECIRCULATION RATE - LITER/S	1988.	(31560 GPM)
L/G RATIO - L/CU.M	6.7	(50.0 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	2.0	(8.1 IN-H2O)
SUPERFICAL GAS VELOCITY - M/SEC	4.1	(13.5 FT/S)
INLET GAS FLOW - CU. M/S	301.81	(639568 ACFM)
INLET GAS TEMPERATURE - C	141.1	(286 F)
SO2 REMOVAL EFFICIENCY - %	89.7	
** ABSORBER		
NUMBER	1	
GENERIC TYPE	PACKED TOWER	
SPECIFIC TYPE	MOBILE BED PACKING	
TRADE NAME/COMMON TYPE	TURBULENT CONTACT ABSORBER	
SUPPLIER	AIR CORRECTION DIVISION, UOP	
DIMENSIONS - FT	45. X 17.5 X 79.5 (HT)	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	AISI 1110	
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A	
LINER GENERIC MATERIAL	ORGANIC	
LINER SPECIFIC MATERIAL	SYNTHETIC RUBBER	
LINER MATERIAL TRADE NAME/COMMON TYPE	CHLOROBUTYL	
GAS CONTACTING DEVICE TYPE	NITRILE RUBBER BALLS (1.5 IN. DIA.)	
NUMBER OF CONTACTING ZONES	4	
DISTANCE BETWEEN GAS CONTACTING ZONES - CM	17.8	(7.0IN)
LIQUID RECIRCULATION RATE - LITER/S	1988.	(31560 GPM)
L/G RATIO - L/CU.M	6.7	(50.0 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	2.0	(8.1 IN-H2O)
SUPERFICAL GAS VELOCITY - M/SEC	4.1	(13.5 FT/S)
INLET GAS FLOW - CU. M/S	301.81	(639568 ACFM)
INLET GAS TEMPERATURE - C	141.1	(286 F)
SO2 REMOVAL EFFICIENCY - %	89.7	
** MIST ELIMINATOR		
PRE-MIST ELIMINATOR/MIST ELIMINATOR	MIST ELIMINATOR	
NUMBER PER SYSTEM	1	
GENERIC TYPE	IMPINGEMENT	
SPECIFIC TYPE	BAFFLE	
TRADE NAME/COMMON TYPE	CHEVRON VANE	
CONFIGURATION	HORIZONTAL	
NUMBER OF STAGES	2	
NUMBER OF PASSES PER STAGE	7	
FREEBOARD DISTANCE - M	3.05	(10.0 FT)
DISTANCE BETWEEN STAGES - CM	11.43	(4.5 IN)
DISTANCE BETWEEN VANES - CM	5.1	(2.00 IN)
VANE ANGLES - DEGREES	90	
PRESSURE DROP - KPA	.5	(1.9 IN-H2O)
SUPERFICAL GAS VELOCITY - M/S	4.2	(13.7 FT/S)
CONSTRUCTION MATERIAL GENERIC TYPE	FIBERGLASS	

COLUMBUS & SOUTHERN OHIO ELEC: CONESVILLE 5 (CONT.)

WASH WATER SOURCE	FRESH MAKEUP (RIVER)
WASH RATE - L/S	63.1 (1000 GAL/MIN)
** REHEATER	
GENERIC TYPE	NONE
SPECIFIC TYPE	N/A
TRADE NAME/COMMON TYPE	N/A
** FANS	
NUMBER	2
NUMBER OF SPARES	0
DESIGN	CENTRIFUGAL
SUPPLIER	GREEN FAN
FUNCTION	UNIT
APPLICATION	INDUCED DRAFT
SERVICE	DRY
FLUE GAS FLOW RATE - CU.M/S	401.11 (850000 ACFM)
FLUE GAS TEMPERATURE - C	141.1 (286 F)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL
** DUCTWORK	
LOCATION	SCRUBBER INLET
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
LINER GENERIC MATERIAL TYPE	NONE
** DUCTWORK	
LOCATION	SCRUBBER OUTLET
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
LINER GENERIC MATERIAL TYPE	ACID RESISTANT GUNITE
** REAGENT PREPARATION EQUIPMENT	
FUNCTION	LIME SLAKING
DEVICE	SLAKER
MANUFACTURER	WALLACE & TIERNAN
NUMBER	5

** TANKS

SERVICE	NUMBER
RECYCLE	2
RECLAIMED WATER	1
SLURRY TRANSFER	1
SLURRY STORAGE	1
M.E. WASH	2

** PUMPS

SERVICE	NUMBER
ABSORBER RECIRCULATION	10
LIME SLURRY TRANSFER	2
SLURRY MAKEUP	3
RECYCLE TANK DRAWOFF	4
MIST ELIMINATOR WASH	4
RECLAIM WATER	2

** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	VACUUM FILTER
NUMBER	3
NUMBER OF SPARES	1
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
BELT GENERIC MATERIAL TYPE	POLYPROPYLENE
FEED STREAM CHARACTERISTICS	35% SOLIDS
OUTLET STREAM CHARACTERISTICS	50% SOLIDS
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	THICKENER
NUMBER	1
NUMBER OF SPARES	0
DIMENSIONS - FT	145(DIA) X 16(DEPTH)
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
OUTLET STREAM CHARACTERISTICS	35% SOLIDS

COLUMBUS & SOUTHERN OHIO ELEC: CONESVILLE 5 (CONT.)

*** SLUDGE

** TREATMENT

METHOD	POZ-O-TEC
PROPRIETARY PROCESS	IUCS

** DISPOSAL

NATURE	FINAL
TYPE	POND
LOCATION	ON SITE
SITE TRANSPORTATION METHOD	PUMPED/CONVEYED

** PROCESS CONTROL AND INSTRUMENTATION

CHEMICAL PARAMETERS	MODULE PH & RECYCLE TANK LEVEL
CONTROL LEVELS	25-100% OUTLET PH 5.6-6.0
MONITOR LOCATION	SLURRY DISCHARGE FROM MODULE
PROCESS CONTROL MANNER	AUTOMATIC
PROCESS CHEMISTRY MODE	FEEDBACK

** WATER BALANCE

WATER LOOP TYPE	OPEN
MAKEUP WATER ADDITION - LITERS/S	31.5 (500 GPM)

** CHEMICALS AND CONSUMPTION

FUNCTION	ABSORBENT
NAME	LIME
CONSUMPTION	16 TPH
POINT OF ADDITION	RECYCLE TANK

** FGD SPARE CAPACITY INDICES

ABSORBER - %	.0

** FGD SPARE COMPONENT INDICES

ABSORBER	.0

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
12/76	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

A MAJOR FIRE IN MODULE A DELAYED THE UNIT START-UP. THE FIRE CAUSED $2.1 MILLION DAMAGE. THE UTILITY'S INSURANCE COVERED THE DAMAGE AND A NEW SCRUBBER MODULE WILL BE PURCHASED FROM AND INSTALLED BY UOP.

THE UTILITY IS CURRENTLY CONDUCTING AIR AND WATER TESTS ON MODULE B.

1/77	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

INITIAL START-UP FOR DEBUGGING AND COMMISSIONING PURPOSES OCCURRED IN EARLY JANUARY. COMMERCIAL AVAILABILITY FOR SERVICE OCURRED ON JANUARY 27.

EARLY OPERATIONS WERE MARKED BY COLD WEATHER RELATED PROBLEMS SUCH AS FROZEN LINES AND GEARS, CRACKED FLANGES, A FROZEN LIME BELT CONVEYOR, AND A FROZEN PIPELINE FROM THE THICKENER TO THE IUCS FACILITY.

2/77	B	43.0		43.0							
	SYSTEM							672	668		

COLUMBUS & SOUTHERN OHIO ELEC: CONESVILLE 5 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
						COMMERCIAL START-UP OF MODULE B OCCURRED ON FEBRUARY 13, 1977. THE LONGEST PERIOD OF CONTINUOUS OPERATION WAS 132 HOURS.					
						THE UTILITY REPORTED THAT THE ESP OPERATED SATISFACTORILY.					
						PRESSURE SURGES OCCURRED IN THE PRESATURATOR PIPING.					
						THE CONTINUOUS SO2 ANALYZERS OPERATED UNSATISFACTORILY.					
						MODULE B EXPERIENCED POOR VELOCITY DISTRIBUTION THROUGH THE TCA BEDS.					
						SCRUBBING LIQUOR WAS CARRYING OVER INTO THE MIST ELIMINATOR SECTION.					
3/77	B		72.9		50.9						
	SYSTEM							744	520		
4/77	B	41.8	40.0	40.5	37.4						
	SYSTEM							720	685		
	** PROBLEMS/SOLUTIONS/COMMENTS										
						A STACK OUTLET TEMPERATURE OF 200 F IS BEING MAINTAINED IN ORDER TO MINIMIZE ACID RAINOUT AND STACK CORROSION PROBLEMS.					
						THE 316 SS PRESATURATOR AREA HAS EXPERIENCED CORROSION.					
						THE RUBBER LINER IN THE RECYCLE TANK HAS BEEN PEELING AWAY. THE PROBLEM APPEARED TO BE APPLICATION-RELATED.					
						SOME PLUGGING HAS OCCURRED IN THE TUBE THICKENERS.					
						THE QUALITY OF THE LIME SLURRY HAS BEEN A PROBLEM AREA. ROCKS UP TO FIVE INCHES IN DIAMETER HAVE BEEN DETECTED. THIS HAS PROMPTED DRAVO TO INSTALL MECHANICAL SEPARATORS AND METAL DETECTORS AT THE LIME SHIPMENT FACILITY.					
5/77	B	58.0	50.0	51.0	48.0						
	SYSTEM							744	712		
6/77	B	66.0	59.0	60.0	58.0						
	SYSTEM							720	713		
7/77	B	.0	.0	.0	.0						
	SYSTEM							744	744		
	** PROBLEMS/SOLUTIONS/COMMENTS										
						THE B-SIDE MODULE DID NOT OPERATE THE ENTIRE MONTH PENDING COMPLETION OF A NUMBER OF NECESSARY MODIFICATIONS AND REPAIRS.					
						MODIFICATIONS WERE MADE TO THE UNIT PROCESS CONTROL SYSTEM.					
						MODIFICATIONS WERE MADE TO THE UNIT INSTRUMENTATION SYSTEM.					
						REPAIRS WERE MADE TO THE ABSORBER LINER.					
						REPAIRS WERE MADE TO THE PIPING BETWEEN THE THICKENER AND IUCS BUILDING.					
						THE UTILITY IS CURRENTLY PLANNING TO CONDUCT A PARTICULATE DROP TEST SCHEDULED FOR SEPTEMBER 1977.					
						THE REPLACEMENT A-SIDE TCA MODULE REPLACING THE ORIGINAL MODULE DESTROYED					

COLUMBUS & SOUTHERN OHIO ELEC: CONESVILLE 5 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
				PERFORMANCE DATA							
		BY FIRE IN DECEMBER 1976 IS EXPECTED TO BE AVAILABLE FOR COMMERCIAL SERVICE IN JANUARY 1978.									
8/77	B	.0	.0	.0	.0						
	SYSTEM							744	613		
9/77	B	52.9	39.9	46.9	26.0						
	SYSTEM							720	469		
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE PARTICULATE DROP TEST SCHEDULED FOR SEPTEMBER 1977 WAS PUSHED BACK TO THE WEEK OF OCTOBER 24 1977.									
		THE SCRUBBER WAS NOT OPERATED THE ENTIRE MONTH OF AUGUST. REPAIRS AND MODIFICATIONS CONTINUED UNTIL SEPTEMBER 13. THERE WERE SOME WEATHER-RELATED DELAYS.									
10/77	B	32.0	24.0	25.0	18.0						
	SYSTEM							744	559		
11/77	A	10.0	4.0	4.0	4.0						
	B	33.0	33.0	33.0	33.0						
	SYSTEM	21.5	18.5	18.5	18.5			720	715	133	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		MODULE A WENT ON LINE NOVEMBER 21. DURING LOW LOAD PERIODS SOLIDS BUILD UP TENDED TO CAUSE PLUGGING BECAUSE OF LOW FLOW RATES. DURING THE LOW LOAD PERIODS ALL GAS WAS DUCTED THROUGH ONE MODULE WHILE THE OTHER WAS SHUT DOWN.									
		THE SCRUBBER WAS DOWN FROM OCTOBER 10 TO NOVEMBER 10 FOR RELINING WITH NEOPRENE RUBBER.									
12/77	A	93.0	64.0	62.0	22.0						
	B	97.0	79.0	76.0	27.0						
	SYSTEM	95.0	71.5	69.0	24.5			744	252	180	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UNIT WENT DOWN DECEMBER 12 FOR A 3-MONTH SCHEDULED OUTAGE. MODULE A BEGAN COMMERCIAL OPERATIONS DECEMBER 3 OPERATING AS MUCH AS POSSIBLE THROUGH DECEMBER 12. MODULE B OPERATED DECEMBER 1 THROUGH 12. DURING THE SHUTDOWN THE UTILITY WILL DECIDE IF THE SYSTEM SUPPLIERS HAVE MET SPECS ON THE BOILER AND TURBINES. THE UNIT IS SCHEDULED TO BE BACK ON LINE IN MID-MARCH BUT THIS MAY BE PUSHED BACK TO APRIL 1.									
		DURING THE DECEMBER TO MARCH 1978 SHUTDOWN THE CARBON STEEL FLUE WILL BE REPLACED WITH AN ACID-BRICK LINING.									
1/78	SYSTEM	.0			.0			744	0	0	.0
2/78	SYSTEM	.0			.0			672	0	0	.0
3/78	A	20.0	19.0	64.0	10.0						
	B	20.0	15.8	54.0	8.0						
	SYSTEM	20.0	17.4	59.0	9.0			744	379	66	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UNIT STARTED UP AGAIN ON MARCH 16.									
		PH CONTROLS AND SO2 ANALYZERS HAVE EXPERIENCED OPERATIONAL PROBLEMS.									

COLUMBUS & SOUTHERN OHIO ELEC: CONESVILLE 5 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
			IMPURITIES IN THE LIME HAVE CAUSED PLUGGING PROBLEMS.								
4/78	A	67.0	58.0	61.0	58.0						
	B	65.0	59.0	63.0	59.0						
	SYSTEM	66.0	58.5	62.0	58.5			720	716	421	
	** PROBLEMS/SOLUTIONS/COMMENTS										
			THE SYSTEM WAS DOWN DUE TO AN EXCESS OF FLOCCULANT IN THE THICKENER.								
			EXCESS FLOCCULANT IN THE THICKENER YIELDED A HIGH SOLIDS LEVEL IN THE OVERFLOW AND RESULTED IN PLUGGING PROBLEMS IN THE ABSORBER MODULES.								
5/78	A	52.0	45.0	45.0	44.0						
	B	54.0	50.0	51.0	69.0						
	SYSTEM	53.0	47.5	48.0	56.5			744	720	420	
	** PROBLEMS/SOLUTIONS/COMMENTS										
			THE SYSTEM WAS TAKEN OUT OF SERVICE BECAUSE OF CONTINUED PROBLEMS WITH THE FLOCCULANT FEED SYSTEM. THE THICKENER WAS EMPTIED TO RESTORE PROPER FLOCCULANT BALANCE.								
6/78	A	48.0	37.0	37.0	37.0						
	B	30.0	30.0	30.0	30.0						
	SYSTEM	39.0	33.5	33.5	33.5			720	720	243	
	** PROBLEMS/SOLUTIONS/COMMENTS										
			AN FRP PIPING FAILURE IN THE MIST ELIMINATOR WASH SYSTEM OCCURRED.								
7/78	A	66.0	66.0	66.0	64.0						
	B	43.0	33.0	33.0	32.0						
	SYSTEM	54.5	49.5	49.5	49.0			744	727	359	
	** PROBLEMS/SOLUTIONS/COMMENTS										
			OUTAGE TIME WAS DUE TO PLUGGING IN THE MIST ELIMINATOR AND SCRUBBER BALL REGIONS.								
8/78	A	18.0	20.0	20.0	18.0						
	B	18.0	21.0	21.0	18.0						
	SYSTEM	18.0	20.5	20.5	18.0			744	667	135	
	** PROBLEMS/SOLUTIONS/COMMENTS										
			THE FORCED OUTAGE TIME WAS DUE, IN PART, TO TIME REQUIRED TO REMOVE SCALE FROM THE MIST ELIMINATOR.								
			THE FORCED OUTAGE TIME WAS DUE, IN PART, TO TIME REQUIRED TO REPLACE SOME OF THE PING PONG BALLS IN THE MODULES.								
			THE UTILITY EXPERIENCED BYPASS DAMPER PROBLEMS DURING THE PERIOD.								
			PROBLEMS OCCURRED RELATED TO BROKEN SLUDGE LINES AND PLUGGING IN THE LIME SLURRY FEED LINES.								
9/78	A	61.0	46.0	55.0	45.0						
	B	54.0	44.0	53.0	43.0						
	SYSTEM	57.5	45.0	54.0	44.0			720	707	316	
10/78	A	72.0	37.0	38.0	36.0						
	B	82.0	46.0	47.0	45.0						
	SYSTEM	77.0	41.5	42.5	40.5			744	713	301	

COLUMBUS & SOUTHERN OHIO ELEC: CONESVILLE 5 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DAMPER DRIVE PROBLEMS WERE REPORTED BY THE UTILITY.									
		MINIMAL RUBBER LINER FAILURE WAS OBSERVED AT THE TOP OF ONE OF THE SCRUBBER MODULES AND JUST AFTER THE PRESATURATOR.									
11/78	A	43.0	29.0	29.0	25.0						
	B	84.0	74.0	75.0	66.0						
	SYSTEM	63.5	51.5	52.0	45.5			720	642	331	
12/78	A	6.6	.3	.3	.3						
	B	33.1	36.3	36.6	30.0						
	SYSTEM	19.8	18.3	18.4	15.1			744	609	112	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE LOW HOURS FOR THIS PERIOD ARE ATTRIBUTED TO FREEZE UPS.									
1/79	SYSTEM	.0	.0	.0	.0			744	602	0	
2/79	SYSTEM	.0	.0	.0	.0			672	629	0	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE SYSTEM WAS UNAVAILABLE DURING JANUARY AND FEBRUARY BECAUSE OF SEVERE WINTER WEATHER.									
3/79	A	50.0	49.0	50.0	43.0						
	B	.0	.0	.0	.0						
	SYSTEM	25.0	24.5	25.0	21.5			744	652	160	
4/79	A	17.0	58.0	73.0	12.0						
	B	.0	.0	.0	.0						
	SYSTEM	8.5	29.0	36.5	6.0			720	149	43	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		MODULE B DID NOT OPERATE DURING MARCH AND APRIL BECAUSE OF SEVERE CORROSION AT THE PRESATURATOR INLET DUCT, WHICH IS BEING REPAIRED BY UOP.									
5/79	SYSTEM	.0	.0	.0	.0			744	744	0	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		REPAIRS WERE MADE TO THE SEAL BETWEEN THE THICKENER BASE AND SIDEWALL.									
		THE FGD SYSTEM WAS DOWN DURING MAY FOR AN ANNUAL OUTAGE.									
6/79	A	69.0	35.0	36.0	33.0						
	B	50.0	21.0	22.0	20.0						
	SYSTEM	59.5	28.0	29.0	26.5			720	670	191	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		PLUGGED PH LINES WERE A PROBLEM DURING MAY AND JUNE.									
		FLYASH CONVEYING PROBLEMS RESULTED IN ABOUT A TWO DAY OUTAGE.									
		OUTLET DAMPER PROBLEMS WERE REPORTED BY THE UTILITY.									
7/79	A	75.3	76.3	77.6	69.0						

COLUMBUS & SOUTHERN OHIO ELEC: CONESVILLE 5 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	B	93.4	89.8	90.8	80.6						
	SYSTEM	84.4	82.8	84.2	74.8			744	672	557	
8/79	A	86.6	24.7	25.0	10.1						
	B	85.6	22.7	23.0	9.3						
	SYSTEM	86.1	23.7	24.0	9.7			744	305	72	
9/79	A	89.3	52.6	59.5	27.9						
	B	95.9	51.3	58.0	27.2						
	SYSTEM	92.6	51.9	58.8	27.6			720	383	199	
10/79	A	53.2	76.3	77.0	45.4						
	B	47.8	77.4	78.1	46.1						
	SYSTEM	50.5	76.9	77.6	45.8			744	443	341	
11/79	A	74.0	90.0	91.0	52.0						
	B	70.0	88.0	89.0	51.0						
	SYSTEM	72.0	89.0	90.0	51.2			720	414	369	
12/79	SYSTEM	.0			.0			744	0	0	.0

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE LAST HALF OF 1979 THE UNIT EXPERIENCED PROBLEMS WITH THE LIME BLOWER COMPRESSOR MOTOR.

CAVITATION WAS SITED IN THE SLUDGE PUMP.

THE FLYASH CONVEYOR SYSTEM CAUSED PROBLEMS DURING THE LATTER HALF OF THE YEAR.

PLUGGING IN THE REAGENT CIRCULATION SYSTEMS WAS ENCOUNTERED.

THERE WERE PROBLEMS WITH THE GUIDE BARS AND SEALS IN THE INLET DAMPER DURING THE LAST HALF OF 1979.

1/80	A	89.0	38.0	45.0	13.0						
	B	93.0	50.0	59.0	17.0						
	SYSTEM	91.0	44.0	52.0	15.0			744	257	113	21.4

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JANUARY A BOILER OUTAGE OCCURRED FROM THE FIRST OF THE MONTH TO JANUARY 20, DURING WHICH TIME MAINTENANCE WAS PERFORMED ON THE FGD SYSTEM.

2/80	A	90.0	63.0	77.0	31.0						
	B	93.0	69.0	84.0	34.0						
	SYSTEM	92.0	66.0	81.0	33.0			696	343	226	31.4

** PROBLEMS/SOLUTIONS/COMMENTS

A BOILER OUTAGE LASTING APPROXIMATELY 17 DAYS ALSO OCCURRED DURING FEBRUARY.

IN FEBRUARY, MIST ELIMINATOR NOZZLE PLUGGING OCCURRED CAUSING SOME FGD SYSTEM OUTAGE TIME.

3/80	A	88.0	82.0	82.0	82.0						
	B	88.0	81.0	82.0	81.0						
	SYSTEM	88.0	82.0	82.0	82.0			744	744	606	75.4

COLUMBUS & SOUTHERN OHIO ELEC: CONESVILLE 5 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING MARCH PROBLEMS WERE EXPERIENCED WITH THE IUCS SLUDGE STABILIZATION PROCESS AND SOME OUTAGE TIME RESULTED. ALSO DURING MARCH SOME GRID RODS REQUIRED REPLACING AND SOME RUBBER LINER FAILURES OCCURRED.									
		THE MAJORITY OF THE MARCH FGD SYSTEM OUTAGE TIME WAS DUE TO CONTINUING PROBLEMS WITH THE MIST ELIMINATOR NOZZLES.									
4/80	A	94.6	84.4	87.7	78.9						
	B	74.9	65.8	68.4	61.5						
	SYSTEM	84.7	75.2	78.0	70.3			720	673	506	63.1
	** PROBLEMS/SOLUTIONS/COMMENTS										
		CONTINUAL PROBLEMS WITH THE DAMPERS, PRESATURATOR HOSES, AND NOZZLES WERE THE CAUSES OF FGD SYSTEM OUTAGE TIME IN APRIL.									
5/80	A	92.1	86.2	86.2	86.2						
	B	90.3	84.3	84.3	84.3						
	SYSTEM	91.3	85.2	85.2	85.2			744	744	634	69.5
	** PROBLEMS/SOLUTIONS/COMMENTS										
		IN MAY, CONTROLS AND INSTRUMENTATION DEVELOPED PROBLEMS THAT CAUSED SOME OUTAGE TIME.									
6/80	A	89.6	71.0	71.0	70.7						
	B	94.3	74.8	74.8	74.4						
	SYSTEM	86.4	72.9	72.9	72.6			720	717	523	65.1
	** PROBLEMS/SOLUTIONS/COMMENTS										
		EXTERNAL CAUSES (IUCS DISPOSAL FACILITY, LOW UNIT DEMAND, SERVICE WATER PROBLEMS, ETC.) WERE RESPONSIBLE FOR THE MAJORITY OF THE JUNE OUTAGES.									
7/80	A	90.6	70.7	72.4	43.8						
	B	88.8	82.0	84.0	50.8						
	SYSTEM	89.7	76.4	78.2	47.3			744	461	352	36.6
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE PRESATURATOR HOSES AND NOZZLES PLUGGED CAUSING THE UNIT TO SHUT DOWN FOR PART OF JULY.									
8/80	A	98.0	83.5	84.9	48.5						
	B	95.4	88.8	90.4	51.6						
	SYSTEM	96.7	86.2	87.6	50.1			744	432	373	40.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UTILITY REPORTED THAT PROBLEMS WITH THE RECLAIM WATER SYSTEM OCCURRED IN AUGUST CAUSING SOME OUTAGE TIME.									
9/80	A	84.8	73.4	74.4	73.1						
	B	85.9	85.1	86.3	82.0						
	SYSTEM	88.2	79.2	80.3	78.9			720	717	568	71.5
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING THE JULY-SEPTEMBER PERIOD INLET DAMPER SEAL LEAKING WAS A MAJOR PROBLEM.									

COLUMBUS & SOUTHERN OHIO ELEC: CONESVILLE 5 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
				PERFORMANCE DATA							
			THE PRESATURATOR PROBLEMS CONTINUED IN SEPTEMBER CAUSING ADDITIONAL OUTAGE TIME FOR THE FGD SYSTEM.								
10/80	A	92.7	77.8	80.8	75.7						
	B	89.2	80.0	82.9	77.7						
	SYSTEM	91.0	78.9	81.9	76.7	95.80		744	723	571	59.7
	** PROBLEMS/SOLUTIONS/COMMENTS										
			DURING OCTOBER MINOR OUTAGES WERE THE RESULT OF DAMPER AND AGITATOR MOTOR PROBLEMS.								
11/80	A	79.0	35.7	36.9	31.3						
	B	86.1	64.6	66.8	56.5						
	SYSTEM	82.6	50.1	51.9	43.9	95.80		720	630	316	35.9
	** PROBLEMS/SOLUTIONS/COMMENTS										
			THE LOW SYSTEM AVAILABILITY DURING THE MONTH OF NOVEMBER WAS A DIRECT RESULT OF A 28 HOUR OUTAGE ATTRIBUTED TO LIME SLURRY TRANSFER TANK AND AGITATOR MOTOR PROBLEMS.								
			ADDITIONAL MINOR PROBLEMS WERE ENCOUNTERED WITH THE PRESATURATOR HOSES, TEMPERATURE PROBES, THICKENERS AND SERVICE WATER DURING THE MONTH OF NOVEMBER.								
12/80	A	93.1	88.8	89.2	82.2						
	B	90.9	86.6	85.3	80.2						
	SYSTEM	92.0	87.7	87.2	81.2	95.80	.06	744	689	604	72.6
	** PROBLEMS/SOLUTIONS/COMMENTS										
			DURING DECEMBER THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED.								

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	COLUMBUS & SOUTHERN OHIO ELEC	
PLANT NAME	CONESVILLE	
UNIT NUMBER	6	
CITY	CONESVILLE	
STATE	OHIO	
REGULATORY CLASSIFICATION	D	
PARTICULATE EMISSION LIMITATION - NG/J	43.	(.100 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	516.	(1.200 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	1950	
GROSS UNIT GENERATING CAPACITY - MW	411	
NET UNIT GENERATING CAPACITY W/FGD - MW	375	
NET UNIT GENERATING CAPACITY WO/FGD - MW	391	
EQUIVALENT SCRUBBED CAPACITY - MW	411	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	COMBUSTION ENGINEERING	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	CYCLING	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	657.78	(1393893 ACFM)
BOILER FLUE GAS TEMPERATURE - C	146.7	(296 F)
STACK HEIGHT - M	244.	(800 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	7.9	(26.0 FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	BITUMINOUS	
AVERAGE HEAT CONTENT - J/G	25237.	(10850 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		10000-12000
AVERAGE ASH CONTENT - %	15.10	
RANGE ASH CONTENT - %	10-24	
AVERAGE MOISTURE CONTENT - %	7.50	
RANGE MOISTURE CONTENT - %	5-18	
AVERAGE SULFUR CONTENT - %	4.67	
RANGE SULFUR CONTENT - %	4.2-5.1	
AVERAGE CHLORIDE CONTENT - %	.01	
RANGE CHLORIDE CONTENT - %	.01-.11	
*** PARTICLE CONTROL		
** ESP		
NUMBER	1	
TYPE	COLD SIDE	
SUPPLIER	RESEARCH-COTTRELL	
INLET FLUE GAS CAPACITY - CU.M/S	657.8	(1393893 ACFM)
INLET FLUE GAS TEMPERATURE - C	146.7	(296 F)
PARTICLE REMOVAL EFFICENCY - %	99.6	
** PARTICLE SCRUBBER		
GENERIC TYPE	NONE	
SPECIFIC TYPE	N/A	
** PARTICLE SCRUBBER		
GENERIC TYPE	NONE	
SPECIFIC TYPE	N/A	
*** FGD SYSTEM		
** GENERAL DATA		
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT	
SO2 REMOVAL MODE	WET SCRUBBING	
PROCESS TYPE	LIME	
PROCESS ADDITIVES	MG PROMOTED	
SYSTEM SUPPLIER	AIR CORRECTION DIVISION, UOP	
A-E FIRM	BLACK & VEATCH	
DEVELOPMENT LEVEL	FULL SCALE	
NEW/RETROFIT	NEW	
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	.00	

COLUMBUS & SOUTHERN OHIO ELEC: CONESVILLE 6 (CONT.)

UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	89.50	
CURRENT STATUS	1	
COMMERCIAL START-UP	7/78	
INITIAL START-UP	6/78	
CONTRACT AWARDED	10/74	
** DESIGN AND OPERATING PARAMETERS		
OPER. & MAINT. REQUIREMENT - MANHR/DAY	84.0	
** QUENCHER/PRESATURATOR		
** ABSORBER		
NUMBER	2	
GENERIC TYPE	PACKED TOWER	
SPECIFIC TYPE	MOBILE BED PACKING	
TRADE NAME/COMMON TYPE	TURBULENT CONTACT ABSORBER	
SUPPLIER	AIR CORRECTION DIVISION, UOP	
DIMENSIONS - FT	45. X 17.5 X 79.5 (HT)	
SHELL GENERIC MATERIAL	CARBON STEEL (CARPENTER 20 PRESATURATOR)	
SHELL SPECIFIC MATERIAL	AISI 1110	
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A	
LINER GENERIC MATERIAL	ORGANIC	
LINER SPECIFIC MATERIAL	SYNTHETIC RUBBER	
LINER MATERIAL TRADE NAME/COMMON TYPE	CHLOROBUTYL	
GAS CONTACTING DEVICE TYPE	NITRILE RUBBER BALLS (1.5 IN. DIA.)	
NUMBER OF CONTACTING ZONES	4	
DISTANCE BETWEEN GAS CONTACTING ZONES - CM	17.8	(7.0IN)
LIQUID RECIRCULATION RATE - LITER/S	1988.	(31560 GPM)
L/G RATIO - L/CU.M	6.7	(50.0 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	2.0	(8.1 IN-H2O)
SUPERFICAL GAS VELOCITY - M/SEC	4.1	(13.5 FT/S)
INLET GAS FLOW - CU. M/S	301.81	(639568 ACFM)
INLET GAS TEMPERATURE - C	141.1	(286 F)
SO2 REMOVAL EFFICIENCY - %	89.5	
** MIST ELIMINATOR		
PRE-MIST ELIMINATOR/MIST ELIMINATOR	MIST ELIMINATOR	
NUMBER PER SYSTEM	1	
GENERIC TYPE	IMPINGEMENT	
SPECIFIC TYPE	BAFFLE	
TRADE NAME/COMMON TYPE	CHEVRON VANE	
CONFIGURATION	HORIZONTAL	
NUMBER OF STAGES	2	
NUMBER OF PASSES PER STAGE	7	
FREEBOARD DISTANCE - M	3.05	(10.0 FT)
DISTANCE BETWEEN STAGES - CM	11.43	(4.5 IN)
DISTANCE BETWEEN VANES - CM	5.1	(2.00 IN)
VANE ANGLES - DEGREES	90	
SUPERFICAL GAS VELOCITY - M/S	4.2	(13.7 FT/S)
CONSTRUCTION MATERIAL GENERIC TYPE	FIBERGLASS	
WASH WATER SOURCE	FRESH MAKEUP (RIVER)	
WASH RATE - L/S	31.5	(500 GAL/MIN)
** REHEATER		
GENERIC TYPE	NONE	
SPECIFIC TYPE	N/A	
TRADE NAME/COMMON TYPE	N/A	
** FANS		
NUMBER	2	
NUMBER OF SPARES	0	
DESIGN	CENTRIFUGAL	
SUPPLIER	GREEN FAN	
FUNCTION	UNIT	
APPLICATION	FORCED DRAFT	
SERVICE	DRY	
FLUE GAS FLOW RATE - CU.M/S	401.11	(850000 ACFM)
FLUE GAS TEMPERATURE - C	141.1	(286 F)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	

COLUMBUS & SOUTHERN OHIO ELEC: CONESVILLE 6 (CONT.)

** DUCTWORK	
LOCATION	SCRUBBER INLET
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
LINER GENERIC MATERIAL TYPE	NONE
** DUCTWORK	
LOCATION	SCRUBBER OUTLET
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
LINER GENERIC MATERIAL TYPE	ACID RESISTANT GUNITE
** REAGENT PREPARATION EQUIPMENT	
FUNCTION	LIME SLAKING
DEVICE	SLAKER
MANUFACTURER	WALLACE & TIERNAN
NUMBER	5
** TANKS	
SERVICE	NUMBER
RECYCLE	2
RECLAIMED WATER	1
SLURRY TRANSFER	1
SLURRY STORAGE	1
M.E. WASH	2
** PUMPS	
SERVICE	NUMBER
ABSORBER RECIRCULATION	10
LIME SLURRY TRANSFER	2
SLURRY MAKEUP	3
RECYCLE TANK DRAWOFF	4
MIST ELIMINATOR WASH	4
RECLAIM WATER	2
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	VACUUM FILTER
NUMBER	3
NUMBER OF SPARES	1
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
BELT GENERIC MATERIAL TYPE	POLYPROPYLENE
OUTLET STREAM CHARACTERISTICS	50% SOLIDS
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	THICKENER
NUMBER	1
NUMBER OF SPARES	0
DIMENSIONS - FT	145(DIA) X 16(DEPTH)
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
OUTLET STREAM CHARACTERISTICS	35% SOLIDS
*** SLUDGE	
** TREATMENT	
METHOD	POZ-O-TEC
PROPRIETARY PROCESS	IUCS
** DISPOSAL	
NATURE	FINAL
TYPE	POND
LOCATION	ON SITE
SITE TRANSPORTATION METHOD	PUMPED/CONVEYED
** PROCESS CONTROL AND INSTRUMENTATION	
CHEMICAL PARAMETERS	MODULE PH & RECYCLE TANK LEVEL
CONTROL LEVELS	25-100% OUTLET PH 5.6-6.0
MONITOR LOCATION	SLURRY DISCHARGE FROM MODULE
PROCESS CONTROL MANNER	AUTOMATIC

COLUMBUS & SOUTHERN OHIO ELEC: CONESVILLE 6 (CONT.)

PROCESS CHEMISTRY MODE	FEEDBACK
** WATER BALANCE	
WATER LOOP TYPE	OPEN
MAKEUP WATER ADDITION - LITERS/S	31.5 (500 GPM)
** CHEMICALS AND CONSUMPTION	
FUNCTION	ABSORBENT
NAME	LIME
CONSUMPTION	16 TPH
POINT OF ADDITION	RECYCLE TANK
** FGD SPARE CAPACITY INDICES	
ABSORBER - %	.0
** FGD SPARE COMPONENT INDICES	
ABSORBER	.0

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
6/78	A	56.0	49.0	51.0	42.0						
	B	44.0	33.0	34.0	30.0						
	SYSTEM	50.0	41.0	42.5	36.0			720	524	174	

** PROBLEMS/SOLUTIONS/COMMENTS

INITIAL OPERATIONS OF THE CONESVILLE 6 FGD SYSTEM BEGAN IN JUNE.

CONTROL OF THE LOUVERED DAMPER OF THE BYPASS SYSTEM WAS LOST. THE RESULT WAS BACK PRESSURE BUILDUP THAT AUTOMATICALLY SHUT DOWN THE BOILER.

SCRUBBER CONTROLS WERE NOT OPERATING PROPERLY AND NEEDED ADJUSTMENT.

7/78	A	83.0	37.0	63.0	25.0						
	B	70.0	19.0	33.0	13.0						
	SYSTEM	76.5	28.0	48.0	19.0			744	502	141	

** PROBLEMS/SOLUTIONS/COMMENTS

THE LOUVERED DAMPER PROBLEM CONTINUED.

THE FRP TRANSFER LINE FROM THE THICKENER TO THE IUCS SYSTEM RUPTURED AS A RESULT OF WATER HAMMER IN THE LINE AND HAD TO BE REPAIRED.

8/78	A	47.0	50.0	66.0	43.0						
	B	62.0	60.0	81.0	52.0						
	SYSTEM	54.5	55.0	73.5	47.5			744	642	354	

** PROBLEMS/SOLUTIONS/COMMENTS

PROBLEMS WERE ENCOUNTERED WITH THE SLUDGE LINE. THE UTILITY REPORTED THAT THIS IS TYPICALLY A HIGH MAINTENANCE AREA.

PROBLEMS WERE ENCOUNTERED WITH THE BYPASS CONTROL DAMPERS. THE UTILITY REPORTED THAT THIS IS TYPICALLY A HIGH MAINTENANCE AREA.

9/78	A	55.0	50.0	53.0	49.0						
	B	69.0	55.0	57.0	54.0						
	SYSTEM	62.0	52.5	55.0	51.5			720	706	372	

** PROBLEMS/SOLUTIONS/COMMENTS

A PROBLEM AREA WAS THE PLUGGING OF THE LIME SLURRY FEED LINES.

BYPASS DAMPER CONTROL PROBLEMS CONTINUED THROUGH SEPTEMBER.

COLUMBUS & SOUTHERN OHIO ELEC: CONESVILLE 6 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
		PERFORMANCE DATA									
10/78	A	98.0	29.0	30.0	24.0						
	B	37.0	35.0	36.0	29.0						
	SYSTEM	67.5	32.0	33.0	26.5			744	603	199	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		PROBLEMS WITH DAMPER SEALS AND GUIDEBARS WERE ENCOUNTERED. THE UTILITY PLANS TO REPLACE THEM DURING THE NEXT BOILER OUTAGE.									
11/78	A	26.0	3.0	3.0	2.0						
	B	26.0	9.0	9.0	8.0						
	SYSTEM	26.0	6.0	6.0	5.0			720	600	36	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		LIME TRANSFER BAGHOUSE SHAKER PROBLEMS WERE EXPERIENCED.									
		THE THICKENER RAKE MOTOR BURNED OUT AND HAD TO BE REWOUND.									
12/78	A	34.8	26.3	26.8	24.2						
	B	26.6	19.0	19.3	17.5						
	SYSTEM	30.7	22.6	23.0	20.8			744	672	155	
1/79	A	5.0	2.0	2.0	2.0						
	B	.0	.0	.0	.0						
	SYSTEM	2.5	1.0	1.0	1.0			744	730	8	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		FREEZE UPS WERE A SERIOUS PROBLEM DURING THE DECEMBER-JANUARY PERIOD.									
2/79	SYSTEM	.0	.0	.0	.0			672	629	0	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE FGD SYSTEM DID NOT OPERATE DURING FEBRUARY DUE TO SEVERE WINTER WEATHER CAUSING SYSTEM FREEZE UPS.									
3/79	A	43.0	37.0	39.0	33.0						
	B	32.0	28.0	29.0	25.0						
	SYSTEM	37.5	32.5	34.0	29.0			744	664	216	
4/79	A	82.0	79.0	79.0	78.0						
	B	72.0	59.0	59.0	58.0						
	SYSTEM	77.0	69.0	69.0	68.0			720	711	489	
5/79	SYSTEM	100.0			.0			744	0	0	.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		REPAIRS WERE MADE TO THE SEAL BETWEEN THE THICKENER BASE AND SIDEWALL.									
		THE BOILER DID NOT OPERATE DURING MAY DUE TO A SCHEDULED ANNUAL OUTAGE.									
6/79	A	43.0	37.0	39.0	27.0						
	B	49.0	49.0	52.0	31.0						
	SYSTEM	46.0	43.0	45.5	29.0			720	433	209	

COLUMBUS & SOUTHERN OHIO ELEC: CONESVILLE 6 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
		FLYASH CONVEYING PROBLEMS RESULTED IN ABOUT A TWO DAY OUTAGE.									
		PLUGGED PH LINES WERE A PROBLEM DURING THIS PERIOD.									
7/79	A	83.9	29.5	29.7	22.0						
	B	88.7	41.2	41.4	30.8						
	SYSTEM	86.3	35.4	35.6	26.4			744	554	196	
8/79	A	76.2	40.8	40.8	40.8						
	B	77.6	42.6	42.6	42.6						
	SYSTEM	76.9	41.7	41.7	41.7			744	744	310	
9/79	A	87.6	58.5	57.4	54.4						
	B	86.5	55.5	56.2	53.3						
	SYSTEM	87.0	57.0	56.8	53.9			720	681	388	
10/79	A	75.9	66.2	66.5	63.3						
	B	43.1	23.6	23.7	22.6						
	SYSTEM	59.5	44.9	45.1	43.0			744	713	320	
11/79	A	67.0	58.0	58.0	48.0						
	B	52.0	49.0	49.0	41.0						
	SYSTEM	59.5	53.5	53.5	44.5			720	599	320	
12/79	A	84.0	76.0	76.0	76.0						
	B	91.0	87.0	87.0	87.0						
	SYSTEM	87.5	81.5	81.5	81.5			744	744	606	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING THE LAST HALF OF 1979 THE UNIT EXPERIENCED PROBLEMS WITH THE LIME BLOWER COMPRESSOR MOTOR.									
		CAVITATION WAS SITED IN THE SLUDGE PUMP.									
		THE FLYASH CONVEYOR SYSTEM CAUSED PROBLEMS DURING THE LATTER HALF OF THE YEAR.									
		PLUGGING IN THE REAGENT CIRCULATION SYSTEMS WAS ENCOUNTERED.									
		THERE WERE PROBLEMS WITH THE GUIDE BARS AND SEALS IN THE INLET DAMPER DURING THE LAST HALF OF 1979.									
1/80	A	88.0	74.0	74.0	74.0						
	B	89.0	78.0	78.0	78.0						
	SYSTEM	89.0	76.0	76.0	76.0			744	744	566	73.9
	** PROBLEMS/SOLUTIONS/COMMENTS										
		NO MAJOR FGD SYSTEM RELATED PROBLEMS WERE REPORTED FOR JANUARY.									
2/80	A	87.0	75.0	78.0	69.0						
	B	92.0	81.0	85.0	75.0						
	SYSTEM	90.0	78.0	82.0	72.0			696	648	503	70.8
	** PROBLEMS/SOLUTIONS/COMMENTS										
		IN FEBRUARY, MIST ELIMINATOR NOZZLE PLUGGING OCCURRED CAUSING SOME OUTAGE TIME.									
3/80	A	93.0	69.0	69.0	15.0						

COLUMBUS & SOUTHERN OHIO ELEC: CONESVILLE 6 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	B	94.0	76.0	76.0	16.0						
	SYSTEM	94.0	73.0	73.0	16.0			744	160	117	17.6
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE BOILER WENT DOWN ON MARCH 9 FOR A BOILER/TURBINE INSPECTION AND REMAINED OUT OF SERVICE THROUGH THE END OF THE MONTH.									
4/80	A	98.8	25.6	29.4	11.1						
	B	98.9	54.2	62.1	23.5						
	SYSTEM	98.9	40.1	45.8	17.4			720	312	125	19.8
	** PROBLEMS/SOLUTIONS/COMMENTS										
		CONTINUOUS PROBLEMS WITH DAMPERS, PRESATURATOR HOSES, AND NOZZLES ACCOUNTED FOR MOST OF THE APRIL FGD SYSTEM OUTAGES.									
5/80	A	96.9	58.3	63.8	55.0						
	B	96.1	33.8	37.0	31.9						
	SYSTEM	96.5	46.1	50.4	43.4			744	701	323	39.1
	** PROBLEMS/SOLUTIONS/COMMENTS										
		CONTROL AND INSTRUMENTATION PROBLEMS THAT DEVELOPED IN MAY WERE RESPONSIBLE FOR SOME FGD SYSTEM OUTAGE TIME.									
6/80	A	97.1	73.6	73.4	73.1						
	B	97.1	50.5	50.3	50.1						
	SYSTEM	97.1	62.1	61.9	61.7			720	715	444	52.5
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE MAJORITY OF THE JUNE FGD SYSTEM OUTAGES WERE A RESULT OF EXTERNAL CAUSES (IUCS DISPOSAL SYSTEM, LOW UNIT DEMAND, SERVICE WATER, ETC.).									
7/80	A	96.0	85.1	85.9	82.7						
	B	99.1	89.1	89.9	86.6						
	SYSTEM	97.5	87.1	87.9	84.6			744	722	630	61.7
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE FGD SYSTEM EXPERIENCED PROCESS CONTROL PROBLEMS DURING JULY.									
		PROBLEMS WITH LEAKING INLET DAMPER SEALS ALSO OCCURRED DURING JULY.									
8/80	A	90.2	65.4	67.3	30.1						
	B	97.4	85.5	88.0	39.4						
	SYSTEM	93.8	75.5	77.6	34.7			744	343	259	28.3
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UTILITY REPORTED THAT PROBLEMS WERE ENCOUNTERED WITH THE RECLAIM WATER AND THE RECYCLE SLURRY SYSTEMS DURING AUGUST.									
9/80	A	93.6	88.2	88.5	87.8						
	B	94.2	90.7	91.0	90.3						
	SYSTEM	93.9	89.5	89.8	89.0			720	716	641	72.6
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE INLET DAMPER SEAL PROBLEM CONTINUED THROUGH AUGUST AND SEPTEMBER.									
		EXTERNAL PROBLEMS WERE EXPERIENCED WITH THE IUCS SYSTEM.									

COLUMBUS & SOUTHERN OHIO ELEC: CONESVILLE 6 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
10/80	A	89.2	72.0	72.6	64.9						
	B	94.1	87.6	88.3	78.9						
	SYSTEM	91.7	79.8	80.5	71.9	92.30		744	670	535	57.2

** PROBLEMS/SOLUTIONS/COMMENTS

BAD C3471 ****
BAD C3471 ****

EXTERNAL PROBLEMS WERE EXPERIENCED WITH THE IUCS SYSTEM.

11/80	A	99.6	92.9	91.1	55.4						
	B	98.2	81.5	79.9	48.6						
	SYSTEM	98.9	87.3	85.5	51.9	92.30		720	429	374	43.1

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING OCTOBER AND NOVEMBER.

12/80	A	86.0	84.0	84.0	84.0						
	B	87.6	76.7	76.7	76.7						
	SYSTEM	86.8	80.3	80.3	80.3	92.30	.12	744	744	744	79.1

** PROBLEMS/SOLUTIONS/COMMENTS

DURING DECEMBER SYSTEM AVAILABILITY WAS LOW DUE TO NECESSARY REPAIRS TO THE RECLAIM WATER TANK.

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	COMMONWEALTH EDISON	
PLANT NAME	POWERTON	
UNIT NUMBER	51	
CITY	PEKIN	
STATE	ILLINOIS	
REGULATORY CLASSIFICATION	E	
PARTICULATE EMISSION LIMITATION - NG/J	43.	(.100 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	774.	(1.800 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	1700	
GROSS UNIT GENERATING CAPACITY - MW	450	
NET UNIT GENERATING CAPACITY W/FGD - MW	400	
NET UNIT GENERATING CAPACITY WO/FGD - MW	425	
EQUIVALENT SCRUBBED CAPACITY - MW	450	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	BABCOCK & WILCOX	
BOILER TYPE	CYCLONE	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	722.18	(1530370 ACFM)
BOILER FLUE GAS TEMPERATURE - C	157.2	(315 F)
STACK HEIGHT - M	137.	(450 FT)
STACK SHELL	******	
STACK TOP DIAMETER - M	6.4	(21.0 FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	******	
AVERAGE HEAT CONTENT - J/G	24516.	(10540 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		******
AVERAGE ASH CONTENT - %	9.16	
RANGE ASH CONTENT - %	******	
AVERAGE MOISTURE CONTENT - %	16.34	
RANGE MOISTURE CONTENT - %	******	
AVERAGE SULFUR CONTENT - %	3.53	
RANGE SULFUR CONTENT - %	******	
AVERAGE CHLORIDE CONTENT - %	.20	
RANGE CHLORIDE CONTENT - %	******	
*** PARTICLE CONTROL		
** MECHANICAL COLLECTOR		
NUMBER	0	
** FABRIC FILTER		
NUMBER	0	
** ESP		
NUMBER	1	
TYPE	COLD SIDE	
SUPPLIER	RESEARCH-COTTRELL	
INLET FLUE GAS TEMPERATURE - C	157.2	(315 F)
PARTICLE REMOVAL EFFICENCY - %	98.7	
** PARTICLE SCRUBBER		
SPECIFIC TYPE	NONE	
SHELL GENERIC MATERIAL	N/A	
SHELL SPECIFIC MATERIAL	N/A	
LINER GENERIC MATERIAL	N/A	
LINER SPECIFIC MATERIAL	N/A	
*** FGD SYSTEM		
** GENERAL DATA		
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT	
SO2 REMOVAL MODE	WET SCRUBBING	
PROCESS TYPE	LIMESTONE	
SYSTEM SUPPLIER	AIR CORRECTION DIVISION, UOP	
DEVELOPMENT LEVEL	FULL SCALE	

COMMONWEALTH EDISON: POWERTON 51 (CONT.)

NEW/RETROFIT	RETROFIT	
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	75.50	
CURRENT STATUS	1	
COMMERCIAL START-UP	6/81	
INITIAL START-UP	4/80	
CONTRACT AWARDED	2/76	

** DESIGN AND OPERATING PARAMETERS

** ABSORBER

NUMBER	3	
GENERIC TYPE	PACKED TOWER	
SPECIFIC TYPE	MOBILE BED PACKING	
TRADE NAME/COMMON TYPE	TURBULENT CONTACT ABSORBER	
SUPPLIER	AIR CORRECTION DIVISION, UOP	
DIMENSIONS - FT	55 X 30 X 18	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	AISI 1110	
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A	
LINER GENERIC MATERIAL	ORGANIC	
LINER SPECIFIC MATERIAL	SYNTHETIC RUBBER	
LINER MATERIAL TRADE NAME/COMMON TYPE	NEOPRENE	
GAS CONTACTING DEVICE TYPE	SPHERES	
NUMBER OF CONTACTING ZONES	3	
LIQUID RECIRCULATION RATE - LITER/S	1575.	(25000 GPM)
L/G RATIO - L/CU.M	8.0	(60.0 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	3.0	(12.0 IN-H2O)
SUPERFICAL GAS VELOCITY - M/SEC	3.8	(12.5 FT/S)
INLET GAS FLOW - CU. M/S	240.73	(510123 ACFM)
INLET GAS TEMPERATURE - C	157.2	(315 F)
SO2 REMOVAL EFFICIENCY - %	75.5	

** MIST ELIMINATOR

PRE-MIST ELIMINATOR/MIST ELIMINATOR	MIST ELIMINATOR	
NUMBER PER SYSTEM	2	
GENERIC TYPE	IMPINGEMENT	
SPECIFIC TYPE	BAFFLE	
TRADE NAME/COMMON TYPE	CHEVRON VANE	
CONFIGURATION	HORIZONTAL	
SUPERFICAL GAS VELOCITY - M/S	2.7	(9.0 FT/S)
CONSTRUCTION MATERIAL GENERIC TYPE	FIBERGLASS REINFORCED PLASTIC	

** REHEATER

GENERIC TYPE	INDIRECT HOT AIR	
SPECIFIC TYPE	EXTERNAL HEAT EXCHANGER	
TRADE NAME/COMMON TYPE	STEAM TUBE BUNDLES	
TEMPERATURE INCREASE - C	-3.9	(25 F)
INLET FLUE GAS FLOW RATE - CU. M/S	583.28	(1236021 ACFM)
INLET FLUE GAS TEMPERATURE - C	54.4	(130 F)

** FANS

DESIGN	CENTRIFUGAL
SUPPLIER	GREEN FAN
FUNCTION	BOOSTER
APPLICATION	FORCED DRAFT
SERVICE	DRY

** REAGENT PREPARATION EQUIPMENT

FUNCTION	LIMESTONE GRINDING	
DEVICE	BALL MILL	
MANUFACTURER	KOPPERS	
NUMBER	2	
FULL LOAD DRY FEED CAPACITY - M.TONS/HR	20.0	(22 TPH)

** TANKS

SERVICE	NUMBER
RECYCLE	3
SLURRY MAKE-UP	1
M.E. WASH	1
WASTE SLURRY	2

COMMONWEALTH EDISON: POWERTON 51 (CONT.)

LIMESTONE TRANSFER	2
RECLAIMED WATER	1
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	VACUUM FILTER
NUMBER	3
NUMBER OF SPARES	1
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
OUTLET STREAM CHARACTERISTICS	55% SOLIDS
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	THICKENER
NUMBER	1
DIMENSIONS - FT	170 (DIA) X 10 (DEPTH)
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
OUTLET STREAM CHARACTERISTICS	35% SOLIDS
*** SLUDGE	
** TREATMENT	
METHOD	POZ-O-TEC
PROPRIETARY PROCESS	IUCS
INLET QUALITY - %	35.0
** DISPOSAL	
NATURE	FINAL
TYPE	LANDFILL
** DISPOSAL	
NATURE	INTERIM
TYPE	LINED POND
LOCATION	ON SITE
SITE CAPACITY - CU.M	122300 (100.0 ACRE-FT)
** PROCESS CONTROL AND INSTRUMENTATION	
CHEMICAL PARAMETERS	SO2, GAS FLOW, PH
PROCESS CONTROL MANNER	AUTOMATIC
PROCESS CHEMISTRY MODE	FEEDBACK/FEED FORWARD
** WATER BALANCE	
WATER LOOP TYPE	CLOSED
MAKEUP WATER ADDITION - LITERS/S	35.3 (560 GPM)

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
4/80	SYSTEM							720			
5/80	SYSTEM							744			
6/80	SYSTEM										

** PROBLEMS/SOLUTIONS/COMMENTS

THE POWERTON 51 FGD SYSTEM BEGAN INITIAL OPERATIONS IN A TESTING MODE IN APRIL. ALTHOUGH THE SYSTEM IS NOW AVAILABLE FOR OPERATION, THE UTILITY IS UNCERTAIN AS TO WHETHER IT WILL BE USED COMMERCIALLY OR NOT. THE SYSTEM WAS INSTALLED TO BRING THE UNIT INTO COMPLIANCE WITH ILLINOIS EMISSION REGULATIONS; HOWEVER DURING THE LATTER PART OF CONSTRUCTION THE FEDERAL NSPS WAS IMPLEMENTED AND THE UTILITY BEGAN UTILIZING LOW SULFUR COAL AS A COMPLIANCE STRATEGY. LOW SULFUR COAL HAS BEEN USED SINCE MAKING OPERATION OF THE FGD SYSTEM UNNECESSARY. UTILITY COST ANALYSES HAVE INDICATED THAT UTILIZING LOW SULFUR COAL WILL PROVE TO BE LESS EXPENSIVE THAN OPERATING THE FGD SYSTEM.

7/80	SYSTEM							744			

COMMONWEALTH EDISON: POWERTON 51 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
		PERFORMANCE DATA									
8/80	SYSTEM							744			
9/80	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

NO DECISION HAS BEEN MADE TO START COMMERCIAL OPERATIONS. THERE ARE NO FGD OPERATIONS EXCEPT TESTING IN ONE MODULE. PERFORMANCE DATA WILL BE AVAILABLE WHEN THE FGD SYSTEM GOES INTO COMMERCIAL OPERATION.

10/80	SYSTEM		.0		.0			744		0	
11/80	SYSTEM		.0		.0			720		0	
12/80	SYSTEM		.0		.0			744		0	

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS NOT OPERATED AT ALL DURING THE FOURTH QUARTER 1980. AN EXPLOSION AND FIRE AT THIS UNIT OCCURRED DURING THE LATTER PART OF NOVEMBER CAUSING THE BOILER TO GO OFF LINE THROUGH THE END OF THE QUARTER.

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	COOPERATIVE POWER ASSOCIATION	
PLANT NAME	COAL CREEK	
UNIT NUMBER	1	
CITY	UNDERWOOD	
STATE	NORTH DAKOTA	
REGULATORY CLASSIFICATION	B	
PARTICULATE EMISSION LIMITATION - NG/J	43.	(.100 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	516.	(1.200 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	1100	
GROSS UNIT GENERATING CAPACITY - MW	545	
NET UNIT GENERATING CAPACITY W/FGD - MW	495	
NET UNIT GENERATING CAPACITY WO/FGD - MW	*****	
EQUIVALENT SCRUBBED CAPACITY - MW	327	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	COMBUSTION ENGINEERING	
BOILER TYPE	PULVERIZED LIGNITE	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	********	(******* ACFM)
BOILER FLUE GAS TEMPERATURE - C	160.0	(320 F)
STACK HEIGHT - M	198.	(650 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	6.7	(22.0 FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	LIGNITE	
AVERAGE HEAT CONTENT - J/G	14556.	(6258 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		3068-7660
AVERAGE ASH CONTENT - %	7.14	
RANGE ASH CONTENT - %	3.89-15.95	
AVERAGE MOISTURE CONTENT - %	39.83	
RANGE MOISTURE CONTENT - %	27.78-52.55	
AVERAGE SULFUR CONTENT - %	.63	
RANGE SULFUR CONTENT - %	0.18-1.41	
AVERAGE CHLORIDE CONTENT - %	.02	
RANGE CHLORIDE CONTENT - %	0.00-0.08	
*** PARTICLE CONTROL		
** ESP		
NUMBER	1	
TYPE	COLD SIDE	
SUPPLIER	WHEELABRATOR-FRYE	
INLET FLUE GAS CAPACITY - CU.M/S	1090.1	(2310000 ACFM)
INLET FLUE GAS TEMPERATURE - C	160.6	(321 F)
PARTICLE REMOVAL EFFICENCY - %	99.5	
** PARTICLE SCRUBBER		
GENERIC TYPE	NONE	
SPECIFIC TYPE	N/A	
*** FGD SYSTEM		
** GENERAL DATA		
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT	
SO2 REMOVAL MODE	WET SCRUBBING	
PROCESS TYPE	LIME/ALKALINE FLYASH	
PROCESS ADDITIVES	NONE	
SYSTEM SUPPLIER	COMBUSTION ENGINEERING	
A-E FIRM	BLACK & VEATCH	
DEVELOPMENT LEVEL	FULL SCALE	
NEW/RETROFIT	NEW	
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.50	
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	54.00	
CURRENT STATUS	1	
COMMERCIAL START-UP	8/79	
INITIAL START-UP	7/79	

COOPERATIVE POWER ASSOCIATION: COAL CREEK 1 (CONT.)

** DESIGN AND OPERATING PARAMETERS		
SPACE REQUIREMENTS - SQ M	3716.0	(40000 SQ FT)
OPER. & MAINT. REQUIREMENT - MANHR/DAY	72.0	
** ABSORBER		
NUMBER	4	
GENERIC TYPE	SPRAY TOWER	
SPECIFIC TYPE	OPEN COUNTERCURRENT SPRAY	
SUPPLIER	COMBUSTION ENGINEERING	
DIMENSIONS - FT	22 X 22 X 20	
SHELL GENERIC MATERIAL	STAINLESS STEEL	
SHELL SPECIFIC MATERIAL	AUSTENITIC	
SHELL MATERIAL TRADE NAME/COMMON TYPE	TYPE 316L	
LINER GENERIC MATERIAL	NONE	
LINER SPECIFIC MATERIAL	N/A	
LINER MATERIAL TRADE NAME/COMMON TYPE	N/A	
NUMBER OF CONTACTING ZONES	3	
L/G RATIO - L/CU.M	8.0	(60.0 GAL/1000 ACF)
SO2 REMOVAL EFFICIENCY - %	90.0	
** MIST ELIMINATOR		
PRE-MIST ELIMINATOR/MIST ELIMINATOR	MIST ELIMINATOR	
NUMBER PER SYSTEM	1	
GENERIC TYPE	IMPINGEMENT	
SPECIFIC TYPE	BAFFLE	
TRADE NAME/COMMON TYPE	CHEVRON VANE	
NUMBER OF STAGES	2	
CONSTRUCTION MATERIAL GENERIC TYPE	FIBERGLASS REINFORCED PLASTIC	
** REHEATER		
GENERIC TYPE	BYPASS	
SPECIFIC TYPE	COLD SIDE	
TRADE NAME/COMMON TYPE	N/A	
PERCENT GAS BYPASSED - AVG	40.0	
TEMPERATURE INCREASE - C	29.4	(85 F)
** FANS		
NUMBER	4	
FUNCTION	BALANCED DRAFT	
APPLICATION	FORCED DRAFT	
SERVICE	DRY	
** REAGENT PREPARATION EQUIPMENT		
FUNCTION	LIME SLAKING	
DEVICE	SLAKER	
NUMBER	1	

** TANKS

SERVICE	NUMBER
REACTION-RECYCLE-THICKENER	2
FLYASH WETTING	****
LIME FEED	****

** PUMPS

SERVICE	NUMBER
BLEED STREAM	3
SLURRY FEED	****
REACTION TANK TRANSFER	6

*** SLUDGE

** TREATMENT	
METHOD	FLYASH STABILIZATION

COOPERATIVE POWER ASSOCIATION: COAL CREEK 1 (CONT.)

** DISPOSAL
NATURE — FINAL
TYPE — LINED POND

** WATER BALANCE
WATER LOOP TYPE — OPEN

** FGD SPARE CAPACITY INDICES
ABSORBER - % — .0

** FGD SPARE COMPONENT INDICES
ABSORBER — .0

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
7/79	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER BEGAN OPERATIONS IN MAY 1979. WET TEST RUNS WERE MADE WITH THE SCRUBBERS DURING THE SECOND WEEK OF JULY AND THE SYSTEM WAS OPERATED WITH LIME SLURRY DURING THE THIRD WEEK OF JULY. THE UTILITY BEGAN INITIAL FGD SYSTEM OPERATIONS AS DEFINED BY THE UTILITY (24-HOUR MINIUM PERIOD) ON JULY 19.

8/79	SYSTEM							744			
9/79	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

THIS UNIT STARTED COMMERCIAL OPERATIONS ON AUGUST 1, 1979. SOME MINOR SHAKEDOWN PROBLEMS WERE REPORTED FOR THE AUGUST-SEPTEMBER PERIOD.

10/79	SYSTEM							744	711		
11/79	SYSTEM							720	703		
12/79	SYSTEM							744	719		

** PROBLEMS/SOLUTIONS/COMMENTS

SINCE STARTUP THE UNIT HAS EXPERIENCED NUMEROUS SHAKEDOWN PROBLEMS BOTH BOILER AND FGD SYSTEM-RELATED. AFTER THE NEXT SCHEDULED OUTAGE IN APRIL, THE UTILITY EXPECTS STABLE FGD OPERATIONS TO BE ESTABLISHED.

DURING DECEMBER TWO OF THE EIGHT COAL PULVERIZERS WERE OUT OF SERVICE DUE TO A PRIMARY AIR DUCT EXPLOSION. LITTLE DOWN TIME RESULTED, HOWEVER, THE UNIT HAD TO OPERATE AT A REDUCED LOAD. NO FGD SYSTEM PROBLEMS WERE REPORTED.

1/80	SYSTEM				100.0		96.1	744	715	715	

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JANUARY TWO MODULES AT A TIME WERE TAKEN OFF-LINE FOR INSPECTION AND CLEANING. SOME CRACKED NOZZLES AND PLUGGING PROBLEMS WERE FOUND DURING THE INSPECTION. THE BOILER WAS OPERATED AT A REDUCED LOAD.

SOME OUTAGE TIME DURING THE MONTH WAS CAUSED BY BOILER-RELATED PROBLEMS. A BOILER TRIP WAS CAUSED BY A TURBINE ELECTRICIAL RELAY ON JANUARY 13.

AN HOUR OF OUTAGE TIME RESULTED FROM A LOSS OF POWER TO THE CONTROL SYSTEM AND AN ABNORMAL BOILER DRUM LEVEL WAS ALSO ENCOUNTERED ON JANUARY 16.

COOPERATIVE POWER ASSOCIATION: COAL CREEK 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR

A THREE TO FOUR HOUR OUTAGE WAS SCHEDULED ON JANUARY 27 TO MAKE REPAIRS ON FGD SYSTEM EQUIPMENT.

2/80	SYSTEM				99.9			696	695		

** PROBLEMS/SOLUTIONS/COMMENTS

WHILE THE BOILER WAS OUT OF SERVICE DUE TO ID FAN PROBLEMS CAUSED BY ELECTRICAL GROUNDING, TWO MODULES WERE TAKEN OUT OF SERVICE SO CALIBRATIONS COULD BE DONE.

3/80	SYSTEM		100.0		96.1			744	715	715	

** PROBLEMS/SOLUTIONS/COMMENTS

BOILER TRIPS OCCURRED THREE TIMES DURING THE MONTH. ONE TRIP WAS DUE TO THE CUT DOWN OF TRANSMISSION POWER ON MARCH 12.

THE FGD SYSTEM WAS SHUTDOWN WITH THE BOILER FOR FOUR HOURS TO CLEAN THE FILTER ON THE BOILER STATOR COOLING PUMPS.

DURING MARCH STACK EMISSION TESTS WERE UNDERTAKEN. THE SYSTEM OPERATED WITH ONE MODULE DOWN DURING TESTING.

4/80	11	96.7	58.3	100.0	21.4						
	12	100.0	81.7	100.0	30.0						
	13	100.0	96.1	100.0	35.3						
	14	100.0	96.9	100.0	35.6						
	SYSTEM	99.2	83.3	100.0	30.6			720	264	220	26.2

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER WAS OFF LINE FOR APPROXIMATELY 19 DAYS FOR THE ANNUAL UNIT OUTAGE. THE SCRUBBING SYSTEM WAS AVAILABLE DURING THE BOILER OUTAGE.

5/80	11	88.3	68.8	100.0	34.4						
	12	79.3	18.6	100.0	9.3						
	13	91.9	79.6	100.0	39.8						
	14	91.3	35.5	100.0	17.7						
	SYSTEM	87.7	50.6	100.0	25.3			744	372	188	28.2

** PROBLEMS/SOLUTIONS/COMMENTS

THE ANNUAL UNIT OUTAGE WAS COMPLETED IN THE BEGINNING OF THE MONTH. THERE WERE PROBLEMS WITH BOILER STARTUP AFTER THIS OUTAGE CAUSING LOW OPERABILITY OF THE FGD SYSTEM.

6/80	11	92.9	49.3	100.0	49.2						
	12	98.5	47.6	100.0	47.5						
	13	74.7	42.2	100.0	42.1						
	14	93.5	73.0	100.0	72.8						
	SYSTEM	89.9	53.0	100.0	52.9			720	718	381	58.5

** PROBLEMS/SOLUTIONS/COMMENTS

THERE WERE NO MAJOR PROBLEMS REPORTED DURING JUNE. ROUTINE MAINTENANCE AND REPAIRS WERE DONE THROUGHOUT THE MONTH.

7/80	SYSTEM	100.0	100.0	100.0	87.1			744	648	648	47.1

COOPERATIVE POWER ASSOCIATION: COAL CREEK 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
		IN JULY, NO PROBLEMS WERE ENCOUNTERED WITH THE FGD SYSTEM.									
8/80	11		24.8		17.5						
	12		43.5		30.6						
	13		42.7		30.1						
	14		78.9		55.6						
	SYSTEM		47.5		33.5			744	525	249	31.8
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING AUGUST.									
9/80	SYSTEM		.0		.0			720	0	0	.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UNIT DID NOT OPERATE DURING SEPTEMBER DUE TO A TURBINE BEARING FAILURE.									
10/80	11		65.6		13.2						
	12		80.3		16.1						
	13		2.7		.0						
	14		36.1		7.3						
	SYSTEM		46.2		9.3			744	149	69	12.1
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING MOST OF OCTOBER THE UNIT DID NOT OPERATE DUE TO THE REPAIRS BEING PERFORMED ON THE TURBINE BEARINGS. THE UNIT OPERATED APPROXIMATELY 150 HOURS DURING THE MONTH.									
11/80	11		46.7		45.8						
	12		48.1		47.2						
	13		33.7		33.1						
	14		45.0		44.2						
	SYSTEM		43.4		42.6			720	707	307	30.8
12/80	11		60.6		60.2						
	12		30.3		30.1						
	13		85.0		84.4						
	14		10.0		9.9						
	SYSTEM		46.6		46.2			744	739	344	72.2
	** PROBLEMS/SOLUTIONS/COMMENTS										
		NO MAJOR PROBLEMS WERE ENCOUNTERED DURING NOVEMBER AND DECEMBER.									

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	COOPERATIVE POWER ASSOCIATION	
PLANT NAME	COAL CREEK	
UNIT NUMBER	2	
CITY	UNDERWOOD	
STATE	NORTH DAKOTA	
REGULATORY CLASSIFICATION	B	
PARTICULATE EMISSION LIMITATION - NG/J	43.	(.100 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	516.	(1.200 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	1100	
GROSS UNIT GENERATING CAPACITY - MW	545	
NET UNIT GENERATING CAPACITY W/FGD - MW	495	
NET UNIT GENERATING CAPACITY WO/FGD - MW	*****	
EQUIVALENT SCRUBBED CAPACITY - MW	327	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	COMBUSTION ENGINEERING	
BOILER TYPE	PULVERIZED LIGNITE	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	********	(******* ACFM)
BOILER FLUE GAS TEMPERATURE - C	160.0	(320 F)
STACK HEIGHT - M	198.	(650 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	6.7	(22.0 FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	LIGNITE	
AVERAGE HEAT CONTENT - J/G	14556.	(6258 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		3068-7660
AVERAGE ASH CONTENT - %	7.14	
RANGE ASH CONTENT - %	3.89-15.95	
AVERAGE MOISTURE CONTENT - %	39.83	
RANGE MOISTURE CONTENT - %	27.78-52.55	
AVERAGE SULFUR CONTENT - %	.63	
RANGE SULFUR CONTENT - %	0.18-1.41	
AVERAGE CHLORIDE CONTENT - %	.02	
RANGE CHLORIDE CONTENT - %	0.00-0.08	
*** PARTICLE CONTROL		
** ESP		
NUMBER	1	
TYPE	COLD SIDE	
SUPPLIER	WHEELABRATOR-FRYE	
INLET FLUE GAS CAPACITY - CU.M/S	1090.1	(2310000 ACFM)
INLET FLUE GAS TEMPERATURE - C	160.6	(321 F)
PARTICLE REMOVAL EFFICENCY - %	99.5	
** PARTICLE SCRUBBER		
GENERIC TYPE	NONE	
SPECIFIC TYPE	N/A	
*** FGD SYSTEM		
** GENERAL DATA		
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT	
SO2 REMOVAL MODE	WET SCRUBBING	
PROCESS TYPE	LIME/ALKALINE FLYASH	
PROCESS ADDITIVES	NONE	
SYSTEM SUPPLIER	COMBUSTION ENGINEERING	
A-E FIRM	BLACK & VEATCH	
DEVELOPMENT LEVEL	FULL SCALE	
NEW/RETROFIT	NEW	
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.50	
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	54.00	
CURRENT STATUS	1	
COMMERCIAL START-UP	9/80	
INITIAL START-UP	7/80	

COOPERATIVE POWER ASSOCIATION: COAL CREEK 2 (CONT.)

** DESIGN AND OPERATING PARAMETERS

** ABSORBER	
NUMBER	4
GENERIC TYPE	SPRAY TOWER
SPECIFIC TYPE	OPEN COUNTERCURRENT SPRAY
SUPPLIER	COMBUSTION ENGINEERING
DIMENSIONS - FT	22 X 22 X 20
SHELL GENERIC MATERIAL	STAINLESS STEEL
SHELL SPECIFIC MATERIAL	AUSTENITIC
SHELL MATERIAL TRADE NAME/COMMON TYPE	TYPE 316L
LINER GENERIC MATERIAL	NONE
LINER SPECIFIC MATERIAL	N/A
LINER MATERIAL TRADE NAME/COMMON TYPE	N/A
NUMBER OF CONTACTING ZONES	3
L/G RATIO - L/CU.M	8.0 (60.0 GAL/1000 ACF)
SO2 REMOVAL EFFICIENCY - %	90.0
** MIST ELIMINATOR	
PRE-MIST ELIMINATOR/MIST ELIMINATOR	MIST ELIMINATOR
NUMBER PER SYSTEM	1
GENERIC TYPE	IMPINGEMENT
SPECIFIC TYPE	BAFFLE
TRADE NAME/COMMON TYPE	CHEVRON VANE
NUMBER OF STAGES	2
CONSTRUCTION MATERIAL GENERIC TYPE	FIBERGLASS REINFORCED PLASTIC
** REHEATER	
GENERIC TYPE	BYPASS
SPECIFIC TYPE	COLD SIDE
TRADE NAME/COMMON TYPE	N/A
PERCENT GAS BYPASSED - AVG	40.0
TEMPERATURE INCREASE - C	29.4 (85 F)
** FANS	
NUMBER	4
FUNCTION	BALANCED DRAFT
APPLICATION	FORCED DRAFT
SERVICE	DRY
** REAGENT PREPARATION EQUIPMENT	
FUNCTION	LIME SLAKING
DEVICE	SLAKER
NUMBER	1

** TANKS

SERVICE	NUMBER
REACTION-RECYCLE-THICKENER	2
FLYASH WETTING	****
LIME FEED	****

** PUMPS

SERVICE	NUMBER
BLEED STREAM	3
SLURRY FEED	****
REACTION TANK	6

*** SLUDGE

** TREATMENT	
METHOD	FLYASH STABILIZATION
** DISPOSAL	
NATURE	FINAL
TYPE	LINED POND

EPA UTILITY FGD SURVEY: OCTOBER - DECEMBER 1980

COOPERATIVE POWER ASSOCIATION: COAL CREEK 2 (CONT.)

** WATER BALANCE
WATER LOOP TYPE OPEN

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
7/80	21		61.8		52.4						
	22		18.7		15.9						
	23		25.0		21.2						
	24		52.9		44.9						
	SYSTEM		39.6		33.6			744	631	250	34.5

** PROBLEMS/SOLUTIONS/COMMENTS

INITIAL OPERATION OF THE FGD SYSTEM BEGAN IN JULY 1980. NO MAJOR START UP PROBLEMS WERE REPORTED.

8/80	21		15.5		11.8						
	22		29.7		22.6						
	23		25.4		19.4						
	24		46.3		35.2						
	SYSTEM		58.5		44.5			744	566	331	36.1

** PROBLEMS/SOLUTIONS/COMMENTS

THE SYSTEM HAS BEEN EXPERIENCING PROBLEMS WITH THE LIME HANDLING CONVEYOR BELT. THIS HAS NOT RESTRICTED OPERATION OF THE SYSTEM; HOWEVER THE UTILITY HAS PLANS TO INSTALL A VIBRATOR CONVEYOR IN JANUARY.

9/80	21		80.2		80.0						
	22		56.8		56.7						
	23		49.0		48.9						
	24		76.9		76.7						
	SYSTEM		65.7		65.6			720	718	472	59.1
10/80	21		92.0		91.7						
	22		86.3		86.0						
	23		22.1		22.0						
	24		70.4		70.2						
	SYSTEM							744	742		70.0
11/80	21		63.1		44.2						
	22		77.0		53.9						
	23		25.0		17.5						
	24		77.8		54.4						
	SYSTEM							720	504		41.0
12/80	21		58.7		57.5						
	22		51.3		50.3						
	23		22.2		21.8						
	24		89.4		87.6						
	SYSTEM		55.4		54.3			744	730	404	65.2

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR PROBLEMS HAVE BEEN ENCOUNTERED FOR THE MONTHS OF SEPTEMBER THROUGH DECEMBER.

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	DELMARVA POWER & LIGHT	
PLANT NAME	DELAWARE CITY	
UNIT NUMBER	1	
CITY	DELAWARE CITY	
STATE	DELAWARE	
REGULATORY CLASSIFICATION	E	
PARTICULATE EMISSION LIMITATION - NG/J	129.	(.300 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	180	
GROSS UNIT GENERATING CAPACITY - MW	60	
NET UNIT GENERATING CAPACITY W/FGD - MW	*****	
NET UNIT GENERATING CAPACITY WO/FGD - MW	*****	
EQUIVALENT SCRUBBED CAPACITY - MW	60	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	RILEY STOKER	
BOILER TYPE	PULVERIZED COKE	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	139.21	(295000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	215.6	(420 F)
STACK HEIGHT - M	152.	(500 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	6.1	(20.0 FT)
** FUEL DATA		
FUEL TYPE	COKE	
FUEL GRADE	FLUID PETROLEUM COKE	
AVERAGE HEAT CONTENT - J/G	32564.	(14000 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		13500-14500
AVERAGE ASH CONTENT - %	.50	
RANGE ASH CONTENT - %	.3-.7	
AVERAGE MOISTURE CONTENT - %	.70	
RANGE MOISTURE CONTENT - %	.5-1.2	
AVERAGE SULFUR CONTENT - %	7.00	
RANGE SULFUR CONTENT - %	5-8	
AVERAGE CHLORIDE CONTENT - %	********	
RANGE CHLORIDE CONTENT - %	******	
*** PARTICLE CONTROL		
** MECHANICAL COLLECTOR		
NUMBER	3	
TYPE	TUBULAR	
SUPPLIER	PRAT-DANIEL	
PARTICLE REMOVAL EFFICENCY -%	92.0	
** FABRIC FILTER		
TYPE	NONE	
TYPICAL GAS/CLOTH RATIO - M/MIN	.6	(2.0 FT/MIN)
** ESP		
NUMBER	3	
SUPPLIER	WESTERN PREC. DIVISION, JOY	
INLET FLUE GAS CAPACITY - CU.M/S	104.3	(221000 ACFM)
INLET FLUE GAS TEMPERATURE - C	54.4	(130 F)
PRESSURE DROP - KPA	.2	(1. IN-H2O)
PARTICLE REMOVAL EFFICENCY - %	95.0	
** PARTICLE SCRUBBER		
NUMBER	3	
GENERIC TYPE	VENTURI TOWER	
SPECIFIC TYPE	VARIABLE-THROAT/BOTTOM-ENTRY PLUMB BOB	
SUPPLIER	AIRPOL	
DIMENSIONS - FT	20 DIA X 70 HIGH	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	AISI 1110	
LINER GENERIC MATERIAL	ORGANIC,INORGANIC	
LINER SPECIFIC MATERIAL	GLASS FLAKE-FILLED POLYESTER, ACID-RESISTANT BRI	

DELMARVA POWER & LIGHT: DELAWARE CITY 1 (CONT.)

NUMBER OF CONTACTING ZONES	1	
LIQUID RECIRCULATION RATE - LITER/S	315.0	(5000 GPM)
PRESSURE DROP - KPA	.5	(2.0 IN-H2O)
INLET GAS FLOW RATE - CU.M/S	139.2	(295000 ACFM)
INLET GAS TEMPERATURE - C	215.6	(420 F)
SO2 REMOVAL EFFICENCY - %	.0	
PARTICLE REMOVAL EFFICIENCY - %	81.5	

*** FGD SYSTEM

** GENERAL DATA

SALEABLE PRODUCT/THROWAWAY PRODUCT	SALEABLE PRODUCT	
SO2 REMOVAL MODE	WET SCRUBBING	
PROCESS TYPE	WELLMAN LORD	
SYSTEM SUPPLIER	DAVY MCKEE	
A-E FIRM	DAVY MCKEE	
DEVELOPMENT LEVEL	FULL SCALE	
NEW/RETROFIT	RETROFIT	
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	90.00	
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	90.00	
CURRENT STATUS	1	
COMMERCIAL START-UP	5/80	
INITIAL START-UP	5/80	
CONTRACT AWARDED	9/77	

** DESIGN AND OPERATING PARAMETERS

SPACE REQUIREMENTS - SQ M	24280.3	(261360 SQ FT)
OPER. & MAINT. REQUIREMENT - MANHR/DAY	144.0	

** ABSORBER

NUMBER	3	
NUMBER OF SPARES	0	
GENERIC TYPE	TRAY TOWER	
SPECIFIC TYPE	VALVE TRAY	
TRADE NAME/COMMON TYPE	BUBBLE CAP TRAY TOWER	
SUPPLIER	DAVY MCKEE	
DIMENSIONS - FT	20 X 20	
SHELL GENERIC MATERIAL	INORGANIC	
SHELL SPECIFIC MATERIAL	REINFORCED CONCRETE	
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A	
LINER GENERIC MATERIAL	INORGANIC	
LINER MATERIAL TRADE NAME/COMMON TYPE	TILE	
GAS CONTACTING DEVICE TYPE	VALVE TRAY	
NUMBER OF CONTACTING ZONES	4	
LIQUID RECIRCULATION RATE - LITER/S	25.	(400 GPM)
INLET GAS FLOW - CU. M/S	103.82	(220000 ACFM)
INLET GAS TEMPERATURE - C	54.4	(130 F)
PARTICLE REMOVAL EFFICENCY - %	.0	

** MIST ELIMINATOR

PRE-MIST ELIMINATOR/MIST ELIMINATOR	MIST ELIMINATOR	
NUMBER PER SYSTEM	3	
GENERIC TYPE	IMPINGEMENT	
SPECIFIC TYPE	BAFFLE	
TRADE NAME/COMMON TYPE	CHEVRON VANE	
CONFIGURATION	HORIZONTAL	
NUMBER OF STAGES	1	
NUMBER OF PASSES PER STAGE	1	
FREEBOARD DISTANCE - M	1.83	(6.0 FT)
DISTANCE BETWEEN STAGES - CM	19.05	(7.5 IN)
PRESSURE DROP - KPA	.1	(.3 IN-H2O)
CONSTRUCTION MATERIAL GENERIC TYPE	NORYL PLASTIC	
WASH WATER SOURCE	COOLED CONDENSATE	
WASH RATE - L/S	3.2	(50 GAL/MIN)

** REHEATER

NUMBER	3	
GENERIC TYPE	DIRECT COMBUSTION	
SPECIFIC TYPE	EXTERNAL COMBUSTION CHAMBER	
TRADE NAME/COMMON TYPE	NATURAL GAS	
TEMPERATURE INCREASE - C	10.0	(50 F)

DELMARVA POWER & LIGHT: DELAWARE CITY 1 (CONT.)

INLET FLUE GAS FLOW RATE - CU. M/S	108.54	(230000 ACFM)
INLET FLUE GAS TEMPERATURE - C	54.4	(130 F)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL - FIRE BRICK	
** FANS		
NUMBER	3	
NUMBER OF SPARES	0	
DESIGN	CENTRIFUGAL	
SUPPLIER	ROBINSON	
FUNCTION	BOOSTER	
APPLICATION	INDUCED DRAFT	
SERVICE	DRY	
FLUE GAS FLOW RATE - CU.M/S	139.21	(295000 ACFM)
FLUE GAS TEMPERATURE - C	215.6	(420 F)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	
** DUCTWORK		
DIMENSIONS	8 X 8	
SHELL GENERIC MATERIAL TYPE	CARBON STEEL	
LINER GENERIC MATERIAL TYPE	FRP	
*** SALEABLE BYPRODUCTS		
NATURE	SULFURIC ACID	
FULL LOAD QUANTITY - M T/H	11.34	(12.50 TPH)
QUALITY - %	93.0	
DISPOSITION	MARKETED	
*** SLUDGE		
** TREATMENT		
METHOD	NEUTRALIZATION	
** DISPOSAL		
NATURE	FINAL	
TYPE	LINED POND	
** PROCESS CONTROL AND INSTRUMENTATION		
CHEMICAL PARAMETERS	PH, SOLIDS, SP.G., CONC.	
MONITOR LOCATION	GAS OUTLET, SOLUTION OUTLET	
PROCESS CONTROL MANNER	AUTOMATIC	
PROCESS CHEMISTRY MODE	FEEDBACK	
** WATER BALANCE		
WATER LOOP TYPE	CLOSED	

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
5/80	SYSTEM	100.0	100.0	100.0	32.3			744	240	240	

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM BEGAN INITIAL AND COMMERCIAL OPERATIONS ON MAY 22, 1980. NO MAJOR PROBLEMS WERE ENCOUNTERED FROM STARTUP THROUGH THE END OF THE MONTH.

6/80	SYSTEM	98.9	98.9	98.9	98.9			720	720	712	

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR PROBLEMS WERE ENCOUNTERED DURING JUNE.

7/80	SYSTEM	97.2	97.0	97.0	90.7			744	696	675	

DELMARVA POWER & LIGHT: DELAWARE CITY 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE FGD SYSTEM WAS DOWN FOR PART OF THE MONTH IN JULY TO REPAIR A LEAK IN THE MIST ELIMINATOR.									
8/80	SYSTEM	99.9	99.9	99.9	99.9			744	744	743	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		NO FGD-RELATED PROBLEMS WERE REPORTED DURING AUGUST.									
9/80	SYSTEM	78.3	78.3	78.3	78.3			720	720	564	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE FGD SYSTEM WAS OFF LINE DURING SEPTEMBER DUE TO NECESSARY REPAIR OF THE CIRCULATING PUMPS AND THE MIST ELIMINATOR.									
		FGD SYSTEM OUTAGE TIME OCCURRED DUE TO INLET DUCT EXPANSION JOINT REPAIRS.									
10/80	SYSTEM	66.1	66.1	66.1	66.1			744	744	492	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING OCTOBER SOME OF THE OUTAGE TIME WAS DUE TO PLUGGED SPRAY HEADERS ON THE MIST ELIMINATOR.									
		PROBLEMS WITH LEAKING CIRCULATING PUMPS OCCURRED IN OCTOBER.									
		OTHER OUTAGE TIME WAS DUE TO THE FAILURE OF ESP DISTRIBUTOR BAFFLES.									
11/80	SYSTEM	93.8	96.0	96.0	93.8			720	704	676	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		FAILURE OF PRESCRUBBER RECIRCULATION PUMPS CAUSED OUTAGE TIME IN NOVEMBER.									
12/80	SYSTEM	33.9	55.9	55.9	30.6			744	408	228	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING DECEMBER THE BOILER WAS OUT OF SERVICE DUE TO A SCHEDULED MAINTENANCE OVERHAUL FOR APPROXIMATELY 360 HOURS. START-UP OF THE FGD SYSTEM WAS DELAYED ABOUT FIVE DAYS DUE TO MATERIAL DELIVERY PROBLEMS.									

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	DELMARVA POWER & LIGHT	
PLANT NAME	DELAWARE CITY	
UNIT NUMBER	2	
CITY	DELAWARE CITY	
STATE	DELAWARE	
REGULATORY CLASSIFICATION	E	
PARTICULATE EMISSION LIMITATION - NG/J	129.	(.300 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	180	
GROSS UNIT GENERATING CAPACITY - MW	60	
NET UNIT GENERATING CAPACITY W/FGD - MW	*****	
NET UNIT GENERATING CAPACITY WO/FGD - MW	*****	
EQUIVALENT SCRUBBED CAPACITY - MW	60	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	RILEY STOKER	
BOILER TYPE	PULVERIZED COKE	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	139.21	(295000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	215.6	(420 F)
STACK HEIGHT - M	152.	(500 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	6.1	(20.0 FT)
** FUEL DATA		
FUEL TYPE	COKE	
FUEL GRADE	FLUID PETROLEUM COKE	
AVERAGE HEAT CONTENT - J/G	32564.	(14000 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		13500-14500
AVERAGE ASH CONTENT - %	.50	
RANGE ASH CONTENT - %	.3-.7	
AVERAGE MOISTURE CONTENT - %	.70	
RANGE MOISTURE CONTENT - %	.5-1.2	
AVERAGE SULFUR CONTENT - %	7.00	
RANGE SULFUR CONTENT - %	5-8	
AVERAGE CHLORIDE CONTENT - %	********	
RANGE CHLORIDE CONTENT - %	******	
*** PARTICLE CONTROL		
** MECHANICAL COLLECTOR		
NUMBER	3	
TYPE	TUBULAR	
SUPPLIER	PRAT-DANIEL	
PARTICLE REMOVAL EFFICENCY -%	92.0	
** FABRIC FILTER		
TYPE	NONE	
TYPICAL GAS/CLOTH RATIO - M/MIN	.6	(2.0 FT/MIN)
** ESP		
NUMBER	3	
SUPPLIER	WESTERN PREC. DIVISION, JOY	
INLET FLUE GAS CAPACITY - CU.M/S	104.3	(221000 ACFM)
INLET FLUE GAS TEMPERATURE - C	54.4	(130 F)
PRESSURE DROP - KPA	.2	(1. IN-H2O)
PARTICLE REMOVAL EFFICENCY - %	95.0	
** PARTICLE SCRUBBER		
NUMBER	3	
GENERIC TYPE	VENTURI TOWER	
SPECIFIC TYPE	VARIABLE-THROAT/BOTTOM-ENTRY PLUMB BOB	
SUPPLIER	AIRPOL	
DIMENSIONS - FT	20 DIA X 70 HIGH	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	AISI 1110	
LINER GENERIC MATERIAL	ORGANIC,INORGANIC	
LINER SPECIFIC MATERIAL	GLASS FLAKE-FILLED POLYESTER, ACID-RESISTANT BRI	

DELMARVA POWER & LIGHT: DELAWARE CITY 2 (CONT.)

NUMBER OF CONTACTING ZONES	1	
LIQUID RECIRCULATION RATE - LITER/S	315.0	(5000 GPM)
PRESSURE DROP - KPA	.5	(2.0 IN-H2O)
INLET GAS FLOW RATE - CU.M/S	139.2	(295000 ACFM)
INLET GAS TEMPERATURE - C	215.6	(420 F)
SO2 REMOVAL EFFICENCY - %	.0	
PARTICLE REMOVAL EFFICIENCY - %	81.5	

*** FGD SYSTEM

** GENERAL DATA

SALEABLE PRODUCT/THROWAWAY PRODUCT	SALEABLE PRODUCT
SO2 REMOVAL MODE	WET SCRUBBING
PROCESS TYPE	WELLMAN LORD
SYSTEM SUPPLIER	DAVY MCKEE
A-E FIRM	DAVY MCKEE
DEVELOPMENT LEVEL	FULL SCALE
NEW/RETROFIT	RETROFIT
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	90.00
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	90.00
CURRENT STATUS	1
COMMERCIAL START-UP	5/80
INITIAL START-UP	5/80
CONTRACT AWARDED	9/77

** DESIGN AND OPERATING PARAMETERS

SPACE REQUIREMENTS - SQ M	24280.3	(261360 SQ FT)
OPER. & MAINT. REQUIREMENT - MANHR/DAY	144.0	

** ABSORBER

NUMBER	3	
NUMBER OF SPARES	0	
GENERIC TYPE	TRAY TOWER	
SPECIFIC TYPE	VALVE TRAY	
TRADE NAME/COMMON TYPE	BUBBLE CAP TRAY TOWER	
SUPPLIER	DAVY MCKEE	
DIMENSIONS - FT	20 X 20	
SHELL GENERIC MATERIAL	INORGANIC	
SHELL SPECIFIC MATERIAL	REINFORCED CONCRETE	
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A	
LINER GENERIC MATERIAL	INORGANIC	
LINER MATERIAL TRADE NAME/COMMON TYPE	TILE	
GAS CONTACTING DEVICE TYPE	VALVE TRAY	
NUMBER OF CONTACTING ZONES	4	
LIQUID RECIRCULATION RATE - LITER/S	25.	(400 GPM)
INLET GAS FLOW - CU. M/S	103.82	(220000 ACFM)
INLET GAS TEMPERATURE - C	54.4	(130 F)
PARTICLE REMOVAL EFFICENCY - %	.0	

** MIST ELIMINATOR

PRE-MIST ELIMINATOR/MIST ELIMINATOR	MIST ELIMINATOR	
NUMBER PER SYSTEM	3	
GENERIC TYPE	IMPINGEMENT	
SPECIFIC TYPE	BAFFLE	
TRADE NAME/COMMON TYPE	CHEVRON VANE	
CONFIGURATION	HORIZONTAL	
NUMBER OF STAGES	1	
NUMBER OF PASSES PER STAGE	1	
FREEBOARD DISTANCE - M	1.83	(6.0 FT)
DISTANCE BETWEEN STAGES - CM	19.05	(7.5 IN)
PRESSURE DROP - KPA	.1	(.3 IN-H2O)
CONSTRUCTION MATERIAL GENERIC TYPE	NORYL PLASTIC	
WASH WATER SOURCE	COOLED CONDENSATE	
WASH RATE - L/S	3.2	(50 GAL/MIN)

** REHEATER

NUMBER	3	
GENERIC TYPE	DIRECT COMBUSTION	
SPECIFIC TYPE	EXTERNAL COMBUSTION CHAMBER	
TRADE NAME/COMMON TYPE	NATURAL GAS	
TEMPERATURE INCREASE - C	10.0	(50 F)

DELMARVA POWER & LIGHT: DELAWARE CITY 2 (CONT.)

INLET FLUE GAS FLOW RATE - CU. M/S	108.54	(230000 ACFM)
INLET FLUE GAS TEMPERATURE - C	54.4	(130 F)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL - FIRE BRICK	

** FANS

NUMBER	3	
NUMBER OF SPARES	0	
DESIGN	CENTRIFUGAL	
SUPPLIER	ROBINSON	
FUNCTION	BOOSTER	
APPLICATION	INDUCED DRAFT	
SERVICE	DRY	
FLUE GAS FLOW RATE - CU.M/S	139.21	(295000 ACFM)
FLUE GAS TEMPERATURE - C	215.6	(420 F)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	

** DUCTWORK

DIMENSIONS	8 X 8	
SHELL GENERIC MATERIAL TYPE	CARBON STEEL	
LINER GENERIC MATERIAL TYPE	FRP	

*** SALEABLE BYPRODUCTS

NATURE	SULFURIC ACID	
FULL LOAD QUANTITY - M T/H	11.34	(12.50 TPH)
QUALITY - %	93.0	
DISPOSITION	MARKETED	

*** SLUDGE

** TREATMENT

METHOD	NEUTRALIZATION

** DISPOSAL

NATURE	FINAL
TYPE	LINED POND

** PROCESS CONTROL AND INSTRUMENTATION

CHEMICAL PARAMETERS	PH, SOLIDS, SP.G., CONC.
MONITOR LOCATION	GAS OUTLET, SOLUTION OUTLET
PROCESS CONTROL MANNER	AUTOMATIC
PROCESS CHEMISTRY MODE	FEEDBACK

** WATER BALANCE

WATER LOOP TYPE	CLOSED

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
5/80	SYSTEM	100.0	100.0	100.0	32.3			744	240	240	

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM BEGAN INITIAL AND COMMERCIAL OPERATIONS ON MAY 22, 1980. NO MAJOR PROBLEMS WERE ENCOUNTERED DURING STARTUP OR THROUGH THE REST OF THE MONTH.

6/80	SYSTEM	80.4	80.4	80.4	80.4			720	720	579	

** PROBLEMS/SOLUTIONS/COMMENTS

THE CHEVRON PACKING IN THE MIST ELIMINATOR FAILED CAUSING SOME FGD SYSTEM OUTAGE TIME DURING JUNE.

DELMARVA POWER & LIGHT: DELAWARE CITY 2 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
			FAILURE OF THE CIRCULATION PUMPS ALSO CAUSED OUTAGE TIME DURING THE MONTH.								
7/80	SYSTEM	50.1	50.1	50.1	50.1			744	744	373	
	** PROBLEMS/SOLUTIONS/COMMENTS										
			THE FGD SYSTEM WAS DOWN FOR PART OF THE MONTH TO REPAIR A LEAK IN THE MIST ELIMINATOR. IT WAS ALSO DOWN TO REBUILD THE CHEVRON PACKING.								
8/80	SYSTEM	92.9	92.9	92.9	92.9			744	744	691	
	** PROBLEMS/SOLUTIONS/COMMENTS										
			REPAIRS WERE MADE TO THE ESP DURING AUGUST.								
9/80	SYSTEM	78.2	78.2	78.2	78.2			720	720	563	
	** PROBLEMS/SOLUTIONS/COMMENTS										
			THE FGD SYSTEM WAS OFF LINE DURING SEPTEMBER DUE TO NECESSARY REPAIR OF THE CIRCULATING PUMPS AND THE MIST ELIMINATOR.								
			FGD SYSTEM OUTAGE TIME OCCURRED DUE TO INLET DUCT EXPANSION JOINT REPAIRS.								
10/80	SYSTEM	60.0	60.0	60.0	60.0			744	743	445	
	** PROBLEMS/SOLUTIONS/COMMENTS										
			DURING OCTOBER THE MAJORITY OF DOWN TIME WAS DUE TO THE ACID PLANT BEING DOWN. IT WAS UNABLE TO PROCESS SO2 FROM THE WELLMAN LORD SOLUTION REGENERATION SECTION.								
11/80	SYSTEM	98.3	98.3	98.3	98.3			720	720	708	
	** PROBLEMS/SOLUTIONS/COMMENTS										
			DURING NOVEMBER OUTAGE TIME WAS REQUIRED TO REPAIR LEAKS IN THE PRE-SCRUBBER.								
12/80	SYSTEM	100.0	100.0	100.0	100.0			744	744	744	
	** PROBLEMS/SOLUTIONS/COMMENTS										
			THE UTILITY REPORTED NO FGD-RELATED PROBLEMS DURING THE MONTH OF DECEMBER.								

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	DELMARVA POWER & LIGHT	
PLANT NAME	DELAWARE CITY	
UNIT NUMBER	3	
CITY	DELAWARE CITY	
STATE	DELAWARE	
REGULATORY CLASSIFICATION	E	
PARTICULATE EMISSION LIMITATION - NG/J	129.	(.300 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	180	
GROSS UNIT GENERATING CAPACITY - MW	60	
NET UNIT GENERATING CAPACITY W/FGD - MW	*****	
NET UNIT GENERATING CAPACITY WO/FGD - MW	*****	
EQUIVALENT SCRUBBED CAPACITY - MW	60	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	RILEY STOKER	
BOILER TYPE	PULVERIZED COKE	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	139.21	(295000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	215.6	(420 F)
STACK HEIGHT - M	152.	(500 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	6.1	(20.0 FT)
** FUEL DATA		
FUEL TYPE	COKE	
FUEL GRADE	FLUID PETROLEUM COKE	
AVERAGE HEAT CONTENT - J/G	32564.	(14000 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		13500-14500
AVERAGE ASH CONTENT - %	.50	
RANGE ASH CONTENT - %	.3-.7	
AVERAGE MOISTURE CONTENT - %	.70	
RANGE MOISTURE CONTENT - %	.5-1.2	
AVERAGE SULFUR CONTENT - %	7.00	
RANGE SULFUR CONTENT - %	5-8	
AVERAGE CHLORIDE CONTENT - %	********	
RANGE CHLORIDE CONTENT - %	******	
*** PARTICLE CONTROL		
** MECHANICAL COLLECTOR		
NUMBER	3	
TYPE	TUBULAR	
SUPPLIER	PRAT-DANIEL	
PARTICLE REMOVAL EFFICENCY -%	92.0	
** FABRIC FILTER		
TYPE	NONE	
TYPICAL GAS/CLOTH RATIO - M/MIN	.6	(2.0 FT/MIN)
** ESP		
NUMBER	3	
SUPPLIER	WESTERN PREC. DIVISION, JOY	
INLET FLUE GAS CAPACITY - CU.M/S	104.3	(221000 ACFM)
INLET FLUE GAS TEMPERATURE - C	54.4	(130 F)
PRESSURE DROP - KPA	.2	(1. IN-H2O)
PARTICLE REMOVAL EFFICENCY - %	95.0	
** PARTICLE SCRUBBER		
NUMBER	3	
SUPPLIER	AIRPOL	
DIMENSIONS - FT	20 DIA X 70 HIGH	
SHELL GENERIC MATERIAL	CARBON STEEL	
LINER GENERIC MATERIAL	GLASS FLAKE, ACID BRICK, CAROBRAX BRICK	
NUMBER OF CONTACTING ZONES	1	
LIQUID RECIRCULATION RATE - LITER/S	315.0	(5000 GPM)
PRESSURE DROP - KPA	.5	(2.0 IN-H2O)
INLET GAS FLOW RATE - CU.M/S	139.2	(295000 ACFM)

DELMARVA POWER & LIGHT: DELAWARE CITY 3 (CONT.)

INLET GAS TEMPERATURE - C	215.6	(420 F)
SO2 REMOVAL EFFICENCY - %	.0	
PARTICLE REMOVAL EFFICIENCY - %	81.5	

*** FGD SYSTEM

** GENERAL DATA

SALEABLE PRODUCT/THROWAWAY PRODUCT	SALEABLE PRODUCT
SO2 REMOVAL MODE	WET SCRUBBING
PROCESS TYPE	WELLMAN LORD
SYSTEM SUPPLIER	DAVY MCKEE
A-E FIRM	DAVY MCKEE
DEVELOPMENT LEVEL	FULL SCALE
NEW/RETROFIT	RETROFIT
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	90.00
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	90.00
CURRENT STATUS	1
COMMERCIAL START-UP	5/80
INITIAL START-UP	5/80
CONTRACT AWARDED	9/77

** DESIGN AND OPERATING PARAMETERS

SPACE REQUIREMENTS - SQ M	24280.3	(261360 SQ FT)
OPER. & MAINT. REQUIREMENT - MANHR/DAY	144.0	

** ABSORBER

NUMBER	3	
NUMBER OF SPARES	0	
GENERIC TYPE	TRAY TOWER	
SPECIFIC TYPE	VALVE TRAY	
TRADE NAME/COMMON TYPE	BUBBLE CAP TRAY TOWER	
SUPPLIER	DAVY MCKEE	
DIMENSIONS - FT	20 X 20	
SHELL GENERIC MATERIAL	INORGANIC	
SHELL SPECIFIC MATERIAL	REINFORCED CONCRETE	
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A	
LINER GENERIC MATERIAL	INORGANIC	
LINER MATERIAL TRADE NAME/COMMON TYPE	TILE	
GAS CONTACTING DEVICE TYPE	VALVE TRAY	
NUMBER OF CONTACTING ZONES	4	
LIQUID RECIRCULATION RATE - LITER/S	25.	(400 GPM)
INLET GAS FLOW - CU. M/S	103.82	(220000 ACFM)
INLET GAS TEMPERATURE - C	54.4	(130 F)
PARTICLE REMOVAL EFFICENCY - %	.0	

** MIST ELIMINATOR

PRE-MIST ELIMINATOR/MIST ELIMINATOR	MIST ELIMINATOR	
NUMBER PER SYSTEM	3	
GENERIC TYPE	IMPINGEMENT	
SPECIFIC TYPE	BAFFLE	
TRADE NAME/COMMON TYPE	CHEVRON VANE	
CONFIGURATION	HORIZONTAL	
NUMBER OF STAGES	1	
NUMBER OF PASSES PER STAGE	1	
FREEBOARD DISTANCE - M	1.83	(6.0 FT)
DISTANCE BETWEEN STAGES - CM	19.05	(7.5 IN)
PRESSURE DROP - KPA	.1	(.3 IN-H2O)
CONSTRUCTION MATERIAL GENERIC TYPE	NORYL PLASTIC	
WASH WATER SOURCE	COOLED CONDENSATE	
WASH RATE - L/S	3.2	(50 GAL/MIN)

** REHEATER

NUMBER	3	
GENERIC TYPE	DIRECT COMBUSTION	
SPECIFIC TYPE	EXTERNAL COMBUSTION CHAMBER	
TRADE NAME/COMMON TYPE	NATURAL GAS	
TEMPERATURE INCREASE - C	10.0	(50 F)
INLET FLUE GAS FLOW RATE - CU. M/S	108.54	(230000 ACFM)
INLET FLUE GAS TEMPERATURE - C	54.4	(130 F)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL - FIRE BRICK	

DELMARVA POWER & LIGHT: DELAWARE CITY 3 (CONT.)

** FANS		
NUMBER	3	
NUMBER OF SPARES	0	
DESIGN	CENTRIFUGAL	
SUPPLIER	ROBINSON	
FUNCTION	BOOSTER	
APPLICATION	INDUCED DRAFT	
SERVICE	DRY	
FLUE GAS FLOW RATE - CU.M/S	139.21	(295000 ACFM)
FLUE GAS TEMPERATURE - C	215.6	(420 F)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	
** DUCTWORK		
DIMENSIONS	8 X 8	
SHELL GENERIC MATERIAL TYPE	CARBON STEEL	
LINER GENERIC MATERIAL TYPE	FRP	
*** SALEABLE BYPRODUCTS		
NATURE	SULFURIC ACID	
FULL LOAD QUANTITY - M T/H	11.34	(12.50 TPH)
QUALITY - %	93.0	
DISPOSITION	MARKETED	
*** SLUDGE		
** TREATMENT		
METHOD	NEUTRALIZATION	
** DISPOSAL		
NATURE	FINAL	
TYPE	LINED POND	
** PROCESS CONTROL AND INSTRUMENTATION		
CHEMICAL PARAMETERS	PH, SOLIDS, SP.G., CONC.	
MONITOR LOCATION	GAS OUTLET, SOLUTION OUTLET	
PROCESS CONTROL MANNER	AUTOMATIC	
PROCESS CHEMISTRY MODE	FEEDBACK	
** WATER BALANCE		
WATER LOOP TYPE	CLOSED	

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
5/80	SYSTEM	100.0	100.0	100.0	32.3			744	240	240	

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM BEGAN INITIAL AND COMMERCIAL OPERATIONS ON MAY 22, 1980. NO MAJOR PROBLEMS WERE ENCOUNTERED DURING STARTUP OR THROUGH THE REST OF THE MONTH.

6/80	SYSTEM	86.4	86.4	86.4	86.4			720	720	622	

** PROBLEMS/SOLUTIONS/COMMENTS

REPAIRS WERE MADE TO A LEAK AND DAMAGED CHEVRON PACKING IN THE MIST ELIMINATOR DURING JUNE.

7/80	SYSTEM	95.3	95.3	95.3	95.3			744	744	709	

DELMARVA POWER & LIGHT: DELAWARE CITY 3 (CONT.)

PERIOD	MODULE	PERFORMANCE DATA: AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
8/80	SYSTEM	73.3	73.3	73.3	73.3			744	744	545	

** PROBLEMS/SOLUTIONS/COMMENTS

SOME FGD SYSTEM OUTAGE TIME DURING THE MONTH WAS CAUSED BY LEAKS IN THE MIST ELIMINATOR THAT NEEDED REPAIR.

AN ELECTRICAL FAILURE IN THE SHUTDOWN INSTRUMENTATION CAUSED THE FGD SYSTEM TO BE OUT OF SERVICE PART OF THE MONTH.

9/80	SYSTEM	46.4	46.4	46.4	46.4			720	720	334	

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS OUT OF SERVICE FOR PART OF THE MONTH TO REPAIR THE PRESCRUBBER MIST ELIMINATOR.

10/80	SYSTEM	44.2	44.2	44.2	44.2			744	744	329	

** PROBLEMS/SOLUTIONS/COMMENTS

FGD SYSTEM OUTAGE TIME OCCURRED DUE TO THE NECESSARY REPAIR OF THE INLET EXPANSION JOINTS DURING SEPTEMBER.

PROBLEMS WERE ENCOUNTERED WITH THE PRE-MIST ELIMINATOR CAUSING ADDITIONAL OUTAGE TIME.

ADDITIONAL OUTAGE TIME WAS NECESSARY TO MAKE REPAIRS TO THE BOOSTER BLOWER ROTOR.

11/80	SYSTEM	.0	.0	.0	.0			720	279	0	

** PROBLEMS/SOLUTIONS/COMMENTS

DURING OCTOBER SOME OF THE OUTAGE TIME WAS DUE TO REPAIRS OF THE BOOSTER BLOWER ROTOR.

REPAIR WORK ON THE DUCT EXPANSION JOINTS ALSO CAUSED SOME OUTAGE TIME DURING THE MONTH.

DURING OCTOBER PROBLEMS WERE ENCOUNTERED WITH THE MIST ELIMINATORS.

12/80	SYSTEM	82.4	79.2	79.2	79.2			744	744	589	

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER WAS OUT OF SERVICE FOR APPROXIMATELY 465 HOURS FOR AN ANNUAL SCHEDULED MAINTENANCE OVERHAUL DURING NOVEMBER. START-UP OF THE FGD SYSTEM WAS DELAYED DUE TO THE LATE DELIVERY OF PIECES OF THE MIST ELIMINATOR INTERNALS.

12/80	SYSTEM	82.4	79.2	79.2	79.2			744	744	589	

** PROBLEMS/SOLUTIONS/COMMENTS

APPROXIMATELY 107 HOURS OF OUTAGE TIME IN DECEMBER WERE DUE TO LEAKS IN THE PRESATURATOR CIRCULATING PIPING.

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	DUQUESNE LIGHT	
PLANT NAME	ELRAMA	
UNIT NUMBER	1-4	
CITY	ELRAMA	
STATE	PENNSYLVANIA	
REGULATORY CLASSIFICATION	D	
PARTICULATE EMISSION LIMITATION - NG/J	43.	(.100 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	258.	(.600 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	494	
GROSS UNIT GENERATING CAPACITY - MW	510	
NET UNIT GENERATING CAPACITY W. FGD - MW	475	
NET UNIT GENERATING CAPACITY WO/FGD - MW	493	
EQUIVALENT SCRUBBED CAPACITY - MW	510	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	BABCOCK & WILCOX	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	********	(******* ACFM)
BOILER FLUE GAS TEMPERATURE - C	*******	(**** F)
STACK HEIGHT - M	******	(**** FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	*******	(***** FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	******	
AVERAGE HEAT CONTENT - J/G	26400.	(11350 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		******
AVERAGE ASH CONTENT - %	21.00	
RANGE ASH CONTENT - %	******	
AVERAGE MOISTURE CONTENT - %	********	
RANGE MOISTURE CONTENT - %	******	
AVERAGE SULFUR CONTENT - %	2.20	
RANGE SULFUR CONTENT - %	1.0-2.8	
AVERAGE CHLORIDE CONTENT - %	********	
RANGE CHLORIDE CONTENT - %	******	
*** PARTICLE CONTROL		
** MECHANICAL COLLECTOR		
SUPPLIER	RESEARCH-COTTRELL	
** ESP		
NUMBER	1	
TYPE	COLD SIDE	
SUPPLIER	RESEARCH-COTTRELL	
** PARTICLE SCRUBBER		
GENERIC TYPE	VENTURI TOWER	
SPECIFIC TYPE	VARIABLE-THROAT/SIDE-MOVABLE BLADES	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	AISI 1110	
LINER SPECIFIC MATERIAL	GLASS FLAKE-FILLED POLYESTER	
*** FGD SYSTEM		
** GENERAL DATA		
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT	
SO2 REMOVAL MODE	WET SCRUBBING	
PROCESS TYPE	LIME	
SYSTEM SUPPLIER	CHEMICO DIVISION, ENVIROTECH	
A-E FIRM	GIBBS & HILL	
DEVELOPMENT LEVEL	FULL SCALE	
NEW/RETROFIT	RETROFIT	
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.00	
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	83.00	
CURRENT STATUS	1	

DUQUESNE LIGHT: ELRAMA 1-4 (CONT.)

COMMERCIAL START-UP	10/75	
INITIAL START-UP	10/75	
CONTRACT AWARDED	12/70	

** DESIGN AND OPERATING PARAMETERS

** ABSORBER

NUMBER	5	
GENERIC TYPE	VENTURI TOWER	
SPECIFIC TYPE	VARIABLE-THROAT/TOP-ENTRY PLUMB BOB	
SUPPLIER	CHEMICO DIVISION, ENVIROTECH	
DIMENSIONS - FT	30 DIA. X 60 HIGH	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	AISI 1110	
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A	
LINER GENERIC MATERIAL	ORGANIC	
LINER MATERIAL TRADE NAME/COMMON TYPE	CEILCOTE	
GAS CONTACTING DEVICE TYPE	BULL AND SPRAY NOZZLES	
NUMBER OF CONTACTING ZONES	1	
LIQUID RECIRCULATION RATE - LITER/S	1008.	(16000 GPM)
L/G RATIO - L/CU.M	5.3	(40.0 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	4.0	(16.0 IN-H2O)
INLET GAS FLOW - CU. M/S	254.83	(540000 ACFM)
INLET GAS TEMPERATURE - C	150.6	(303 F)
SO2 REMOVAL EFFICIENCY - %	86.0	
PARTICLE REMOVAL EFFICENCY - %	99.0	

** MIST ELIMINATOR

PRE-MIST ELIMINATOR/MIST ELIMINATOR	MIST ELIMINATOR	
GENERIC TYPE	IMPINGEMENT	
SPECIFIC TYPE	BAFFLE	
TRADE NAME/COMMON TYPE	CHEVRON VANE	
CONFIGURATION	HORIZONTAL	
NUMBER OF STAGES	1	
NUMBER OF PASSES PER STAGE	3	
FREEBOARD DISTANCE - M	1.37	(4.5 FT)
DISTANCE BETWEEN VANES - CM	.0	(.00 IN)
VANE ANGLES - DEGREES	90	
SUPERFICAL GAS VELOCITY - M/S	.3	(1.0 FT/S)
CONSTRUCTION MATERIAL GENERIC TYPE	FIBERGLASS REINFORCED PLASTIC	
WASH WATER SOURCE	THICKENER OVERFLOW	

** REHEATER

GENERIC TYPE	DIRECT COMBUSTION	
SPECIFIC TYPE	IN-LINE BURNER	
TRADE NAME/COMMON TYPE	OIL	
TEMPERATURE INCREASE - C	-1.1	(30 F)

** FANS

NUMBER	5	
NUMBER OF SPARES	1	
DESIGN	CENTRIFUGAL	
FUNCTION	BOOSTER	
APPLICATION	INDUCED DRAFT	
SERVICE	WET	
CONSTRUCTION MATERIAL GENERIC TYPE	HIGH ALLOY	

** DUCTWORK

LOCATION	SCRUBBER INLET	
SHELL GENERIC MATERIAL TYPE	CARBON STEEL	
LINER GENERIC MATERIAL TYPE	NONE	

** DUCTWORK

LOCATION	SCRUBBER OUTLET	
SHELL GENERIC MATERIAL TYPE	CARBON STEEL	
LINER GENERIC MATERIAL TYPE	FLAKEGLASS	

DUQUESNE LIGHT: ELRAMA 1-4 (CONT.)

** PUMPS	
SERVICE	NUMBER
SCRUBBER/ABSORBER RECIRCULATION	10
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	THICKENER
NUMBER	2
OUTLET STREAM CHARACTERISTICS	32% SOLIDS
*** SLUDGE	
** TREATMENT	
METHOD	POZ-O-TEC
PROPRIETARY PROCESS	IUCS
** DISPOSAL	
NATURE	FINAL
TYPE	LANDFILL
LOCATION	OFF SITE
SITE TRANSPORTATION METHOD	TRUCK
** WATER BALANCE	
WATER LOOP TYPE	OPEN
** FGD SPARE CAPACITY INDICES	
ABSORBER - %	25.0
** FGD SPARE COMPONENT INDICES	
ABSORBER	1.0

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
0/75	SYSTEM										

** PROBLEMS/SOLUTIONS/COMMENTS

THE FIRST ELRAMA SCRUBBER WAS PLACED IN SERVICE ON OCTOBER 26, 1975. IT HAD BEEN SCHEDULED FOR AN EARLIER STARTUP DATE BUT BECAUSE OF THE SEVERITY AND NUMBER OF PROBLEMS ENCOUNTERED AT PHILLIPS, STARTUP WAS DELAYED UNTIL MANY OF THE PROBLEMS AT PHILLIPS WERE RESOLVED AND THE MODIFICATIONS COULD BE INCORPORATED AT BOTH STATIONS.

BOILER NO. 2 WAS INITIALLY CONNECTED TO THE FGD SYSTEM. THIS BOILER HAS AN EQUIVALENT CAPACITY OF APPROXIMATELY 100 MW AND THE EMISSIONS CAN BE HANDLED BY ONE SCRUBBER. HOWEVER, TO ENSURE RELIABILITY IN THE CASE OF A SCRUBBER MALFUNCTION, TWO SCRUBBERS ARE OPERATED AT PARTIAL LOAD TO PROTECT THE BOILER AND TURBINE GENERATOR AGAINST A TRIP-OFF.

THE BOILER OPERATED CONTINUOUSLY ON THE SCRUBBER SYSTEM THROUGH JANUARY 1976 WITH THE EXCEPTION OF TWO MINOR OUTAGES. ON FEBRUARY 4, 1976 A SECOND BOILER WAS COUPLED INTO THE SCRUBBER COMPLEX. PRESENTLY, TWO UNITS ARE THE MAXIMUM THAT CAN BE TIED INTO THE SCRUBBER PLANT. TO DATE, THE UTILITY HAS ENCOUNTERED THE USUAL MINOR STARTUP PROBLEMS AND SOME MAJOR PROBLEMS AS WELL. THE MAJOR PROBLEMS HAVE BEEN WITH FROZEN PIPES AND THICKENERS, THE LATTER INVOLVING HARDWARE AND DESIGN PROBLEMS ASSOCIATED WITH RECIRCULATION OF THE SLUDGE WITHIN THE THICKENERS TO ATTAIN 30 TO 40% SOLIDS CONCENTRATION.

10/75	SYSTEM							744	744		

DUQUESNE LIGHT: ELRAMA 1-4 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE SCRUBBING SYSTEM BEGAN OPERATIONS WITH ONE BOILER CONNECTED TO THE SYSTEM (100 MW) DURING THE MONTH. THE SCRUBBING SYSTEM IS CURRENTLY IN THE SHAKEDOWN PHASE OF OPERATION.									
11/75	SYSTEM							720	720		
12/75	SYSTEM							744	744		
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE SYSTEM IS STILL OPERATING WITH ONE BOILER CONNECTED. THE UTILITY IS PLANNING TO CONNECT ONE OR TWO ADDITIONAL BOILERS TO THE SYSTEM IN LATE JANUARY.									
1/76	SYSTEM							744	744		
	** PROBLEMS/SOLUTIONS/COMMENTS										
		FOUR OF THE FIVE SCRUBBER VESSELS HAVE BEEN IN SERVICE IN VARIOUS COMBINATIONS, AND THE SERVICE HOURS THROUGH JANUARY 31, 1976 ARE: NO. 1 - 69 HOURS NO. 2 - 1508 HOURS NO. 3 - 976 HOURS NO. 4 - 838 HOURS THE FIFTH VESSEL HAS NOT BEEN IN SERVICE BECAUSE IT IS BEING SERVICED FOR THE TRIAL INSTALLATION OF RUBBER LINED RECYCLE PUMPS.									
2/76	SYSTEM							696	696		
3/76	SYSTEM							744	744		
4/76	SYSTEM							720	720		
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE SYSTEM OPERATED DURING MARCH AND APRIL WITH TWO BOILERS COUPLED INTO THE SCRUBBING SYSTEM. REVISIONS TO THE FIFTH SCRUBBING VESSEL HAVE BEEN COMPLETED AND OPERATIONS ARE PROCEEDING WITH TWO RUBBER-LINED RECYCLE PUMPS.									
5/76	SYSTEM							744	744		
6/76	SYSTEM							720	720		
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE SYSTEM IS STILL OPERATING WITH TWO BOILERS COUPLED INTO THE SCRUBBING SYSTEM. THE IUCS SLUDGE FIXATION SYSTEM IS CONTINUING TO OPERATE AT THIS STATION. THE FIFTH SCRUBBING VESSEL WAS TAKEN OUT OF SERVICE FOR REPAIRS AND MODIFICATIONS REQUIRED FOR THE RUBBER-LINED RECYCLE PUMPS. THE UTILITY IS CURRENTLY CONDUCTING A PERFORMANCE TEST ON THE SCRUBBING SYSTEM IN THE TWO BOILER OPERATION MODE.									
7/76	SYSTEM							744	744		
8/76	SYSTEM							744	744		

DUQUESNE LIGHT: ELRAMA 1-4 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE FIFTH SCRUBBING VESSEL EMPLOYING TWO RUBBER-LINED RECYCLE PUMPS WAS OPERATIONAL FOR A SHORT PERIOD OF TIME DURING THE REPORTING MONTHS. TWO BOILERS REMAIN COUPLED INTO THE SCRUBBING SYSTEM. THE CONSTRUCTION OF ADDITIONAL LIME STORAGE SILOS AND A THICKENER WILL BE REQUIRED FOR FULL SCALE OPERATION. THE UTILITY HAS SIGNED A LETTER OF INTENT WITH IUCS FOR A LONG TERM SLUDGE FIXATION SYSTEM. HIGH CALCIUM LIME IS STILL BEING EMPLOYED IN THE SCRUBBING SYSTEM.									
9/76	SYSTEM							720	720		
10/76	SYSTEM							744	744		
	** PROBLEMS/SOLUTIONS/COMMENTS										
		OPERATIONS AT THIS STATION DURING THE REPORT PERIOD PROCEEDED WITH TWO BOILERS COUPLED INTO THE FIVE-MODULE SCRUBBING SYSTEM. THE FIFTH SCRUBBING VESSEL WAS OPERATIONAL DURING THE REPORT PERIOD WITH THE RUBBER-LINED RECYCLE PUMPS IN SERVICE. OPERATIONS ARE STILL PROCEEDING ON AN OPEN WATER-LOOP BASIS. PART OF THE THICKENER OVERFLOW IS STILL BEING DIVERTED TO THE ASH POND AND NOT RECYCLED BACK TO THE PROCESS. BECAUSE BOTH BEAVER VALLEY AND BRUCE MANSFIELD STATIONS ARE FULLY OPERATIONAL, THIS STATION HAS BEEN RELEGATED TO PEAK LOAD OPERATIONS. GENERAL LOAD OPERATIONS ARE FULL CAPACITY IN THE DAYTIME AND 50 TO 60% REDUCTION AT NIGHT. TESTS WERE CONDUCTED DURING THE PERIOD TO DETERMINE PARTICULATE AND SO2 REMOVAL EFFICIENCIES. SO2 REMOVAL EFFICIENCY WAS 50%. PARTICULATE EMISSIONS WERE BEING REDUCED WELL BELOW 0.1 LB/MM BTU STANDARD (ACTUAL RESULTS: 0.04 LB/MM BTU). THESE RESULTS WERE BASED ON TWO BOILERS COUPLED INTO THE FIVE SCRUBBING MODULES WHILE BURNING MEDIUM-SULFUR (1.0 TO 2.8%) COAL. THE MECHANICAL COLLECTORS AND ESP'S WERE IN SERVICE DURING THE TESTS.									
11/76	SYSTEM							720	720		
12/76	SYSTEM							744	744		
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE SCRUBBER REMAINED IN SERVICE THROUGHOUT THE REPORT PERIOD WITH TWO BOILERS COUPLED INTO THE SCRUBBING SYSTEM. A RECYCLE PUMP EVALUATION IS BEING CONDUCTED BY THE UTILITY AT BOTH PHILLIPS AND ELRAMA STATIONS. OBSERVATIONS OF THE RUBBER-LINED RECYCLE PUMPS INDICATE SOME SEVERE ABRASION AND GOUGING HAVE OCCURRED AFTER 1000 HOURS OF SERVICE TIME.									
1/77	SYSTEM							744	744		
2/77	SYSTEM							672	672		
3/77	SYSTEM							744	744		
	** PROBLEMS/SOLUTIONS/COMMENTS										
		TESTING WITH THIOSORBIC LIME WAS CONDUCTED DURING THE PERIOD. THE SCRUBBER PLANT CONTINUED OPERATIONS DURING JANUARY AND FEBRUARY WITH TWO BOILERS COUPLED INTO THE SYSTEM. INSTALLATION OF THE ADDITIONAL THICKENER LIME FEEDERS AND SILOS IS STILL IN PROGRESS. FULL COMPLIANCE OPERATION FOR THIS STATION IS SCHEDULED FOR EARLY 1978. THE FULL COMPLIANCE STRATEGY WILL CONSIST OF THE FOLLOWING: 83% SO2 REMOVAL FOR 2% SULFUR COAL UTILIZING THIOSORBIC LIME (6-12% MG), FIXATING THE SCRUBBER SLUDGE									

DUQUESNE LIGHT: ELRAMA 1-4 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR

WITH THE IUCS POZ-O-TEC STABILIZATION METHOD AND HAULING THIS MATERIAL TO AN OFFSITE DISPOSAL/LANDFILL AREA. CURRENT SO2 AND PARTICULATE REMOVAL EFFICIENCIES ARE 50 AND 99+%, RESPECTIVELY. THE INTERIM IUCS UNIT NOW IN SERVICE CONSISTS OF THE OLD MOHAVE PROTOTYPE PLUS A VACUUM FILTER. THE STABILIZATION MATERIAL HAS BEEN UTILIZED IN A PARKING LOT CONSTRUCTION PROJECT. IUCS HAS BEEN AWARDED A 10-YEAR CONTRACT FOR THE CONTINUED USE OF THIS SYSTEM FOR FUTURE PLANT OPERATIONS.

4/77	SYSTEM							720	720		
5/77	SYSTEM							744	744		

** PROBLEMS/SOLUTIONS/COMMENTS

CONSTRUCTION OF TWO 120-FOOT DIAMETER THICKENERS IS CONTINUING. DUE TO THE GOUGING OF THE RUBBER-LINED RECYCLE PUMPS DURING THEIR TESTING, THEY HAVE BEEN REMOVED. THE UTILITY IS CONSIDERING TRYING ANOTHER SET OF RUBBER-LINED PUMPS. DUQUESNE LIGHT ALSO IS CONTINUING EFFORTS TO OBTAIN ALTERNATE LANDFILL AREAS FOR SLUDGE DISPOSAL.

6/77	SYSTEM							720	720		
7/77	SYSTEM							744	744		

** PROBLEMS/SOLUTIONS/COMMENTS

DUQUESNE LIGHT REPORTED THE FOLLOWING ITEMS FOR THE ELRAMA SCRUBBER PLANT DURING THE REPORT PERIOD:
-TWO BOILERS (200 MW) WERE COUPLED INTO THE SCRUBBER PLANT.
-THE INTERIM IUCS STABILIZATION UNIT (MOHAVE PROTOTYPE) CONTINUED TO FIX-ATE SCRUBBER WASTES.
-CONSTRUCTION OF THE TWO ADDITIONAL THICKENERS CONTINUED (CONSTRUCTION IS ON SCHEDULE).
-FULL PLANT COMPLIANCE IS PROJECTED FOR FEBRUARY 1978.
-SO2 REMOVAL EFFICIENCY IS APPROXIMATELY 50%.
-ELRAMA IS OPERATING IN A BASE/INTERMEDIATE LOAD MODE (FULL LOAD DAYTIME/ HALF LOAD NIGHT-TIME). 1976 CAPACITY FACTOR WAS 69.5%.

8/77	SYSTEM							744	744		
9/77	SYSTEM							720	720		

** PROBLEMS/SOLUTIONS/COMMENTS

THE TWO ADDITIONAL THICKENERS WERE COMPLETELY INSTALLED. THE IUCS SYSTEM WAS UPGRADED. CONSTRUCTION COMPLETION IS PROJECTED FOR FEBRUARY 1978. FULL PLANT COMPLIANCE IS PROJECTED FOR APRIL 1978.

10/77	SYSTEM							744	744		

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE 101 WAS UNAVAILABLE ON OCTOBER 4 DUE TO A BLEED VALVE LEAK AND WAS TAKEN OUT OF SERVICE AT THE END OF THE MONTH FOR CLEANUP.

MODULE 201 WAS AVAILABLE FOR THE ENTIRE MONTH OF OCTOBER.

MODULE 301 AND 401 HAD OUTAGES IN OCTOBER RESULTING FROM A RUBBER LINING FAILURE ON AN ID FAN.

MODULE 501 EXPERIENCED RECYCLE PUMP OUTAGES IN LATE NOVEMBER.

NEW RUBBER LINED WORMEN RECYCLE PUMPS WERE INSTALLED. THE LIME HANDLING SYSTEM INSTALLATION WORK CONTINUED. THE LAST TWO BOILERS ARE EXPECTED TO

DUQUESNE LIGHT: ELRAMA 1-4 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
			BE TIED INTO THE FGD SYSTEM BY JANUARY 1978.								
11/77	101		.0		.0						
	201		11.7		11.7						
	301		93.3		93.3						
	401		22.5		22.5						
	501		59.2		59.2						
	SYSTEM		46.7		46.7			720	720	336	
	** PROBLEMS/SOLUTIONS/COMMENTS										
			MODULE 101, 201 AND 401 HAVE LOW OPERATIONAL HOURS BECAUSE ONLY TWO BOILER ARE TIED INTO THE FGD SYSTEM TO DATE.								
			THE SLUDGE HANDLING SYSTEM IS FUNCTIONING PROPERLY AND IS NOW IN FULL SERVICE.								
			TUBE LEAKS FORCED A BOILER OUTAGE IN NOVEMBER.								
12/77	SYSTEM							744	744		
1/78	101		94.1		94.1						
	201		90.5		90.5						
	301		5.1		5.1						
	401		24.3		24.3						
	501		3.5		3.5						
	SYSTEM		54.4		54.4			744	744	405	
	** PROBLEMS/SOLUTIONS/COMMENTS										
			DURING THE PERIOD THE UTILITY REPORTED THAT A NEW WORMEN RECYCLE PUMP INSTALLED IN NOVEMBER EXPERIENCED JACK SHAFT BEARING PROBLEMS RESULTING IN REMOVAL OF SCRUBBER TRAIN 501 FROM SERVICE.								
			BOILER NO. 4 WAS CONNECTED, ADDING AN ADDITIONAL 176 MW OF FLUE GAS LOAD TO THE FGD SYSTEM.								
			THE IUCS SLUDGE DISPOSAL FACILITY IS IN SERVICE PRODUCING GOOD PRODUCT. LOW LOAD AND A COAL STRIKE HAVE HAMPERED GOOD SCRUBBER OPERATIONS. SOME OUTAGE TIME HAS BEEN SCHEDULED FOR MARCH.								
2/78	101		70.8		30.4						
	201		96.2		41.2						
	301		.0		.0						
	401		37.2		15.9						
	501		40.0		18.0						
	SYSTEM		61.1		26.4			672	288	177	
3/78	SYSTEM		.0		.0			744	216	141	
	** PROBLEMS/SOLUTIONS/COMMENTS										
			THE SYSTEM WAS SHUTDOWN ON FEBRUARY 11 AS A RESULT OF A COAL SHORTAGE. BOILERS 1, 2 AND 4 ARE NOW COMPLETELY CONNECTED TO THE FGD SYSTEM. BOILER 3 IS UNDERGOING AN EXTENSIVE OVERHAUL AND WILL BE CONNECTED TO THE SYSTEM IN LATE APRIL.								
			BOILER EXIT DAMPERS WERE LINED WITH 316 SS ON AREAS OF HIGH EROSION CAUSED BY FLYASH IMPINGEMENT DURING THE OUTAGE.								
			EXPANSION JOINTS IN THE UPSTREAM DUCTWORK WERE SHIELDED BY METAL PLATES WHICH WERE WELDED AT ONE END DURING THE FEBRUARY-MARCH PERIOD. EXPANSION JOINTS IN THE DOWNSTREAM DUCTWORK WERE COMPLETELY REPLACED. THE DOWNSTREAM DUCTWORK WAS RELINED WITH CEILCOTE.								

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTO

ALSO DURING THE OUTAGE THE MODULE 401 INTERNALS WERE CLEANED AND SOME HOLES IN THE UPPER CONICAL REGION WERE REPAIRED.

THE SYSTEM CAME BACK ON LINE IN LATE MARCH, HOWEVER, BOILER NUMBER 3 WAS NOT IN SERVICE.

4/78	SYSTEM							720	720		
5/78	SYSTEM							744	744		

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE APRIL-MAY PERIOD BOILER NUMBER 3 WAS STILL BEING OVERHAULED. FGD SYSTEM CONSTRUCTION WAS COMPLETED AND PRELIMINARY TESTING WITH THIOSORBIC LIME VERIFIED A SYSTEM SO2 REMOVAL EFFICIENCY OF 83%.

6/78	SYSTEM							720	720		
7/78	101	59.9	59.9	59.9	59.9						
	201	100.0	100.0	100.0	100.0						
	301	66.5	66.5	66.5	66.5						
	401	100.0	98.9	100.0	98.9						
	501	77.1	77.1	77.1	77.1						
	SYSTEM	100.0	100.0	100.0	100.0			744	744	744	

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE 301 WAS PULLED OFF FOR A MAJOR CLEANING DURING THE JUNE-JULY PERIOD.

MIST ELIMINATOR PLUGGING WAS EXPERIENCED AS A RESULT OF LOW PH.

THE CHRONIC INABILITY TO CONTROL CHEMISTRY (PH) IS DIRECTLY RELATED TO GRIT BUILD-UP IN THE LIME HANDLING AND SLURRY PREPARATION SYSTEM.

THE UTILITY IS CURRENTLY STUDYING WAYS TO TIGHTEN THE WATER BALANCE BY USING THICKENER SUPERNATANT INTERMITTENTLY WITH CLEAR SERVICE WATER FOR THE MIST ELIMINATORS.

8/78	101	76.9	76.9	76.9	76.9						
	201	100.0	100.0	100.0	100.0						
	301	50.7	50.7	50.7	50.7						
	401	100.0	100.0	100.0	100.0						
	501	70.9	70.9	70.9	70.9						
	SYSTEM	99.6	100.0	99.6	99.6			744	744	741	
9/78	101	72.1	72.1	72.1	72.1						
	201	59.6	56.3	58.2	56.3						
	301	93.3	89.0	92.9	89.0						
	401	78.1	78.1	78.1	78.1						
	501	93.6	93.6	93.6	93.6						
	SYSTEM	99.2	100.0	98.7	97.3			720	720	700	

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE AUGUST-SEPTEMBER PERIOD THE UTILITY REPORTED THAT MODULES 301 AND 501 WERE TAKEN OFF LINE FOR CLEANING.

THE RUBBER LININS ON THREE FAN HOUSINGS REQUIRED REPAIR DURING AUGUST AND SEPTEMBER.

IT WAS NECESSARY TO SHUT DOWN THE LIME MIXING BASIN IN ORDER TO CLEAN OUT EXCESSIVE GRIT AND SOLIDS BUILD UP.

DUQUESNE LIGHT: ELRAMA 1-4 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
			A PARTICLE EMISSION COMPLIANCE TEST WAS RUN IN DECEMBER WHICH SHOWED THE UNIT TO BE IN COMPLIANCE.								
10/78	101	100.0	76.6	100.0	76.6						
	201	98.9	98.9	98.9	98.9						
	301	100.0	100.0	100.0	100.0						
	401	80.5	80.5	80.5	80.5						
	501	78.6	78.6	78.6	78.6						
	SYSTEM	100.0	100.0	100.0	100.0			744	744	744	
11/78	101	100.0	100.0	100.0	100.0						
	201	100.0	78.4	100.0	78.4						
	301	100.0	84.2	100.0	84.2						
	401	100.0	86.8	100.0	86.8						
	501	81.1	62.5	76.8	62.5						
	SYSTEM	100.0	100.0	100.0	100.0			720	720	720	
	** PROBLEMS/SOLUTIONS/COMMENTS										
			THE PARTICLE EMISSION TEST RUN IN AUGUST SHOWED THAT THE UNIT MET STATE STANDARDS. THE SO2 TEST WILL HAVE TO BE RERUN BECAUSE OF SAMPLING ERRORS.								
			THE UTILITY REPORTED DURING THE OCTOBER-NOVEMBER PERIOD THAT IT HAS HAD SOME PROBLEMS WITH AN INSUFFICIENT LIME SUPPLY.								
12/78	101	100.0	94.7	100.0	94.7						
	201	76.3	72.7	75.4	72.7						
	301	93.0	85.6	92.5	85.6						
	401	68.0	64.8	66.9	64.8						
	501	97.9	69.5	97.0	69.5						
	SYSTEM	100.0	100.0	100.0	96.8			744	744	720	
	** PROBLEMS/SOLUTIONS/COMMENTS										
			DURING DECEMBER A SO2 EMISSION COMPLIANCE TEST WAS RUN AND THE UNIT WAS FOUND TO BE WITHIN THE ALLOWABLE STANDARD OF 0.6 LB/MM BTU.								
1/79	101	44.7	39.8	41.9	39.8						
	201	100.0	95.2	100.0	95.2						
	301	67.8	60.2	65.3	60.2						
	401	100.0	100.0	100.0	100.0						
	501	100.0	100.0	100.0	100.0						
	SYSTEM	100.0	100.0	100.0	98.8			744	744	735	
	** PROBLEMS/SOLUTIONS/COMMENTS										
			THE UTILITY HAS STARTED HAULING SLUDGE OFF-SITE TO AN AREA ABOUT 10 MILES AWAY.								
2/79	101	100.0	100.0	100.0	100.0						
	201	90.2	90.2	90.2	90.2						
	301	14.1	14.1	14.1	14.1						
	401	97.8	97.3	97.8	97.3						
	501	100.0	100.0	100.0	100.0						
	SYSTEM	100.0	100.0	100.0	100.0			672	672	672	
3/79	101	98.9	95.4	98.8	95.4						
	201	100.0	91.0	100.0	91.0						
	301	77.7	73.8	76.8	73.8						
	401	54.5	39.2	46.3	39.2						
	501	70.4	65.9	69.0	65.9						
	SYSTEM	100.0	100.0	97.7	91.4			744	744	680	

EPA UTILITY FGD SURVEY: OCTOBER - DECEMBER 1980

DUQUESNE LIGHT: ELRAMA 1-4 (CONT.)

PERIOD	MODULE	PERFORMANCE DATA AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
4/79	101	64.1	61.9	63.3	61.9						
	201	57.4	53.5	55.7	53.5						
	301	100.0	99.3	100.0	99.3						
	401	100.0	89.9	100.0	89.9						
	501	92.8	90.4	92.6	90.4						
	SYSTEM	100.0	95.6	100.0	95.6			720	720	688	
5/79	101	100.0	100.0	100.0	100.0						
	201	97.8	97.8	97.8	97.8						
	301	100.0	83.1	100.0	83.1						
	401	100.0	100.0	100.0	100.0						
	501	51.6	21.4	30.6	21.4						
	SYSTEM	100.0	100.0	100.0	100.0			744	744	744	
6/79	101	100.0	100.0	100.0	100.0						
	201	98.5	58.5	97.5	58.5						
	301	93.3	40.0	85.7	40.0						
	401	100.0	100.0	100.0	100.0						
	501	100.0	100.0	100.0	100.0						
	SYSTEM	100.0	100.0	100.0	99.6			720	720	717	
7/79	101	100.0	81.0	100.0	81.0						
	201	100.0	94.8	100.0	94.8						
	301	86.0	86.0	86.0	86.0						
	401	100.0	99.3	100.0	99.3						
	501	40.7	40.7	40.7	40.7						
	SYSTEM	100.0	100.0	100.0	100.0			744	744	744	
8/79	101	100.0	98.7	100.0	98.7						
	201	100.0	100.0	100.0	100.0						
	301	100.0	96.5	100.0	96.5						
	401	41.2	33.3	36.2	33.3						
	501	72.8	72.8	72.8	72.8						
	SYSTEM	100.0	100.0	100.0	100.0			744	744	744	
9/79	101	44.0	35.0	38.4	35.0						
	201	100.0	93.3	100.0	93.3						
	301	100.0	86.6	100.0	86.6						
	401	90.0	90.0	90.0	90.0						
	501	76.9	70.0	75.2	70.0						
	SYSTEM	100.0	93.8	100.0	93.8			720	720	675	
10/79	101	100.0	100.0	100.0	100.0						
	201	100.0	96.1	100.0	96.1						
	301	47.8	34.6	39.1	34.6						
	401	94.4	87.3	94.0	87.3						
	501	84.4	84.5	84.4	84.5						
	SYSTEM	100.0	100.0	100.0	100.0			744	744	744	
11/79	101	100.0	100.0	100.0	100.0						
	201	15.3	15.2	15.3	15.2						
	301	92.4	92.5	92.4	92.5						
	401	100.0	98.3	100.0	98.3						
	501	95.0	93.9	94.9	93.9						
	SYSTEM	100.0	100.0	100.0	100.0			720	720	720	
12/79	101	100.0	51.6	100.0	48.5						
	201	100.0	90.9	100.0	85.5						
	301	100.0	100.0	96.1	100.0						
	401	88.1	68.6	84.4	64.5						
	501	100.0	100.0	100.0	100.0						
	SYSTEM	100.0	100.0	100.0	98.7			744	700	734	

DUQUESNE LIGHT: ELRAMA 1-4 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THERE WERE NO SCRUBBER-RELATED OUTAGES DURING THE SEPTEMBER THROUGH DECEMBER PERIOD.									
		A NEW SO2 MONITOR, WHICH WAS INSTALLED IN OCTOBER, HAS PLUGGED ONLY ONCE SINCE INSTALLATION AND HAS REQUIRED ONLY FOUR HOURS OF MAINTENANCE PER WEEK.									
1/80	101	95.8	91.2	94.8	75.2						
	201	87.1	100.0	87.1	87.1						
	301	84.6	100.0	84.6	84.6						
	401	86.4	55.6	77.1	45.8						
	501	100.0	100.0	100.0	100.0						
	SYSTEM	100.0	100.0	100.0	98.2			744	613	528	
2/80	101	100.0	85.4	100.0	60.5						
	201	100.0	100.0	100.0	96.6						
	301	100.0	100.0	100.0	100.0						
	401	100.0	100.0	100.0	70.7						
	501	77.6	56.8	64.0	40.2						
	SYSTEM	100.0	100.0	100.0	92.0			696	493	427	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE NEW SO2 MONITOR INSTALLED LAST OCTOBER IS STILL OPERATING WELL AND HAS LOGGED SIX MONTHS OF OPERATION.									
		THE HIGH AVAILABILITIES ARE DUE TO THE 5TH MODULE BEING A TRUE SPARE. AS OF FEBRUARY 1980 AND ARE STILL OPERATING WITHOUT ANY MAJOR PROBLEMS.									
		THE TWO RUBBER LINED WORMEN RECYCLE PUMPS HAVE NOW LOGGED 14,000 HOURS									
3/80	101	100.0	100.0	100.0	100.0						
	201	100.0	100.0	100.0	100.0						
	301	73.7	73.7	73.7	73.7						
	401	100.0	48.4	100.0	48.4						
	501	78.1	78.1	78.1	78.1						
	SYSTEM	100.0	100.0	100.0	100.0			744	744	595	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE FGD SYSTEM WAS AVAILABLE FOR OPERATION THE ENTIRE MONTH OF MARCH.									
4/80	101	40.3	38.1	40.0	40.0						
	201	72.3	72.3	72.3	72.3						
	301	87.3	87.3	87.3	87.3						
	401	100.0	100.0	100.0	100.0						
	501	100.0	100.0	100.0	100.0						
	SYSTEM	99.4	99.4	100.0	99.4			720	720	572	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING APRIL THE 101 AND 201 RECYCLE PUMP IMPELLERS HAD TO BE REPLACED. THIS CAUSED EIGHT HOURS OF OUTAGE TIME FOR THESE TWO MODULES. NO OTHER FGD SYSTEM OUTAGES OCCURRED.									
5/80	101	100.0	100.0	100.0	100.0						
	201	40.1	37.1	38.2	37.1						
	301	94.1	89.0	93.8	89.0						
	401	90.3	71.2	88.0	71.2						
	501	96.8	96.8	96.8	96.8						
	SYSTEM	100.0	98.5	100.0	98.5			744	744	586	

DUQUESNE LIGHT: ELRAMA 1-4 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING MAY THE FGD SYSTEM WAS AVAILABLE FOR OPERATION THE ENTIRE MONTH.									
6/80	101	100.0	100.0	100.0	100.0						
	201	100.0	97.8	100.0	97.8						
	301	100.0	96.7	100.0	96.7						
	401	.0	.0	.0	.0						
	501	100.0	100.0	100.0	100.0						
	SYSTEM	100.0	98.6	99.7	98.6			720	720	710	61.6
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING JUNE MODULE 401 WAS CLEANED AND THE CEILCOTE LINER WAS REPLACED. THIS IS THE FIRST TIME SINCE START UP (APPROXIMATELY 17,000 OPERATING HOURS) THAT ANY MODULE NEEDED RELINED.									
		DURING JUNE NO FGD-RELATED PROBLEMS OCCURRED ON MODULES 101, 201, 301 OR 501.									
7/80	101	100.0	64.9	100.0	64.9						
	201	100.0	91.1	100.0	91.1						
	301	98.5	85.6	98.3	85.6						
	401	75.8	75.8	75.8	75.8						
	501	35.5	12.9	16.7	12.9						
	SYSTEM	100.0	82.6	97.7	82.6			744	744	615	66.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE RELINING OF MODULE 401 CONTINUED INTO PART OF JULY.									
8/80	101	30.9	21.2	23.5	21.2						
	201	100.0	94.8	100.0	94.8						
	301	100.0	93.3	100.0	93.3						
	401	99.1	99.1	99.1	99.1						
	501	83.9	82.5	83.7	82.5						
	SYSTEM	100.0	97.7	100.0	97.7			744	744	727	65.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE RELINING WITH CEILCOTE ON MODULE 501 COMMENCED IN JULY AND CONTINUED FOR APPROXIMATELY 120 HOURS IN AUGUST.									
		THE RELINING OF MODULE 101 WITH CEILCOTE STARTED IN AUGUST ACCOUNTING FOR THE LOW AVAILABILITY DURING THE MONTH.									
9/80	101	59.7	59.7	59.7	59.7						
	201	39.0	22.8	27.2	22.8						
	301	100.0	100.0	100.0	96.0						
	401	100.0	100.0	100.0	100.0						
	501	100.0	99.2	100.0	99.2						
	SYSTEM	99.7	95.4	96.8	94.4			720	720	680	64.5
10/80	101	97.9	95.8	97.8	95.8						
	201	32.4	23.3	25.6	23.3						
	301	98.5	98.5	98.5	98.5						
	401	90.5	72.7	88.3	72.7						
	501	98.5	96.5	98.4	96.5						
	SYSTEM	100.0	96.8	100.0	96.8			744	744	720	75.1
11/80	101	68.8	68.8	68.8	68.8						
	201	96.4	96.4	96.4	96.4						

DUQUESNE LIGHT: ELRAMA 1-4 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	301	62.6	59.3	61.4	59.3						
	401	93.8	93.8	93.8	93.8						
	501	77.2	77.2	77.2	77.2						
	SYSTEM	99.8	98.9	99.4	98.9			720	720	711	79.3

** PROBLEMS/SOLUTIONS/COMMENTS

DURING SEPTEMBER-NOVEMBER THE LINERS IN MODULES 101, 201 AND 301 WERE REPLACED.

DURING NOVEMBER THE RUBBER LINER IN THE FAN HOUSING OF MODULE 101 WAS COATED WITH URETHANE.

THE UTILITY REPORTED THAT THE WORMAN RECYCLE PUMPS HAVE NOW ATTAINED 20,000 HOURS OF OPERATION WITHOUT REPAIRS.

12/80 SYSTEM 744

** PROBLEMS/SOLUTIONS/COMMENTS

INFORMATION FOR THE MONTH OF DECEMBER WAS NOT AVAILABLE.

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	DUQUESNE LIGHT	
PLANT NAME	PHILLIPS	
UNIT NUMBER	1-6	
CITY	SOUTH HEIGHT	
STATE	PENNSYLVANIA	
REGULATORY CLASSIFICATION	D	
PARTICULATE EMISSION LIMITATION - NG/J	34.	(.080 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	258.	(.600 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	387	
GROSS UNIT GENERATING CAPACITY - MW	408	
NET UNIT GENERATING CAPACITY W/FGD - MW	373	
NET UNIT GENERATING CAPACITY WO/FGD - MW	387	
EQUIVALENT SCRUBBED CAPACITY - MW	408	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	FOSTER WHEELER	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	873.01	(1850000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	182.2	(360 F)
STACK HEIGHT - M	104.	(340 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	*******	(***** FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	BITUMINOUS	
AVERAGE HEAT CONTENT - J/G	26830.	(11535 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		******
AVERAGE ASH CONTENT - %	16.27	
RANGE ASH CONTENT - %	******	
AVERAGE MOISTURE CONTENT - %	5.02	
RANGE MOISTURE CONTENT - %	******	
AVERAGE SULFUR CONTENT - %	1.92	
RANGE SULFUR CONTENT - %	1.0-2.8	
AVERAGE CHLORIDE CONTENT - %	********	
RANGE CHLORIDE CONTENT - %	******	
*** PARTICLE CONTROL		
** MECHANICAL COLLECTOR		
NUMBER	6	
TYPE	MULTICLONES	
SUPPLIER	RESEARCH-COTTRELL	
** ESP		
NUMBER	6	
SUPPLIER	RESEARCH-COTTRELL	
PARTICLE REMOVAL EFFICENCY - %	80.0	
** PARTICLE SCRUBBER		
GENERIC TYPE	VENTURI TOWER	
SPECIFIC TYPE	VARIABLE-THROAT/SIDE-MOVABLE BLADES	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	AISI 1110	
LINER SPECIFIC MATERIAL	GLASS FLAKE-FILLED POLYESTER	
*** FGD SYSTEM		
** GENERAL DATA		
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT	
SO2 REMOVAL MODE	WET SCRUBBING	
PROCESS TYPE	LIME	
PROCESS ADDITIVES	NONE	
SYSTEM SUPPLIER	CHEMICO DIVISION, ENVIROTECH	
A-E FIRM	GIBBS & HILL	
DEVELOPMENT LEVEL	FULL SCALE	
NEW/RETROFIT	RETROFIT	

DUQUESNE LIGHT: PHILLIPS 1-6 (CONT.)

UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.00	
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	83.00	
CURRENT STATUS	1	
COMMERCIAL START-UP	6/74	
INITIAL START-UP	7/73	
CONTRACT AWARDED	7/71	

** DESIGN AND OPERATING PARAMETERS

** ABSORBER

NUMBER	4	
GENERIC TYPE	VENTURI TOWER	
SPECIFIC TYPE	VARIABLE-THROAT/TOP-ENTRY PLUMB BOB	
SUPPLIER	CHEMICO DIVISION, ENVIROTECH	
DIMENSIONS - FT	40 DIA. X 66 HIGH	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	AISI 1110	
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A	
LINER GENERIC MATERIAL	ORGANIC	
LINER MATERIAL TRADE NAME/COMMON TYPE	CEILCOTE	
GAS CONTACTING DEVICE TYPE	BULL AND SPRAY NOZZLES	
NUMBER OF CONTACTING ZONES	1	
LIQUID RECIRCULATION RATE - LITER/S	520.	(8250 GPM)
L/G RATIO - L/CU.M	5.3	(40.0 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	4.0	(16.0 IN-H2O)
SUPERFICAL GAS VELOCITY - M/SEC	12.2	(40.0 FT/S)
INLET GAS FLOW - CU. M/S	258.13	(547000 ACFM)
INLET GAS TEMPERATURE - C	171.1	(340 F)
SO2 REMOVAL EFFICIENCY - %	90.0	
PARTICLE REMOVAL EFFICENCY - %	99.0	

** ABSORBER

NUMBER	1	
GENERIC TYPE	VENTURI TOWER	
SPECIFIC TYPE	VARIABLE-THROAT/TOP-ENTRY PLUMB BOB	
SUPPLIER	CHEMICO DIVISION, ENVIROTECH	
DIMENSIONS - FT	40 DIA. X 66 HIGH	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	AISI 1110	
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A	
LINER GENERIC MATERIAL	ORGANIC	
LINER MATERIAL TRADE NAME/COMMON TYPE	CEILCOTE	
GAS CONTACTING DEVICE TYPE	BULL AND SPRAY NOZZLES	
NUMBER OF CONTACTING ZONES	1	
LIQUID RECIRCULATION RATE - LITER/S	208.	(3300 GPM)
L/G RATIO - L/CU.M	5.3	(40.0 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	4.0	(16.0 IN-H2O)
SUPERFICAL GAS VELOCITY - M/SEC	12.2	(40.0 FT/S)
INLET GAS FLOW - CU. M/S	258.13	(547000 ACFM)
INLET GAS TEMPERATURE - C	171.1	(340 F)
SO2 REMOVAL EFFICIENCY - %	90.0	
PARTICLE REMOVAL EFFICENCY - %	90.0	

** MIST ELIMINATOR

PRE-MIST ELIMINATOR/MIST ELIMINATOR	MIST ELIMINATOR	
NUMBER PER SYSTEM	8	
GENERIC TYPE	IMPINGEMENT	
SPECIFIC TYPE	BAFFLE	
TRADE NAME/COMMON TYPE	CHEVRON VANE	
CONFIGURATION	HORIZONTAL	
NUMBER OF STAGES	1	
NUMBER OF PASSES PER STAGE	3	
FREEBOARD DISTANCE - M	1.37	(4.5 FT)
VANE ANGLES - DEGREES	90	
PRESSURE DROP - KPA	1.0	(4.0 IN-H2O)
SUPERFICAL GAS VELOCITY - M/S	.3	(1.0 FT/S)
CONSTRUCTION MATERIAL GENERIC TYPE	FIBERGLASS REINFORCED PLASTIC	
WASH RATE - L/S	12.0	(190 GAL/MIN)

DUQUESNE LIGHT: PHILLIPS 1-6 (CONT.)

** REHEATER		
NUMBER	2	
GENERIC TYPE	DIRECT COMBUSTION	
SPECIFIC TYPE	IN-LINE BURNER	
TRADE NAME/COMMON TYPE	OIL	
TEMPERATURE INCREASE - C	-1.1	(30 F)
** FANS		
NUMBER	5	
NUMBER OF SPARES	1	
DESIGN	CENTRIFUGAL	
FUNCTION	BOOSTER	
APPLICATION	INDUCED DRAFT	
SERVICE	WET	
FLUE GAS FLOW RATE - CU.M/S	235.95	(500000 ACFM)
FLUE GAS TEMPERATURE - C	171.1	(340 F)
CONSTRUCTION MATERIAL GENERIC TYPE	HIGH ALLOY	
** DUCTWORK		
LOCATION	SCRUBBER INLET	
SHELL GENERIC MATERIAL TYPE	CARBON STEEL	
LINER GENERIC MATERIAL TYPE	NONE	
** DUCTWORK		
LOCATION	SCRUBBER OUTLET	
SHELL GENERIC MATERIAL TYPE	CARBON STEEL	
LINER GENERIC MATERIAL TYPE	FLAKEGLASS	

** TANKS

SERVICE	NUMBER
RECYCLE	1
SLAKER TRANSFER	1
THICKENER OVERFLOW	1
SLUDGE STABILIZATION MIXING	1

** PUMPS

SERVICE	NUMBER
SCRUBBER RECIRCULATION	10
THICKENER OVERFLOW	6
THICKENER UNDERFLOW	1
SLURRY FEED	5
MAKE-UP WATER	1
ABSORBER RECIRCULATION	2

** SOLIDS CONCENTRATING/DEWATERING		
DEVICE	VACUUM FILTER	
NUMBER	1	
CAPACITY	600 TON/DAY	
** SOLIDS CONCENTRATING/DEWATERING		
DEVICE	THICKENER	
NUMBER	2	
DIMENSIONS - FT	75 DIA	
SHELL GENERIC MATERIAL TYPE	MILD STEEL	
OUTLET STREAM CHARACTERISTICS	32% SOLIDS	
*** SLUDGE		
** TREATMENT		
METHOD	POZ-O-TEC	
PROPRIETARY PROCESS	IUCS	
** DISPOSAL		
NATURE	INTERIM	
TYPE	LINED POND	
LOCATION	ON SITE	

DUQUESNE LIGHT: PHILLIPS 1-6 (CONT.)

SITE CAPACITY - CU.M 4892 (4.0 ACRE-FT)

** DISPOSAL
NATURE FINAL
TYPE LANDFILL
LOCATION OFF SITE
SITE TRANSPORTATION METHOD TRUCK

** WATER BALANCE
WATER LOOP TYPE OPEN

** FGD SPARE CAPACITY INDICES
ABSORBER - % .0

** FGD SPARE COMPONENT INDICES
ABSORBER .0

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
0/73	SYSTEM										

** PROBLEMS/SOLUTIONS/COMMENTS

DETERMINATION OF THE AVAILABILITY OF THE PHILLIPS SYSTEM HAS BEEN DIFFICULT. UNTIL ALL BOILERS WERE CONNECTED TO THE SCRUBBERS, THERE WAS AT LEAST ONE SPARE TRAIN AND AS MUCH AS 100% SPARE SCRUBBER CAPACITY. THEREFORE HAVING A TRAIN OUT OF SERVICE FOR MAINTENANCE DID NOT REDUCE THE CAPABILITY OF THE SCRUBBER SYSTEM. UNTIL ALL SIX BOILERS WERE CONNECTED, MEANINGFUL AVAILABILITY FACTORS COULD NOT BE COMPUTED. ON MARCH 17, 1975, THE SIXTH BOILER WAS CONNECTED, AND ALL FOUR SCRUBBER TRAINS WERE REQUIRED TO BE IN SERVICE. OPERATION IN THAT MODE CONTINUED UNTIL AUGUST 4, 1975, WHEN THE NO. 6 BOILER WAS REMOVED FROM THE SCRUBBER SYSTEM BECAUSE THE PH LEVEL COULD NOT BE MAINTAINED AND DEPOSITS BECAME UNMANAGEABLE TO THE POINT THAT SCRUBBER OUTAGES WERE REDUCING GENERATING CAPABILITY OF THE STATION.

7/73	SYSTEM		81.0	31.2				744		232	

** PROBLEMS/SOLUTIONS/COMMENTS

SCRUBBING OPERATIONS BEGAN DURING JULY.

8/73	SYSTEM							744			
9/73	SYSTEM							720			
10/73	SYSTEM							744			
11/73	SYSTEM							720			
12/73	SYSTEM							744			
1/74	SYSTEM							744			
2/74	SYSTEM							672			
3/74	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

STARTUP OF A PORTION OF THE PHILLIPS SCRUBBER SYSTEM BEGAN JULY 1973. SEVERAL PROBLEMS THEN DEVELOPED IN THE FORM OF EROSION OF FANS AND THE LIME FEED SYSTEM CAUSING OUTAGES OF THE SCRUBBER SYSTEM. AFTER AND EXTENDED OUTAGE, THE SCRUBBER SYSTEM WAS RETURNED TO SERVICE IN MARCH 1974. THE SYSTEM HAS BEEN OPERATING CONTINUOUSLY SINCE IT RETURNED TO SERVICE WITH VARIOUS NUMBERS OF BOILERS CONNECTED TO THE SCRUBBER SYSTEM AND

DUQUESNE LIGHT: PHILLIPS 1-6 (CONT.)

PERIOD	MODULE	PERFORMANCE DATA: AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
		SCRUBBER TRAINS IN SERVICE.									
4/74	SYSTEM							720			
5/74	SYSTEM							744			
6/74	SYSTEM							720			
7/74	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM CONSISTS OF 1 TWO-STAGE AND 3 ONE-STAGE VENTURI SCRUBBERS. PRESENTLY ONLY THE TWO-STAGE AND 1 ONE-STAGE TRAIN ARE IN SERVICE TREATING FLUE GAS FROM BOILERS 2, 3,AND 4 (ABOUT 40% OF THE STATION CAPACITY). CHRONIC PROBLEMS INCLUDE PUMP EROSION AND FAN VIBRATION.

8/74	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM EXPERIENCED PLUGGING PROBLEMS IN EARLY AUGUST. THE UTILITY IS CURRENTLY INVOLVED IN A RECYCLE PUMP STUDY. CONSIDERATIONS FOR PUMP DESIGN AND MATERIALS ARE BEING MADE TO IMPROVE PUMP LIVE.

9/74	SYSTEM							720			
10/74	SYSTEM							744			
11/74	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

SINCE STARTUP IN SEPTEMBER 1973 THE FGD SYSTEM HAS OPERATED AT REDUCED CAPACITY WITH ONLY 2 OR 3 OF THE 4 TRAINS OPERATING AT ANY TIME TREATING FLUE GAS FROM 4 BOILERS (ABOUT 40% OF THE STATION CAPACITY). THE TIE IN OF BOILER NO. 5 DURING NOVEMBER HAS BOOSTED THE FGD SYSTEMS LOAD TO ABOUT 62% OF THE STATION CAPACITY. OVERALL SO2 REMOVAL EFFICIENCY IS 60%. THE TWO-STAGE TRAIN ITSELF REMOVES 80% OF THE INLET SO2. TESTS WITH MAGNESIUM PROMOTED LIME INDICATE THAT SO2 REMOVAL EFFICIENCY CAN BE BOOSTED BY 60% OVER COMMERCIAL LIME.

DURING THE PERIOD REBRACING OF FAN BLADES WAS IN PROGRESS.

12/74	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

DURING DECEMBER REPAIRS WERE MADE TO HOLES IN THE MIST ELIMINATORS WITH CEILCOTE APPLICATIONS.

FOUR TONS OF SLUDGE WERE REMOVED FROM ONE SCRUBBER BASE. THE VENTURI DAMPERS WERE SEIZING AS A RESULT OF SOLIDS BUILDUP.

THE UTILITY IS AWAITING THE DELIVERY OF SPARE RECYCLE PUMPS.

1/75	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

THREE SCRUBBING TRAINS OPERATED ON TWO THIRDS OF THE BOILER FLUE GAS OUTPUT. THE SCRUBBING SYSTEM OPERATED ON FLUE GAS FROM FIVE BOILERS THROUGHOUT JANUARY WITH NEARLY 100% FGD SYSTEM AVAILABILITY. OVERALL SO2 REMOVAL EFFICIENCY WAS APPROXIMATELY 60%.

DUQUESNE LIGHT: PHILLIPS 1-6 (CONT.)

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR

BECAUSE OF SOLIDS BUILDUP THE DAMPERS WERE SEIZING. THE UTILITY HAS BEEN EXERCISING THE DAMPERS MORE FREQUENTLY AS A RESULT AND THIS SEEMS TO HAVE IMPROVED DAMPER OPERATIONS.

DUE TO COLD WINTER WEATHER AND RELATED CONDITIONS THE SLUDGE STABILIZATION PROCESS REQUIRES A LONGER PERIOD OF TIME. THE SLUDGE PONDS HAVE BEEN FILLING IN 8 TO 9 DAYS. 6 TO 7 DAYS ARE REQUIRED TO EMPTY PONDS. THE CURRENT SLUDGE PRODUCT HAS BEEN A SOUPY CONSISTENCY REQUIRING A CLAMSHELL TYPE DREDGE FOR THE POND. PLUGGING IN THE STABILIZING AGENT INJECTION LINES IS THOUGHT TO HAVE CONTRIBUTED TO THE POOR SLUDGE QUALITY.

SOME WET SIDE SO2 MONITORS FAILED DURING THE PERIOD. THEY ARE CURRENTLY BEING MODIFIED BY THE MANUFACTURER.

THE REHEATERS HAVE NOT YET BEEN TESTED.

2/75	SYSTEM							672			
3/75	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

THE FOURTH FGD TRAIN AND THE SIXTH BOILER WERE TIED IN ON MARCH 17, 1975. ONE OF THE BOILERS WAS DOWN FOR MAINTENANCE SO THE SCRUBBING SYSTEM DID NOT OPERATE ON FLUE GAS FROM ALL SIX BOILERS.

DURING MARCH THE PROGRAM TO IMPROVE SCRUBBER RECYCLE PUMP PERFORMANCE CONTINUED. FOUR OUT OF SIX NEW PUMPS HAVE BEEN INSTALLED.

THE CALCILOX INJECTION SYSTEM LINES HAVE BEEN PLUGGING FREQUENTLY. THE UTILITY IS CONSIDERING A NEW PNEUMATIC DELIVERY SYSTEM FOR CALCILOX.

THE UTILITY IS CURRENTLY LOOKING FOR NEW SLUDGE DISPOSAL SITES.

4/75	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

THE PRESSURE DROP INSTRUMENTATION AT THE VENTURIS HAS BEEN A PROBLEM AREA.

THE DAMPERS HAVE STILL BEEN SEIZING BECAUSE OF SOLIDS BUILDUP.

ALL SIX BOILERS AND FOUR SCRUBBING TRAINS OPERATED IN AN INTEGRATED MODE IN APRIL. SOME SOLIDS BUILDUP HAS BEEN DISCOVERED AGAIN IN THE SCRUBBING TRAINS.

BECAUSE OF EROSION AND PLUGGING PROBLEMS, A CONTINUOUS WASH IS NOW PERFORMED ON THE MIST ELIMINATORS.

5/75	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

PRELIMINARY PARTICULATE MATTER REMOVAL EFFICIENCY TESTS SHOWED THAT THE UNIT MEETS THE 0.8 LB/MM BTU ALLEGHENY COUNTY STANDARD. THE OUTLET LOADINGS IN MAY WERE IN THE 0.04 LB/MM BTU RANGE.

A HOLE WAS DISCOVERED IN A SCRUBBER LINER DURING MAY. A PREVIOUSLY PATCHED AREA HAD FAILED AGAIN.

6/75	SYSTEM							720			

DUQUESNE LIGHT: PHILLIPS 1-6 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE FGD SYSTEM OPERATED ON FLUE GAS FROM ALL SIX BOILERS DURING JUNE. THE TWO-STAGE SCRUBBING TRAIN HAS BEEN OUT OF SERVICE FOR GENERAL MAINTENANCE AND A LINER LEAK REPAIR IN THE FIRST-STAGE SCRUBBER SINCE JUNE 19.									
		SOME RECYCLE PUMP REPLACEMENTS WERE REQUIRED DURING JUNE.									
		THE SLUDGE STABILIZATION FACILITY HAS BEEN EXPERIENCING PROBLEMS.									
		UNBURNED CARBON FINES ARE CAUSING PLUGGING IN THE SCRUBBING SYSTEMS. THE UTILITY HAS BEEN TRYING A WETTING AGENT TO MINIMIZE THE PROBLEM.									
		PROBLEMS WERE EXPERIENCED WITH THE LIME HANDLING SYSTEM DURING JUNE.									
7/75	101		79.1		53.8						
	201		35.5		24.2						
	301		100.0		71.4						
	401		100.0		97.2						
	SYSTEM		90.5		61.6			744	506	458	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		GENERAL MECHANICAL PROBLEMS WERE EXPERIENCED IN JULY.									
8/75	101		97.7		64.2						
	201		100.0		91.7						
	301		66.0		43.4						
	401		65.3		42.9						
	SYSTEM		82.3		60.5			744	489	453	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		SCRUBBER UNAVAILABILITY FORCED BOILER NO.6 TO BE RETURNED TO THE SCRUBBER BYPASS PATH IN ORDER TO PREVENT LOSS OF BOILER CAPACITY.									
		PLUGGING AND MAINTENANCE PROBLEMS HAVE BEEN ENCOUNTERED.									
		EVALUATION OF VARIOUS RECYCLE PUMPS CONTINUED IN AUGUST.									
9/75	101		8.5		7.9						
	201		83.5		77.9						
	301		100.0		95.1						
	401		79.8		74.4						
	SYSTEM		68.0		63.8			519	672	460	
10/75	101		88.4		81.6						
	201		30.1		27.8						
	301		73.5		67.9						
	401		70.9		65.5						
	SYSTEM		65.7		60.7			744	687	451	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		IN OCTOBER 1975, THIOSORBIC LIME SCRUBBING WAS INITIATED IN THE PHILLIPS SINGLE-STAGE SCRUBBING TRAINS ON AN EXPERIMENTAL BASIS. THE UTILITY IS STUDYING COMPLIANCE FEASIBILITY, SO2 REMOVAL EFFICIENCY, AND QUALITY OF THE SLUDGE GENERATED BY THE SINGLE-STAGE SCRUBBING TRAINS.									
		PRESENTLY ONLY 4 OF THE 6 BOILERS ARE TIED INTO THE FGD SYSTEM.									
11/75	101		86.9		86.9						

DUQUESNE LIGHT: PHILLIPS 1-6 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	201		100.0		100.0						
	301		.0		.0						
	401		10.4		10.4						
	SYSTEM		49.3		49.3			720	720	355	
12/75	101		50.8		48.4						
	201		93.2		88.8						
	301		25.7		24.5						
	401		54.4		51.9						
	SYSTEM		56.0		53.4			744	709	397	

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY CONCLUDED THE THIOSORBIC LIME TESTING PROGRAM IN MID-DECEMBER. FOUR BOILERS WERE COUPLED TO THE SCRUBBING SYSTEM DURING THE RUN. THE UTILITY IS NOW ANALYZING THE DATA GENERATED DURING THE TEST PROGRAM. THE SCRUBBERS HAVE BEEN PUT BACK ON REGULAR LIME. NO UNUSUAL PROBLEMS WERE ENCOUNTERED DURING THE TEST RUN. THE UTILITY HAS STARTED CONSTRUCTION ON AN ADDITIONAL LIME SLAKER FOR FULL SCALE MAGNESIUM PROMOTED LIME OPERATION. THE THICKENER MAY REQUIRE REDESIGN TO ACCOMODATE INCREASED CAPACITY.

1/76	101		38.4		37.2						
	201		74.2		72.0						
	301		14.0		13.6						
	401		97.9		95.0						
	SYSTEM		56.1		54.4			744	722	405	

** PROBLEMS/SOLUTIONS/COMMENTS

THE 2.5-MONTH TEST PROGRAM WITH THIOSORBIC LIME INCLUDED 1612 HOURS ON ONE TRAIN AND 1309 HOURS ON ANOTHER TRAIN. RESULTS INDICATE THAT THE REQUIRED DEGREE OF SO2 REMOVAL (83%) CAN BE OBTAINED WITH AN MGO CONTENT OF 8-10% IN THE LIME WITH SINGLE-STAGE SCRUBBING.

2/76	101		97.8		94.4						
	201		98.5		95.1						
	301		24.7		23.9						
	401		60.4		58.3						
	SYSTEM		70.4		67.9			696	672	472	
3/76	101				93.4						
	201				47.5						
	301				88.6						
	401				62.0						
	SYSTEM				72.9			744		542	
4/76	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY IS STILL EXPERIENCING PROBLEMS WITH SOLIDS DEPOSITION IN THE VENTURI THROAT OF THE SCRUBBING TRAINS, CAUSING MOVEMENT INHIBITION AND GREATER PRESSURE DROPS.

THE SLUDGE STABILIZATION PRACTICES ARE STILL CONTINUING AT THIS FACILITY.

PLANT OPERATION IS PROCEEDING WITH A TOTAL OF FOUR BOILERS COUPLED INTO THE SCRUBBING SYSTEM (EQUALING 336 MW, WHICH IS 87% OF THE TOTAL PLANT CAPACITY). THE FGD SYSTEM OPERATED ON HIGH CALCIUM LIME DURING THE REPORT PERIOD. THE GENERAL OPERATION MODE AT THIS FACILITY HAS ONE OF THE FOUR SCRUBBING TRAINS OUT CONTINUALLY FOR REPAIRS, CLEANING, AND PREVENTIVE MAINTENANCE. THE FGD SYSTEM AVAILABILITY FOR THE FIRST QUARTER OF 1976 WAS 72%.

DUQUESNE LIGHT: PHILLIPS 1-6 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTO
5/76	SYSTEM							744			
6/76	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

REDUCED LOAD OPERATIONS WERE REPORTED BY THE UTILITY FOR THE MAY-JUNE PERIOD BECAUSE OF A SCHEDULED TURBINE OVERHAUL ON BOILER NO. 6.

THE UTILITY IS PROCEEDING WITH THE INSTALLATION OF THREE ADDITIONAL LIME STORAGE SILOS AND A THIRD THICKENER.

THE SCRUBBING SYSTEM WAS SHUT DOWN ON JUNE 27 FOR A SCHEDULED FOUR WEEK REPAIR PERIOD. THE MAJORITY OF THE WORK WILL BE CONCENTRATED ON THE STACK ASSOCIATED DUCTWORK AND BOILER DAMPERS. THE ACID BRICK FLUE HAS BEEN LEAKING PARTICULARLY IN THE MORTAR JOINTS AND STEEL BANDS SUPPORTING THE BRICK HAVE BEEN CORRODING. CORROSION HAS OCCURRED IN THE DUCTWORK IN THE EXPANSION JOINT AREA WHERE THE DUCT ENTERS THE STACK.

THE SLUDGE IS CURRENTLY BEING STABILIZED WITH A CALCILOX ADDITION AT A RATE OF APPROXIMATELY 10% BY WEIGHT OF SLUDGE. THE UTILITY IS PLANNING TO CONTRACT IUCS FOR SLUDGE STABILIZATION IN APPROXIMATELY A YEAR.

7/76	SYSTEM							744			
8/76	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

THE FOUR-WEEK SYSTEM OVERHAUL WAS COMPLETED JULY 25. THE THREE ADDITIONAL LIME STORAGE SILOS AND THE FOUNDATION FOR THE ADDITIONAL 75-FOOT DIAMETER THICKENER HAVE BEEN INSTALLED. WHEN THE NEW EQUIPMENT IS INSTALLED THE UTILITY WILL SWITCH FROM LIME TO MAGNESIUM PROMOTED (THIOSORBIC) LIME. THE UTILITY HAS SIGNED A LETTER OF INTENT WITH IUCS FOR A LONG-TERM SLUDGE TREATMENT SYSTEM.

REPAIRS WERE MADE ON THE TURNING VANES TO THE SCRUBBER MIST ELIMINATORS. THE CEILCOTE COATING ON MODULE 401 FAILED (ORIGINAL COAT ERODDED AWAY AND CORROSION HAD SET IN).

REPAIR WORK WAS COMPLETED ON THE EXPANSION JOINT SEAL WHERE THE DUCTWORK TIES INTO THE MAIN STACK.

THE STEEL BANDS AROUND THE INNER STACK STRUCTURE WERE REPAIRED.

THE SCRUBBERS ID FANS WERE OVERHAULED.

THE BOILER EXIT DAMPERS WERE REPAIRED.

REPAIRS WERE MADE TO STOP LEAKING IN THE ACID-BRICK FLUE OF THE MAIN STACK.

9/76	SYSTEM							720			
10/76	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

BOILER NUMBERS 2 THROUGH 6 WERE COUPLED INTO THE SCRUBBING SYSTEM. BOILER NO. 1 IS DOWN FOR OVERHAUL AND REPAIRS. THE IUCS INTERIM SLUDGE PROCESSING PLANT IS UNDER CONSTRUCTION AND WILL BE IN SERVICE BY DECEMBER 1976. THE TEMPORARY FACILITIES WILL PROCESS THE THICKENER UNDERFLOW AND PONDED SLUDGE UNTIL THE POND IS DEPLETED OF SLUDGE AND THE PERMANENT FACILITY HAS

DUQUESNE LIGHT: PHILLIPS 1-6 (CONT.)

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER BOILER HOURS	FGD HOURS	CAP. FACTOR

BEEN INSTALLED. SCRUBBING OPERATIONS ARE STILL PROCEEDING IN AN OPEN WATER LOOP MODE WITH PART OF THE THICKENER OVERFLOW BEING DIVERTED TO THE ASH POND. BECAUSE BOTH THE BEAVER VALLEY AND BRUCE MANSFIELD STATIONS ARE FULLY OPERATIONAL, THIS STATION HAS BEEN RELEGATED TO PEAK LOAD OPERATIONS. GENERAL LOAD OPERATIONS ARE FULL LOAD CAPACITY IN THE DAYTIME AND 50 TO 67% LOAD REDUCTION AT NIGHT.

TOTAL SCRUBBER HOURS: 23,274
TOTAL BOILER HOURS: 83,642
TOTAL SCRUBBER OUTAGE TIME: 5,500
TOTAL SCRUBBER AVAILABLE HOURS: 23,274
AVERAGE MW LOAD/SCRUBBER OPERATION HOUR: 243
TOTAL OPERABILITY INDEX: 28%
TOTAL RELIABILITY INDEX: 81%

THE FIGURES AT THE LEFT WERE COMPILED BY THE UTILITY FOR SYSTEM OPERATIONS FOR THE PERIOD FOLLOWING START-UP IN JULY 1973 INCLUSIVE TO OCTOBER 1976. THE TOTAL SCRUBBER HOURS VALUE INCLUDES OPERATION TIME WHEN ONE OR MORE OF THE MODULES WERE IN SERVICE. TOTAL BOILER AND UNAVAILABILITY VALUES APPLY FOR ALL THE CORRESPONDING UNITS. THE TOTAL SCRUBBER AVAILABILITY INDEX INCLUDES THE TIME WHEN ONE OR MORE MODULES WERE AVAILABLE FOR SERVICE.

11/76	SYSTEM							720		
12/76	SYSTEM							744		

** PROBLEMS/SOLUTIONS/COMMENTS

THE IUCS SLUDGE STABILIZATION FACILITY AT PHILLIPS WAS INSTALLED AND STARTED UP IN DECEMBER. THE FACILITY INCLUDES EQUIPMENT FOR DEWATERING, ESP-COLLECTED FLYASH ADDITION AND TRANSPORT TO THE OFF-SITE LANDFILL.

THE RECYCLE PUMP EVALUATION IS CONTINUING. AFTER 2500 HOURS OF OPERATION THE PUMPS USING CARBORUNDUM WEAR RINGS AND CD4 MCU IMPELLERS WERE HOLDING UP WELL. THEY HAVE NOW ACCUMULATED 2800 HOURS OF OPERATION (THEY WERE INSPECTED AFTER 2500 HOURS). AFTER 2900 HOURS OF OPERATION PUMPS USING CARBORUNDUM WEAR RINGS AND TITANIUM IMPELLERS WERE PERFORMING WELL.

BOILERS 2 THROUGH 6 WERE COUPLED INTO THE SYSTEM THROUGHOUT THE PERIOD. BOILER 1 REMAINED SHUT DOWN.

THE FIRST NEW SLAKER (PASTE TYPE SLAKER), ONE OF FOUR NEW UNITS CAME ON LINE DURING THE PERIOD. HIGHER STOICHIOMETRIC RATIOS, HIGHER PH VALUES AND INCREASED SO2 REMOVAL EFFICIENCY RESULTED IN THE SYSTEMS.

IN ORDER TO ENHANCE SETTLING IN THE TWO 75-FOOT DIAMETER THICKENERS A POLYELECTROLYTE MATERIAL WILL BE ADDED ON A TEMPORARY BASIS. WHEN THE NEW 75-FOOT THICKENER IS BROUGHT ON LINE THE POLYELECTROLYTE ADDITION IS EXPECTED TO BE TERMINATED.

THE CONTRACT WITH DRAVO FOR THIOSORBIC LIME (MG-PROMOTED LIME) HAS BEEN FINALIZED. THE SWITCH TO MAGNESIUM PROMOTED LIME WILL TAKE PLACE WHEN THE LAST THICKENER IS COUPLED INTO THE SYSTEM.

THE VENTURIS ARE ENCOUNTERING A GREAT DEAL OF SCALING. PRESSURE DROPS ACROSS THE VENTURIS ARE REGISTERING TWICE THE NORMAL PRESSURE DROP AT 12 INCHES H2O(6 INCHES H2O IS DESIGN).

1/77	SYSTEM							744		
2/77	SYSTEM							672		

DUQUESNE LIGHT: PHILLIPS 1-6 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
3/77	SYSTEM								744		
4/77	SYSTEM								720		
5/77	SYSTEM								720		
6/77	SYSTEM								720		

** PROBLEMS/SOLUTIONS/COMMENTS

1977 FULL COMPLIANCE OPERATIONS WILL INCLUDE 83% SO2 REMOVAL FOR 2% SULFUR COAL UTILIZING THIOSORBIC LIME (6-12% MG) AND FIXATING THE SCRUBBER WASTES WITH THE IUCS POZ-O-TEC METHOD. THE FIXATED MATTER WILL BE HAULED AWAY TO AN OFF-SITE DISPOSAL AND LANDFILL. IUCS HAS BEEN AWARDED A TEN YEAR CONTRACT FOR THE USE OF THIS METHOD.

** PROBLEMS/SOLUTIONS/COMMENTS

ALL SIX BOILERS ARE COUPLED INTO THE FGD SYSTEM.

THE RECYCLE PUMP EVALUATION IS CONTINUING. THE CARBORUNDUM IMPELLERS AND WEAR RINGS ARE PERFORMING WELL AFTER 4000 OPERATING HOURS.

CONSTRUCTION OF THE THICKENERS AND LIME FEEDERS IS STILL CONTINUING. FULL PLANT COMPLIANCE SHOULD OCCUR BY DECEMBER 1977 WHEN THE NEW THICKENERS AND SLAKERS COME ON LINE.

THE IUCS FACILITY IS JUST FILTERING OUT WATER. NO FIXATIVE IS BEING ADDED. THE WASTE ARE BEING HAULED AWAY TO AN OFF-SITE LANDFILL ONE MILE FROM THE STATION.

SO2 AND PARTICULATE MATTER REMOVAL EFFICIENCIES ARE 50 AND 99+% RESPECTIVELY.

1975 THIOSORBIC LIME TESTS SHOWS THAT 8% MGO IN THE LIME WAS OPTIMUM FOR SO2 REMOVAL BUT IT IS POSSIBLE TO GO AS HIGH AS 12% MGO. LIME ARRIVING AT PHILLIPS WILL HAVE A 6% MGO CONCENTRATION. IT WILL BE POSSIBLE TO BLEND THE LIME TO ACHIEVE HIGHER MGO AT THE STATION IF NECESSARY.

** PROBLEMS/SOLUTIONS/COMMENTS

DAMPER AND MIST ELIMINATOR REPAIRS WILL BE CORRECTED DURING THE NEXT SCHEDULED OUTAGE. OVERALL SCRUBBER OPERABILITY IS ABOUT 75%.

THIOSORBIC LIME TESTS BEGAN IN LATE MAY BUT LASTED ONLY ABOUT ONE WEEK.

THE SCRUBBER SYSTEM WAS SHUT DOWN FOR THREE TO FOUR DAYS IN MAY DUE TO LEAKING IN THE WET DUCT HEADER THAT LEADS TO THE STACK. WHEN THE LEAK WAS REPAIRED SCRUBBING OPERATIONS BEGAN AGAIN ON FLUE GAS FROM FOUR BOILERS.

WHILE FIXING A DUCT LEAK INSPECTION OF OTHER COMPONENTS REVEALED THAT THE BOILER EXIT DAMPERS WERE ERODING.

ONE OF THE MODULE 201 EXTERNAL MIST ELIMINATORS WAS SEVERLY ERODED AND PLUGGED.

THE INTERIM SLUDGE DISPOSAL SYSTEM IS STILL OPERATIONAL. THE PERMANENT SLUDGE DISPOSAL FACILITY IS ON SCHEDULE FOR THE DECEMBER 1977 COMPLETION DATE.

THE CARBORUNDUM WEAR RINGS AND IMPELLERS WERE CONTINUING TO PERFORM WELL AFTER 5000 OPERATING HOURS.

DUQUESNE LIGHT: PHILLIPS 1-6 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
7/77	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

ALL SIX BOILERS ARE COUPLED INTO THE SCRUBBER PLANT. FLUE GAS FROM FIVE OF THESE UNITS IS BEING TREATED BY THE SCRUBBERS. ONLY FOUR OF THE SIX BOILERS ARE ACTUALLY OPERATING BECAUSE OF THE CURRENT TURBINE REPAIR OUTAGE. OPERATIONS ARE PROCEEDING WITH ONE SCRUBBING TRAIN OUT OF SERVICE AT ALL TIMES FOR MAINTENANCE AND CLEANOUT. SO2 REMOVAL EFFICIENCY IS APPROXIMATELY 50%.

BOILER 6 HAS BEEN OUT OF SERVICE WHILE TURBINE REPAIRS ARE BEING MADE.

THE RECYCLE PUMP EVALUATION STUDY CONTINUED DURING THE PERIOD. COMPONENTS BEING EVALUATED INCLUDE: CARBORUNDUM IMPELLERS, CARBORUNDUM WEAR RINGS, TITANIUM IMPELLERS, 317SS WEAR RINGS AND STELLITE TIPPED IMPELLERS.

A THIOSORBIC LIME TEST WAS PREMATURELY TERMINATED BECAUSE OF SOME MINOR SLAKER/FEEDER PROBLEMS. HIGH CALCIUM VIRGIN LIME WAS UTILIZED DURING THE MAJORITY OF OPERATIONS THROUGHOUT THE PERIOD.

8/77	SYSTEM							744			
9/77	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

LIME HANDLING AND SOLID WASTE DISPOSAL FACILITIES WERE BEING SCALED UP TO HANDLE FULL CAPACITY AND A THIRD THICKENER WAS INSTALLED AND BROUGHT INTO SERVICE DURING THIS REPORT PERIOD. THE IUCS SYSTEM IS STILL PERFORMING INTERIM PHASE OPERATIONS. WASTE WATER IS BEING MIXED WITH FLYASH AND DISPOSED WITHOUT FIXATIVE ADDITION. CURRENT CONSTRUCTION WORK IS EXPECTED TO BE COMPLETED BY THE END OF JANUARY WHEN ALL SIX BOILERS WILL BE BACK ON LINE FOR A TWO MONTH TEST PERIOD. THIOSORBIC LIME IS STILL BEING TESTED. RESULTS ARE NOT YET AVAILABLE. THE FGD SYSTEM WILL BE DOWN FOR THE FIRST WEEKEND OF NOVEMBER. THE SYSTEM WILL ALSO BE CHECKED FOR MAIN DUCT LEAKS AT THIS TIME. THE SCRUBBER AND STACK LININGS AND RECYCLE PUMPS WILL BE THOROUGHLY CHECKED AS WELL. NECESSARY REPLACEMENTS AND REPAIRS WILL BE CARRIED OUT. CURRENT SO2 REMOVAL EFFICIENCY IS 50%. BY EARLY APRIL 1978 THE SYSTEM IS EXPECTED TO REACH COMPLIANCE WITH AN SO2 REMOVAL EFFICIENCY OF 83%.

10/77	101	92.6	92.6								
	201	4.0	4.0								
	301	88.3	88.3								
	401	87.7	87.7								
	SYSTEM							744	744	507	

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE 101 WAS DOWN A TOTAL OF 113 HOURS IN OCTOBER FOR REGULAR MAINTENANCE AND REPAIRS.

MODULE 201 WAS PUT IN SERVICE ON OCTOBER 26 AFTER EXTENSIVE CLEAN UP. ALSO REPAIRS TO THE ID FAN HOUSING RUBBER LINING WERE MADE AND THE FAN WAS BALANCED.

MODULE 301 WAS DOWN A TOTAL OF 57 HOURS IN OCTOBER FOR MAINTENANCE AND REPAIRS.

MODULE 401 WAS DOWN A TOTAL OF 36 HOURS IN OCTOBER FOR REPAIR OF HOLES IN THE ID FAN LINING AND FOR THE TIE-IN OF THE THICKENER BLEED LINE.

DUQUESNE LIGHT: PHILLIPS 1-6 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
11/77	101		92.1		92.1						
	201		91.6		91.6						
	301		28.1		28.1						
	401		56.3		56.3						
	SYSTEM		67.0		67.0			720	720	483	

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE SHUTDOWN OUTLET DUCT LEAKS WERE REPAIRED.

BOILER EXIT DAMPERS WERE REPLACED. THE OLD DAMPERS FAILED DUE TO FLYASH EROSION.

CORROSION OF STEEL BANDS IN STACK WAS DISCOVERED DURING THE PERIOD. THE CORROSION IS A RESULT OF CONDENSED MOISTURE SEEPING THROUGH THE MORTAR.

SLUDGE HANDLING PROBLEMS HAVE OCCURRED BECAUSE DEWATERING OPERATIONS ARE NOT WORKING PROPERLY.

THE RESULTS FROM THIOSORBIC LIME USE CAN NOT YET BE QUANTIFIED DUE TO LIME FEED SYSTEM PROBLEMS.

LIME FEED SYSTEM PROBLEMS OCCURRED OVER THE PERIOD.

THE MIST ELIMINATORS WERE CLEANED DURING NOVEMBER.

12/77	SYSTEM							744			
1/78	101		84.3		84.3						
	201		77.2		77.2						
	301		.0		.0						
	401		65.1		65.1						
	SYSTEM		56.6		56.7			744	744	421	

** PROBLEMS/SOLUTIONS/COMMENTS

CUMULATIVE HOURS FOR JANUARY 1, 1977 THROUGH JANUARY 8, 1978 WERE 22391 FOR MODULE 101, 20998 FOR MODULE 201, 22229 FOR MODULE 301 AND 22259 FOR MODULE 401.

SCRUBBER TRAIN 301 WAS DOWN FOR AN OVERHAUL FROM NOVEMBER 17 TO FEBRUARY 6, 1978 WHEN IT WAS RETURNED TO SERVICE.

SCRUBBER TRAIN 401 WAS REMOVED FROM SERVICE ON FEBRUARY 6.

THE IUCS INTERIM SLUDGE TREATMENT SYSTEM HAS SOME DEWATERING PROBLEMS. DURING DECEMBER PHILLIPS EXPERIENCED POOR SLUDGE REMOVAL. THE IUCS PLANT IS WORKING ON A PART TIME BASIS. FULL OPERATIONS ARE EXPECTED LATE THIS SPRING. THE POOR QUALITY SLUDGE IS SENT TO AN EMERGENCY POND AND THEN RE-CIRCULATED BACK TO THE THICKENER.

TESTING WITH THIOSORBIC LIME AT 5% MGO HAS SHOWN THAT THE MGO CONCENTRATION IS NOT GREAT ENOUGH TO EFFECT ADEQUATE SO2 REMOVAL ON A SINGLE STAGE SCRUBBER. THE UTILITY IS GOING TO TEST AT A GREATER MGO CONCENTRATION BY STARTING AT 10% AND THEN DROPPING BACK UNTIL THE CONCENTRATION IS SATISFACTORY. THIS TESTING, AS WELL AS SCRUBBER OPERATIONS, HAVE, HOWEVER, BEEN HAMPERED BY LOW LOADS AS A RESULT OF THE COAL STRIKE.

AN OUTAGE HAS BEEN SCHEDULED AT PHILLIPS TO REPLACE THE CARBON STEEL SUPPORT BANDS IN THE STACK WITH STAINLESS STEEL BANDS.

2/78	101		43.5		31.1						

DUQUESNE LIGHT: PHILLIPS 1-6 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	201		58.5		41.8						
	301		3.8		2.7						
	401		31.7		22.6						
	SYSTEM		34.4		24.6			672	480	167	
3/78	SYSTEM	.0			.0			744	0	0	

** PROBLEMS/SOLUTIONS/COMMENTS

AN OUTAGE OCCURRED BETWEEN JANUARY 6 AND JANUARY 8 WHEN THE STACK DRAIN LEAKS WERE REPAIRED BY SANDBLASTING THE OUTER WALL AND REPLACING THE CARBON STEEL BANDS WITH STAINLESS STEEL BANDS.

THE SYSTEM WAS SHUTDOWN ON FEBRUARY 11 DUE TO THE COAL SHORTAGE. THE OUTAGE CONTINUED THROUGH MARCH AND THE SYSTEM IS SCHEDULED TO BE ON LINE BY APRIL 15. DURING THE OUTAGE A NUMBER OF REPAIRS AND MODIFICATIONS WERE MADE.

THE BOILER EXIT DAMPERS WERE LINED WITH 316SS ON AREAS OF HIGH EROSION CAUSED BY FLYASH IMPINGEMENT.

EXPANSION JOINTS ON THE INLET DUCTWORK WERE SHIELED BY METAL PLATES WHICH WERE WELDED AT ONE END.

NUMEROUS HOLES IN THE WET GAS DUCT WORK WERE REPAIRED AND THE DUCTS WERE RELINED WITH CEILCOTE.

THE VENTURI THROAT DAMPERS WERE CLEANED ON ALL THE SCRUBBERS.

INTERNAL MIST ELIMINATORS WERE CLEANED. THE EXTERNAL MIST ELIMINATORS, WHICH ARE BADLY DETERIORATED, MAY BE REPLACED.

THE STACK ACID BRICK FLUE WAS INSPECTED AND SOME BRICKS WERE REPLACED AT THE TOP OF THE STACK.

CONSTRUCTION WORK ON ADDITIONAL EQUIPMENT SUCH AS THE THICKENER AND SILOS IS ALMOST COMPLETE. IT WAS NOTED THAT THE CEILCOTE LINER COROLINE 505AR HAS HELD UP WELL OVER THREE YEARS ON THE CONICAL APEX OF MODULE 401.

4/78	SYSTEM							720	528		
5/78	SYSTEM							744	744		

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM CAME BACK ON LINE AFTER THE COAL STRIKE IN LATE MARCH. IT IS NOT OPERATING AT FULL LOAD BECAUSE THE NO. 6 BOILER IS STILL OUT AND SHOULD BE BACK ON LINE IN MID-JULY. COMPLIANCE TESTS WILL TAKE PLACE IN JULY, AFTER BOILER 6 IS BACK ON LINE, TO SEE IF THE SYSTEM IS MEETING THE 83% SO2 REMOVAL REQUIREMENT FOR 2% SULFUR COAL. THERE WERE NO HOURS REPORTED FOR THIS PERIOD BECAUSE OF PRELIMINARY TESTING BEING CONDUCTING IN PREPARATION FOR THE COMPLIANCE TESTS. SO FAR, TESTS INDICATE THAT THE SYSTEM WILL COMPLY WITH THE REQUIRED STANDARDS. THE OPERABILITY FOR ALL FOUR TRAINS WAS BETWEEN 65 AND 75%.

6/78	SYSTEM							720	720		
7/78	101	48.3	48.3		48.3						
	201	43.9	43.9		43.9						
	301	85.7	78.7		78.7						
	401	82.5	76.0		76.0						
	SYSTEM	65.1	61.7		61.7			744	744	459	

DUQUESNE LIGHT: PHILLIPS 1-6 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
		PERFORMANCE DATA									
8/78	101	100.0	97.3	97.3							
	201	73.2	71.9	71.9							
	301	100.0	88.8	88.8							
	401	92.4	85.0	85.0							
	SYSTEM	91.4	85.8	85.8				744	744	638	

** PROBLEMS/SOLUTIONS/COMMENTS

THE INTERNAL MIST ELIMINATOR ON MODULE 201 WAS REPLACED AND THE MODULE 301 MIST ELIMINATORS WERE CLEANED OVER THE PERIOD.

THE FGD SYSTEM HAS ACCUMULATED APPROXIMATELY 24000 HOURS OF OPERATION ON ALL FOUR MODULES SINCE START-UP.

WATER BALANCE PROBLEMS HAVE CONTRIBUTED TO THE OCCURRANCE OF LOW PH, RESULTING IN MIST ELIMINATOR PLUGGING.

THE MIST ELIMINATOR PLUGGING IS ALSO RELATED TO LOW PH RESULTING FROM LIME HANDLING AND SLURRY PREPARATION SYSTEM FAILURE.

THE UTILITY IS CURRENTLY STUDYING WAYS TO TIGHTEN THE WATER BALANCE BY USING THICKENER SUPERNATANT INTERMITTENTLY WITH CLEAR SERVICE WATER FOR THE MIST ELIMINATORS.

THE LIME HANDLING FACILITY DOES NOT INCLUDE A GRIT REMOVAL STAGE. GRIT IS CAUSING PLUGGING IN THE SLURRY HANDLING SYSTEM AND MIXING EQUIPMENT.

PROCESS CHEMISTRY CONTROL IS A CHRONIC PROBLEM AT PHILLIPS DUE IN PART TO TO WATER BALANCE AND LIME HANDLING EQUIPMENT.

WHEN WATER BALANCE IS ACHIEVED THE FGD SYSTEM EXPERIENCES A BUILD UP OF SALTS.

9/78	101	63.7	62.4	62.4							
	201	82.7	75.6	75.6							
	301	83.9	67.5	67.5							
	401	65.6	55.7	55.7							
	SYSTEM	74.0	65.3	65.3				720	720	470	

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE AUGUST-SEPTEMBER PERIOD MIST ELIMINATOR CLEANING TOOK PLACE IN ORDER TO CORRECT THE PLUGGING PROBLEM.

IN AUGUST THE INTERNAL MIST ELIMINATOR ON MODULE 201 WAS REPLACED.

THE LIME MIXING BASIN HAD TO BE SHUT DOWN OVER A WEEKEND SO THAT EXCESSIVE GRIT AND SOLID PARTICLES THAT HAD BUILT UP COULD BE CLEANED OUT.

HIGH PRESSURE WATER CLEANING WAS PERFORMED ON MODULES 101 AND 401.

THE RUBBER LINING IN MODULE 101 WAS REPAIRED.

A MAJOR PROBLEM AREA DURING THE PERIOD WAS CAUSED BY INSUFFICIENT SUPPLIES OF DRY FLYASH TO MIX WITH THE SLUDGE. AS A RESULT THE SLUDGE HAS BEEN LEAKING OUT OF THE TRANSPORT TRUCKS WHILE IN TRANSIT TO THE FINAL DISPOSAL SITE. APPARENTLY NOT ENOUGH FLYASH IS BEING COLLECTED WITH THE PRESENT

DUQUESNE LIGHT: PHILLIPS 1-6 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
			PERFORMANCE DATA								
			SYSTEM.								
10/78	101	100.0	96.1	96.1							
	201	97.7	87.5	87.5							
	301	95.3	87.9	87.9							
	401	4.8	2.2	2.2							
	SYSTEM	74.5	68.4	68.4				744	744	509	
11/78	101	44.0	41.1	41.1							
	201	100.0	100.0	100.0							
	301	91.7	88.9	88.9							
	401	71.3	69.0	69.0							
	SYSTEM	76.8	74.8	74.8				720	720	538	

** PROBLEMS/SOLUTIONS/COMMENTS

SO2 AND PARTICULATE MATTER REMOVAL EFFICIENCY TESTS INDICATE THAT THE STATION NOW MEETS STATE STANDARDS.

THE FGD SYSTEM IS EXPERIENCING A LARGE AMOUNT OF SCALING BECAUSE OF THE HIGH EXCESS AIR ENTERING THE SYSTEM FROM THE BOILERS OXIDIZING THE SOFT SULFITE TO SULFATE ON THE SCRUBBER INTERNALS.

12/78	101	91.7	90.8	90.8							
	201	98.0	88.1	88.1							
	301	30.3	27.8	27.8							
	401	90.4	87.5	87.5							
	SYSTEM	77.6	73.6	73.6				744	744	547	

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE PERIOD A LACK OF FLYASH FOR MIXING WITH SLUDGE RESULTED IN A WET SLUDGE PRODUCT THAT MUST BE LEFT ON SITE TO DRY BEFORE TRANSPORT TO THE LANDFILL.

1/79	101	89.0	86.8	86.8							
	201	77.9	69.2	69.2							
	301	50.1	50.0	50.0							
	401	86.1	83.7	83.7							
	SYSTEM	75.8	72.4	72.4				744	744	539	
2/79	101	38.9	38.9	38.9							
	201	72.1	72.1	72.1							
	301	88.3	88.3	88.3							
	401	100.0	100.0	100.0							
	SYSTEM	74.8	74.8	74.8				672	672	503	

** PROBLEMS/SOLUTIONS/COMMENTS

EXCESSIVE SCALING IN THE MODULE 101 EXIT DUCT CAUSED SUPPORT COLUMNS TO COLLAPSE. THE SCALE WAS REMOVED AND THE SUPPORT COLUMNS WERE SHORED UP.

3/79	101	.0	.0	.0							
	201	96.6	96.3	96.3							
	301	97.6	88.0	88.0							
	401	100.0	100.0	100.0							
	SYSTEM	73.6	71.1	71.1				744	744	529	
4/79	101	89.9	86.8	86.8							
	201	5.9	5.9	5.9							
	301	97.6	85.0	85.0							
	401	89.0	84.9	84.9							
	SYSTEM	70.6	65.7	65.7				720	720	473	

EPA UTILITY FGD SURVEY: OCTOBER - DECEMBER 1980

DUQUESNE LIGHT: PHILLIPS 1-6 (CONT.)

PERIOD	MODULE	PERFORMANCE DATA: AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
5/79	101	100.0	100.0		100.0						
	201	.0	.0		.0						
	301	99.3	96.6		96.6						
	401	99.4	99.2		99.2						
	SYSTEM	74.7	74.0		74.0						
6/79	101	70.8	70.5		70.5			744	744	550	
	201	28.8	22.2		22.2						
	301	85.6	83.7		83.7						
	401	85.5	77.2		77.2						
	SYSTEM	67.7	63.4		63.4						
7/79	101	100.0	98.6		98.6			720	720	457	
	201	98.5	95.8		95.8						
	301	72.7	71.4		71.4						
	401	29.9	25.5		25.5						
	SYSTEM	75.3	72.8		72.8						
8/79	101	100.0	100.0		100.0			744	744	542	
	201	97.6	89.5		89.5						
	301	100.0	89.3		89.3						
	401	.0	.0		.0						
	SYSTEM	74.4	69.7		69.7						
9/79	101	88.8	81.8	88.8	81.8			744	744	519	
	201	94.8	80.3	93.9	80.3						
	301	99.6	85.5	99.6	85.5						
	401	.0	.0	.0	.0						
	SYSTEM	70.8	61.9	70.4	61.9						
10/79	101	99.4	97.0	99.3	97.0			720	720	446	
	201	86.5	86.6	86.6	86.6						
	301	93.8	93.0	93.7	93.0						
	401	.0	.0	.0	.0						
	SYSTEM	69.9	69.2	69.9	69.2						
11/79	101	53.0	50.7	51.9	50.7			744	696	515	
	201	99.0	99.0	99.0	99.0						
	301	83.6	83.6	83.6	83.6						
	401	11.5	11.5	11.6	11.5						
	SYSTEM	61.8	61.2	61.5	61.2						
12/79	101	.0	.0	.0	.0			720	720	441	
	201	100.0	98.6	100.0	98.6						
	301	90.7	89.6	90.6	89.6						
	401	77.7	72.9	76.6	72.9						
	SYSTEM	67.1	65.3	66.8	65.3						

** PROBLEMS/SOLUTIONS/COMMENTS

PRESENTLY THE UTILITY HAS BEEN ADDING SODIUM THIOSULFATE TO THE LIME TO PREVENT SCALE FORMATION. THIS PROCESS HAS IMPROVED SO2 COLLECTION AS WELL.

THE SCRUBBER FAN HOUSING LINERS ARE BEING REPLACED.

THE MECHANICAL COLLECTORS ARE BEING UPGRADED TO IMPROVE THE QUALITY OF THE WET SLUDGE.

1/80	101	.0	.0	.0	.0			744	744	486	
	201	98.1	93.3	98.0	93.3						
	301	100.0	99.0	100.0	99.0						

DUQUESNE LIGHT: PHILLIPS 1-6 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	401	97.6	95.8	97.5	95.8						
	SYSTEM	73.9	72.0	73.9	72.0			744	744	536	
2/80	101	13.7	13.7	13.7	13.7						
	201	91.6	91.6	91.7	91.6						
	301	86.2	84.6	86.0	84.6						
	401	94.2	90.5	94.0	90.5						
	SYSTEM	71.4	70.1	71.4	70.1			696	696	488	

** PROBLEMS/SOLUTIONS/COMMENTS

SODIUM THIOSULFATE ADDITION CONTINUED THROUGH THE FIRST QUARTER RESULTING IN A INCIDENCE OF SIGNIFICANTLY REDUCED MIST ELIMINATOR SCALING. 2000-5000 HOURS OF OPERATION HAVE BEEN LOGGED WITHOUT MIST ELIMINATOR SCALE ACCUMULATION. THE UTILITY REPORTED THAT SO2 REMOVAL EFFICIENCY HAS IMPROVED 3% DUE TO THE SODIUM THIOSULFATE ADDITION. THE UTILITY IS LOOKING INTO SODIUM THIOSULFATE ADDITION AT ELRAMA.

THE FAN RUBBER LINERS HAVE BEEN A CONTINUAL PROBLEM. TWO FANS WILL BE REPLACED WITH INCONEL THE NEXT TIME THE RUBBER LINERS FAIL.

THE PHILLIPS FGD SYSTEM HAD A SYSTEM AVAILABILITY OF 71.8% FOR THE YEAR 1979.

3/80	101	94.7	84.0	94.0	84.0						
	201	59.0	53.9	56.8	53.9						
	301	48.4	40.3	43.8	40.3						
	401	95.4	95.3	99.8	95.3						
	SYSTEM	60.3	54.7	73.6	54.7			744	744	407	

** PROBLEMS/SOLUTIONS/COMMENTS

PROBLEMS WERE ENCOUNTERED WITH THE MODULE 101 ID FAN. THE MODULE WAS TAKEN OFF LINE SO THE ID FAN COULD BE BALANCED.

PROBLEMS WERE ENCOUNTERED WITH THE HUB BOLTS ON THE ID FAN OF MODULE 201, CAUSING THE MODULE TO COME OFF LINE FOR 11 DAYS.

THE RUBBER LINING ON THE ID FAN HOUSING OF MODULE 301 NEEDED REPAIR DURING MARCH.

MODULE 401 WAS TAKEN OFF LINE FOR APPROXIMATELY 2 HOURS SO REPAIRS COULD BE MADE ON THE SCRUBBER MAKE-UP VALVES.

4/80	101	92.6	89.4	92.4	89.4						
	201	14.2	10.0	10.5	10.0						
	301	99.2	99.0	99.8	99.0						
	401	95.8	94.6	98.6	94.6						
	SYSTEM	96.9	73.3	75.6	73.3			720	720	527	

** PROBLEMS/SOLUTIONS/COMMENTS

ON APRIL 5 MODULE 101 WAS TAKEN OFF LINE DUE TO ID FAN BEARING PROBLEMS. LATER IN THE MONTH THE MODULE WAS SHUTDOWN DUE TO AN ID FAN INSTRUMENTATION PRESSURE SWITCH PROBLEM.

TOWARDS THE LATTER PART OF APRIL, MODULE 201 WAS SHUTDOWN DUE TO ID FAN BEARING PROBLEMS. THIS PROBLEM WAS CORRECTED BY BALANCING THE FAN.

MODULE 301 WAS REMOVED FROM OPERATION ON APRIL 11 DUE TO AN ID FAN MOTOR MALFUNCTION.

THE RECYCLE PUMP PACKING ON MODULE 401 NEEDED TO BE REPLACED DURING THE MONTH.

DUQUESNE LIGHT: PHILLIPS 1-6 (CONT.)

PERIOD	MODULE	PERFORMANCE DATA AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
5/80	101	67.5	53.9	62.3	53.9						
	201	81.6	69.0	78.9	69.0						
	301	91.7	73.1	89.8	73.1						
	401	92.2	75.9	90.6	75.9						
	SYSTEM	83.2	68.0	80.2	68.0			744	744	506	

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE 101 CAME OFF LINE IN MAY SO REPAIRS COULD BE MADE ON THE CONTROL DAMPER AND TO INSTRUMENTATION.

DURING MAY MODULE 201 EXPERIENCED PROBLEMS WITH THE MIST ELIMINATOR AND THE ID FAN. THE MODULE WAS TAKEN OFF LINE FOR APPROXIMATELY TWO DAYS TO WASH THE MISTELIMINATOR INTERNALS AND ONE DAY TO REPAIR THE ID FAN BEARING.

MODULE 301 EXPERIENCED ID FAN PROBLEMS AND WAS TAKEN OFF LINE WHILE THE ID FAN WAS BALANCED.

MODULE 401 WAS SHUTDOWN APPROXIMATELY 58 HOURS SO THAT THE ID FAN CONTROL DAMPERS COULD BE INSPECTED.

6/80	101	97.1	86.3	96.5	80.5						
	201	100.0	81.7	100.0	76.2						
	301	75.5	69.4	72.6	64.8						
	401	100.0	76.5	100.0	71.4						
	SYSTEM	93.2	78.5	91.5	73.2			720	672	527	55.3

** PROBLEMS/SOLUTIONS/COMMENTS

THE MODULE 101 MIST ELIMINATOR WAS CLEANED DURING JUNE.

DURING JUNE MODULE 301 WAS DOWN FOR ID FAN HOUSING REPAIRS (RUBBER LINING) CAUSING APPROXIMATELY 176 HOURS DOWN TIME.

7/80	101	94.0	86.2	93.5	86.2						
	201	100.0	94.7	100.0	94.7						
	301	94.7	84.1	94.0	84.1						
	401	91.1	83.5	90.3	83.5						
	SYSTEM	94.9	87.1	94.5	87.1			744	744	648	71.4

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JULY THE RECYCLE PUMP IMPELLERS WERE REPLACED ON ALL THE MODULES EXCEPT FOR MODULE 201.

8/80	101	91.1	72.9	90.6	72.9						
	201	96.9	85.8	96.5	85.8						
	301	87.6	85.3	89.6	85.3						
	401	92.3	86.1	91.8	86.1						
	SYSTEM	92.0	82.5	91.5	82.5			744	744	614	58.5

** PROBLEMS/SOLUTIONS/COMMENTS

DURING AUGUST MODULE 401 EXPERIENCED PACKING PROBLEMS WITH THE RECYCLE PUMP.

DURING THE PERIOD OF JUNE THROUGH AUGUST THE RUBBER LININGS ON THE FAN HOUSINGS WERE REPAIRED.

9/80	101	55.8	55.8	60.9	55.8						
	201	46.1	41.7	43.6	41.7						
	301	54.9	46.2	50.6	46.2						

DUQUESNE LIGHT: PHILLIPS 1-6 (CONT.)

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	401	60.6	32.9	45.5	32.9						
	SYSTEM	54.4	47.3	47.0	44.2			720	720	318	30.1

** PROBLEMS/SOLUTIONS/COMMENTS

ON SEPTEMBER 20 THE ENTIRE PLANT WAS SHUTDOWN FOR A SCRUBBER INSPECTION. THE INSPECTION REVEALED THAT THERE IS EXTENSIVE MORTAR DETERIORATION IN THE STACK AND THAT REPAIRS WILL BE NECESSARY WITHIN THE NEXT TWO YEARS.

THE INSPECTION LASTED UNTIL OCTOBER 1 DUE TO THE NECESSARY REPAIR OF A DUCT EXPANSION JOINT AND THE REPAIR OF THE UPPER PORTION OF THE STACK JOINTS.

10/80	101	94.2	94.2	94.2	94.2						
	201	93.9	90.1	93.5	90.1						
	301	4.0	4.0	4.0	4.0						
	401	93.8	92.6	93.6	92.6						
	SYSTEM	71.5	70.2	71.3	70.2			744	720	523	58.2

** PROBLEMS/SOLUTIONS/COMMENTS

DURING OCTOBER SCRUBBER MODULES 301 AND 401 WERE RELINED WITH CEILCOTE CORALINE 505 AR LINERS.

11/80	101	51.5	50.8	51.2	50.8						
	201	100.0	99.9	99.9	99.9						
	301	95.3	93.5	95.2	93.5						
	401	92.3	91.6	92.2	91.6						
	SYSTEM	84.8	84.0	84.6	84.0			720	720	604	72.1

** PROBLEMS/SOLUTIONS/COMMENTS

DURING NOVEMBER MODULE 101 WAS RELINED WITH CEILCOTE CORALINE 505 AR LINER.

12/80	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

INFORMATION FOR THE MONTH OF DECEMBER WAS NOT AVAILABLE AT THIS TIME.

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	GULF POWER	
PLANT NAME	SCHOLZ	
UNIT NUMBER	1	
CITY	SNEADS	
STATE	FLORIDA	
REGULATORY CLASSIFICATION	E	
PARTICULATE EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	80	
GROSS UNIT GENERATING CAPACITY - MW	20	
NET UNIT GENERATING CAPACITY W/FGD - MW	*****	
NET UNIT GENERATING CAPACITY WO/FGD - MW	*****	
EQUIVALENT SCRUBBED CAPACITY - MW	20	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	BABCOCK & WILCOX	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	50.02	(106000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	*******	(**** F)
STACK HEIGHT - M	******	(**** FT)
STACK SHELL	******	
STACK TOP DIAMETER - M	*******	(***** FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	******	
AVERAGE HEAT CONTENT - J/G	30005.	(12900 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		******
AVERAGE ASH CONTENT - %	********	
RANGE ASH CONTENT - %	******	
AVERAGE MOISTURE CONTENT - %	********	
RANGE MOISTURE CONTENT - %	******	
AVERAGE SULFUR CONTENT - %	3.25	
RANGE SULFUR CONTENT - %	3-3.5	
AVERAGE CHLORIDE CONTENT - %	********	
RANGE CHLORIDE CONTENT - %	******	
*** PARTICLE CONTROL		
** ESP		
NUMBER	1	
*** FGD SYSTEM		
** GENERAL DATA		
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT	
SO2 REMOVAL MODE	WET SCRUBBING	
PROCESS TYPE	DUAL ALKALI/LIMESTONE	
SYSTEM SUPPLIER	COMBUSTION EQUIP ASSOCIATES	
A-E FIRM	A.D. LITTLE	
DEVELOPMENT LEVEL	DEMONSTRATION	
NEW/RETROFIT	RETROFIT	
CURRENT STATUS	1	
INITIAL START-UP	8/80	
** DESIGN AND OPERATING PARAMETERS		
** ABSORBER		
GENERIC TYPE	TRAY TOWER	
** REHEATER		
GENERIC TYPE	INDIRECT HOT AIR	
TEMPERATURE INCREASE - C	4.4	(40 F)
** SOLIDS CONCENTRATING/DEWATERING		
DEVICE	CENTRIFUGE	
NUMBER	4	

GULF POWER: SCHOLZ 1 (CONT.)

SHELL SPECIFIC MATERIAL TYPE	STAINLESS STEEL
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	CENTRIFUGE
NUMBER	4
SHELL GENERIC MATERIAL TYPE	STAINLESS STEEL
FEED STREAM CHARACTERISTICS	10% SOLIDS
** WATER BALANCE	
WATER LOOP TYPE	CLOSED

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
8/80	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

INITIAL OPERATION OF THIS DEMONSTRATION LIMESTONE DUAL ALKALI SYSTEM BEGAN ON AUGUST 20. OPERATIONS DURING THE REST OF THE MONTH WERE INTERMITTENT AS MECHANICAL PROBLEMS WERE RECTIFIED.

9/80	SYSTEM							720			
10/80	SYSTEM							744			
11/80	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM CONTINUED TO OPERATE THROUGH NOVEMBER IN A DEBUGGING MODE OF OPERATION.

12/80	SYSTEM				75.9			744		565	

** PROBLEMS/SOLUTIONS/COMMENTS

DURING DECEMBER THE DEMONSTRATION FGD SYSTEM OPERATED CONTINUOUSLY FOR TWO EIGHT DAY PERIODS. DURING THIS TIME THE SYSTEM SO2 REMOVAL EFFICIENCY WAS FOUND TO BE GREATER THAN 90%.

THE FGD SYSTEM WAS FORCED TO REMAIN OFF LINE FOR 6-8 DAYS IN DECEMBER DUE TO AN UNAVAILABILITY OF RAW MATERIALS.

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	INDIANAPOLIS POWER & LIGHT	
PLANT NAME	PETERSBURG	
UNIT NUMBER	3	
CITY	PETERSBURG	
STATE	INDIANA	
REGULATORY CLASSIFICATION	B	
PARTICULATE EMISSION LIMITATION - NG/J	43.	(.100 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	516.	(1.200 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	1180	
GROSS UNIT GENERATING CAPACITY - MW	532	
NET UNIT GENERATING CAPACITY W/FGD - MW	515	
NET UNIT GENERATING CAPACITY WO/FGD - MW	528	
EQUIVALENT SCRUBBED CAPACITY - MW	532	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	COMBUSTION ENGINEERING	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	928.23	(1967000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	137.2	(279 F)
STACK HEIGHT - M	188.	(616 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	6.1	(20.0 FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	BITUMINOUS	
AVERAGE HEAT CONTENT - J/G	25004.	(10750 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		******
AVERAGE ASH CONTENT - %	********	
RANGE ASH CONTENT - %	9-10	
AVERAGE MOISTURE CONTENT - %	********	
RANGE MOISTURE CONTENT - %	10.5-16.5	
AVERAGE SULFUR CONTENT - %	3.25	
RANGE SULFUR CONTENT - %	1.5-4.5	
AVERAGE CHLORIDE CONTENT - %	********	
RANGE CHLORIDE CONTENT - %	******	
*** PARTICLE CONTROL		
** ESP		
NUMBER	2	
TYPE	COLD SIDE	
SUPPLIER	RESEARCH-COTTRELL	
INLET FLUE GAS CAPACITY - CU.M/S	928.2	(1967000 ACFM)
INLET FLUE GAS TEMPERATURE - C	137.2	(279 F)
PRESSURE DROP - KPA	.4	(2. IN-H2O)
PARTICLE REMOVAL EFFICENCY - %	99.3	
** PARTICLE SCRUBBER		
GENERIC TYPE	NONE	
SPECIFIC TYPE	N/A	
*** FGD SYSTEM		
** GENERAL DATA		
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT	
SO2 REMOVAL MODE	WET SCRUBBING	
PROCESS TYPE	LIMESTONE	
PROCESS ADDITIVES	NONE	
SYSTEM SUPPLIER	AIR CORRECTION DIVISION, UOP	
A-E FIRM	GIBBS & HILL	
DEVELOPMENT LEVEL	FULL SCALE	
NEW/RETROFIT	NEW	
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.30	
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	85.00	
CURRENT STATUS	1	
COMMERCIAL START-UP	12/77	

INDIANAPOLIS POWER & LIGHT: PETERSBURG 3 (CONT.)

INITIAL START-UP	12/77	
CONTRACT AWARDED	1/75	

** DESIGN AND OPERATING PARAMETERS

** ABSORBER

NUMBER	4	
NUMBER OF SPARES	0	
GENERIC TYPE	PACKED TOWER	
SPECIFIC TYPE	MOBILE BED PACKING	
TRADE NAME/COMMON TYPE	TURBULENT CONTACT ABSORBER	
SUPPLIER	AIR CORRECTION DIVISION, UOP	
DIMENSIONS - FT	30 X 30 X 100	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	AISI 1110	
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A	
LINER GENERIC MATERIAL	ORGANIC	
LINER SPECIFIC MATERIAL	SYNTHETIC RUBBER	
LINER MATERIAL TRADE NAME/COMMON TYPE	NEOPRENE	
GAS CONTACTING DEVICE TYPE	1.5 INCH DIA RUBBER BALLS	
NUMBER OF CONTACTING ZONES	3	
DISTANCE BETWEEN GAS CONTACTING ZONES - CM	30.5	(12.0IN)
LIQUID RECIRCULATION RATE - LITER/S	5947.	(94400 GPM)
L/G RATIO - L/CU.M	6.7	(50.0 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	1.7	(7.0 IN-H2O)
SUPERFICAL GAS VELOCITY - M/SEC	4.4	(14.5 FT/S)
INLET GAS FLOW - CU. M/S	176.96	(375000 ACFM)
INLET GAS TEMPERATURE - C	47.8	(118 F)
SO2 REMOVAL EFFICIENCY - %	85.0	

** MIST ELIMINATOR

PRE-MIST ELIMINATOR/MIST ELIMINATOR	MIST ELIMINATOR	
NUMBER PER SYSTEM	8	
GENERIC TYPE	IMPINGEMENT	
SPECIFIC TYPE	BAFFLE	
TRADE NAME/COMMON TYPE	CHEVRON VANE	
CONFIGURATION	HORIZONTAL	
NUMBER OF STAGES	2	
NUMBER OF PASSES PER STAGE	7	
FREEBOARD DISTANCE - M	.37	(1.2 FT)
CONSTRUCTION MATERIAL GENERIC TYPE	PLASTIC	
WASH WATER SOURCE	THICKENER OVERFLOW AND MAKEUP	

** REHEATER

NUMBER	2	
GENERIC TYPE	INDIRECT HOT AIR	
SPECIFIC TYPE	EXTERNAL HEAT EXCHANGER	
TRADE NAME/COMMON TYPE	STEAM TUBE BUNDLES	
PERCENT GAS BYPASSED - AVG	.0	
TEMPERATURE INCREASE - C	-1.1	(30 F)
INLET FLUE GAS FLOW RATE - CU. M/S	149.59	(317000 ACFM)
INLET FLUE GAS TEMPERATURE - C	21.1	(70 F)
NUMBER OF TUBES PER BUNDLE	565	
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	

** FANS

NUMBER	2	
NUMBER OF SPARES	0	
DESIGN	CENTRIFUGAL	
SUPPLIER	STURTEVANT DIV., WESTINGHOUSE	
FUNCTION	BOOSTER	
APPLICATION	FORCED DRAFT	
SERVICE	DRY	
FLUE GAS FLOW RATE - CU.M/S	224.15	(475000 ACFM)
FLUE GAS TEMPERATURE - C	137.2	(279 F)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	

** DUCTWORK

LOCATION	SCRUBBER INLET
DIMENSIONS	10 X 10
SHELL GENERIC MATERIAL TYPE	CARBON STEEL

INDIANAPOLIS POWER & LIGHT: PETERSBURG 3 (CONT.)

LINER GENERIC MATERIAL TYPE	NONE
** DUCTWORK	
LOCATION	SCRUBBER OUTLET
DIMENSIONS	10 X 10
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
LINER GENERIC MATERIAL TYPE	RESISTIFLAKE 1150
** REAGENT PREPARATION EQUIPMENT	
FUNCTION	LIMESTONE GRINDING
DEVICE	BALL MILL
MANUFACTURER	KENNEDY VAN SAUN
NUMBER	1
FULL LOAD DRY FEED CAPACITY - M.TONS/HR	38.1 (42 TPH)
PRODUCT QUALITY - % SOLIDS	48.8
** TANKS	
SERVICE	NUMBER
LIMESTONE SLURRY	2
WASTE SLURRY	1
RECYCLE	4
THICKENER OVERFLOW	1
** PUMPS	
SERVICE	NUMBER
ABSORBER RECIRCULATION	12
SLURRY TRANSFER	2
WASTE SLURRY	2
WASTE SLURRY BOOSTER	2
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	VACUUM FILTER
NUMBER	2
NUMBER OF SPARES	0
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	THICKENER
NUMBER	1
NUMBER OF SPARES	0
DIMENSIONS - FT	165 DIA.
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
LINER SPECIFIC MATERIAL TYPE	RUBBER
FEED STREAM CHARACTERISTICS	10.6% SOLIDS
OUTLET STREAM CHARACTERISTICS	35% SOLIDS
*** SLUDGE	
** TREATMENT	
METHOD	POZ-O-TEC
PROPRIETARY PROCESS	IUCS
** DISPOSAL	
NATURE	FINAL
TYPE	LANDFILL
LOCATION	ON SITE
SITE TRANSPORTATION METHOD	TRUCK
** PROCESS CONTROL AND INSTRUMENTATION	
CHEMICAL PARAMETERS	PH, FLUE GAS OUTLET FLOW, INLET SO2 CONCENTRATIO
CONTROL LEVELS	PH 5.5-5.9
MONITOR LOCATION	RECYCLE SLURRY LINE
PROCESS CONTROL MANNER	MANUAL
PROCESS CHEMISTRY MODE	FEEDBACK
** WATER BALANCE	
WATER LOOP TYPE	CLOSED
MAKEUP WATER ADDITION - LITERS/S	55.6 (882 GPM)

INDIANAPOLIS POWER & LIGHT: PETERSBURG 3 (CONT.)

** CHEMICALS AND CONSUMPTION

FUNCTION	ABSORBENT
NAME	LIMESTONE
CONSUMPTION	84300 LB/HR

** FGD SPARE CAPACITY INDICES

ABSORBER - %	.0

** FGD SPARE COMPONENT INDICES

ABSORBER	.0

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
12/77	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER BEGAN COMMERCIAL OPERATIONS ON NOVEMBER 29, 1977.

OPERATION OF ALL FOUR MODULES COMMENCED DURING DECEMBER. CURRENTLY PH ADJUSTMENTS AND OTHER SHAKEDOWN PROCEDURES ARE IN PROGRESS.

REPAIRS TO THE RECYCLE TANK AGITATOR WERE REQUIRED.

COLD WEATHER ARRIVED EARLIER THAN EXPECTED. TEMPORARY ENCLOSURES WERE CONSTRUCTED AROUND SOME FGD COMPONENTS. THESE ENCLOSURES WILL BE REMOVED WHEN INSTALLATION OF HEAT TRACING CAN BE COMPLETED.

1/78	SYSTEM							744		0	

** PROBLEMS/SOLUTIONS/COMMENTS

INSTALLATION OF HEAT TRACING ON FGD SYSTEM COMPONENTS WAS COMPLETED DURING THE PERIOD.

2/78	SYSTEM							672		0	

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER WAS TAKEN OFF LINE ON FEBRUARY 24 TO ALLOW CORRECTION OF THE PROBLEMS ASSOCIATED WITH THE FLYASH REMOVAL SYSTEM.

PIPE AND VALVE FREEZE-UP DAMAGE WAS ENCOUNTERED AND REPAIRED.

REPAIRS WERE MADE ON THE ISOLATION DAMPERS.

3/78	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

INSULATION WAS INSTALLED ON FGD SYSTEM COMPONENTS DURING A SCHDEULED SYSTEM OUTAGE.

A BROKEN PINION GEAR IN THE THICKENER WAS REPAIRED DURING THE SYSTEM OUTAGE.

INSTRUMENTATION MAINTENANCE WAS PERFORMED DURING THE SYSTEM OUTAGE.

PROBLEMS WITH THE FLYASH HANDLING SYSTEM HAVE NOT YET BEEN SOLVED.

4/78	SYSTEM							720			

INDIANAPOLIS POWER & LIGHT: PETERSBURG 3 (CONT.)

PERIOD	MODULE AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER BOILER HOURS	FGD HOURS	CAP. FACTOR
				PERFORMANCE DATA					
5/78	SYSTEM						744		
	** PROBLEMS/SOLUTIONS/COMMENTS								
	THE MAIN POWER TRANSFORMER FAULTED CAUSING THE SYSTEM TO SHUTDOWN.								
6/78	SYSTEM						720		
	** PROBLEMS/SOLUTIONS/COMMENTS								
	THE SYSTEM SHUTDOWN RESULTING FROM THE MAIN POWER TRANSFORMER FAILURE IN MAY, LASTED THROUGH JUNE 16.								
7/78	SYSTEM						744		
	** PROBLEMS/SOLUTIONS/COMMENTS								
	THE FGD SYSTEM IS STILL EXPERIENCING SHAKEDOWN PROBLEMS. DURING THIS PERIOD SOME DESIGN CHANGES HAVE BEEN MADE TO IMPROVE OPERATIONS.								
	VALVE PROBLEMS WERE ENCOUNTERED DURING JULY. MANY VALVES HAD TO BE REMOVED AND REPAIRED.								
8/78	SYSTEM						744		
	** PROBLEMS/SOLUTIONS/COMMENTS								
	PROBLEMS HAVE BEEN EXPERIENCED WITH INSTRUMENTATION.								
	CRACKING PROBLEMS HAVE BEEN EXPERIENCED WITH FIBERGLASS PIPING. THE PROBLEM WAS SOLVED BY REPLACING SECTIONS WITH RUBBER LINED STEEL PIPING, NEW FRP PIPING, AND PROVIDING ADDITIONAL PIPE SUPPORTS.								
9/78	SYSTEM						720		
10/78	SYSTEM						744		
	** PROBLEMS/SOLUTIONS/COMMENTS								
	BYPASS DAMPER PROBLEMS WERE EXPERIENCED.								
	AN SO2 COMPLIANCE TEST WAS INVALID DUE TO BYPASS DAMPER PROBLEMS.								
11/78	SYSTEM						720		
	** PROBLEMS/SOLUTIONS/COMMENTS								
	FREEZE-UPS IN THE LIME DELIVERY SYSTEM WERE EXPERIENCED.								
	AN INSTRUMENTATION POWER TRANSFORMER FAILURE FORCED THE SYSTEM OUT OF SERVICE FOR ABOUT SIX DAYS.								
12/78	SYSTEM						744		

INDIANAPOLIS POWER & LIGHT: PETERSBURG 3 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
				PERFORMANCE DATA							

** PROBLEMS/SOLUTIONS/COMMENTS

MONTHLY OPERATIONAL HOURS ARE NOT YET AVAILABLE. THE UTILITY REPORTED THAT THE SYSTEM HAS NOT YET PASSED AN ACCEPTANCE TEST.

THE FOLLOWING CUMULATIVE FGD SYSTEM UTILIZATION FIGURES FOR THE PERIOD SEPTEMBER 15 THROUGH DECEMBER 29, 1978 WERE CALCULATED BASED UPON UTILITY REPORTED FGD SYSTEM HOURS FOR THE SAME PERIOD.

A MODULE	22.1%
B MODULE	21.7%
C MODULE	34.6%
D MODULE	34.1%
SYSTEM	28.1%

REPORTED FGD SYSTEM HOURS FOR THIS PERIOD WERE 562, 551, 880 AND 868 FOR MODULES A, B, C AND D RESPECTIVELY.

1/79	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS SHUTDOWN ON JANUARY 1, 1979 AS A RESULT OF SEVERE WINTER WEATHER CONDITIONS.

2/79	SYSTEM							672			
3/79	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS DOWN FROM JANUARY 1 TO MARCH 15 DUE TO SEVERE WINTER WEATHER.

4/79	SYSTEM							722			

** PROBLEMS/SOLUTIONS/COMMENTS

DUE TO THE FORMER STACK LINING PEELING AWAY, THE STEEL SHELL WAS SAND BLASTED AND RIGIFLAKE 4850 APPLIED BY TROWEL.

ALL MIST ELIMINATORS WERE CLEANED DUE TO SEVERE SCALING PROBLEMS.

EXTENSIVE REPAIRS WERE MADE TO THE INLET DAMPERS, THE OUTLET DUCTS WERE LINED WITH RESISTIFLAKE 1150, AND MAJOR REPAIRS WERE MADE TO BONNETS BECAUSE OF ACID CORROSION.

THE SYSTEM HAS BEEN DOWN SINCE MID-MARCH FOR INSPECTION AND MAINTENANCE.

5/79	SYSTEM							744			
6/79	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE SYSTEM RAN ABOUT THREE DAYS TOTAL DURING THIS THIS PERIOD.

PROCESS CONTROL HAS BEEN A MAJOR PROBLEM AREA SINCE THE SYSTEM BEGAN INITIAL OPERATIONS.

MIST ELIMINATOR PLUGGING CONTRIBUTED TO THE OUTAGE TIME ACCUMULATED DURING THIS PERIOD.

7/79	SYSTEM							744			

EPA UTILITY FGD SURVEY: OCTOBER - DECEMBER 1980

INDIANAPOLIS POWER & LIGHT: PETERSBURG 3 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
				PERFORMANCE DATA							
8/79	SYSTEM							744			
9/79	SYSTEM				.0			720	0	0	.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UNIT WAS SHUTDOWN FOR A SCHEDULED BOILER AND SCRUBBER OVERHAUL IN SEPTEMBER.									
10/79	SYSTEM				.0			744	0	0	.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UNIT WAS DOWN FOR A SCHEDULED BOILER/TURBINE/FGD SYSTEM OUTAGE FOR FOUR WEEKS. THE UNIT STARTED UP AGAIN AFTER THE OUTAGE BUT HAD TO SHUTDOWN AFTER ONLY A FEW DAYS BECAUSE OF BOILER PROBLEMS.									
		INSTRUMENTATION IS A CONTINUING PROBLEM. THE MODULE PRESSURE MONITORS, AND SO2 AND PH MONITORS ARE ALL INOPERATIVE. THE UTILITY HAS BEEN UNABLE TO KEEP THE FGD SYSTEM ON LINE FOR MORE THAN 10 DAYS WITHOUT HAVING AT LEAST ONE MODULE FORCED OUT OF SERVICE.									
11/79	SYSTEM							720	360		
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UNIT CAME BACK ON LINE AGAIN IN MID-NOVEMBER AFTER RESOLUTION OF BOILER PROBLEMS.									
12/79	SYSTEM							744			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING THE FOURTH QUARTER THE UTILITY REPORTED THAT THERE WERE NO NEW MAJOR PROBLEMS.									
1/80	SYSTEM							744			
2/80	SYSTEM							696			
3/80	SYSTEM							744			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING THE FIRST QUARTER OF 1980, THE ENTIRE SCRUBBER PACKING BED WAS LOST DUE TO EXCESSIVE WEAR OF THE NEOPRENE FOAM PACKING BALLS. THE UNIT WILL BE TAKEN OFF LINE IN APRIL TO ACCOMODATE NECESSARY REPAIRS AND REPLACEMENT OF THE BALLS.									
		BYPASS DAMPER FAILURES ALSO OCCURRED AND ARE REPORTED TO BE A CONTINUAL PROBLEM. MODIFICATIONS WERE MADE TO THE GULLOTINE TYPE DAMPERS DURING THE PERIOD.									
4/80	SYSTEM							720			
5/80	SYSTEM							744			
6/80	SYSTEM							720			

INDIANAPOLIS POWER & LIGHT: PETERSBURG 3 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
	NO INFORMATION WAS AVAILABLE FOR THE PERIOD APRIL 1980 THROUGH JUNE 1980.										
7/80	SYSTEM							744			
8/80	SYSTEM							744			
9/80	SYSTEM							720			
	** PROBLEMS/SOLUTIONS/COMMENTS										
	THE OPERATIONAL DATA FOR THE THIRD QUARTER 1980 WERE NOT AVAILABLE FOR PUBLICATION.										
10/80	SYSTEM							744			
11/80	SYSTEM							720			
12/80	SYSTEM							744			
	** PROBLEMS/SOLUTIONS/COMMENTS										
	THE UTILITY REPORTED DTHAT OPERATIONAL DATA FOR FGD OPERATIONS AT PETERSBURG 3 ARE STILL UNAVAILABLE FOR RELEASE.										

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	KANSAS CITY POWER & LIGHT	
PLANT NAME	HAWTHORN	
UNIT NUMBER	3	
CITY	KANSAS CITY	
STATE	MISSOURI	
REGULATORY CLASSIFICATION	D	
PARTICULATE EMISSION LIMITATION - NG/J	64.	(.150 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	836	
GROSS UNIT GENERATING CAPACITY - MW	90	
NET UNIT GENERATING CAPACITY W/FGD - MW	85	
NET UNIT GENERATING CAPACITY WO/FGD - MW	87	
EQUIVALENT SCRUBBED CAPACITY - MW	90	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	COMBUSTION ENGINEERING	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	CYCLING	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	235.95	(500000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	148.9	(300 F)
STACK HEIGHT - M	61.	(200 FT)
STACK SHELL	CARBON STEEL	
STACK TOP DIAMETER - M	5.5	(18.0 FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	BITUMINOUS	
AVERAGE HEAT CONTENT - J/G	22795.	(9800 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		******
AVERAGE ASH CONTENT - %	11.00	
RANGE ASH CONTENT - %	******	
AVERAGE MOISTURE CONTENT - %	********	
RANGE MOISTURE CONTENT - %	******	
AVERAGE SULFUR CONTENT - %	.60	
RANGE SULFUR CONTENT - %	******	
AVERAGE CHLORIDE CONTENT - %	********	
RANGE CHLORIDE CONTENT - %	******	
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	BITUMINOUS	
AVERAGE HEAT CONTENT - J/G	26516.	(11400 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		******
AVERAGE ASH CONTENT - %	14.00	
RANGE ASH CONTENT - %	******	
AVERAGE MOISTURE CONTENT - %	********	
RANGE MOISTURE CONTENT - %	******	
AVERAGE SULFUR CONTENT - %	3.00	
RANGE SULFUR CONTENT - %	******	
AVERAGE CHLORIDE CONTENT - %	********	
RANGE CHLORIDE CONTENT - %	******	
*** PARTICLE CONTROL		
** PARTICLE SCRUBBER		
GENERIC TYPE	PACKED TOWER	
SPECIFIC TYPE	STATIC BED PACKING	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	AISI 1110	
*** FGD SYSTEM		
** GENERAL DATA		
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT	
SO2 REMOVAL MODE	WET SCRUBBING	
PROCESS TYPE	LIME	
PROCESS ADDITIVES	NONE	
SYSTEM SUPPLIER	COMBUSTION ENGINEERING	

KANSAS CITY POWER & LIGHT: HAWTHORN 3 (CONT.)

A-E FIRM	BLACK & VEATCH	
DEVELOPMENT LEVEL	FULL SCALE	
NEW/RETROFIT	RETROFIT	
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.00	
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	70.00	
CURRENT STATUS	1	
INITIAL START-UP	11/72	
CONTRACT AWARDED	0/71	

** DESIGN AND OPERATING PARAMETERS

** ABSORBER

NUMBER	2	
GENERIC TYPE	PACKED TOWER	
SPECIFIC TYPE	STATIC BED PACKING	
TRADE NAME/COMMON TYPE	MARBLE BED SCRUBBER	
SUPPLIER	COMBUSTION ENGINEERING	
DIMENSIONS - FT	18 X 26 X 56	
SHELL GENERIC MATERIAL	STAINLESS STEEL,CARBON STEEL	
SHELL SPECIFIC MATERIAL	AISI 1110,AUSTENITIC	
SHELL MATERIAL TRADE NAME/COMMON TYPE	TYPE 316L,N/A	
LINER GENERIC MATERIAL	ORGANIC	
LINER SPECIFIC MATERIAL	GLASS FLAKE-FILLED POLYESTER	
LINER MATERIAL TRADE NAME/COMMON TYPE	CEILCOTE FLAKEGLASS	
GAS CONTACTING DEVICE TYPE	0.75 IN DIA GLASS MARBLES IN A 3 TO 4 IN BED	
NUMBER OF CONTACTING ZONES	1	
DISTANCE BETWEEN GAS CONTACTING ZONES - CM	10.2	(4.0IN)
L/G RATIO - L/CU.M	3.5	(26.0 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	2.7	(11.0 IN-H2O)
SUPERFICAL GAS VELOCITY - M/SEC	3.0	(10.0 FT/S)
INLET GAS FLOW - CU. M/S	76.45	(162000 ACFM)
INLET GAS TEMPERATURE - C	50.0	(122 F)
SO2 REMOVAL EFFICIENCY - %	70.0	

** MIST ELIMINATOR

PRE-MIST ELIMINATOR/MIST ELIMINATOR	MIST ELIMINATOR	
NUMBER PER SYSTEM	2	
GENERIC TYPE	IMPINGEMENT	
SPECIFIC TYPE	BAFFLE	
TRADE NAME/COMMON TYPE	CHEVRON VANE	
CONFIGURATION	HORIZONTAL	
NUMBER OF STAGES	2	
NUMBER OF PASSES PER STAGE	2	
FREEBOARD DISTANCE - M	3.05	(10.0 FT)
DISTANCE BETWEEN STAGES - CM	15.24	(6.0 IN)
DISTANCE BETWEEN VANES - CM	7.6	(3.00 IN)
VANE ANGLES - DEGREES	45	
PRESSURE DROP - KPA	.3	(1.2 IN-H2O)
SUPERFICAL GAS VELOCITY - M/S	3.0	(10.0 FT/S)
CONSTRUCTION MATERIAL GENERIC TYPE	FIBERGLASS REINFORCED PLASTIC	
WASH WATER SOURCE	BLENDED RIVER AND THICKENER OVERFLOW WATER	
WASH RATE - L/S	126.2	(2000 GAL/MIN)

** REHEATER

GENERIC TYPE	IN-LINE	
SPECIFIC TYPE	HOT WATER	
TEMPERATURE INCREASE - C	10.0	(50 F)
NUMBER OF TUBES PER BUNDLE	2	
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	

** FANS

NUMBER	2	
DESIGN	CENTRIFUGAL	
FUNCTION	BOOSTER	
APPLICATION	INDUCED DRAFT	
SERVICE	DRY	
FLUE GAS TEMPERATURE - C	79.4	(175 F)

** DUCTWORK

LOCATION	SCRUBBER INLET	
SHELL GENERIC MATERIAL TYPE	COR-TEN STEEL	

KANSAS CITY POWER & LIGHT: HAWTHORN 3 (CONT.)

LINER GENERIC MATERIAL TYPE	GUNITE (2 IN)
** DUCTWORK	
LOCATION	SCRUBBER OUTLET
SHELL GENERIC MATERIAL TYPE	COR-TEN STEEL
LINER GENERIC MATERIAL TYPE	GUNITE (2 IN)
** REAGENT PREPARATION EQUIPMENT	
FUNCTION	LIME SLAKING
DEVICE	SLAKER
NUMBER	1
FULL LOAD DRY FEED CAPACITY - M.TONS/HR	51.7 (57 TPH)
** TANKS	
SERVICE	NUMBER
-------	------
SO2 SCRUBBER TOWER HOLDUP	****
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	THICKENER
NUMBER	1
DIMENSIONS - FT	115 (DIA) X 10 (DEPTH)
*** SLUDGE	
** TREATMENT	
METHOD	FLYASH STABILIZATION
** DISPOSAL	
NATURE	FINAL
TYPE	POND
LOCATION	ON SITE
SITE CAPACITY - CU.M	3130880 (2560.0 ACRE-FT)
** PROCESS CONTROL AND INSTRUMENTATION	
CHEMICAL PARAMETERS	PH
CONTROL LEVELS	4.5-6.5
** WATER BALANCE	
WATER LOOP TYPE	CLOSED
** FGD SPARE CAPACITY INDICES	
ABSORBER - %	.0
** FGD SPARE COMPONENT INDICES	
ABSORBER	.0

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
0/72	SYSTEM										

** PROBLEMS/SOLUTIONS/COMMENTS

THE ORIGINAL FGD SYSTEM INSTALLED ON THE HAWTHORN 3 UNIT BEGAN INITIAL OPERATIONS IN NOVEMBER 1972. THE PROCESS CONSISTED OF DRY LIMESTONE INJECTION INTO THE BOILER FURNACE WHERE THE LIMESTONE WAS CALCINED TO LIME. THE FURNACE CALCINED LIMESTONE AND BOILER FLUE GAS WERE THEN DISCHARGED TO A TAIL-END WET SCRUBBING SYSTEM CONSISTING OF TWO MARBLE-BED ABSORBERS WHERE PARTICLES AND SO2 WERE REMOVED FROM THE GAS STREAM. EACH ABSORBER WAS CAPABLE OF TREATING 500,000 ACFM OF FLUE GAS AT 300 F.

7/75	3A	.0	.0							
	3B	42.0	33.2							
	SYSTEM	21.0	16.6					744	584	123

KANSAS CITY POWER & LIGHT: HAWTHORN 3 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
		PROBLEMS WITH THE 3A MODULE DURING JULY INCLUDED A LEAK IN THE CITY WATER LINE, A PLUGGED DUCT TO THE ID FAN, AND A MALFUNCTIONING OUTLET DAMPER FROM THE SCRUBBER. IN MODULE 3B SOME MARBLES WERE LOST FROM THE BED AND A SPRAY HEADER WAS BROKEN.									
8/75	SYSTEM				.0			744	0	0	.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE ID FAN FOR HALF THE BOILER WAS LOST DURING AUGUST.									
		THE PROBLEMS ENCOUNTERED IN JULY CONTINUED INTO AUGUST FORCING THE FGD SYSTEM TO REMAIN OFF LINE FOR THE MONTH.									
9/75	3A		69.0		34.3						
	3B		23.0		11.3						
	SYSTEM		46.0		22.8			720	358	164	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		AN OUTAGE DUE TO CLEANING AND MECHANICAL REPAIRS OCCURRED. POTS, COVERS, AND MARBLES IN THE MARBLE BED OF MODULE 3B WERE REPLACED. THE BOILER HOURS OF OPERATION ARE BASED ON THE NUMBER OF HOURS OF COAL FIRED OPERATION (I.E., TIME DURING WHICH THE BOILER FIRED NATURAL GAS IS NOT INCLUDED).									
10/75	3A		65.0		15.7						
	3B		81.0		19.5						
	SYSTEM		73.0		17.6			744	180	131	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		MODULE 3A OUTAGE WAS DUE LARGELY TO REPLACEMENT OF A RECYCLE PUMP MOTOR.									
		A SCHEDULED BOILER OVERHAUL REDUCED BOILER OPERATION HOURS DURING OCTOBER.									
11/75	SYSTEM				.0			720	0	0	.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE BOILERS AND SCRUBBERS WERE SHUT DOWN FOR A SCHEDULED TURBINE OVERHAUL. THE SYSTEM IS SCHEDULED TO GO BACK ON-LINE IN JANUARY 1976.									
12/75	SYSTEM				.0			744	0	0	.0
1/76	SYSTEM				.0			744	0	0	.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE FGD SYSTEM REMAINED OFF LINE THROUGH JANUARY DUE TO FROZEN EQUIPMENT AND LINES, LACK OF HEAT TRACING AND A LACK OF MANPOWER DUE TO A BOILER AND TURBINE OVERHAUL ON THE NO. 5 BOILER.									
2/76	3A		29.4		21.3						
	3B		1.4		1.0						
	SYSTEM		15.4		11.2			696	503	77	

KANSAS CITY POWER & LIGHT: HAWTHORN 3 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
		SCRUBBER OUTAGES IN FEBRUARY RESULTED FROM PLUGGING IN THE SCRUBBER BED, STEMMING FROM THE CONVERSION FROM AN UNDER-BED TO OVER-BED SPRAY SYSTEM.									
3/76	SYSTEM				.0			744	0	0	.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE FGD SYSTEM WAS INOPERATIVE DURING MARCH DUE TO MANPOWER CONSTRAINTS AND INCLEMENT WEATHER. THE UTILITY WAS UNABLE TO PERFORM NECESSARY MAINTENANCE.									
		RECONVERSION OF THE MODULE 3B SPRAY SYSTEM TO AN UNDER-BED CONFIGURATION HAS BEEN COMPLETED.									
		THE BYPASS SYSTEM WILL BE MODIFIED AND CHANGED TO A SLIDE-GATE DAMPER ARRANGEMENT.									
4/76	SYSTEM				.0			720	0	0	.0
5/76	SYSTEM				.0			744	0	0	.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE SYSTEM REMAINED DOWN THROUGH MAY DUE TO THE CONTINUATION OF MANPOWER SHORTAGE PROBLEMS. THE UTILITY PERFORMED SOME CLEANING AND REPAIRS DURING THE MONTH.									
6/76	3A		39.0		27.6						
	3B		44.0		30.4						
	SYSTEM		41.5		29.0			720	505	209	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UTILITY IS IN THE PROCESS OF MODIFYING THE MIST ELIMINATOR WASH SYSTEM ON BOTH UNITS 3 AND 4. THE WATER LANCES ARE BEING CHANGED FROM FRP TO CARBON STEEL IN AN ATTEMPT TO PREVENT THE LOSS OF THE NOZZLE INSERTS AND THE SUBSEQUENT SHATTERING OF THE LANCES.									
7/76	SYSTEM				.0			744	0	0	.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UTILITY BEGAN CONVERTING THIS SYSTEM FROM LIMESTONE INJECTION AND TAIL END SCRUBBING TO A LIME SLURRY BASED SCRUBBING SYSTEM DURING JULY.									
8/76	SYSTEM				.0			744	0	0	.0
9/76	SYSTEM				.0			720	0	0	.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE SYSTEM WAS VIRTUALLY OUT OF SERVICE THE ENTIRE JULY-SEPTEMBER PERIOD DUE TO CONTINUING SYSTEM MODIFICATIONS. MANPOWER COMMITMENTS WERE SERIOUSLY HAMPERED BY A MAJOR EXPLOSION WHICH OCCURRED IN THE COAL MILL PULVERIZING AREA OF HAWTHORN NO. 5.									
10/76	SYSTEM				.0			744	0	0	.0
11/76	SYSTEM				.0			720	0	0	.0

KANSAS CITY POWER & LIGHT: HAWTHORN 3 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UNIT DID NOT OPERATE BECAUSE OF THE ONGOING MAJOR MODIFICATIONS BEING IMPLEMENTED ON THE SCRUBBING SYSTEM. THE SYSTEM SHOULD BE READY FOR OPERATION FEB 1. THE UNIT MUST UNDERGO A SERIES OF TESTS TO INSURE COMPLIANCE WITH CITY AND FEDERAL REGULATIONS.									
12/76	SYSTEM				.0			744	0	0	.0
1/77	SYSTEM				.0			744	0	0	.0
2/77	3A		87.8		50.1						
	3B		68.8		39.3						
	SYSTEM		78.3		44.7			672	383	300	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		UNIT NO. 3 WAS DOWN FOR THE ENTIRE DECEMBER-JANUARY PERIOD FOR THE COMPLETION OF MODIFICATIONS AND REPAIRS ON THE SCRUBBERS AND BOILER. THE UNIT BECAME AVAILABLE FOR SERVICE AND TESTING ON FEBRUARY 7. THE PARTICULATE EMISSION LEVEL MEASURED AT THE SCRUBBER OUTLET WAS 0.12 LB/MM BTU (WELL BELOW THE REQUIRED 0.17 LB/MM BTU) BURNING APPROXIMATELY 2.0 % SULFUR COAL. THE CONVERSION FROM LIMESTONE TO LIME HAS GONE SMOOTHLY. SOME INITIAL PROBLEMS WITH PROCESS CHEMISTRY CONTROL HAVE BEEN CORRECTED. OTHER MINOR PROBLEMS INCLUDED PUMP MALFUNCTIONS AND LOSS OF SLAKING WATER PRESSURE. SYSTEM OPERATIONS ARE CONTINUING AT 0% SOLIDS AND 100% BLOWDOWN WITH \ FRESH WATER MAKE-UP OF APPROXIMATELY 7.0 GPM/MW.									
3/77	3A		98.8		64.0						
	3B		35.3		55.2						
	SYSTEM		92.1		59.6			744	482	443	
4/77	3A		56.7		56.7						
	3B		56.7		56.7						
	SYSTEM		56.7		56.7			720	720	408	
5/77	3A		58.0		40.6						
	3B		58.0		40.6						
	SYSTEM		58.0		40.6			744	736	302	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE SYSTEM IS NOW OPERATING AT ABOUT 15-25% BLOWDOWN. THE PH CONTROL SYSTEM OPERATIONS HAVE BEEN EXCELLENT. DURING MAY THE BOILER BURNED GAS FOR 216 HOURS (NOT INCLUDED IN OPERABILITY FIGURES). SO2 REMOVAL EFFICIENCY IS ESTIMATED AT 50-60% FOR BOTH MODULES, ALTHOUGH ACTUAL TESTS HAVE NOT BEEN RUN FOR ABOUT A YEAR AND A HALF. BOTH MODULES ARE CURRENTLY OPERATING SIMULTANEOUSLY.									
6/77	3A		100.0		10.0						
	3B		100.0		10.0						
	SYSTEM		100.0		10.0			720	72	72	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UNIT FIRED NATURAL GAS THROUGHOUT JUNE WITH THE EXCEPTION OF A 72-HOUR PERIOD DURING WHICH COAL WAS FIRED AND THE SCRUBBERS WERE OPERATED FOR SCRUBBER PERSONNEL PURPOSES ONLY. (GAS OPERATION IS NOT INCLUDED IN THE OPERABILITY FIGURES).									
7/77	SYSTEM				.0			744	0	0	
8/77	SYSTEM				.0			744	0	0	

KANSAS CITY POWER & LIGHT: HAWTHORN 3 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UNIT FIRED NATURAL GAS FOR THE ENTIRE JULY-AUGUST PERIOD, MAKING SCRUBBER OPERATION UNNECESSARY.									
9/77	SYSTEM				.0			720	0	0	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UNIT CONTINUED TO FIRE NATURAL GAS THROUGH THE SEPTEMBER REPORT PERIOD.									
10/77	SYSTEM				.0			744	0	0	.0
11/77	SYSTEM		100.0		57.1			720	411	411	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UNIT WAS SHUT DOWN IN OCTOBER DUE TO A LACK OF NATURAL GAS AND REMAINED DOWN UNTIL NOVEMBER 3, WHEN IT RE-STARTED FIRING COAL.									
		DURING THE BOILER DOWN TIME, THE REACTION TANKS AND SPRAY HEADERS WERE REPLACED BY STAINLESS STEEL COMPONENTS; THE INTERCONNECTING PIPING IS RUBBER LINED.									
12/77	SYSTEM		100.0		72.1			744	541	541	
1/78	SYSTEM		100.0		46.5			744	346	346	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE FGD MODULES WERE CLEANED DURING BOILER OUTAGES (THERE WERE NO FGD-RELATED OUTAGES).									
		SOME LEAKS IN THE FGD PIPING WERE REPAIRED DURING DECEMBER.									
2/78	SYSTEM		100.0		24.9			672	167	167	
3/78	SYSTEM		100.0		54.6			744	406	406	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING FEBRUARY THE UNIT WAS DOWN FOUR TIMES WITH ECONOMIZER AND WATER WALL LEAKS (504 HOURS TOTAL). WATER WALL LEAK REPAIR AS WELL AS ACID CLEANING OF THE BOILER CAUSED ADDITIONAL OUTAGE TIME DURING THE LAST WEEK OF MARCH.									
		A TWO WEEK OUTAGE WAS SCHEDULED DURING MARCH FOR SEASONAL MAINTENANCE.									
4/78	SYSTEM		40.1		30.6			720	548	220	
5/78	SYSTEM		100.0		54.2			744	403	403	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		AN AIR PREHEATER FIRE DISCOVERED ON MAY 12 CAUSED DAMAGES THAT FORCED MODULE A TO BE DOWN THE REST OF THE MONTH.									
6/78	SYSTEM							720			
7/78	SYSTEM							744			

KANSAS CITY POWER & LIGHT: HAWTHORN 3 (CONT.)

PERIOD	MODULE	PERFORMANCE DATA: AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
		NO INFORMATION WAS AVAILABLE FOR THE JUNE-JULY REPORT PERIOD DUE TO A PLANT STRIKE; HOWEVER, THE FGD SYSTEM HAS OPERATED AND IS BEING RUN BY SUPERVISORY PERSONNEL.									
8/78	SYSTEM							744			
9/78	SYSTEM							720			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE SCRUBBER SYSTEM IS OPERATING EVEN THOUGH THE UTILITY IS STILL IN THE MIDST OF A STRIKE. FGD PERFORMANCE FIGURES ARE NOT AVAILABLE SINCE THE UTILITY IS NOT RECORDING FGD SYSTEM OPERATING HOURS DURING THE STRIKE.									
10/78	SYSTEM							744			
11/78	SYSTEM							720			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		ALTHOUGH THE STRIKE IS OVER, OPERATIONAL DATA IS STILL UNAVAILABLE. THE FGD SYSTEM IS IN OPERATION.									
12/78	SYSTEM							744			
1/79	SYSTEM							744			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		HOURS OF OPERATION ARE STILL NOT AVAILABLE. THE FGD SYSTEM IS IN OPERATION BUT AT PRESENT PERSONNEL ARE BEING REASSIGNED PREVENTING ACCURATE DATA RECORDING.									
2/79	SYSTEM							672			
3/79	SYSTEM							744			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		OPERATING INFORMATION IS STILL NOT AVAILABLE FOR UNIT 3.									
4/79	SYSTEM		100.0		18.1			720	130	130	9.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE BOILER WAS DOWN IN APRIL FOR 543 HOURS FOR TURBINE OVERHAUL.									
5/79	SYSTEM		100.0		55.0			744	409	409	29.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		IN MAY THE BOILER OUTAGE TIME WAS DUE TO TUBE LEAKS.									
6/79	SYSTEM							720	696		
7/79	SYSTEM							744	744		
8/79	SYSTEM							744	558		
9/79	SYSTEM		100.0		84.0			720	605	605	

EPA UTILITY FGD SURVEY: OCTOBER - DECEMBER 1980

KANSAS CITY POWER & LIGHT: HAWTHORN 3 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
				PERFORMANCE DATA							
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UTILITY BURNED PRIMARILY GAS DURING JUNE, JULY AND AUGUST. THE UNIT RETURNED TO FIRING ALL COAL IN SEPTEMBER. THE SCRUBBER WAS LARGELY AVAILABLE BUT WAS NOT NEEDED FOR MOST OF THE PERIOD. THE UTILITY REPORTED ONLY REGULAR MAINTENANCE TOOK PLACE WITH NO PROBLEMS ENCOUNTERED.									
10/79	SYSTEM		100.0		91.0			744	677	677	
11/79	SYSTEM		100.0		38.1			720	274	274	
12/79	SYSTEM		100.0		91.9			744	684	684	
1/80	SYSTEM		100.0		93.0			744	692	692	
2/80	SYSTEM		100.0		100.0			696	696	696	
3/80	SYSTEM		100.0		100.0			744	744	744	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE FGD SYSTEM WAS AVAILABLE 100% OF THE TIME THE BOILER OPERATED. NO PROBLEMS WERE ENCOUNTERED.									
4/80	SYSTEM				68.0			720		490	
5/80	SYSTEM				60.0			744		446	
6/80	SYSTEM				66.0			720		475	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UNIT 3 BOILER EXPERIENCED SUPERHEATER AND ECONOMIZER LEAKS DURING THE APRIL-JUNE PERIOD ACCOUNTING FOR THE LOW SCRUBBER UTILIZATION FIGURES.									
7/80	SYSTEM		100.0		65.0			744	484	484	45.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE OUTAGE TIME DURING JULY WAS CAUSED BY BOILER TUBE LEAKS. NO FGD-RELATED PROBLEMS WERE ENCOUNTERED.									
8/80	SYSTEM							744	642		49.4
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UTILITY REPORTED THAT THE FGD SYSTEM IS NOW CERTIFIED, THEREFORE THE SCRUBBER OPERATING HOURS ARE NO LONGER RECORDED.									
		THE FGD SYSTEM WAS SHUT DOWN FOR 10 HOURS DURING AUGUST TO REPAIR REHEATER TUBE LEAKS.									
9/80	SYSTEM							720	248		13.9
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING SEPTEMBER BOILER OPERATION WAS LIMITED DUE TO A SCHEDULED OVERHAUL.									
		DURING THE MONTH 67 HOURS OF SCRUBBER OUTAGE TIME WERE DUE TO REQUIRED CLEANING OF THE SCRUBBER MODULES.									
10/80	SYSTEM	100.0	100.0	100.0	32.9			744	245	245	12.0

KANSAS CITY POWER & LIGHT: HAWTHORN 3 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
					DURING OCTOBER THE UNIT WAS SHUTDOWN FOR A FALL OUTAGE WHICH LASTED APPROXIMATELY 359 HOURS.						
					ONE HOUR OF OUTAGE TIME WAS REQUIRED DURING THE MONTH TO REPAIR A SUPER HEATER TUBE LEAK.						
11/80	SYSTEM	80.1	100.0	100.0	40.0			720	288	288	32.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
					DURING NOVEMBER 143 HOURS OF OUTAGE TIME WERE REQUIRED TO CLEAN THE SCRUBBER MODULES.						
					AN ECONOMIZER LEAK CAUSED THE UNIT TO SHUTDOWN FOR 108 HOURS.						
					THE UNIT DID NOT OPERATE 181 HOURS DURING THE MONTH DUE TO LACK OF DEMAND.						
12/80	SYSTEM	57.9	100.0	100.0	24.5			744	182	182	15.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
					THE FGD SYSTEM WAS OUT OF SERVICE 82 HOURS IN DECEMBER SO THAT THE MODULES COULD BE CLEANED.						
					THE UNIT DID NOT OPERATE 249 HOURS DURING DECEMBER. OF THE 249 HOURS 114 HOURS WERE DUE TO LACK OF DEMAND AND 135 HOURS WERE THE RESULT OF A FUEL SUPPLY LIMITATION.						

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	KANSAS CITY POWER & LIGHT	
PLANT NAME	HAWTHORN	
UNIT NUMBER	4	
CITY	KANSAS CITY	
STATE	MISSOURI	
REGULATORY CLASSIFICATION	D	
PARTICULATE EMISSION LIMITATION - NG/J	64.	(.150 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	836	
GROSS UNIT GENERATING CAPACITY - MW	90	
NET UNIT GENERATING CAPACITY W/FGD - MW	85	
NET UNIT GENERATING CAPACITY WO/FGD - MW	87	
EQUIVALENT SCRUBBED CAPACITY - MW	90	

** UNIT DATA - BOILER AND STACK

BOILER SUPPLIER	COMBUSTION ENGINEERING	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	CYCLING	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	235.95	(500000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	148.9	(300 F)
STACK HEIGHT - M	61.	(200 FT)
STACK SHELL	CARBON STEEL	
STACK TOP DIAMETER - M	5.5	(18.0 FT)

** FUEL DATA

FUEL TYPE	COAL	
FUEL GRADE	BITUMINOUS	
AVERAGE HEAT CONTENT - J/G	22795.	(9800 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		******
AVERAGE ASH CONTENT - %	11.00	
RANGE ASH CONTENT - %	******	
AVERAGE MOISTURE CONTENT - %	********	
RANGE MOISTURE CONTENT - %	******	
AVERAGE SULFUR CONTENT - %	.60	
RANGE SULFUR CONTENT - %	******	
AVERAGE CHLORIDE CONTENT - %	********	
RANGE CHLORIDE CONTENT - %	******	

** FUEL DATA

FUEL TYPE	COAL	
FUEL GRADE	BITUMINOUS	
AVERAGE HEAT CONTENT - J/G	26516.	(11400 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		******
AVERAGE ASH CONTENT - %	14.00	
RANGE ASH CONTENT - %	******	
AVERAGE MOISTURE CONTENT - %	********	
RANGE MOISTURE CONTENT - %	******	
AVERAGE SULFUR CONTENT - %	3.00	
RANGE SULFUR CONTENT - %	******	
AVERAGE CHLORIDE CONTENT - %	********	
RANGE CHLORIDE CONTENT - %	******	

*** PARTICLE CONTROL

** PARTICLE SCRUBBER

GENERIC TYPE	PACKED TOWER
SPECIFIC TYPE	STATIC BED PACKING
SHELL GENERIC MATERIAL	CARBON STEEL
SHELL SPECIFIC MATERIAL	AISI 1110

*** FGD SYSTEM

** GENERAL DATA

SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT
SO2 REMOVAL MODE	WET SCRUBBING
PROCESS TYPE	LIME
PROCESS ADDITIVES	NONE
SYSTEM SUPPLIER	COMBUSTION ENGINEERING

KANSAS CITY POWER & LIGHT: HAWTHORN 4 (CONT.)

A-E FIRM	BLACK & VEATCH		
DEVELOPMENT LEVEL	FULL SCALE		
NEW/RETROFIT	RETROFIT		
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.00		
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	70.00		
CURRENT STATUS	1		
INITIAL START-UP	8/72		
CONTRACT AWARDED	0/71		

** DESIGN AND OPERATING PARAMETERS

** ABSORBER

NUMBER	2		
GENERIC TYPE	PACKED TOWER		
SPECIFIC TYPE	STATIC BED PACKING		
TRADE NAME/COMMON TYPE	MARBLE BED SCRUBBER		
SUPPLIER	COMBUSTION ENGINEERING		
DIMENSIONS - FT	18 X 26 X 56		
SHELL GENERIC MATERIAL	STAINLESS STEEL,CARBON STEEL		
SHELL SPECIFIC MATERIAL	AISI 1110,AUSTENITIC		
SHELL MATERIAL TRADE NAME/COMMON TYPE	TYPE 316L,N/A		
LINER GENERIC MATERIAL	ORGANIC		
LINER SPECIFIC MATERIAL	GLASS FLAKE-FILLED POLYESTER		
LINER MATERIAL TRADE NAME/COMMON TYPE	CEILCOTE FLAKEGLASS		
GAS CONTACTING DEVICE TYPE	0.75 IN. DIA GLASS MARBLES IN A 3 TO 4 IN. BED		
DISTANCE BETWEEN GAS CONTACTING ZONES - CM	10.2	(4.0IN)	
L/G RATIO - L/CU.M	3.5	(26.0 GAL/1000 ACF)	
GAS-SIDE PRESSURE DROP - KPA	2.7	(11.0 IN-H2O)	
SUPERFICAL GAS VELOCITY - M/SEC	3.0	(10.0 FT/S)	
INLET GAS FLOW - CU. M/S	76.45	(162000 ACFM)	
INLET GAS TEMPERATURE - C	50.0	(122 F)	
SO2 REMOVAL EFFICIENCY - %	70.0		

** MIST ELIMINATOR

PRE-MIST ELIMINATOR/MIST ELIMINATOR	MIST ELIMINATOR		
NUMBER PER SYSTEM	2		
GENERIC TYPE	IMPINGEMENT		
SPECIFIC TYPE	BAFFLE		
TRADE NAME/COMMON TYPE	CHEVRON VANE		
CONFIGURATION	HORIZONTAL		
NUMBER OF STAGES	2		
NUMBER OF PASSES PER STAGE	2		
FREEBOARD DISTANCE - M	3.05	(10.0 FT)	
DISTANCE BETWEEN STAGES - CM	15.24	(6.0 IN)	
DISTANCE BETWEEN VANES - CM	7.6	(3.00 IN)	
VANE ANGLES - DEGREES	45		
PRESSURE DROP - KPA	.3	(1.2 IN-H2O)	
SUPERFICAL GAS VELOCITY - M/S	3.0	(10.0 FT/S)	
CONSTRUCTION MATERIAL GENERIC TYPE	FIBERGLASS REINFORCED PLASTIC		
WASH WATER SOURCE	BLENDED RIVER AND THICKENER OVERFLOW WATER		
WASH RATE - L/S	126.2	(2000 GAL/MIN)	

** REHEATER

GENERIC TYPE	IN-LINE		
SPECIFIC TYPE	HOT WATER		
TEMPERATURE INCREASE - C	10.0	(50 F)	
NUMBER OF TUBES PER BUNDLE	2		
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL		

** FANS

NUMBER	2		
FUNCTION	BOOSTER		
APPLICATION	INDUCED DRAFT		
SERVICE	DRY		
FLUE GAS TEMPERATURE - C	79.4	(175 F)	
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL		

** DUCTWORK

LOCATION	SCRUBBER INLET		
SHELL GENERIC MATERIAL TYPE	COR-TEN STEEL		
LINER GENERIC MATERIAL TYPE	GUNITE		

KANSAS CITY POWER & LIGHT: HAWTHORN 4 (CONT.)

** DUCTWORK	
LOCATION	SCRUBBER OUTLET
SHELL GENERIC MATERIAL TYPE	COR-TEN STEEL
LINER GENERIC MATERIAL TYPE	GUNITE
** REAGENT PREPARATION EQUIPMENT	
FUNCTION	LIME SLAKING
DEVICE	SLAKER
NUMBER	1
FULL LOAD DRY FEED CAPACITY - M.TONS/HR	51.7 (57 TPH)
** TANKS	
SERVICE	NUMBER
-------	------
SO2 SCRUBBER TOWER HOLDUP	****
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	THICKENER
NUMBER	1
DIMENSIONS - FT	115 (DIA) X 10 (DEPTH)
*** SLUDGE	
** TREATMENT	
METHOD	FLYASH STABILIZATION
** DISPOSAL	
NATURE	FINAL
TYPE	POND
LOCATION	ON SITE
SITE CAPACITY - CU.M	3130880 (2560.0 ACRE-FT)
** PROCESS CONTROL AND INSTRUMENTATION	
CHEMICAL PARAMETERS	PH
CONTROL LEVELS	4.5-6.5
** WATER BALANCE	
WATER LOOP TYPE	CLOSED
** FGD SPARE CAPACITY INDICES	
ABSORBER - %	.0
** FGD SPARE COMPONENT INDICES	
ABSORBER	.0

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
0/72	SYSTEM										

** PROBLEMS/SOLUTIONS/COMMENTS

THE ORIGINAL FGD SYSTEM INSTALLED ON THE HAWTHORN 4 UNIT BEGAN INITIAL OPERATIONS IN AUGUST 1972. THE PROCESS CONSISTED OF DRY LIMESTONE INJECTION INTO THE BOILER FURNACE WHERE THE LIMESTONE WAS CALCINED TO LIME. THE FURNACE CALCINED LIME AND BOILER FLUE GAS WERE THEN DISCHARGED TO A TAIL-END WET SCRUBBING SYSTEM CONSISTING OF TWO MARBLE-BED ABSORBERS WHERE PARTICLES AND SO2 WERE REMOVED FROM THE GAS STREAM. BECAUSE OF BOILER TUBE PLUGGING ATTRIBUTED TO THE LIMESTONE INJECTION, THE MODE OF OPERATION WAS MODIFIED IN LATE 1972 TO LIMESTONE INJECTION INTO THE FLUE GAS DUCT NEAR THE INLET TO THE MARBLE-BED ABSORBERS.

7/75	4A		8.0		5.5						

KANSAS CITY POWER & LIGHT: HAWTHORN 4 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	4B		25.0		17.2						
	SYSTEM		16.3		11.4			744	518	84	

** PROBLEMS/SOLUTIONS/COMMENTS

BOTH MODULES ENCOUNTERED MARBLE BED PLUGGING AND STRAINER PROBLEMS.

8/75	4A				22.6						
	4B				28.5						
	SYSTEM				25.5			744		190	

** PROBLEMS/SOLUTIONS/COMMENTS

A NEW PROCESS CHEMISTRY IS BEING TRIED- ATTEMPTING TO RUN AT 100% BLOWDOWN AND NEAR 0% SOLIDS WITH PH BEING MAINTAINED AT 5 WITHOUT LIMESTONE INJECTION. EMPHASIS IS BEING PLACED ON PARTICULATE CONTROL.

LOST HALF OF BOILER TO ID FAN OUTAGE CAUSING BOTH FGD MODULES TO BE SHUT DOWN TO PREVENT LOSS OF THE ENTIRE UNIT.

9/75	4A		52.2		28.6						
	4B		53.2		29.2						
	SYSTEM		52.7		28.9			720	395	208	

** PROBLEMS/SOLUTIONS/COMMENTS

SCRUBBER MODULES WERE RETURNED TO SERVICE ON SEPTEMBER 21 AFTER REPLACEMENT THE ORIGINAL ID FAN ON MODULE 4B.

THE MARBLE BED WAS REMOVED FROM MODULE A AND REPLACED WITH A STAINLESS STEEL PERFORATED BED. THE MARBLES WERE REMOVED BECAUSE OF CONTINUING OPERATIONAL DIFFICULTIES. THE NEW DESIGN RESULTED IN INCREASED AVAILABILITY AND CONTINUED HIGH PARTICULATE EFFICIENCY (97%).

10/75	4A		59.5		57.7						
	4B		91.0		88.2						
	SYSTEM		75.3		73.0			744	721	543	

** PROBLEMS/SOLUTIONS/COMMENTS

THE EXPERIMENT WITH A PROCESS CHEMISTRY OF 100% BLOWDOWN AND 0% SOLIDS IS STILL IN PROGRESS. SO2 REMOVAL EFFICIENCY IS IN THE 50 TO 60% RANGE. KCP&L IS CONCENTRATING ON PARTICULATE CONTROL.

THERE WAS A MINOR BOILER RESTRICTION ON THE A-SIDE BETWEEN THE ECONOMIZER AND THE INLET DRAFT DUCT RESULTING IN A LOSS OF FLUE GAS VELOCITY.

11/75	4A		.0		.0						
	4B		99.0		99.0						
	SYSTEM		49.5		49.5			720	720	357	
12/75	4A		.0		.0						
	4B		16.1		13.8						
	SYSTEM		8.1		6.9			744	640	52	

** PROBLEMS/SOLUTIONS/COMMENTS

A BOILER OUTAGE OF 5 DAYS IN DECEMBER WAS DUE TO A SCHEDULED OVERHAUL.

MODULE 4A WAS SHUT DOWN DURING THE NOVEMBER-DECEMBER PERIOD DUE TO LOSS OF DRAFT THROUGH THE DUCTWORK FROM THE ECONOMIZER TO THE AIR PREHEATER, WHICH WAS RESULTING IN FREQUENT PLUGGING OF THE REHEATER.

1/76	SYSTEM				.0			744	0	0	.0

KANSAS CITY POWER & LIGHT: HAWTHORN 4 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UNIT WAS DOWN ALL MONTH DUE TO FROZEN EQUIPMENT AND LINES; MANPOWER WAS ASSIGNED TO A BOILER AND TURBINE OVERHAUL ON UNIT 5.									
2/76	4A		.0		.0						
	4B		77.7		64.7						
	SYSTEM		38.9		32.3			696	579	225	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		MODULE 4A WAS SHUT DOWN THE ENTIRE MONTH BECAUSE OF CONTINUING LOSS OF DRAFT THROUGH THE DUCTWORK FROM THE ECONOMIZER TO THE AIR PREHEATER.									
		MODULE B EXPERIENCED PLUGGING IN THE MARBLE BED.									
		A RECYCLE PUMP MALFUNCTIONED ON THE B-SIDE.									
3/76	4A		.0		.0						
	4B		3.4		3.2						
	SYSTEM		1.7		1.6			744	706	12	
4/76	4A		42.0		32.1						
	4B		40.0		30.6						
	SYSTEM		41.0		31.4			720	550	226	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE SCRUBBER BYPASS SEALS WERE REPLACED WITH SLIDE-GATE DAMPERS ON APRIL 1.									
5/76	4A		39.3		26.7						
	4B		43.5		29.6						
	SYSTEM		41.4		28.2			744	506	209	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		CURRENTLY, THE UTILITY IS IN THE PROCESS OF MODIFYING THE SCRUBBING SYSTEM FROM A LIMESTONE INJECTION AND TAIL-END SCRUBBING BASED SYSTEM TO A LIME SLURRY BASED SYSTEM.									
6/76	4A		63.9		40.8						
	4B		5.0		3.2						
	SYSTEM		34.5		22.0			720	460	158	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		PLUGGING IN THE B-SIDE REHEATER WAS EXPERIENCED DURING JUNE AND ONE SECTION OF REHEAT TUBES WERE REMOVED TO FACILITATE CLEANING AND MAINTENANCE WORK.									
7/76	SYSTEM				.0			744	0	0	.0
8/76	SYSTEM				.0			744	0	0	.0
9/76	SYSTEM				.0			720	0	0	.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE SYSTEM WAS OUT OF SERVICE VIRTUALLY THE ENTIRE JULY-SEPTEMBER PERIOD DUE TO THE ON-GOING SYSTEM MODIFICATIONS AND A MAJOR EXPLOSION WHICH OCCURRED IN THE COAL MILL PULVERIZING AREA OF UNIT 5, WHICH SERIOUSLY HAMPERED MANPOWER COMMITMENTS.									
10/76	SYSTEM				.0			744	0	0	.0

KANSAS CITY POWER & LIGHT: HAWTHORN 4 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
11/76	4A		90.8		61.4						
	4B		.0		.0						
	SYSTEM		45.5		30.7			720	486	221	
12/76	SYSTEM				.0			744	0	0	.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE A-SIDE OPERATED 442 HOURS IN NOVEMBER WHILE BOTH MODULES REMAINED OUT OF SERVICE IN DECEMBER DUE TO THE FGD SYSTEM MODIFICATIONS BEING PERFORMED.

1/77	85.3		85.0		65.6						
	4B		74.1		57.0						
	SYSTEM		79.7		61.3			744	572	456	

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT BECAME AVAILABLE FOR SERVICE IN THE LIME SCRUBBING MODE ON JANUARY 5, 1977. TESTING FOR COMPLIANCE WITH PARTICULATE CODES OCCURRED DURING THE MONTH. THE UNIT WAS FOUND TO MEET THE EMISSION REGULATION OF 0.17 LB/MM BTU BURNING 2.0% SULFUR COAL. SYSTEM OPERATIONS ARE STILL CONTINUING AT 0% SOLIDS AND 100% BLOWDOWN. THE FRESH WATER MAKE-UP REQUIREMENT IS 770 GPM/MW.

2/77	4A		79.2		69.6						
	4B		49.4		43.5						
	SYSTEM		64.3		56.6			672	591	380	
3/77	4A		81.6		59.1						
	4B		97.4		70.6						
	SYSTEM		89.5		64.9			744	539	482	

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE FEBRUARY-MARCH PERIOD PROBLEMS WERE ENCOUNTERED WITH PLUGGING ON THE SUCTION SIDE OF THE SCRUBBER RECYCLE TANK.

4/77	4A		43.2		43.2						
	4B		43.2		43.2						
	SYSTEM		43.2		43.2			720	720	311	

** PROBLEMS/SOLUTIONS/COMMENTS

THE SYSTEM IS NOW OPERATING WELL AT ABOUT 15-25% BLOWDOWN. THE PH CONTROL SYSTEM OPERATIONS HAVE BEEN EXCELLENT. DURING MAY THE BOILER BURNED GAS FOR 408 HOURS (NOT INCLUDED IN THE OPERABILITY VALUES). SO2 REMOVAL EFFICIENCY IS ESTIMATED AT 50-60% FOR BOTH MODULES. ALTHOUGH ACTUAL TESTS HAVE NOT BEEN RUN FOR ONE-AND-A-HALF YEARS. CURRENTLY BOTH MODULES ARE BEING OPERATED SIMULTANEOUSLY.

5/77	4A		54.2		24.2						
	4B		54.2		24.2						
	SYSTEM		54.2		24.2			744	740	180	
6/77	SYSTEM				.0			720	0	0	

** PROBLEMS/SOLUTIONS/COMMENTS

UNIT NO. 4 FIRED GAS THROUGHOUT THE MONTH, ALLOWING THE SCRUBBER PLANT TO BE SHUT DOWN FOR MODIFICATIONS DURING THE PERIOD.

MODIFICATIONS TO THE SCRUBBER MODULES INCLUDED: REPLACEMENT OF THE UNDER-

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
				PERFORMANCE DATA							
			BED SPRAY HEADERS WITH 316L SS, INSTALLATION OF A NEW REACTION TANK LINER, AND REPLACEMENT OF THE ORIGINAL CARBON STEEL PIPING WITH RUBBER-LINED PIPING (FROM THE RECYCLE PUMPS TO THE SPRAY MANIFOLD).						
7/77	4A		17.2		16.1						
	4B		17.2		16.1						
	SYSTEM		17.2		16.1			744	696	120	
	** PROBLEMS/SOLUTIONS/COMMENTS										
			THE STAINLESS STEEL MODIFICATIONS WERE COMPLETED BY JULY 25 AND THE UNIT RESUMED COAL FIRING. THE SCRUBBER MODULES WERE IN SERVICE APPROXIMATELY 120 HOURS FOR THE REMAINDER OF THE MONTH. THE SYSTEM SUCCESSFULLY COMPLETED FEDERAL PARTICULATE REMOVAL TESTS (0.15 LB/MM BTU MEASURED) DURING THIS TIME, WHILE BURNING HIGH SULFUR, HIGH ASH (PEABODY-OKLAHOMA) COAL. OPACITY TESTS FOR BOTH UNITS 3 AND 4 WILL BE CONDUCTED IN SEPTEMBER.						
8/77	4A		100.0		73.9						
	4B		100.0		73.9						
	SYSTEM		100.0		73.9			744	550	550	
9/77	4A		100.0		72.2						
	4B		100.0		72.2						
	SYSTEM		100.0		72.2			720	589	520	
	** PROBLEMS/SOLUTIONS/COMMENTS										
			DURING THE LATTER PART OF SEPTEMBER THE CLARIFIER BECAME PLUGGED. THE UNIT FIRED NATURAL GAS UNTIL THE CLARIFIER WAS CLEANED. THE BOILER HOURS DURING WHICH GAS WAS FIRED WERE NOT INCLUDED IN THE OPERABILITY FIGURES.						
10/77	SYSTEM		100.0		73.9			744	550	550	
11/77	SYSTEM		100.0		68.9			720	496	496	
	** PROBLEMS/SOLUTIONS/COMMENTS										
			THE BOILER WENT DOWN FOR PART OF OCTOBER DUE TO A PROBLEM WITH THE GENERATOR EXCITER.								
			SOME FGD SYSTEM OUTAGE TIME IN OCTOBER WAS DUE TO A PLUGGED HEADER.								
			AN FGD SYSTEM OUTAGE ALSO OCCURRED IN OCTOBER WHEN THE LIQUID LEVEL IN THE INTERNAL REACTION TANK EXCEEDED THE CONTROL LEVEL, RESULTING IN PLUGGING OF THE INLET GAS DUCT TO THE SCRUBBER.						
			DURING NOVEMBER THERE WERE TWO INSTANCES OF PLUGGED UNDER BED NOZZLES ON THE 4A MODULE.						
			ON NOVEMBER 10 AN EPA OPACITY TEST WAS RUN ON UNITS 3 AND 4. THE AVERAGE OPACITY WAS 16.76% RUNNING AT OR NEAR FULL LOAD. THE UNITS ARE NOW CERTIFIED FOR PARTICULATE AND OPACITY.						
12/77	SYSTEM		100.0		69.9			744	520	520	
1/78	SYSTEM		100.0		68.3			744	508	508	
	** PROBLEMS/SOLUTIONS/COMMENTS										
			DURING JANUARY SPRAY NOZZLE PLUGGING WAS ENCOUNTERED. SOME NEW SPRAY NOZZLES WERE INSTALLED.								
			THE STRAINER ON THE RECYCLE PUMP MALFUNCTIONED CAUSING DOWN TIME.								

KANSAS CITY POWER & LIGHT: HAWTHORN 4 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
					THERE WERE SEVERAL BOILER RELATED OUTAGES IN JANUARY.						
2/78	SYSTEM		100.0		29.5			672	198	198	
	** PROBLEMS/SOLUTIONS/COMMENTS										
					THE UNIT WAS DOWN THREE TIMES DURING FEBRUARY FOR NON-SCRUBBER RELATED PROBLEMS AND ONCE FOR A FUEL SAFETY TRIP.						
3/78	SYSTEM		100.0		63.3			744	471	471	
	** PROBLEMS/SOLUTIONS/COMMENTS										
					DURING MARCH THERE WERE THREE ECONOMIZER LEAK OUTAGES (231 HOURS) AND THE ABSORBER REQUIRED AN ADDITIONAL 32 HOURS OF OUTAGE FOR MAINTENANCE.						
4/78	SYSTEM		100.0		40.0			720	288	288	
	** PROBLEMS/SOLUTIONS/COMMENTS										
					APRIL OUTAGE TIME WAS FOR SCHEDULED GENERAL MAINTENANCE AND CLEANING.						
5/78	SYSTEM		100.0		56.6			744	421	421	
	** PROBLEMS/SOLUTIONS/COMMENTS										
					FGD OUTAGE IN MAY WAS DUE TO CLARIFIER PLUGGING.						
6/78	SYSTEM							720			
7/78	SYSTEM							744			
	** PROBLEMS/SOLUTIONS/COMMENTS										
					NO INFORMATION WAS AVAILABLE FOR THE JUNE-JULY PERIOD BECAUSE OF A PLANT STRIKE.						
8/78	SYSTEM							744			
9/78	SYSTEM							720			
	** PROBLEMS/SOLUTIONS/COMMENTS										
					THE SCRUBBING SYSTEM IS OPERATING ALTHOUGH THE UTILITY IS STILL IN THE MIDST OF A STRIKE. FGD PERFORMANCE FIGURES ARE NOT AVAILABLE BECAUSE THE UTILITY IS NOT RECORDING FGD OPERATION HOURS DURING THE STRIKE.						
10/78	SYSTEM							744			
11/78	SYSTEM							720			
	** PROBLEMS/SOLUTIONS/COMMENTS										
					ALTHOUGH THE STRIKE IS OVER NO OPERATIONAL DATA ARE YET AVAILABLE. THE FGD SYSTEM IS OPERATIONAL.						
12/78	SYSTEM							744			
1/79	SYSTEM							744			

KANSAS CITY POWER & LIGHT: HAWTHORN 4 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
		HOURS OF OPERATION ARE STILL NOT AVAILABLE. THE FGD SYSTEM IS OPERATIONAL BUT AT PRESENT PERSONNEL ARE BEING REASSIGNED PREVENTING ACCURATE DATA RECORDING.									
2/79	SYSTEM							672			
3/79	SYSTEM							744			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		OPERATING INFORMATION FOR UNIT 4 IS STILL NOT AVAILABLE.									
4/79	SYSTEM		100.0		56.9			720	410	410	30.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		AN EXCITER FAILURE ON THE GENERATOR CAUSED THE APRIL BOILER OUTAGE TIME.									
5/79	SYSTEM		100.0		94.0			744	699	699	49.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		MAY OUTAGE TIME WAS FOR SCRUBBER CLEANING AND GENERAL MAINTENANCE.									
6/79	SYSTEM		100.0		14.0			720	101	101	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE LOW BOILER HOURS IN JUNE WERE A RESULT OF A SCHEDULED BOILER OVERHAUL.									
7/79	SYSTEM							744	692		
8/79	SYSTEM							744	744		
9/79	SYSTEM							720	497		
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING JULY AND AUGUST MOSTLY GAS WAS FIRED. THERE WERE NO MAJOR SCRUBBER PROBLEMS DURING THE JULY-SEPTEMBER PERIOD.									
10/79	SYSTEM		100.0		91.0			744	677	677	
11/79	SYSTEM		100.0		38.1			720	274	274	
12/79	SYSTEM		100.0		91.9			744	684	684	
1/80	SYSTEM				.0			744	0	0	.0
2/80	SYSTEM				.0			696	0	0	.0
3/80	SYSTEM				.0			744	0	0	.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UNIT REMAINED OFF LINE THROUGH THE FIRST QUARTER OF 1980 BECAUSE OF A TURBINE GENERATOR OVERHAUL.									
4/80	SYSTEM				65.0			720		468	

KANSAS CITY POWER & LIGHT: HAWTHORN 4 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
		LOW APRIL SCRUBBER UTILIZATION FIGURES OCCURRED BECAUSE THE BOILER WAS OUT OF SERVICE FOR SCHEDULED MAINTENANCE DURING PART OF THE MONTH.									
5/80	SYSTEM				90.1			744		670	
6/80	SYSTEM				98.1			720		706	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UTILITY REPORTED THAT NO UNUSUAL FGD SYSTEM PROBLEMS OCCURRED DURING MAY AND JUNE.									
7/80	SYSTEM		100.0		78.0			744	580	580	55.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		NECESSARY REPAIRS TO THE GENERATOR COLLECTOR RING CAUSED SYSTEM OUTAGE TIME DURING JULY.									
		A 53 HOUR OUTAGE WAS DUE TO THE REPLACING OF THE UNDER BED SPRAY HEADERS ON THE 4A MODULE. THIS WAS THE ONLY FGD-RELATED PROBLEM DURING JULY.									
8/80	SYSTEM							744	569		47.4
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UTILITY REPORTED THAT THE FGD SYSTEM IS NOW CERTIFIED, THEREFORE THE SCRUBBER OPERATING HOURS ARE NO LONGER RECORDED.									
		DURING AUGUST APPROXIMATELY 66 HOURS WERE NECESSARY TO PERFORM GENERAL MAINTENANCE ON THE SYSTEM.									
9/80	SYSTEM							720	111		9.4
	** PROBLEMS/SOLUTIONS/COMMENTS										
		LOW BOILER UTILIZATION DURING SEPTEMBER WAS DUE TO A LACK OF DEMAND.									
		NO FGD SYSTEM PROBLEMS WERE REPORTED FOR THE MONTH OF SEPTEMBER.									
10/80	SYSTEM	100.0	100.0	100.0	68.4			744	509	509	31.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING OCTOBER THE BOILER DID NOT OPERATE 155 HOURS DUE TO A LACK OF DEMAND.									
		AN ECONOMIZER LEAK CAUSED THE UNIT TO COME OFF LINE APPROXIMATELY 48 HOURS.									
11/80	SYSTEM	71.8	100.0	100.0	65.8			720	474	474	53.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		A 203 HOUR OUTAGE WAS NECESSARY DURING NOVEMBER TO CLEAN THE SCRUBBER AND TO REPAIR A RECYCLE PIPING BLOWDOWN LINE LEAK.									
		DURING THE MONTH THE UNIT WAS OFF LINE 43 HOURS DUE TO A LACK OF DEMAND.									
12/80	SYSTEM	92.1	100.0	100.0	59.1			744	440	440	41.0

EPA UTILITY FGD SURVEY: OCTOBER - DECEMBER 1980

KANSAS CITY POWER & LIGHT: HAWTHORN 4 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR

** PROBLEMS/SOLUTIONS/COMMENTS

DURING DECEMBER 162 HOURS OUTAGE TIME WAS NECESSARY TO REPAIR A WATER WALL TUBE LEAK.

DURING THE MONTH THE SYSTEM WAS OFF LINE FOR 59 HOURS FOR CLEANING.

THE UNIT DID NOT OPERATE 81 HOURS DUE TO LACK OF DEMAND.

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	KANSAS CITY POWER & LIGHT	
PLANT NAME	LA CYGNE	
UNIT NUMBER	1	
CITY	LA CYGNE	
STATE	KANSAS	
REGULATORY CLASSIFICATION	E	
PARTICULATE EMISSION LIMITATION - NG/J	55.	(.128 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	645.	(1.500 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	1450	
GROSS UNIT GENERATING CAPACITY - MW	820	
NET UNIT GENERATING CAPACITY W/FGD - MW	820	
NET UNIT GENERATING CAPACITY WO/FGD - MW	844	
EQUIVALENT SCRUBBED CAPACITY - MW	820	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	BABCOCK & WILCOX	
BOILER TYPE	CYCLONE	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	1302.44	(2760000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	140.6	(285 F)
STACK HEIGHT - M	213.	(700 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	7.0	(23.0 FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	SUBBITUMINOUS	
AVERAGE HEAT CONTENT - J/G	21913.	(9421 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		9000-9700
AVERAGE ASH CONTENT - %	24.36	
RANGE ASH CONTENT - %	24-25	
AVERAGE MOISTURE CONTENT - %	8.60	
RANGE MOISTURE CONTENT - %	9-10	
AVERAGE SULFUR CONTENT - %	5.39	
RANGE SULFUR CONTENT - %	5-6	
AVERAGE CHLORIDE CONTENT - %	.03	
RANGE CHLORIDE CONTENT - %	0.02-0.03	
*** PARTICLE CONTROL		
** PARTICLE SCRUBBER		
NUMBER	8	
GENERIC TYPE	VENTURI TOWER	
SPECIFIC TYPE	VARIABLE-THROAT/SIDE-MOVABLE BLOCKS	
SUPPLIER	BABCOCK & WILCOX	
DIMENSIONS - FT	21.5 LONG X 1.83 WIDE	
SHELL GENERIC MATERIAL	STAINLESS STEEL	
SHELL SPECIFIC MATERIAL	AUSTENITIC	
LINER GENERIC MATERIAL	INORGANIC	
LINER SPECIFIC MATERIAL	HYDRAULICALLY-BONDED CEMENT	
GAS CONTACTING DEVICE TYPE	NONE	
NUMBER OF CONTACTING ZONES	1	
LIQUID RECIRCULATION RATE - LITER/S	315.0	(5000 GPM)
L/G RATIO - LITER/CU.M	1.6	(12.0 GAL/1000ACF)
PRESSURE DROP - KPA	1.7	(7.0 IN-H2O)
SUPERFICIAL GAS VELOCITY - M/S	39.6	(130.0 FT/S)
INLET GAS FLOW RATE - CU.M/S	162.8	(345000 ACFM)
INLET GAS TEMPERATURE - C	140.6	(285 F)
PARTICLE REMOVAL EFFICIENCY - %	98.2	
*** FGD SYSTEM		
** GENERAL DATA		
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT	
SO2 REMOVAL MODE	WET SCRUBBING	
PROCESS TYPE	LIMESTONE	
PROCESS ADDITIVES	NONE	
SYSTEM SUPPLIER	BABCOCK & WILCOX	

KANSAS CITY POWER & LIGHT: LA CYGNE 1 (CONT.)

A-E FIRM	BLACK & VEATCH	
DEVELOPMENT LEVEL	FULL SCALE	
NEW/RETROFIT	NEW	
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.50	
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	80.00	
CURRENT STATUS	1	
COMMERCIAL START-UP	6/73	
INITIAL START-UP	2/73	
CONTRACT AWARDED	3/71	

** DESIGN AND OPERATING PARAMETERS

** ABSORBER

NUMBER	8	
GENERIC TYPE	TRAY TOWER	
SPECIFIC TYPE	SIEVE TRAY	
SUPPLIER	BABCOCK & WILCOX	
DIMENSIONS - FT	32 X 16 X 65	
SHELL GENERIC MATERIAL	STAINLESS STEEL	
SHELL SPECIFIC MATERIAL	AUSTENITIC	
SHELL MATERIAL TRADE NAME/COMMON TYPE	TYPE 316L	
LINER GENERIC MATERIAL	NONE	
LINER SPECIFIC MATERIAL	N/A	
LINER MATERIAL TRADE NAME/COMMON TYPE	N/A	
NUMBER OF CONTACTING ZONES	1	
LIQUID RECIRCULATION RATE - LITER/S	567.	(9000 GPM)
L/G RATIO - L/CU.M	5.0	(37.7 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	1.5	(6.0 IN-H2O)
SUPERFICAL GAS VELOCITY - M/SEC	4.6	(15.0 FT/S)
INLET GAS FLOW - CU. M/S	112.55	(238500 ACFM)
INLET GAS TEMPERATURE - C	50.0	(122 F)
SO2 REMOVAL EFFICIENCY - %	80.0	

** MIST ELIMINATOR

PRE-MIST ELIMINATOR/MIST ELIMINATOR	PRE-MIST ELIMINATOR
NUMBER PER SYSTEM	8
GENERIC TYPE	BULK SEPARATION
SPECIFIC TYPE	PERFORATED PLATE
TRADE NAME/COMMON TYPE	SIEVE TRAY
CONFIGURATION	HORIZONTAL
CONSTRUCTION MATERIAL GENERIC TYPE	SS

** REHEATER

NUMBER	4	
GENERIC TYPE	IN-LINE	
SPECIFIC TYPE	STEAM	
TRADE NAME/COMMON TYPE	BARE TUBE	
TEMPERATURE INCREASE - C	15.6	(60 F)
INLET FLUE GAS FLOW RATE - CU. M/S	145.11	(307500 ACFM)
INLET FLUE GAS TEMPERATURE - C	50.0	(122 F)
NUMBER OF TUBES PER BUNDLE	32	
CONSTRUCTION MATERIAL GENERIC TYPE	ORIGINALLY 304 SS CHANGED TO 316L SS	

** FANS

NUMBER	6	
SUPPLIER	STURTEVANT DIV., WESTINGHOUSE	
FUNCTION	BALANCED DRAFT	
APPLICATION	INDUCED DRAFT	
SERVICE	DRY	
FLUE GAS FLOW RATE - CU.M/S	210.09	(445200 ACFM)
FLUE GAS TEMPERATURE - C	77.8	(172 F)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL WITH SS CLAD BLADES; THE HOUSINGS A	

** FANS

NUMBER	3
FUNCTION	BALANCED DRAFT
APPLICATION	BOILER I.D.
SERVICE	DRY

KANSAS CITY POWER & LIGHT: LA CYGNE 1 (CONT.)

** DUCTWORK	
LOCATION	SCRUBBER INLET
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
LINER GENERIC MATERIAL TYPE	NONE
** DUCTWORK	
LOCATION	FROM PLENUM THROUGH STACK
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
LINER GENERIC MATERIAL TYPE	DERAKANE
** REAGENT PREPARATION EQUIPMENT	
FUNCTION	LIMESTONE GRINDING
DEVICE	BALL MILL
MANUFACTURER	KOPPERS
NUMBER	2
FULL LOAD DRY FEED CAPACITY - M.TONS/HR	99.9 (110 TPH)
PRODUCT QUALITY - % SOLIDS	66.0
** TANKS	
SERVICE	NUMBER
-------	------
LIMESTONE SLURRY MAKEUP	2
RECYCLE	8
DILUTION	2
** PUMPS	
SERVICE	NUMBER
-------	------
POND RETURN	2
SLURRY FEED	1
ABSORBER RECIRCULATION	8
SCRUBBER RECIRCULATION	8

*** SLUDGE

** DISPOSAL	
NATURE	FINAL
TYPE	UNLINED POND
LOCATION	ON SITE
SITE TRANSPORTATION METHOD	PUMPED
SITE DIMENSIONS	160 ACRES X 11 FT DEEP
SITE CAPACITY - CU.M	2152480 (1760.0 ACRE-FT)
** PROCESS CONTROL AND INSTRUMENTATION	
CHEMICAL PARAMETERS	PH, SOLIDS %
CONTROL LEVELS	PH(5.6-5.8)
MONITOR LOCATION	PH AT VENTURI, SOLIDS AT VENTURI RECIRC. LINE
PROCESS CONTROL MANNER	AUTOMATIC
** WATER BALANCE	
WATER LOOP TYPE	CLOSED
MAKEUP WATER ADDITION - LITERS/S	72.3 (1148 GPM)
** FGD SPARE CAPACITY INDICES	
ABSORBER - %	.0
** FGD SPARE COMPONENT INDICES	
ABSORBER	.0

KANSAS CITY POWER & LIGHT: LA CYGNE 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
		PERFORMANCE DATA									
12/72	SYSTEM							744			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE FIRST TRIAL OPERATION BEGAN ON DECEMBER 26, 1972 AND WAS PLAGUED WITH NUMEROUS PROBLEMS. SOME OF THESE PROBLEMS, SUCH AS VIBRATIONS OF THE INDUCED-DRAFT FANS AND THEIR SENSITIVITY TO INBALANCE, OCCURRED EVEN BEFORE THE BOILER WAS FIRED. AS THESE FABRICATION PROBLEMS WERE CORRECTED AND THE FGD SYSTEM WENT INTO OPERATION TWO OTHER TYPES OF PROBLEMS APPEARED. THE FIRST TYPE ASSOCIATED WITH THE WET LIMESTONE PROCESS, INCLUDED PLUGGING OF THE MIST ELIMINATORS AND STRAINERS. THE CORROSION ASSOCIATED WITH CONDENSATION OF ACID VAPORS FROM THE GAS ON THE REHEATER TUBE BUNDLES WAS CONTROLLED BY INJECTION OF SLIP STREAMS OF HOT AIR FROM THE BOILER COMBUSTION AIR HEATER INTO THE SCRUBBED FLUE GASES AT THE INLET TO THE REHEATER UNITS. THIS PRACTICE WHICH REDUCED THE MAXIMUM GENERATING CAPACITY OF THE BOILER BY LIMITING THE AIR AVAILABLE FOR COAL COMBUSTION, IS NO LONGER NECESSARY BECAUSE OF SYSTEM DESIGN MODIFICATIONS.								
6/73	A			20.0							
	B			21.0							
	C			40.0							
	D			21.0							
	E			27.0							
	F			30.0							
	G			23.0							
	SYSTEM		64.0	26.0				720	294	187	15.2
7/73	A			7.0							
	B			24.0							
	C			25.0							
	D			41.0							
	E			27.0							
	F			25.0							
	G			31.0							
	SYSTEM		64.0	26.0				744	303	195	15.2
8/73	A			79.0							
	B			64.0							
	C			65.0							
	D			74.0							
	E			47.0							
	F			48.0							
	G			70.0							
	SYSTEM		68.0	64.0				744	699	476	42.1
9/73	A			13.0							
	B			.0							
	C			13.0							
	D			13.0							
	E			13.0							
	F			.0							
	G			.0							
	SYSTEM		53.0	7.0				720	95	50	3.5
10/73	A			28.0							
	B			41.0							
	C			34.0							
	D			54.0							
	E			33.0							
	F			3.0							
	G			46.0							
	SYSTEM		56.0	34.0				744	452	253	19.7

KANSAS CITY POWER & LIGHT: LA CYGNE 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
		PERFORMANCE DATA									
11/73	A				48.0						
	B				1.0						
	C				38.0						
	D				4.0						
	E				63.0						
	F				59.0						
	G				49.0						
	SYSTEM		57.0		37.0			720	463	266	18.1
12/73	A				42.0						
	B				20.0						
	C				5.0						
	E				26.0						
	D				31.0						
	F				11.0						
	G				32.0						
	SYSTEM		53.0		24.0			744	339	179	10.3
0/74	SYSTEM										

** PROBLEMS/SOLUTIONS/COMMENTS

THE 1974 FIGURES ARE BASED UPON ACTUAL SYSTEM OPERATION HOURS AS A FUNCTION OF ACTUAL BOILER HOURS

1/74	A		49.0								
	B		32.0								
	C		44.0								
	D		87.0								
	E		23.0								
	F		37.0								
	G		81.0								
	SYSTEM		50.0		24.0			744	364	182	6.0
2/74	A		66.0								
	B		68.0								
	C		59.0								
	D		76.0								
	E		52.0								
	F		100.0								
	G		65.0								
	SYSTEM		69.0		37.0			672	364	251	16.0
3/74	SYSTEM				.0			744	0	0	.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER WAS SHUTDOWN FOR THE ENTIRE MONTH OF MARCH.

4/74	A		67.0								
	B		70.0								
	C		75.0								
	D		88.0								
	E		74.0								
	F		100.0								
	G		88.0								
	SYSTEM		80.0		37.0			720	332	266	15.0
5/74	A		69.0								
	B		83.0								
	C		78.0								
	D		85.0								

EPA UTILITY FGD SURVEY: OCTOBER - DECEMBER 1980

KANSAS CITY POWER & LIGHT: LA CYGNE 1 (CONT.)

PERIOD	MODULE	PERFORMANCE DATA AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	E	78.0									
	F	84.0									
	G	80.0									
	SYSTEM	80.0			54.0			744	500	400	27.0
6/74	A	92.0									
	B	84.0									
	C	83.0									
	D	90.0									
	E	82.0									
	F	83.0									
	G	87.0									
	SYSTEM	86.0			57.0			720	480	413	32.0
7/74	A	75.0									
	B	80.0									
	C	80.0									
	D	81.0									
	E	85.0									
	F	79.0									
	G	77.0									
	SYSTEM	80.0			34.0			744	313	250	19.0
8/74	A	90.0									
	B	90.0									
	C	73.0									
	D	81.0									
	E	81.0									
	F	78.0									
	G	99.0									
	SYSTEM	85.0			65.0			744	571	485	39.0
9/74	A	69.0									
	B	88.0									
	C	73.0									
	D	76.0									
	E	83.0									
	F	89.0									
	G	86.0									
	SYSTEM	81.0			68.0			720	606	491	36.0
10/74	A	71.0									
	B	61.0									
	C	59.0									
	D	81.0									
	E	79.0									
	F	93.0									
	G	89.0									
	SYSTEM	76.0			68.0			744	662	503	39.0
11/74	A	90.0									
	B	71.0									
	C	60.0									
	D	61.0									
	E	84.0									
	F	85.0									
	G	84.0									
	SYSTEM	76.0			41.0			720	386	293	23.0
12/74	SYSTEM				.0			744	0	0	.0
0/75	SYSTEM										

KANSAS CITY POWER & LIGHT: LA CYGNE 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE 1975 FIGURES ARE BASED UPON SYSTEM AVAILABLE HOURS AS A FUNCTION OF HOURS IN THE PERIOD.									
1/75	SYSTEM	100.0			.0			744	0	0	.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE BOILER WAS SHUTDOWN DURING JANUARY AND FEBRUARY FOR TURBINE/GENERATOR REPAIR.									
2/75	SYSTEM	100.0			.0			672	0	0	.0
3/75	A	82.0									
	B	96.0									
	C	90.0									
	D	77.0									
	E	93.0									
	F	92.0									
	G	96.0									
	SYSTEM	89.0						744	694		41.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING REDUCED LOAD CONDITIONS SOME OF THE MODULES WERE NOT REQUIRED AND THEREFORE SHUT DOWN ALTHOUGH THEY WERE AVAILABLE. AVAILABILITY WAS THEREFOR HIGHER THAN SOME OF THE POSTED FIGURES INDICATE.									
4/75	SYSTEM	100.0						720			3.4
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING APRIL THE BOILER WAS OFF LINE FOR 25 DAYS DUE TO NECESSARY GENERATOR REPAIRS.									
5/75	A	95.0									
	B	85.0									
	C	94.0									
	D	90.0									
	E	90.0									
	F	89.0									
	G	83.0									
	SYSTEM	89.0						744	683		56.0
6/75	A	88.0									
	B	85.0									
	C	84.0									
	D	85.0									
	E	84.0									
	F	86.0									
	G	89.0									
	SYSTEM	86.0						720	667		56.0
7/75	A	78.0									
	B	90.0									
	C	90.0									
	D	84.0									
	E	85.0									
	F	87.0									
	G	85.0									
	SYSTEM	86.0						744	590		50.0

KANSAS CITY POWER & LIGHT: LA CYGNE 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
8/75	A	75.0									
	B	88.0									
	C	87.0									
	D	78.0									
	E	92.0									
	F	85.0									
	G	83.0									
	SYSTEM	84.0						744	630		50.0

** PROBLEMS/SOLUTIONS/COMMENTS

MODULES A AND D ARE USED FOR RESEARCH TESTS. ONE MODULE IS SHUT DOWN EACH EVENING FOR CLEANING.

9/75	A	78.0									
	B	84.0									
	C	84.0									
	D	85.0									
	E	79.0									
	F	78.0									
	G	74.0									
	SYSTEM	80.0						720	610		42.0
10/75	A	66.0									
	B	77.0									
	C	46.0									
	D	74.0									
	E	72.0									
	F	73.0									
	G	65.0									
	SYSTEM	68.0						744	231		13.0
11/75	A	93.0									
	B	91.0									
	C	80.0									
	D	93.0									
	E	96.0									
	F	89.0									
	G	94.0									
	SYSTEM	91.0						720	346		29.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE SYSTEM WAS DOWN OCTOBER 16 TO NOVEMBER 13 OWING TO PROBLEMS WITH THE GENERATOR AND ID AIR FAN.

AVAILABILITY FIGURES FOR OCTOBER AND NOVEMBER DO NOT INCLUDE THE OUTAGE TIME FROM OCTOBER 16 TO NOVEMBER 13.

12/75	A	91.0									
	B	87.0									
	C	81.0									
	D	85.0									
	E	87.0									
	F	89.0									
	G	84.0									
	SYSTEM	86.0						744	597		47.0

** PROBLEMS/SOLUTIONS/COMMENTS

THREE BOILER OUTAGES OCCURRED DURING DECEMBER.

1/76	A	86.0									

KANSAS CITY POWER & LIGHT: LA CYGNE 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	B	85.0									
	C	91.0									
	D	72.0									
	E	84.0									
	F	82.0									
	G	84.0									
	SYSTEM	83.0						744	621		51.0
2/76	A	94.0									
	B	90.0									
	C	86.0									
	D	91.0									
	E	92.0									
	F	93.0									
	G	95.0									
	SYSTEM	92.0						696	595		55.0
3/76	A	92.0									
	B	90.0									
	C	88.0									
	D	93.0									
	E	94.0									
	F	91.0									
	G	91.0									
	SYSTEM	91.0						744	643		57.0
4/76	A	92.0									
	B	91.0									
	C	89.0									
	D	97.0									
	E	96.0									
	F	98.0									
	G	95.0									
	SYSTEM	94.0						720	143		13.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE SYSTEM WAS SHUT DOWN ON APRIL 6 FOR A SCHEDULED BOILER AIR PREHEATER, AND STACK BREECHING OVERHAUL. THE UNIT WAS RESTARTED ON MAY 10.

DURING THE OUTAGE SOME MAINTENANCE WAS PERFORMED ON THE SCRUBBER DUCTWORK, PRIMARILY BECAUSE OF CORROSION PROBLEMS.

5/76	A	97.0									
	B	92.0									
	C	94.0									
	D	96.0									
	E	89.0									
	F	95.0									
	G	96.0									
	SYSTEM	94.0						744	436		38.0

** PROBLEMS/SOLUTIONS/COMMENTS

FROM MAY 10 TO THE END OF THE MONTH FOUR UNIT OUTAGES WERE ENCOUNTERED.

6/76	A	93.0									
	B	94.0									
	C	94.0									
	D	95.0									
	E	92.0									
	F	94.0									
	G	91.0									
	SYSTEM	93.0						720	656		56.0

KANSAS CITY POWER & LIGHT: LA CYGNE 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTO
	** PROBLEMS/SOLUTIONS/COMMENTS										
		FOUR FORCED MINOR SCRUBBER OUTAGES OCCURRED DURING JUNE.									
7/76	A	96.0									
	B	95.0									
	C	92.0									
	D	93.0									
	E	93.0									
	F	94.0									
	G	94.0									
	SYSTEM	94.0						744	688		60.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		TWO MINOR SCRUBBER OUTAGES OCCURRED DURING JULY.									
		THE UNIT RECORDED ITS LARGEST MW-HOUR MONTH SINCE INITIATION OF COMMERCIAL OPERATION (359,028).									
8/76	A	94.0									
	B	93.0									
	C	92.0									
	D	93.0									
	E	92.0									
	F	90.0									
	G	88.0									
	SYSTEM	92.0						744	521		46.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UNIT WAS TAKEN OUT OF SERVICE AUGUST 24 FOR REPAIR OF A TURBINE BLADE. THE UNIT WAS RETURNED TO SERVICE ON OCTOBER 20. OPERATION WAS INTERMITTENT PENDING TURBINE BLADE REBALANCING AND REESTABLISHMENT OF NORMAL OPERATING CONDITIONS.									
		DURING THE TURBINE REPAIR PERIOD THE UTILITY COATED THE STACK INNER STRUCTURE WITH PLASTITE 4005.									
		THE AUGUST AVAILABILITY FIGURES DO NOT INCLUDE THE OUTAGE TIME.									
9/76	SYSTEM	100.0				.0		720	0	0	.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE SYSTEM WAS DOWN DUE TO TURBINE REPAIR.									
10/76	A	97.0									
	B	97.0									
	C	98.0									
	D	89.0									
	E	96.0									
	F	96.0									
	G	96.0									
	SYSTEM	96.0						744	256		15.0
11/76	A	95.0									
	B	93.0									
	C	94.0									
	D	95.0									
	E	94.0									
	F	91.0									

KANSAS CITY POWER & LIGHT: LA CYGNE 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	G	94.0									
	SYSTEM	94.0						720	627		59.0
12/76	A	87.0									
	B	89.0									
	C	81.0									
	D	94.0									
	E	94.0									
	F	95.0									
	G	91.0									
	SYSTEM	90.0						744	706		60.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE A-MODULE VENTURI RECYCLE PUMP EXPERIENCED SOME PROBLEMS AND WAS REPAIRED.

THE C-MODULE REHEAT STEAM TUBE BUNDLES WERE INCREASED IN NUMBER FROM FOUR TO EIGHT.

1/77	A	94.0									
	B	90.0									
	C	95.0									
	D	95.0									
	E	95.0									
	F	92.0									
	G	90.0									
	SYSTEM	93.0						744	539		43.0
2/77	A	93.0									
	B	93.0									
	C	93.0									
	D	94.0									
	E	93.0									
	F	94.0									
	G	88.0									
	SYSTEM	93.0						672	590		58.0
3/77	A	94.0									
	B	92.0									
	C	86.0									
	D	94.0									
	E	91.0									
	F	94.0									
	G	90.0									
	SYSTEM	92.0						744	558		50.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE EIGHTH MODULE HAS BEEN INSTALLED.

THE MIST ELIMINATORS IN TWO MODULES HAVE BEEN MODIFIED TO THE POINT WHERE THEY HAVE BEEN OPERATING CONTINUOUSLY CLEAN.

ADDITIONAL BANKS OF STEAM TUBE BUNDLES HAVE BEEN INSTALLED IN SOME MODULES. 50 F OF REHEAT HAS BEEN DETERMINED AS THE NECESSARY TEMPERATURE BOOST AT LA CYGNE TO PRECLUDE STACK PROBLEMS RELATED TO ACID DEW POINT.

THE WATER LOOP IS NOW 95% CLOSED.

A NEW SETTLING POND IS BEING INSTALLED AT THE PLANT.

THE PLANT IS STILL GENERATING 700-720 MW DURING THE DAY AND 500-570 MW AT NIGHT.

KANSAS CITY POWER & LIGHT: LA CYGNE 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
4/77	A	96.0									
	B	94.0									
	C	97.0									
	D	94.0									
	E	95.0									
	F	96.0									
	G	95.0									
	SYSTEM	95.0						720	384		31.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE EIGHTH MODULE HAS BEEN RUN FOR TWO DAYS.

5/77	SYSTEM	100.0			.0			744	0	0	.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS SHUT DOWN IN MAY DUE TO TURBINE PROBLEMS. THE UNIT RESTARTED JULY 5, 1977.

THE MIST ELIMATOR WASHING CONFIGURATION IS BEING CHANGED TO WORK COUNTERCURRENT TO THE GAS FLOW.

ADDITIONAL STEAM TUBE BUNDLES ARE BEING ADDED TO INCREASE THE REHEAT AREA.

THE NEW SETTLING POND IS STILL BEING DRAWN UP. EXCAVATION HAS NOT BEGUN.

6/77	SYSTEM	100.0			.0			720	0	0	.0

** PROBLEMS/SOLUTIONS/COMMENTS

MINOR CLEANOUT AND REPAIR WORK WAS DONE ON THE SCRUBBING SYSTEM DURING THE TURBINE OUTAGE.

7/77	A	95.0									
	B	93.0									
	C	94.0									
	D	95.0									
	E	95.0									
	F	95.0									
	G	95.0									
	H	95.0									
	SYSTEM	95.0						744	485		36.0

** PROBLEMS/SOLUTIONS/COMMENTS

RESUMPTION OF OPERATIONS WAS CONDUCTED WITH EIGHT SCRUBBER MODULES IN THE FLUE GAS PATH, ENABLING THE UNIT TO OPERATE AT A MAXIMUM CONTINUOUS LOAD CAPACITY OF 800-820 MW.

8/77	A	89.0									
	B	55.0									
	C	93.0									
	D	93.0									
	E	90.0									
	F	93.0									
	G	93.0									
	H	93.0									
	SYSTEM	87.0						744	501		43.0

KANSAS CITY POWER & LIGHT: LA CYGNE 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
		PARTICLE REMOVAL TESTS WERE CONDUCTED IN LATE AUGUST AND UNIT NO.1 HAS PASSED THE COMPLIANCE REQUIREMENTS (0.13 LB/MM BTU).									
		MODULE B HAD LOW AVAILABILITY DUE TO THE BURNING OF THE MOTOR ON THE RECIRCULATING PUMP. IT WAS REMOVED FROM SERVICE AND STARTED AGAIN AFTER 12 DAYS.									
9/77	A	93.0									
	B	94.0									
	C	89.0									
	D	90.0									
	E	93.0									
	F	95.0									
	G	92.0									
	H	93.0									
	SYSTEM	92.0				72.80		720	524		50.0
10/77	A	91.0									
	B	96.0									
	C	89.0									
	D	94.0									
	E	93.0									
	F	94.0									
	G	89.0									
	H	93.0									
	SYSTEM	92.0						744	457		
	** PROBLEMS/SOLUTIONS/COMMENTS										
		A 12 DAY OUTAGE IN OCTOBER WAS REQUIRED TO DESLAG THE BOILER.									
11/77	A	93.0									
	B	96.0									
	C	93.0									
	D	94.0									
	E	92.0									
	F	93.0									
	G	96.0									
	H	95.0									
	SYSTEM	94.0						720	234		
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE BOILER WAS SHUT DOWN NOVEMBER 15 BECAUSE OF A NECESSARY TURBINE OVERHAUL. THE BOILER WENT BACK ON LINE DECEMBER 25.									
12/77	A	98.0									
	B	98.0									
	C	96.0									
	D	96.0									
	E	96.0									
	F	97.0									
	G	98.0									
	H	99.0									
	SYSTEM	97.0						744	300		
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THERE WERE A FEW SMALL BOILER RELATED OUTAGES IN DECEMBER.									
1/78	A	90.0									

KANSAS CITY POWER & LIGHT: LA CYGNE 1 (CONT.)

PERIOD	MODULE	PERFORMANCE DATA AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	B	95.0									
	C	95.0									
	D	95.0									
	E	93.0									
	F	94.0									
	G	94.0									
	H	94.0									
	SYSTEM	94.0						744	597		

** PROBLEMS/SOLUTIONS/COMMENTS

THERE WERE SOME BOILER RELATED OUTAGES IN JANUARY, TOTALING ABOUT 50 HOURS.

THE FGD SYSTEM CONTINUED TO OPERATE WITHOUT ANY PROBLEMS.

2/78	A	92.0									
	B	93.0									
	C	95.0									
	D	94.0									
	E	91.0									
	F	97.0									
	G	96.0									
	H	93.0									
	SYSTEM	94.0						672	578		58.0
3/78	A	95.0									
	B	95.0									
	C	90.0									
	D	95.0									
	E	94.0									
	F	95.0									
	G	89.0									
	H	93.0									
	SYSTEM	93.0						744	741		62.0
4/78	A	91.0									
	B	92.0									
	C	93.0									
	D	91.0									
	E	90.0									
	F	92.0									
	G	91.0									
	H	91.0									
	SYSTEM	91.0						720	620		

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER WAS DOWN A TOTAL OF 100 HOURS IN APRIL. THIS TIME INCLUDED THREE OUTAGES DUE TO BOILER LEAKS AND LACK OF LOAD REQUIREMENT.

DURING THE BOILER OUTAGES MODIFICATIONS TO THE FGD SYSTEM INCLUDED CHANGING THE REHEAT TUBE BUNDLES.

5/78	A	89.0									
	B	92.0									
	C	92.0									
	D	93.0									
	E	92.0									
	F	91.0									
	G	93.0									
	H	86.0									
	SYSTEM	91.0						744	593		

KANSAS CITY POWER & LIGHT: LA CYGNE 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
		IN MA ' THE BOILER WAS DOWN TWICE FOR A TOTAL OF 151 HOURS. OUTAGES WERE AGAIN CAUSED BY BOILER LEAKS.									
		GENER L MAINTENANCE AND REPAIRS ON THE FGD SYSTEM CONTINUED.									
6/78	SYSTEM							720	15		
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UNIT WAS UP FOR ONLY 15 HOURS IN JUNE. IN THE FIRST PART OF JUNE THERE WERE BOILER TUBE LEAKS. FROM JUNE 8 TO JUNE 17 A BOILER OUTAGE WAS NECESSARY FOR GENERATOR REPAIR.									
7/78	A	88.0									
	B	97.0									
	C	92.0									
	D	94.0									
	E	88.0									
	F	93.0									
	G	93.0									
	H	95.0									
	SYSTEM	93.0						744	341		
8/78	A	92.0									
	B	93.0									
	C	95.0									
	D	96.0									
	E	93.0									
	F	94.0									
	G	95.0									
	H	95.0									
	SYSTEM	94.0						744	577		
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THERE WERE TWO BOILER OUTAGES IN AUGUST.									
		THE UTILITY IS EXPERIMENTING WITH A 3-STAGE MIST ELIMINATOR AND SOME DOUBLE STAGE MIST ELIMINATORS. BETTER MIST ELIMINATION AT THE SCRUBBER EXIT WOULD REDUCE THE FREQUENCY OF REHEATER CLEANING.									
9/78	A	96.0									
	B	96.0									
	C	96.0									
	D	96.0									
	E	96.0									
	F	96.0									
	G	95.0									
	H	97.0									
	SYSTEM	96.0						720	720		
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING THE JULY-SEPTEMBER PERIOD TWO ID FAN ROTERS WERE REPLACED.									
10/78	A	96.0									
	B	96.0									
	C	98.0									
	D	97.0									
	E	97.0									

KANSAS CITY POWER & LIGHT: LA CYGNE 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	F	98.0									
	G	97.0									
	H	96.0									
	SYSTEM	97.0						744	255		

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO UNUSUAL OPERATING PROBLEMS WERE ENCOUNTERED DURING OCTOBER AND NOVEMBER.

11/78	A	92.0									
	B	95.0									
	C	94.0									
	D	93.0									
	E	94.0									
	F	93.0									
	G	94.0									
	H	96.0									
	SYSTEM	94.0						720	720		

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO UNUSUAL OPERATING PROBLEMS WERE ENCOUNTERED DURING OCTOBER AND NOVEMBER.

12/78	A	93.9									
	B	92.9									
	C	94.0									
	D	95.0									
	E	94.7									
	F	90.5									
	G	94.4									
	H	94.7									
	SYSTEM	93.8						744	239		
1/79	A	95.6									
	B	96.5									
	C	97.2									
	D	96.3									
	E	90.7									
	F	97.2									
	G	97.2									
	H	95.4									
	SYSTEM	95.8						744	205		

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE DECEMBER-JANUARY PERIOD THE UNIT EXPERIENCED A MULTITUDE OF BOILER OUTAGES.

2/79	A	95.0									
	B	94.6									
	C	92.6									
	D	93.5									
	E	95.1									
	F	94.3									
	G	94.1									
	H	93.8									
	SYSTEM	94.1						672	342		
3/79	A	96.1									
	B	96.0									
	C	93.2									

KANSAS CITY POWER & LIGHT: LA CYGNE 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	D	95.6									
	E	96.5									
	F	94.8									
	G	95.7									
	H	93.4									
	SYSTEM	95.2						744	314		

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD SYSTEM PROBLEMS WERE REPORTED BY THE UTILITY FOR FEBRUARY OR MARCH.

THE UTILITY HAS REPORTED THAT MANY TUBE LEAKS AND CYCLONE LEAKS WERE EXPERIENCED WITH THE BOILER.

4/79	A	95.5									
	B	95.7									
	C	94.4									
	D	91.4									
	E	95.5									
	F	96.2									
	G	95.9									
	H	95.7									
	SYSTEM	95.0						720	638		
5/79	A	96.5									
	B	96.3									
	C	96.7									
	D	95.3									
	E	95.4									
	F	95.7									
	G	96.3									
	H	95.5									
	SYSTEM	96.0						744	476		

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD PROBLEMS HAD OCCURRED.

6/79	SYSTEM	100.0				.0		720	0	0	.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS REMOVED FROM SERVICE THE LATTER PART OF MAY FOR SCHEDULED BOILER OVERHAUL AND REMAINED OUT OF SERVICE THROUGH JUNE.

7/79	SYSTEM	100.0				.0		744	0	0	

** PROBLEMS/SOLUTIONS/COMMENTS

THE TURBINE WAS OVERHAULED DURING JULY. DURING THE OUTAGE SOME MINOR MAINTENANCE WAS PERFORMED ON THE SCRUBBING SYSTEM.

8/79	A	86.8									
	B	95.9									
	C	96.3									
	D	96.3									
	E	95.9									
	F	96.2									
	G	88.5									
	H	96.9									
	SYSTEM	94.1						744	231		
9/79	A	96.0									

KANSAS CITY POWER & LIGHT: LA CYGNE 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	B	96.1									
	C	95.6									
	D	94.3									
	E	96.7									
	F	96.1									
	G	96.0									
	H	96.9									
	SYSTEM	96.0						720	618		

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD UNITS OPERATED WITH NO MAJOR PROBLEMS AND ONLY REGULAR MAINTENANCE WAS PERFORMED DURING AUGUST AND SEPTEMBER.

10/79	A	95.3									
	B	95.8									
	C	94.7									
	D	92.7									
	E	94.4									
	F	94.9									
	G	94.7									
	H	94.5									
	SYSTEM	94.6						744	436		
11/79	SYSTEM	.0				.0		720	0	0	.0
12/79	SYSTEM	.0				.0		744	0	0	.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER WENT DOWN FOR AN OVERHAUL ON OCTOBER 19 AND WAS OUT OF SERVICE THROUGH DECEMBER.

EXTENSIVE MAINTENANCE WORK BEGAN ON THE FGD SYSTEM LATE IN OCTOBER CAUSING THE SYSTEM TO BE UNAVAILABLE DURING NOVEMBER AND DECEMBER. SOME ITEMS INCLUDED IN THE MAINTENANCE WERE:

THE INSTALLATION OF TWO NEW SPRAY HEADERS IN SIX OF THE MODULES, REPLACEMENT OF THE ABSORBER SIDEWALLS, REPLACEMENT OF THE MODULE OUTLET DUCTS AND DAMPERS, AND VARIOUS DUCTWORK PATCHING.

1/80	SYSTEM	.0				.0		744	0	0	.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER AND FGD SYSTEM REMAINED UNAVAILABLE DURING JANUARY DUE TO THE ON-GOING GENERATOR/TURBINE OVERHAUL AND THE EXTENSIVE FGD SYSTEM MODIFICATIONS BEING PERFORMED.

2/80	A	98.2	84.1	95.7	20.0						
	B	98.2	58.3	92.9	13.2						
	C	97.4	66.2	89.7	14.9						
	D	99.1	45.9	92.3	10.3						
	E	98.2	93.0	97.3	21.0						
	F	99.1	91.7	97.3	20.7						
	G	99.1	91.7	97.3	20.7						
	H	99.6	92.4	97.3	20.8						
	SYSTEM	98.6	77.7	95.3	17.5			696	157	122	10.9

** PROBLEMS/SOLUTIONS/COMMENTS

THE TURBINE/GENERATOR OVERHAUL WAS COMPLETED IN FEBRUARY AND THE BOILER AND FGD SYSTEM RETURNED TO SERVICE ON FEBRUARY 20. THE FGD SYSTEM WAS AVAILABLE FOR OPERATION MOST OF THE MONTH.

KANSAS CITY POWER & LIGHT: LA CYGNE 1 (CONT.)

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
3/80	A	94.6	100.0	100.0	4.3						
	B	96.2	100.0	100.0	4.3						
	C	96.1	100.0	100.0	4.3						
	D	96.1	100.0	100.0	4.3						
	E	95.8	93.8	100.0	4.0						
	F	94.7	53.1	100.0	2.3						
	G	93.3	31.3	100.0	1.3						
	H	95.7	.0		.0						
	SYSTEM	95.3	72.3	100.0	3.1			744	32	23	1.7

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS OPERATED FOR ONLY 23 HOURS IN MARCH AS A RESULT OF GENERATOR/TURBINE PROBLEMS. SOME ROUTINE CLEANING AND INSPECTIONS OF THE FGD SYSTEM WERE PERFORMED DURING THE OUTAGE TIME.

4/80	A	96.3	94.1	94.5	61.7						
	B	95.1	78.4	91.4	51.4						
	C	95.0	97.5	92.9	63.9						
	D	96.7	93.6	94.8	61.4						
	E	95.3	86.0	92.3	56.4						
	F	92.5	76.3	87.2	50.0						
	G	97.0	68.4	93.9	44.9						
	H	97.0	62.9	93.4	41.3						
	SYSTEM	95.6	82.2	92.6	53.9			720	472	388	37.6
5/80	A	96.4	89.4	96.0	84.1						
	B	94.6	87.9	93.9	82.7						
	C	95.7	88.3	95.2	83.1						
	D	95.9	83.9	95.1	78.9						
	E	96.1	84.4	95.3	79.4						
	F	96.5	89.3	96.2	84.0						
	G	96.1	96.0	94.0	90.3						
	H	96.8	82.3	96.2	77.4						
	SYSTEM	96.0	87.7	95.5	82.5			744	700	614	49.9
6/80	A	98.2	89.5	97.2	46.0						
	B	98.1	90.3	96.8	46.4						
	C	97.4	96.8	96.7	49.7						
	D	98.1	92.5	98.0	47.5						
	E	98.1	87.6	97.9	45.0						
	F	98.3	91.1	98.5	46.8						
	G	98.8	88.2	97.3	45.3						
	H	99.3	87.3	98.6	44.9						
	SYSTEM	98.3	90.4	98.9	46.4			720	370	334	35.5

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD RELATED PROBLEMS WERE REPORTED FOR THE SECOND QUARTER OF 1980.

7/80	A	89.7	86.9	87.1	69.9						
	B	97.8	97.6	97.3	78.5						
	C	97.3	96.9	96.6	77.9						
	D	98.1	98.0	97.7	78.8						
	E	98.2	97.6	97.8	78.4						
	F	98.6	98.6	98.3	79.3						
	G	98.1	97.9	97.6	78.7						
	H	97.7	96.9	97.1	77.9						
	SYSTEM	96.9	96.3	96.2	77.4			744	598	576	60.9

KANSAS CITY POWER & LIGHT: LA CYGNE 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
		NO MAJOR FGD-RELATED PROBLEMS WERE REPORTED FOR JULY.									
8/80	A	94.6	92.7	93.9	66.9						
	B	97.9	97.3	97.2	70.3						
	C	98.1	97.3	97.3	70.3						
	D	97.7	96.8	97.4	69.9						
	E	97.2	96.2	96.7	69.5						
	F	98.7	97.2	98.1	70.2						
	G	97.6	96.9	96.7	69.9						
	H	97.3	96.4	96.3	69.6						
	SYSTEM	97.4	96.4	96.7	69.6			744	537	518	54.7
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UTILITY REPORTED THAT NO MAJOR PROBLEMS WERE ENCOUNTERED DURING THE MONTH OF AUGUST.									
9/80	A	98.9	90.4	98.0	53.9						
	B	98.6	91.1	97.5	54.3						
	C	97.8	90.7	96.0	54.0						
	D	94.9	84.8	90.8	50.6						
	E	98.6	91.1	97.5	54.3						
	F	99.2	93.0	98.5	55.4						
	G	99.2	93.0	98.5	55.4						
	H	98.8	90.2	97.7	53.8						
	SYSTEM	98.2	90.7	97.0	54.0			720	429	389	43.3
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE FGD SYSTEM WAS TAKEN OFF LINE SEVERAL TIMES FOR A TOTAL OF 118 HOURS BECAUSE OF BOILER TUBE LEAKS.									
		THE BOILER WENT DOWN ON SEPTEMBER 27, 1980 FOR A SCHEDULED MAINTENANCE OVERHAUL. THE FGD SYSTEM WAS AVAILABLE DURING THIS TIME.									
10/80	SYSTEM	100.0			.0			744	0	0	.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING OCTOBER THE BOILER REMAINED OUT OF SERVICE DUE TO AN ANNUAL TURBINE/ BOILER OVERHAUL. THE FGD SYSTEM WAS AVAILABLE DURING THIS TIME.									
11/80	A	99.9	92.1	98.3	8.0						
	B	100.0	100.0	100.0	10.0						
	C	100.0	100.0	100.0	10.0						
	D	.0	.0	.0	.0						
	E	100.0	100.0	100.0	10.0						
	F	100.0	100.0	100.0	10.0						
	G	99.7	85.7	96.4	7.5						
	H	100.0	59.5	100.0	5.2						
	SYSTEM	98.7	87.3	85.9	7.6			720	63	55	8.7
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING NOVEMBER THE BOILER WAS IN SERVICE APPROXIMATELY 63 HOURS DUE TO THE ANNUAL TURBINE/BOILER OVERHAUL. THE FGD SYSTEM WAS AVAILABLE 98.7% DURING THIS TIME.									
		MODULE D WAS OUT OF SERVICE DUE TO REPAIRS CAUSED BY FIRE DAMAGE RECEIVED ON OCTOBER 13, 1980.									

KANSAS CITY POWER & LIGHT: LA CYGNE 1 (CONT.)

PERIOD	MODULE	PERFORMANCE DATA: AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
12/80	A	97.8	96.7	96.9	66.7						
	B	98.0	96.3	97.0	66.4						
	C	98.1	97.1	97.3	66.9						
	D	.0	.0	.0	.0						
	E	98.5	97.7	97.8	67.3						
	F	98.2	93.8	97.4	64.6						
	G	95.2	90.6	92.8	62.5						
	H	98.9	93.6	98.1	64.5						
	SYSTEM	98.9	93.6	98.1	64.5			720	513	427	45.2

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE D REMAINED OUT OF SERVICE THE ENTIRE MONTH DUE TO THE NECESSARY REPAIRS CAUSED BY FIRE DAMAGE IN OCTOBER.

THE UTILITY REPORTED NO MAJOR FGD-RELATED PROBLEMS OCCURRED DURING THE MONTH OF DECEMBER.

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	KANSAS POWER & LIGHT	
PLANT NAME	JEFFREY	
UNIT NUMBER	1	
CITY	WAMEGO	
STATE	KANSAS	
REGULATORY CLASSIFICATION	D	
PARTICULATE EMISSION LIMITATION - NG/J	43.	(.100 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	129.	(.300 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	2720	
GROSS UNIT GENERATING CAPACITY - MW	720	
NET UNIT GENERATING CAPACITY W/FGD - MW	680	
NET UNIT GENERATING CAPACITY WO/FGD - MW	*****	
EQUIVALENT SCRUBBED CAPACITY - MW	540	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	COMBUSTION ENGINEERING	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	********	(******* ACFM)
BOILER FLUE GAS TEMPERATURE - C	135.6	(276 F)
STACK HEIGHT - M	183.	(600 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	7.9	(26.0 FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	******	
AVERAGE HEAT CONTENT - J/G	18899.	(8125 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		******
AVERAGE ASH CONTENT - %	5.80	
RANGE ASH CONTENT - %	******	
AVERAGE MOISTURE CONTENT - %	28.00	
RANGE MOISTURE CONTENT - %	******	
AVERAGE SULFUR CONTENT - %	.32	
RANGE SULFUR CONTENT - %	******	
AVERAGE CHLORIDE CONTENT - %	.01	
RANGE CHLORIDE CONTENT - %	******	
*** PARTICLE CONTROL		
** ESP		
NUMBER	2	
TYPE	COLD SIDE	
SUPPLIER	C.E. WALTHER.	
INLET FLUE GAS CAPACITY - CU.M/S	1327.9	(2814000 ACFM)
INLET FLUE GAS TEMPERATURE - C	139.4	(283 F)
PRESSURE DROP - KPA	.0	(0. IN-H2O)
PARTICLE REMOVAL EFFICENCY - %	98.6	
** PARTICLE SCRUBBER		
GENERIC TYPE	NONE	
SPECIFIC TYPE	N/A	
*** FGD SYSTEM		
** GENERAL DATA		
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT	
SO2 REMOVAL MODE	WET SCRUBBING	
PROCESS TYPE	LIMESTONE	
PROCESS ADDITIVES	NONE	
SYSTEM SUPPLIER	COMBUSTION ENGINEERING	
A-E FIRM	BLACK & VEATCH	
DEVELOPMENT LEVEL	FULL SCALE	
NEW/RETROFIT	NEW	
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.00	
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	80.00	
CURRENT STATUS	1	
INITIAL START-UP	8/78	

KANSAS POWER & LIGHT: JEFFREY 1 (CONT.)

CONTRACT AWARDED	7/73	

** DESIGN AND OPERATING PARAMETERS

** ABSORBER

NUMBER	6	
NUMBER OF SPARES	1	
GENERIC TYPE	SPRAY TOWER	
SPECIFIC TYPE	OPEN COUNTERCURRENT SPRAY	
SUPPLIER	COMBUSTION ENGINEERING	
SHELL GENERIC MATERIAL	STAINLESS STEEL	
SHELL SPECIFIC MATERIAL	AUSTENITIC	
SHELL MATERIAL TRADE NAME/COMMON TYPE	TYPE 316L	
LINER GENERIC MATERIAL	NONE	
LINER SPECIFIC MATERIAL	N/A	
LINER MATERIAL TRADE NAME/COMMON TYPE	N/A	
L/G RATIO - L/CU.M	4.1	(30.4 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	1.0	(4.0 IN-H2O)
SO2 REMOVAL EFFICIENCY - %	60.0	

** MIST ELIMINATOR

PPE-MIST ELIMINATOR/MIST ELIMINATOR	MIST ELIMINATOR	
GENERIC TYPE	IMPINGEMENT	
SPECIFIC TYPE	BAFFLE	
TRADE NAME/COMMON TYPE	CHEVRON VANE	
CONFIGURATION	HORIZONTAL	
NUMBER OF STAGES	2	
NUMBER OF PASSES PER STAGE	2	
FREEBOARD DISTANCE - M	1.22	(4.0 FT)
DISTANCE BETWEEN VANES - CM	5.1	(2.00 IN)
VANE ANGLES - DEGREES	45	
SUPERFICAL GAS VELOCITY - M/S	.3	(1.0 FT/S)
CONSTRUCTION MATERIAL GENERIC TYPE	FIBERGLASS	
WASH WATER SOURCE	POND WATER	

** REHEATER

NUMBER	1	
GENERIC TYPE	BYPASS	
SPECIFIC TYPE	COLD SIDE	
TRADE NAME/COMMON TYPE	N/A	
PERCENT GAS BYPASSED - AVG	25.0	
TEMPERATURE INCREASE - C	7.2	(45 F)
CONSTRUCTION MATERIAL GENERIC TYPE	FRP	

** FANS

NUMBER	4	
SUPPLIER	GREEN FAN	
FUNCTION	BALANCED DRAFT	
APPLICATION	BOILER I.D.	
SERVICE	DRY	
FLUE GAS TEMPERATURE - C	135.6	(276 F)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	

** DUCTWORK

LOCATION	SCRUBBER INLET
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
LINER GENERIC MATERIAL TYPE	NONE

** DUCTWORK

LOCATION	SCRUBBER OUTLET TO STACK
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
LINER GENERIC MATERIAL TYPE	GUNITE FROM BYPASS REHEAT SECTION TO STACK

** REAGENT PREPARATION EQUIPMENT

FUNCTION	LIMESTONE GRINDING	
DEVICE	BALL MILL	
NUMBER	1	
FULL LOAD DRY FEED CAPACITY - M.TONS/HR	10.9	(12 TPH)

KANSAS POWER & LIGHT: JEFFREY 1 (CONT.)

** TANKS

SERVICE	NUMBER
REACTION	4

** PUMPS

SERVICE	NUMBER
ABSORBER RECIRCULATION	6

*** SLUDGE

** TREATMENT

** DISPOSAL

NATURE	FINAL	
TYPE	POND	
LOCATION	ON SITE	
SITE TRANSPORTATION METHOD	PUMPED	

** WATER BALANCE

WATER LOOP TYPE	CLOSED	
MAKEUP WATER ADDITION - LITERS/S	35.1	(557 GPM)

** FGD SPARE CAPACITY INDICES

ABSORBER - %	20.0

** FGD SPARE COMPONENT INDICES

ABSORBER	1.0

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
8/78	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER AND TURBINE WERE SYNCHRONIZED ON JUNE 11 AND THE BOILER IS NOW OPERATIONAL.

THE FGD SYSTEM IS IN THE SHAKEDOWN PHASE OF OPERATION. EACH OF THE SIX MODULES OPERATED DURING THIS PERIOD. NO MAJOR PROBLEMS WERE REPORTED. INTEGRATED OPERATION OF THE SYSTEM IS EXPECTED DURING THE FIRST HALF OF OCTOBER.

9/78	SYSTEM							720			
10/78	SYSTEM							744			
11/78	SYSTEM							720			
12/78	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

INTEGRATED OPERATION FOR THIS UNIT HAS NOT YET BEEN ACHIEVED. A CERTIFICATION TEST WHICH HAD BEEN SCHEDULED WAS CANCELLED DUE TO A BOILER OUTAGE. AT THIS TIME THE COLD WEATHER HAS FORCED POSTPONMENT OF THE TEST INDEFINITELY. INTERMITTENT FGD OPERATIONS ARE CONTINUING.

1/79	SYSTEM							744			
2/79	SYSTEM							672			
3/79	SYSTEM							744			

KANSAS POWER & LIGHT: JEFFREY 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
	NO BOILER OR FGD SYSTEM PROBLEMS WERE REPORTED FOR FEBRUARY OR MARCH.										
4/79	SYSTEM				.0			720	0	0	.0
5/79	SYSTEM				.0			744	0	0	.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
	THE BOILER WAS SHUT DOWN FOR WARRANTY INSPECTION ON APRIL 1 AND REMAINED OUT OF SERVICE DURING MAY.										
6/79	SYSTEM							720			
	** PROBLEMS/SOLUTIONS/COMMENTS										
	THE UTILITY REPORTED THAT THE UNIT RETURNED TO SERVICE THE FIRST WEEK OF JUNE AND HAS SUFFERED NO OPERATIONAL DIFFICULTIES SINCE RESTART.										
7/79	SYSTEM							744			
8/79	SYSTEM							744			
9/79	SYSTEM							720			
	** PROBLEMS/SOLUTIONS/COMMENTS										
	NO UNUSUAL BOILER OR FGD SYSTEM PROBLEMS WERE ENCOUNTERED DURING JULY OR AUGUST. THE UNIT PASSED THE COMPLIANCE TEST DURING THE JUNE-JULY PERIOD. THE UNIT WILL SHUT DOWN IN MID-SEPTEMBER FOR THE NORMAL TWO WEEK INSPECTION AND MAINTENANCE OUTAGE. THE UNIT IS EXPECTED BACK ON LINE ON OCTOBER 1.										
10/79	SYSTEM							744			
11/79	SYSTEM							720			
12/79	SYSTEM							744			
	** PROBLEMS/SOLUTIONS/COMMENTS										
	THE UTILITY HAS REPORTED THAT THERE HAS BEEN NO MAJOR OPERATING PROBLEMS DURING THIS REPORT PERIOD. EXCESSIVE BALL WEAR IN THE LIMESTONE BALL MILL WAS DETECTED.										
	AGITATOR FAILURES IN THE REACTION TANK HAVE OCCURRED. THE AGITATORS HAVE EXPERIENCED MOTOR FAILURES, PADDLE ARM DETACHMENTS AND SHAFT BREAKING.										
1/80	SYSTEM							744			
2/80	SYSTEM							696			
3/80	SYSTEM	100.0	100.0	100.0	67.7			744	504	504	
	** PROBLEMS/SOLUTIONS/COMMENTS										
	THE BOILER WENT OFF LINE FOR TEN DAYS IN MARCH FOR A SCHEDULED INSPECTION. DURING THE BOILER OUTAGE GENERAL MAINTENANCE WAS PERFORMED ON THE FGD SYSTEM. OTHER THAN THIS OUTAGE, THE FGD UNIT OPERATED 100% OF THE TIME IN MARCH.										
4/80	SYSTEM	100.0	100.0	100.0	100.0			720	720	720	
5/80	SYSTEM	100.0	100.0	100.0	100.0			744	744	744	

KANSAS POWER & LIGHT: JEFFREY 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
6/80	SYSTEM	100.0	100.0	100.0	100.0			720	720	720	

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE APRIL THROUGH JUNE PERIOD THE FGD SYSTEM OPERATED 100% OF THE TIME.

7/80	SYSTEM	100.0	100.0	100.0	69.1			744	514	514	49.3

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JULY A 230 HOUR OUTAGE OCCURRED DUE TO A REHEATER TUBE LEAK IN THE BOILER. NO FGD-RELATED PROBLEMS OCCURRED DURING THE MONTH.

8/80	SYSTEM	100.0	100.0	100.0	84.8			744	631	631	42.8

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS TAKEN OUT OF SERVICE FOR PART OF AUGUST SO REPAIRS COULD BE CONDUCTED ON A BOILER REHEAT TUBE.

9/80	SYSTEM	100.0	100.0	100.0	100.0			720	720	720	67.7

** PROBLEMS/SOLUTIONS/COMMENTS

NO PROBLEMS WITH THE BOILER OR THE FGD SYSTEM WERE ENCOUNTERED DURING SEPTEMBER.

10/80	SYSTEM	100.0	100.0	100.0	37.4			744	278	278	

** PROBLEMS/SOLUTIONS/COMMENTS

DURING OCTOBER THE BOILER DID NOT OPERATE FOR APPROXIMATELY 466 HOURS DUE TO A SCHEDULED INSPECTION.

11/80	SYSTEM	99.9	99.8	99.8	86.8			720	626	625	

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER WAS OUT OF SERVICE APPROXIMATELY 94 HOURS DUE TO BOILER INSPECTION AND BEARING FAILURES.

THE FGD SYSTEM WAS DOWN APPROXIMATELY ONE HOUR DUE TO AN AUTOMATIC DAMPER MALFUNCTION.

12/80	SYSTEM	100.0	100.0	100.0	98.5			744	733	733	

** PROBLEMS/SOLUTIONS/COMMENTS

DURING DECEMBER THE FGD SYSTEM WAS AVAILABLE 100%.

A BOILER OUTAGE DURING THE MONTH WAS DUE TO A AIR PREHEATER PROBLEM.

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	KANSAS POWER & LIGHT	
PLANT NAME	JEFFREY	
UNIT NUMBER	2	
CITY	WAMEGO	
STATE	KANSAS	
REGULATORY CLASSIFICATION	D	
PARTICULATE EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	*****	
GROSS UNIT GENERATING CAPACITY - MW	700	
NET UNIT GENERATING CAPACITY W/FGD - MW	680	
NET UNIT GENERATING CAPACITY WO/FGD - MW	*****	
EQUIVALENT SCRUBBED CAPACITY - MW	490	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	COMBUSTION ENGINEERING	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	********	(******* ACFM)
BOILER FLUE GAS TEMPERATURE - C	*******	(**** F)
STACK HEIGHT - M	183.	(600 FT)
STACK SHELL	******	
STACK TOP DIAMETER - M	*******	(***** FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	******	
AVERAGE HEAT CONTENT - J/G	18841.	(8100 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		******
AVERAGE ASH CONTENT - %	5.80	
RANGE ASH CONTENT - %	7-8	
AVERAGE MOISTURE CONTENT - %	28.00	
RANGE MOISTURE CONTENT - %	******	
AVERAGE SULFUR CONTENT - %	.30	
RANGE SULFUR CONTENT - %	******	
AVERAGE CHLORIDE CONTENT - %	********	
RANGE CHLORIDE CONTENT - %	******	
*** PARTICLE CONTROL		
** ESP		
NUMBER	2	
TYPE	COLD SIDE	
SUPPLIER	COMBUSTION ENGINEERING	
INLET FLUE GAS CAPACITY - CU.M/S	1327.9	(2814000 ACFM)
INLET FLUE GAS TEMPERATURE - C	139.4	(283 F)
PARTICLE REMOVAL EFFICENCY - %	98.6	
** PARTICLE SCRUBBER		
GENERIC TYPE	NONE	
SPECIFIC TYPE	N/A	
*** FGD SYSTEM		
** GENERAL DATA		
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT	
SO2 REMOVAL MODE	WET SCRUBBING	
PROCESS TYPE	LIMESTONE	
SYSTEM SUPPLIER	COMBUSTION ENGINEERING	
A-E FIRM	BLACK & VEATCH	
DEVELOPMENT LEVEL	FULL SCALE	
NEW/RETROFIT	NEW	
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	80.00	
CURRENT STATUS	1	
COMMERCIAL START-UP	1/80	
INITIAL START-UP	4/80	
CONTRACT AWARDED	7/73	

KANSAS POWER & LIGHT: JEFFREY 2 (CONT.)

** DESIGN AND OPERATING PARAMETERS

** ABSORBER		
GENERIC TYPE	SPRAY TOWER	
SPECIFIC TYPE	OPEN COUNTERCURRENT SPRAY	
SUPPLIER	COMBUSTION ENGINEERING	
SHELL GENERIC MATERIAL	STAINLESS STEEL	
SHELL SPECIFIC MATERIAL	AUSTENITIC	
SHELL MATERIAL TRADE NAME/COMMON TYPE	TYPE 316L	
LINER GENERIC MATERIAL	NONE	
LINER SPECIFIC MATERIAL	N/A	
LINER MATERIAL TRADE NAME/COMMON TYPE	N/A	
L/G RATIO - L/CU.M	4.1	(30.4 GAL/1000 ACF)
SO2 REMOVAL EFFICIENCY - %	60.0	
** MIST ELIMINATOR		
PRE-MIST ELIMINATOR/MIST ELIMINATOR	MIST ELIMINATOR	
GENERIC TYPE	IMPINGEMENT	
SPECIFIC TYPE	BAFFLE	
TRADE NAME/COMMON TYPE	CHEVRON VANE	
** REHEATER		
GENERIC TYPE	BYPASS	
SPECIFIC TYPE	COLD SIDE	
TRADE NAME/COMMON TYPE	N/A	
PERCENT GAS BYPASSED - AVG	30.0	
TEMPERATURE INCREASE - C	7.2	(45 F)

*** SLUDGE

** TREATMENT	
METHOD	BOTTOM ASH STABILIZATION
** DISPOSAL	
NATURE	FINAL
TYPE	LINED POND
LOCATION	ON SITE
SITE TRANSPORTATION METHOD	PUMPED
** WATER BALANCE	
WATER LOOP TYPE	CLOSED

----------PERFORMANCE DATA----------

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
1/80	SYSTEM							744			
2/80	SYSTEM							696			
3/80	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

INITIAL OPERATIONS AT JEFFREY 2 BEGAN IN JANUARY 1980. NO MAJOR PROBLEMS HAVE BEEN ENCOUNTERED SINCE STARTUP.

4/80	SYSTEM							720		

** PROBLEMS/SOLUTIONS/COMMENTS

DURING APRIL THE SYSTEM WAS STILL IN THE SHAKEDOWN/DEBUGGING PHASE.

5/80	SYSTEM	100.0	100.0	100.0	100.0			744	744	744
6/80	SYSTEM	100.0	100.0	100.0	100.0			720	720	720

KANSAS POWER & LIGHT: JEFFREY 2 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
		COMMERCIAL OPERATIONS BEGAN ON MAY 1, 1980. SINCE THEN THERE HAVE BEEN NO PROBLEMS ENCOUNTERED WITH THE FGD SYSTEM. THE UNIT HAS OPERATED 100% OF THE TIME.									
7/80	SYSTEM	100.0	100.0	100.0	95.3			744	709	709	81.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING JULY A 35 HOUR OUTAGE OCCURRED DUE TO A REHEATER TUBE LEAK IN THE BOILER. NO FGD-RELATED OUTAGES OCCURRED DURING THE MONTH.									
8/80	SYSTEM	100.0	100.0	100.0	100.0			744	744	744	80.1
9/80	SYSTEM	100.0	100.0	100.0	100.0			720	720	720	73.3
	** PROBLEMS/SOLUTIONS/COMMENTS										
		NO PROBLEMS WERE ENCOUNTERED WITH THE BOILER OR THE FGD SYSTEM DURING THE AUGUST AND SEPTEMBER PERIOD.									
10/80	SYSTEM	100.0	100.0	100.0	100.0			744	744	744	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UTILITY REPORTED THAT NO MAJOR PROBLEMS WERE ENCOUNTERED DURING THE MONTH OF OCTOBER.									
11/80	SYSTEM	100.0	100.0	100.0	56.1			720	404	404	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING NOVEMBER NO MAJOR FGD-RELATED PROBLEMS OCCURRED. HOWEVER, THE BOILER WAS OUT OF SERVICE APPROXIMATELY 316 HOURS DUE TO A SCHEDULE OUTAGE.									
12/80	SYSTEM	100.0	100.0	100.0	62.9			744	468	468	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING DECEMBER THE BOILER WAS OUT OF SERVICE DUE TO SUPERHEATER TUBE PROBLEMS. DURING THIS TIME THE FGD SYSTEM WAS 100% AVAILABLE.									

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	KANSAS POWER & LIGHT	
PLANT NAME	LAWRENCE	
UNIT NUMBER	4	
CITY	LAWRENCE	
STATE	KANSAS	
REGULATORY CLASSIFICATION	D	
PARTICULATE EMISSION LIMITATION - NG/J	43.	(.100 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	129.	(.300 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	576	
GROSS UNIT GENERATING CAPACITY - MW	125	
NET UNIT GENERATING CAPACITY W/FGD - MW	115	
NET UNIT GENERATING CAPACITY WO/FGD - MW	*****	
EQUIVALENT SCRUBBED CAPACITY - MW	125	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	COMBUSTION ENGINEERING	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	CYCLING	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	190.18	(403000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	137.8	(280 F)
STACK HEIGHT - M	37.	(120 FT)
STACK SHELL	CARBON STEEL	
STACK TOP DIAMETER - M	2.4	(8.0 FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	******	
AVERAGE HEAT CONTENT - J/G	23260.	(10000 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		******
AVERAGE ASH CONTENT - %	9.80	
RANGE ASH CONTENT - %	******	
AVERAGE MOISTURE CONTENT - %	12.00	
RANGE MOISTURE CONTENT - %	******	
AVERAGE SULFUR CONTENT - %	.55	
RANGE SULFUR CONTENT - %	******	
AVERAGE CHLORIDE CONTENT - %	.03	
RANGE CHLORIDE CONTENT - %	******	
*** PARTICLE CONTROL		
** ESP		
NUMBER	1	
TYPE	COLD SIDE	
INLET FLUE GAS CAPACITY - CU.M/S	165.2	(350000 ACFM)
INLET FLUE GAS TEMPERATURE - C	147.2	(297 F)
PARTICLE REMOVAL EFFICENCY - %	99.0	
** PARTICLE SCRUBBER		
NUMBER	2	
GENERIC TYPE	VENTURI TOWER	
SPECIFIC TYPE	VARIABLE-THROAT/VERTICALLY-ADJUSTABLE ROD DECKS	
SUPPLIER	COMBUSTION ENGINEERING	
DIMENSIONS - FT	3 X 23	
SHELL GENERIC MATERIAL	STAINLESS STEEL	
SHELL SPECIFIC MATERIAL	AUSTENITIC	
LINER GENERIC MATERIAL	NONE	
LINER SPECIFIC MATERIAL	N/A	
GAS CONTACTING DEVICE TYPE	RUBBER COATED FIBERGLASS (NORYL) RODS (SPRAY NOZ	
NUMBER OF CONTACTING ZONES	1	
LIQUID RECIRCULATION RATE - LITER/S	226.8	(3600 GPM)
L/G RATIO - LITER/CU.M	2.4	(18.0 GAL/1000ACF)
PRESSURE DROP - KPA	2.2	(9.0 IN-H2O)
INLET GAS FLOW RATE - CU.M/S	95.1	(201500 ACFM)
INLET GAS TEMPERATURE - C	137.8	(280 F)
*** FGD SYSTEM		

KANSAS POWER & LIGHT: LAWRENCE 4 (CONT.)

** GENERAL DATA			
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT		
SO2 REMOVAL MODE	WET SCRUBBING		
PROCESS TYPE	LIMESTONE		
PROCESS ADDITIVES	NONE		
SYSTEM SUPPLIER	COMBUSTION ENGINEERING		
A-E FIRM	BLACK & VEATCH		
DEVELOPMENT LEVEL	FULL SCALE		
NEW/RETROFIT	RETROFIT		
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	98.90		
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	73.00		
CURRENT STATUS	1		
INITIAL START-UP	1/77		
CONTRACT AWARDED	12/68		
** DESIGN AND OPERATING PARAMETERS			
** ABSORBER			
NUMBER	2		
GENERIC TYPE	SPRAY TOWER		
SPECIFIC TYPE	OPEN COUNTERCURRENT SPRAY		
SUPPLIER	COMBUSTION ENGINEERING		
SHELL GENERIC MATERIAL	STAINLESS STEEL		
SHELL SPECIFIC MATERIAL	AUSTENITIC		
SHELL MATERIAL TRADE NAME/COMMON TYPE	TYPE 316L		
LINER GENERIC MATERIAL	NONE		
LINER SPECIFIC MATERIAL	N/A		
LINER MATERIAL TRADE NAME/COMMON TYPE	N/A		
GAS CONTACTING DEVICE TYPE	7 IN DIA. RODS		
NUMBER OF CONTACTING ZONES	2		
LIQUID RECIRCULATION RATE - LITER/S	334.	(5300 GPM)	
L/G RATIO - L/CU.M	4.0	(30.0 GAL/1000 ACF)	
GAS-SIDE PRESSURE DROP - KPA	.6	(2.5 IN-H2O)	
INLET GAS FLOW - CU. M/S	82.35	(174500 ACFM)	
INLET GAS TEMPERATURE - C	51.1	(124 F)	
SO2 REMOVAL EFFICIENCY - %	73.0		
PARTICLE REMOVAL EFFICENCY - %	98.9		
** MIST ELIMINATOR			
PRE-MIST ELIMINATOR/MIST ELIMINATOR	MIST ELIMINATOR		
NUMBER PER SYSTEM	8		
GENERIC TYPE	IMPINGEMENT		
SPECIFIC TYPE	BAFFLE		
TRADE NAME/COMMON TYPE	CHEVRON VANE		
CONFIGURATION	HORIZONTAL		
NUMBER OF STAGES	2		
NUMBER OF PASSES PER STAGE	2		
FREEBOARD DISTANCE - M	1.07	(3.5 FT)	
DISTANCE BETWEEN STAGES - CM	2.54	(1.0 IN)	
DISTANCE BETWEEN VANES - CM	8.9	(3.50 IN)	
VANE ANGLES - DEGREES	90		
PRESSURE DROP - KPA	.2	(1.0 IN-H2O)	
SUPERFICAL GAS VELOCITY - M/S	1.8	(6.0 FT/S)	
CONSTRUCTION MATERIAL GENERIC TYPE	FIBERGLASS REINFORCED PLASTIC		
WASH WATER SOURCE	COOLING TOWER BLOWDOWN		
WASH RATE - L/S	315.4	(5000 GAL/MIN)	
** REHEATER			
NUMBER	1		
GENERIC TYPE	IN-LINE		
SPECIFIC TYPE	HOT WATER		
TRADE NAME/COMMON TYPE	FIN TUBE		
TEMPERATURE INCREASE - C	10.0	(50 F)	
INLET FLUE GAS FLOW RATE - CU. M/S	171.30	(363000 ACFM)	
INLET FLUE GAS TEMPERATURE - C	62.2	(144 F)	
NUMBER OF TUBES PER BUNDLE	66		
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL		

KANSAS POWER & LIGHT: LAWRENCE 4 (CONT.)

** FANS		
NUMBER	2	
SUPPLIER	BUFFALO FORGE	
APPLICATION	BOILER I.D.	
SERVICE	DRY	
FLUE GAS FLOW RATE - CU.M/S	80.22	(170000 ACFM)
FLUE GAS TEMPERATURE - C	62.2	(144 F)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	
** DUCTWORK		
LOCATION	SCRUBBER INLET	
SHELL GENERIC MATERIAL TYPE	CARBON STEEL	
LINER GENERIC MATERIAL TYPE	NONE	
** DUCTWORK		
LOCATION	SCRUBBER OUTLET	
SHELL GENERIC MATERIAL TYPE	CARBON STEEL	
LINER GENERIC MATERIAL TYPE	NONE	
** REAGENT PREPARATION EQUIPMENT		
FUNCTION	LIMESTONE GRINDING	
DEVICE	BALL MILL	
NUMBER	2	
FULL LOAD DRY FEED CAPACITY - M.TONS/HR	5.4	(6 TPH)

** TANKS	
SERVICE	NUMBER
TOWER RECIRCULATION TANK	2
VENTURI RECYCLE	2
CLARIFICATION & COLLECTION TANK	1
DILUTION	1
REACTION BLEED TANK	1

** PUMPS	
SERVICE	NUMBER
SLURRY FEED	6
MIST ELIMINATOR WASH	****
MILL SLURRY	3
CLASSIFICATION TANK TRANSFER	3
VENTURI RECIRCULATION	2
ABSORBER RECIRCULATION	2

** SOLIDS CONCENTRATING/DEWATERING		
DEVICE	THICKENER	
NUMBER	1	
*** SLUDGE		
** TREATMENT		
METHOD	FORCED OXIDATION	
INLET QUALITY - %	32.5	
** DISPOSAL		
NATURE	INTERIM	
TYPE	POND	
LOCATION	ON SITE	
** DISPOSAL		
NATURE	FINAL	
TYPE	POND	
LOCATION	ON SITE	
SITE TRANSPORTATION METHOD	OVERFLOW FROM INTERIM SLUDGE POND	
** DISPOSAL		
NATURE	FINAL	
TYPE	POND	

KANSAS POWER & LIGHT: LAWRENCE 4 (CONT.)

LOCATION	ON SITE
SITE TRANSPORTATION METHOD	OVERFLOW FROM INTERIM SLUDGE POND
** DISPOSAL	
NATURE	FINAL
TYPE	POND
LOCATION	ON SITE
** DISPOSAL	
NATURE	FINAL
TYPE	POND
LOCATION	ON SITE
** PROCESS CONTROL AND INSTRUMENTATION	
CHEMICAL PARAMETERS	SO2, SLURRY FLOWS, PH, % SOLIDS, PRESSURE DROP
CONTROL LEVELS	PH = 5.5-5.7
MONITOR LOCATION	PH PROBES IN REACTION TANKS
PROCESS CONTROL MANNER	AUTOMATIC
PROCESS CHEMISTRY MODE	FEEDBACK
** WATER BALANCE	
WATER LOOP TYPE	CLOSED
** FGD SPARE CAPACITY INDICES	
ABSORBER - %	.0
** FGD SPARE COMPONENT INDICES	
ABSORBER	.0

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
0/69	SYSTEM										

** PROBLEMS/SOLUTIONS/COMMENTS

PROBLEMS WITH THE FGD SYSTEM ON BOILER NO. 4 INCLUDED BUILDUP AND PLUGGING OF THE INLET DUCT WHERE HOT GASES ENTER THE SCRUBBERS, EROSION OF SCRUBBER WALLS, CORROSION OF SCRUBBERS INTERNALS, BUILDUP ON ID FAN ROTORS, AND PLUGGING OF DRAIN LINES, MARBLE BEDS, AND MIST ELIMINATORS. LOW SO2 REMOVAL WAS CAUSED BY OVERBURNING OF THE LIMESTONE AND DROPOUT OF THE LIME WITH THE ASH IN THE BOTTOM OF THE SCRUBBER.

THE SCRUBBERS WERE MODIFIED IN 1969 BY RAISING THE MIST ELIMINATOR AND ADDING SOOT BLOWERS IN THE INLET DUCT AND REHEATER TO REDUCE PLUGGING. NEW SPRAY NOZZLES WERE ALSO INSTALLED. REHEATER PLUGGING WAS ELIMINATED BY REPLACING COPPER REHEAT COILS WITH A CARBON STEEL UNIT HAVING WIDELY SPACED FINS.

0/70 SYSTEM

** PROBLEMS/SOLUTIONS/COMMENTS

MAJOR MODIFICATIONS IN 1970 WERE SANDBLASTING AND COATING OF THE INTERIOR OF THE SCRUBBERS, REPLACEMENT OF ALL INTERNAL STEEL PIPES WITH PLASTIC AND FIBERGLASS, AND REPLACEMENT OF STAINLESS STEEL MIST ELIMINATORS WITH FIBERGLASS. SINCE MIST ELIMINATOR PLUGGING WAS NOT COMPLETELY STOPPED, THE UNIT WAS WASHED MANUALLY EVERY NIGHT TO MAINTAIN THE REQUIRED MODULE SERVICE.

0/72 SYSTEM

** PROBLEMS/SOLUTIONS/COMMENTS

THE MODIFICATIONS IN THE SUMMER OF 1972 ON THE TWO FGD MODULES INCLUDED ENLARGEMENT OF THE CRYSTALLIZATION TANK, AND INSTALLATION OF NEW PLASTIC SPRAY NOZZLES, NEW SLURRY PUMPS AND STRAINERS, AND NEW MULTIPLE MIXERS

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR

IN THE TANK. PROBLEMS THAT REMAINED INCLUDED CORROSION, INEFFICIENT DAMPERS, EXPANSION JOINT FAILURE, MIST ELIMINATOR FOULING, RAPID EROSION OF THE SLURRY PUMP, AND VALVE FAILURE.

0/73 SYSTEM

** PROBLEMS/SOLUTIONS/COMMENTS

OPERATION OF THE FGD SYSTEM SINCE THE FALL OF 1973 HAS BEEN THE MOST SUCCESSFUL TO DATE.

0/74 SYSTEM

** PROBLEMS/SOLUTIONS/COMMENTS

IN 1974 THIS UNIT WAS AVAILABLE FOR OPERATION 343 DAYS. 50% OF THE FUEL CONSUMED WAS COAL, 2% FUEL OIL, AND 48% NATURAL GAS.

0/75 SYSTEM

** PROBLEMS/SOLUTIONS/COMMENTS

DURING 1975 THIS UNIT WAS AVAILABLE FOR OPERATION 333 DAYS. 64% OF THE FUEL CONSUMED WAS COAL, 33% FUEL OIL, AND 33% NATURAL GAS.

THE UTILITY COMPLETED NEGOTIATIONS FOR A LOW-SULFUR COAL SUPPLY FROM SOUTHEAST WYOMING (MEDICINE BOW) IN 1974. THE HIGH-SULFUR KANSAS COAL WAS COMPLETELY PHASED OUT BY LATE SPRING OF 1975. THIS IMPROVED SCRUBBER OPERATIONS BECAUSE OF REDUCED SULFUR REMOVAL REQUIREMENTS AND THE ALKALINE SPECIES IN THE NEW COAL REDUCED THE AMOUNT OF NECESSARY LIMESTONE ADDITION.

6/75 SYSTEM 720

** PROBLEMS/SOLUTIONS/COMMENTS

STATION LOAD IS REDUCED TO 50% EVERY NIGHT. THEREFORE, ONE OF THE MODULES CAN BE TAKEN OFF-LINE NIGHTLY FOR CLEANING OR REPAIR. WYOMING COAL (0.5% SULFUR) IS NOW BEING BURNED IN THE BOILER FURNACE. SOME NATURAL GAS HAS BEEN BURNED SINCE JUNE 20, 1975.

7/75 SYSTEM 744

** PROBLEMS/SOLUTIONS/COMMENTS

EACH MODULE HAS BEEN SHUT DOWN ONCE PER WEEK FOR INSPECTION AND CLEAN-UP.

8/75 SYSTEM 744

9/75 SYSTEM 720

10/75 SYSTEM 744

11/75 SYSTEM 720

12/75 SYSTEM 744

1/76 SYSTEM 744

KANSAS POWER & LIGHT: LAWRENCE 4 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
				PERFORMANCE DATA							
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UTILITY IS REPLACING THE LINESTONE INJECTION FGD SYSTEM WITH A ROD-DECK VENTURI/SPRAY TOWER FGD SYSTEM. THE NEW SYSTEM WILL BE BROUGHT ON LINE IN EARLY JANUARY 1977.									
2/76	SYSTEM							696			
3/76	SYSTEM							744			
4/76	SYSTEM							720			
5/76	SYSTEM							744			
6/76	SYSTEM							720			
7/76	SYSTEM							744			
8/76	SYSTEM							744			
9/76	SYSTEM							720			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		A SCHEDULED UNIT OUTAGE BEGAN IN MID-SEPTEMBER FOR A TURBINE OVERHAUL. THE UNIT IS SCHEDULED TO COME BACK ON LINE IN EARLY JANUARY.									
10/76	SYSTEM							744			
11/76	SYSTEM							720			
12/76	SYSTEM							744			
1/77	SYSTEM							744			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE NEW LIMESTONE FGD SYSTEM BECAME COMMERCIALLY OPERABLE IN EARLY JANUARY 1977. THE UTILITY REPORTED THAT BOTH PARTICULATE AND SO2 REMOVALS IN THE ROD-DECK VENTURI/SPRAY TOWER SCRUBBING UNIT ARE QUITE SATISFACTORY.									
2/77	SYSTEM							672			
3/77	SYSTEM							744			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		MINOR PROBLEMS HAVE BEEN RELATED TO MAINTAINING DESIRED SOLIDS LEVEL IN THE MAKE-UP TANK. MODIFICATIOON PLANS INCLUDE CESSATION OF SLURRY DILUTION, WHICH CURRENTLY PRECEDES THE INTRODUCTION OF THE FRESH LIMESTONE SLURRY INTO THE RECIRCULATION LOOP. THE UTILITY PLANS TO PUMP THE 35% SOLIDS SLURRY DIRECTLY FROM THE SLURRY TANK INTO THE RECIRCULATION LOOP. CURRENTLY SEVERAL DIFFERENT MAKES OF SLURRY PUMPS ARE BEING USED. ALL ARE FUNCTIONING WELL SO FAR. THE PUMPS HAVE NOT BEEN IN SERVICE LONG ENOUGH FOR COMPARISONS TO BE DRAWN.									
4/77	SYSTEM							720			

KANSAS POWER & LIGHT: LAWRENCE 4 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	BOILER HOURS	FGD HOURS	CAP. FACTOR
				PERFORMANCE DATA						
	** PROBLEMS/SOLUTIONS/COMMENTS									
		THE SCRUBBER WAS NOT REQUIRED FOR SERVICE DURING THE REPORT PERIOD BECAUSE NATURAL GAS WAS FIRED IN THE BOILER.								
5/77	SYSTEM							744		
6/77	SYSTEM							720		
	** PROBLEMS/SOLUTIONS/COMMENTS									
		MIST ELIMINATOR CRACKS HAVE BEEN A PROBLEM.								
		A COMPRESSOR BREAKDOWN IN THE RECYCLE TANK AIR AGITATION SYSTEM AND THE RECYCLE TANK STRAINER SCREEN WASH HAVE BEEN PROBLEM AREAS. THE WASH SYSTEM HAS BEEN TWISTING OFF UNDER WATER PRESSURE.								
		SOOT BLOWER PROBLEMS WERE ENCOUNTERED.								
		THE DENVER SLURRY PUMPS ARE EXPERIENCING SOME ON-GOING PROBLEMS, WHILE THE ALLEN-SHERMAN-HOFF PUMPS ARE OPERATING SATISFACTORILY.								
7/77	SYSTEM							744		
8/77	SYSTEM							744		
	** PROBLEMS/SOLUTIONS/COMMENTS									
		THE BOILER BURNED NATURAL GAS THROUGHOUT AUGUST.								
		THE MIST ELIMINATOR CRACKS HAVE BEEN REPAIRED.								
		THE RECYCLE TANK STRAINER PROBLEMS PERSISTED AND THE AIR AGITATION SYSTEM COMPRESSOR WAS MALFUNCTIONING RESULTING IN SOLIDS SETTLING IN THE RECYCLE TANK.								
		THE DENVER SLURRY PUMPS ARE FUNCTIONING ADEQUATELY AT PRESENT. THE PUMP GLAND PACKINGS ARE BEING REDESIGNED.								
9/77	SYSTEM							720		
	** PROBLEMS/SOLUTIONS/COMMENTS									
		THE NO. 4 BOILER HAS BEEN FIRING 100% NATURAL GAS FOR ALL BUT 8 TO 10 DAYS SINCE THE BEGINNING OF APRIL 1977. AS OF SEPTEMBER 15 THE UNIT BEGAN BURNING COAL AGAIN.								
10/77	SYSTEM							744		
	** PROBLEMS/SOLUTIONS/COMMENTS									
		THE SYSTEM LOAD WAS CUT BACK TO 50% IN OCTOBER BECAUSE A NEW COOLING TOWER IS BEING CONSTRUCTED.								
11/77	SYSTEM							720		
	** PROBLEMS/SOLUTIONS/COMMENTS									
		ON NOVEMBER 15 A MAJOR FGD SYSTEM OVERHAUL TOOK PLACE WHILE THE TURBINE WAS DOWN FOR INSPECTION AND THE NEW COOLING TOWER WAS BEING CONNECTED.								
12/77	SYSTEM							744		

KANSAS POWER & LIGHT: LAWRENCE 4 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UNIT CAME BACK ON LINE DECEMBER 20 AT FULL CAPACITY. THE TURBINES WERE BALANCED DURING DECEMBER.									
1/78	SYSTEM							744			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE FGD SYSTEM OPERATED WITHOUT ANY PROBLEMS OTHER THAN SOME FREEZING OF THE PIPELINES.									
		THICKENER DISCHARGE LINE FREEZING CAUSED CLARIFIER PLUGGING.									
2/78	SYSTEM							672			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE THICKENER UNDERFLOW LINE IS STILL FROZEN AND TWO 3 INCH DIAMETER FIRE HOSES ARE BEING USED TO PUMP THE UNDERFLOW SOLIDS TO THE POND.									
3/78	SYSTEM							744			
4/78	A	100.0	100.0	100.0							
	B	100.0	100.0	100.0							
	SYSTEM	100.0	100.0	100.0				720	720	720	
5/78	A	100.0	100.0	100.0							
	B	100.0	100.0	100.0							
	SYSTEM	100.0	100.0	100.0				744	744	744	
6/78	A	100.0	100.0	100.0							
	B	100.0	100.0	100.0							
	SYSTEM	100.0	100.0	100.0				720	720	720	
7/78	A	100.0	100.0	100.0							
	B	100.0	100.0	100.0							
	SYSTEM	100.0	100.0	100.0				744	744	744	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE BOILER AND FGD SYSTEM BOTH OPERATED THROUGHOUT JUNE AND JULY WITHOUT ANY FORCED OUTAGES.									
8/78	A	100.0	100.0	100.0							
	B	100.0	100.0	100.0							
	SYSTEM	100.0	100.0	100.0				744	744	744	
9/78	A	100.0	100.0	63.0							
	B	100.0	100.0	63.0							
	SYSTEM	100.0	100.0	63.0				720	456	456	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UTILITY REPORTED THAT THE SYSTEM RAN WITH NO FORCED OUTAGES DURING AUGUST AND SEPTEMBER.									
		THE UNIT WAS DOWN THE LAST WEEK AND A HALF IN SEPTEMBER FOR A SCHEDULED FALL TURBINE/BOILER OUTAGE. ROUTINE MAINTENANCE INCLUDED BOILER AND TURBINE CLEANING AND REPAIR.									
10/78	SYSTEM							744	576		
11/78	SYSTEM							720	720		

KANSAS POWER & LIGHT: LAWRENCE 4 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
12/78	SYSTEM							744	744		
	** PROBLEMS/SOLUTIONS/COMMENTS										
	AN EPA SPONSORED CONTINUOUS MONITORING TEST BEGAN AT THIS UNIT AT THE BEGINNING OF DECEMBER AND WILL CONTINUE THROUGH THE END OF JANUARY. THE TEST INVOLVES 24 HOUR MONITORING OF SO2, OPACITY AND NOX.										
1/79	SYSTEM							744			
	** PROBLEMS/SOLUTIONS/COMMENTS										
	AN ID FAN WAS FORCED OUT OF SERVICE ON JANUARY 5 FORCING THE UNIT TO OPERATE AT 50% CAPACITY. THE FAN IS EXPECTED TO BE REPLACED BY JANUARY 12.										
2/79	A	96.0	96.0	96.0							
	B	71.0	71.0	71.0							
	SYSTEM	84.0	84.0	84.0				672	672	564	
	** PROBLEMS/SOLUTIONS/COMMENTS										
	ONE MODULE WAS FORCED OUT OF SERVICE FOR TWO DAYS WHEN ITS TANK AGITATOR FAILED.										
	ONE MODULE WAS FORCED OUT OF SERVICE FOR AN EIGHT DAY PERIOD DUE TO A FAN MOTOR MALFUNCTION										
3/79	SYSTEM							744			
	** PROBLEMS/SOLUTIONS/COMMENTS										
	UNIT 4 EXPERIENCED A MOTOR FAILURE ON AN ID FAN DURING THE FEBRUARY-MARCH PERIOD.										
4/79	SYSTEM							720			
5/79	SYSTEM							744			
6/79	SYSTEM							720			
	** PROBLEMS/SOLUTIONS/COMMENTS										
	THE UTILITY REPORTED THAT THE SYSTEM RAN WELL. THE ONLY FGD SYSTEM RELATED OUTAGES WERE DUE TOA MIXER FAILURE AND GENERAL MAINTENANCE.										
7/79	SYSTEM							744			
8/79	SYSTEM							744			
9/79	SYSTEM							720			
	** PROBLEMS/SOLUTIONS/COMMENTS										
	DURING THE THIRD QUARTER AN OUTAGE WAS CAUSED BY MIXER MOTOR AND OTHER MIXER RELATED PROBLEMS. DURING THE OUTAGE MAINTENANCE WAS DONE ON THE BOILER AND SCRUBBERS AND REPAIR WORK WAS DONE ON THE MIXERS.										
10/79	SYSTEM							744			

KANSAS POWER & LIGHT: LAWRENCE 4 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UNIT WAS OPERATED AT HALF LOAD DURING THE LAST WEEK OF SEPTEMBER AND WAS SHUT DOWN COMPLETELY IN EARLY OCTOBER FOR THE ANNUAL FALL OUTAGE.									
11/79	SYSTEM							720			
12/79	SYSTEM							744			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UNIT WAS DOWN FOR APPROXIMATELY 10 DAYS OF SCHEDULED OUTAGE FOR FALL MAINTENANCE.									
		SOME AGITATOR SHAFT FAILURES OCCURRED IN THE REACTION TANK CAUSING MAINTENANCE ATTENTION.									
1/80	SYSTEM		100.0		100.0			744	744	744	
2/80	SYSTEM		100.0		100.0			696	696	696	
3/80	SYSTEM		100.0		100.0			744	744	744	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		NO MAJOR PROBLEMS WERE REPORTED FOR THE LAWRENCE 4 SCRUBBER DURING THE FIRST QUARTER 1980.									
4/80	SYSTEM	100.0	100.0	100.0	80.0			720	576	576	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE BOILER WAS OFF LINE FOR SIX DAYS IN APRIL FOR A SCHEDULED INSPECTION. DURING THE BOILER OUTAGE GENERAL MAINTENANCE WAS PERFORMED ON THE FGD SYSTEM.									
5/80	SYSTEM	100.0	100.0	100.0	100.0			744	744	744	
6/80	SYSTEM	100.0	100.0	100.0	100.0			720	720	720	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UTILITY REPORTED THAT THE FGD SYSTEM OPERATED 100% OF THE TIME IN MAY AND JUNE.									
7/80	SYSTEM	96.8	96.8	96.8	96.8			744	744	720	54.8
	** PROBLEMS/SOLUTIONS/COMMENTS										
		A STORAGE TANK ERODED COMPLETELY THROUGH CAUSING A TWO DAY OUTAGE IN JULY.									
8/80	SYSTEM	100.0	100.0	100.0	100.0			744	744	744	50.2
	** PROBLEMS/SOLUTIONS/COMMENTS										
		NO PROBLEMS WERE ENCOUNTERED WITH THE FGD SYSTEM OR THE BOILER DURING AUGUST.									
9/80	SYSTEM	96.9	100.0	100.0	40.3			720	290	290	16.4

KANSAS POWER & LIGHT: LAWRENCE 4 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
				PERFORMANCE DATA							
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE BOILER WAS OUT OF SERVICE FOR APPROXIMATELY 17 DAYS FOR A BOILER INSPECTION.									
		ECONOMIZER WELD REPAIRS CAUSED THE SYSTEM TO REMAIN OUT OF SERVICE FOR 22 HOURS.									
10/80	SYSTEM	100.0	100.0	100.0	100.0			744	744	744	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE MONTH OF OCTOBER.									
11/80	SYSTEM	100.0	100.0	100.0	89.7			720	646	646	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING NOVEMBER THE BOILER WAS OUT OF SERVICE APPROXIMATELY 74 HOURS DUE TO TUBE LEAKS. THE FGD SYSTEM WAS AVAILABLE 100% DURING THIS TIME.									
12/80	SYSTEM	100.0	100.0	100.0	98.1			744	730	730	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING DECEMBER 14 HOURS OF OUTAGE TIME WAS DUE TO TRANSFORMER PROBLEMS. THE FGD SYSTEM WAS AVAILABLE THE ENTIRE MONTH.									

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	KANSAS POWER & LIGHT	
PLANT NAME	LAWRENCE	
UNIT NUMBER	5	
CITY	LAWRENCE	
STATE	KANSAS	
REGULATORY CLASSIFICATION	D	
PARTICULATE EMISSION LIMITATION - NG/J	43.	(.100 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	215.	(.500 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	58	
GROSS UNIT GENERATING CAPACITY - MW	420	
NET UNIT GENERATING CAPACITY W/FGD - MW	400	
NET UNIT GENERATING CAPACITY WO/FGD - MW	*****	
EQUIVALENT SCRUBBED CAPACITY - MW	420	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	COMBUSTION ENGINEERING	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	CYCLING	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	599.78	(1271000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	148.9	(300 F)
STACK HEIGHT - M	114.	(375 FT)
STACK SHELL	CARBON STEEL	
STACK TOP DIAMETER - M	4.9	(16.0 FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	******	
AVERAGE HEAT CONTENT - J/G	23260.	(10000 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		******
AVERAGE ASH CONTENT - %	9.80	
RANGE ASH CONTENT - %	******	
AVERAGE MOISTURE CONTENT - %	12.00	
RANGE MOISTURE CONTENT - %	******	
AVERAGE SULFUR CONTENT - %	.55	
RANGE SULFUR CONTENT - %	******	
AVERAGE CHLORIDE CONTENT - %	.03	
RANGE CHLORIDE CONTENT - %	******	
*** PARTICLE CONTROL		
** PARTICLE SCRUBBER		
NUMBER	2	
GENERIC TYPE	VENTURI TOWER	
SPECIFIC TYPE	VARIABLE-THROAT/VERTICALLY-ADJUSTABLE ROD DECKS	
SUPPLIER	COMBUSTION ENGINEERING	
DIMENSIONS - FT	5 X 37	
SHELL GENERIC MATERIAL	STAINLESS STEEL	
SHELL SPECIFIC MATERIAL	AUSTENITIC	
LINER GENERIC MATERIAL	NONE	
LINER SPECIFIC MATERIAL	N/A	
GAS CONTACTING DEVICE TYPE	316L SS RODS, 2 LEVELS OF SPRAY NOZZLES	
NUMBER OF CONTACTING ZONES	1	
LIQUID RECIRCULATION RATE - LITER/S	655.2	(10400 GPM)
L/G RATIO - LITER/CU.M	2.1	(16.0 GAL/1000ACF)
PRESSURE DROP - KPA	2.2	(9.0 IN-H2O)
INLET GAS FLOW RATE - CU.M/S	299.7	(635000 ACFM)
INLET GAS TEMPERATURE - C	148.9	(300 F)
*** FGD SYSTEM		
** GENERAL DATA		
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT	
SO2 REMOVAL MODE	WET SCRUBBING	
PROCESS TYPE	LIMESTONE	
PROCESS ADDITIVES	NONE	
SYSTEM SUPPLIER	COMBUSTION ENGINEERING	
A-E FIRM	BLACK & VEATCH	
DEVELOPMENT LEVEL	FULL SCALE	

KANSAS POWER & LIGHT: LAWRENCE 5 (CONT.)

NEW/RETROFIT	RETROFIT	
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	98.90	
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	52.00	
CURRENT STATUS	1	
INITIAL START-UP	4/78	
CONTRACT AWARDED	9/69	

** DESIGN AND OPERATING PARAMETERS

** ABSORBER

NUMBER	2	
GENERIC TYPE	SPRAY TOWER	
SPECIFIC TYPE	OPEN COUNTERCURRENT SPRAY	
SUPPLIER	COMBUSTION ENGINEERING	
SHELL GENERIC MATERIAL	STAINLESS STEEL	
SHELL SPECIFIC MATERIAL	AUSTENITIC	
SHELL MATERIAL TRADE NAME/COMMON TYPE	TYPE 316L	
LINER GENERIC MATERIAL	NONE	
LINER SPECIFIC MATERIAL	N/A	
LINER MATERIAL TRADE NAME/COMMON TYPE	N/A	
NUMBER OF CONTACTING ZONES	1	
LIQUID RECIRCULATION RATE - LITER/S	655.	(10400 GPM)
L/G RATIO - L/CU.M	2.5	(19.0 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	.6	(2.5 IN-H2O)
INLET GAS FLOW - CU. M/S	256.71	(544000 ACFM)
INLET GAS TEMPERATURE - C	52.2	(126 F)
SO2 REMOVAL EFFICIENCY - %	52.0	
PARTICLE REMOVAL EFFICENCY - %	98.9	

** MIST ELIMINATOR

PRE-MIST ELIMINATOR/MIST ELIMINATOR	MIST ELIMINATOR	
NUMBER PER SYSTEM	4	
GENERIC TYPE	IMPINGEMENT	
SPECIFIC TYPE	BAFFLE	
TRADE NAME/COMMON TYPE	CHEVRON VANE	
CONFIGURATION	HORIZONTAL	
NUMBER OF STAGES	2	
NUMBER OF PASSES PER STAGE	2	
FREEBOARD DISTANCE - M	1.07	(3.5 FT)
DISTANCE BETWEEN VANES - CM	8.9	(3.50 IN)
VANE ANGLES - DEGREES	90	
PRESSURE DROP - KPA	.2	(1.0 IN-H2O)
CONSTRUCTION MATERIAL GENERIC TYPE	FIBERGLASS REINFORCED PLASTIC	
WASH WATER SOURCE	COOLING TOWER BLOWDOWN	
WASH RATE - L/S	315.4	(5000 GAL/MIN)

** REHEATER

NUMBER	1	
GENERIC TYPE	IN-LINE	
SPECIFIC TYPE	HOT WATER	
TRADE NAME/COMMON TYPE	FIN TUBE	
TEMPERATURE INCREASE - C	10.0	(50 F)
INLET FLUE GAS FLOW RATE - CU. M/S	551.18	(1168000 ACFM)
INLET FLUE GAS TEMPERATURE - C	68.9	(156 F)
NUMBER OF TUBES PER BUNDLE	66	
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	

** FANS

NUMBER	2	
SUPPLIER	AMERICAN STANDARD	
APPLICATION	BOILER I.D.	
SERVICE	DRY	
FLUE GAS FLOW RATE - CU.M/S	283.14	(600000 ACFM)
FLUE GAS TEMPERATURE - C	52.2	(126 F)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	

** DUCTWORK

LOCATION	SCRUBBER INLET
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
LINER GENERIC MATERIAL TYPE	NONE

KANSAS POWER & LIGHT: LAWRENCE 5 (CONT.)

** DUCTWORK	
LOCATION	SCRUBBER OUTLET
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
LINER GENERIC MATERIAL TYPE	NONE
** REAGENT PREPARATION EQUIPMENT	
FUNCTION	LIMESTONE GRINDING
DEVICE	BALL MILL
NUMBER	2
FULL LOAD DRY FEED CAPACITY - M.TONS/HR	21.8 (24 TPH)
PRODUCT QUALITY - % SOLIDS	60.0
** TANKS	
SERVICE	NUMBER
-------	------
CLARIFICATION & COLLECTION	1
DILUTION & STORAGE	1
** PUMPS	
SERVICE	NUMBER
-------	------
REACTION/RECYCLE TANK BLEED	****
VENTURI RECIRCULATION	2
SLURRY FEED	3
MIST ELIMINATOR WASH	****
MILL SLURRY	2
CLASSIFICATION TANK TRANSFER	2
ABSORBER RECIRCULATION	2
*** SLUDGE	
** TREATMENT	
METHOD	FORCED OXIDATION
INLET QUALITY - %	10.0
** DISPOSAL	
NATURE	INTERIM
TYPE	POND
LOCATION	ON SITE
** DISPOSAL	
NATURE	FINAL
TYPE	POND
LOCATION	ON SITE
SITE TRANSPORTATION METHOD	OVERFLOW FROM INTERIM SLUDGE POND
** DISPOSAL	
NATURE	FINAL
TYPE	POND
LOCATION	ON SITE
SITE TRANSPORTATION METHOD	OVERFLOW FROM INTERIM SLUDGE POND
** PROCESS CONTROL AND INSTRUMENTATION	
CHEMICAL PARAMETERS	SO2, SLURRY FLOWS, PH, % SOLIDS, PRESSURE CHANGE
CONTROL LEVELS	PH=5.5-5.7
MONITOR LOCATION	PH PROBES IN REACTION TANKS
PROCESS CONTROL MANNER	AUTOMATIC
PROCESS CHEMISTRY MODE	FEEDBACK
** WATER BALANCE	
WATER LOOP TYPE	CLOSED
** FGD SPARE CAPACITY INDICES	
ABSORBER - %	.0
** FGD SPARE COMPONENT INDICES	
ABSORBER	.0

KANSAS POWER & LIGHT: LAWRENCE 5 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER BOILER HOURS	FGD HOURS	CAP. FACTOR
0/74	SYSTEM									

** PROBLEMS/SOLUTIONS/COMMENTS

THE LAWRENCE 5 BOILER WAS ORIGINALLY EQUIPPED WITH A LIMESTON INJECTION FGD SYSTEM MODELED AFTER THE FGD SYSTEM RETROFITTED ONTO THE LAWRENCE 4 BOILER. CONSTRUCTION OF THE LAWRENCE 5 BOILER AND SCRUBBING SYSTEM BEGAN IN MARCH 1968 AND PROCEEDED SIMULTANEOUSLY WITH THE RETROFIT WORK ON LAWRENCE 4. INITIAL OPERATION OF THE LAWRENCE 5 BOILER AND SCRUBBING SYSTEM OCCURRED IN MARCH 1977. COMMERCIAL OPERATIONS WERE ACHIEVED IN NOVEMBER 1971 WITH THE COMPLETION OF THE SHAKEDOWN PHASE OF OPERATIONS.

THE LIMESTONE INJECTION FGD SYSTEM INCLUDED FACILITIES FOR PULVERIZING LIMESTONE AND THEN INJECTING IT INTO THE BOILER FURNACE CHAMBER FOR CALCINATION. THE FLUE GAS TRANSPORTS THE CALCINED LIMESTONE AND FLYASH TO THE SCRUBBER MODULES, EACH CONSISTING OF A SINGLE MARBLE BED EQUIPPED WITH OVERFLOW POTS FOR DRAINAGE OF RECIRCULATING SLURRY, FOR PARTICLE AND SULFUR DIOXIDE REMOVAL. THE CLEANED GASES THEN PASSED THROUGH A SET OF MIST ELIMINATORS, REHEATERS, AND INDUCED DRAFT FANS BEFORE BEING DISCHARGED THROUGH THE STACKS TO THE ATMOSPHERE.

ALTHOUGH THE CONFIGURATION OF THIS ORIGINAL SYSTEM WAS FAIRLY SIMPLE, MANY OPERATING PROBLEMS AND DESIGN INADEQUACIES WERE ENCOUNTERED. IN THE INJECTION PROCESS IT WAS DIFFICULT TO ACHIEVE SATISFACTORY CONTROL OF THE LIMESTONE CALCINATION AS WELL AS THE AMOUNT OF LIME/LIMESTONE CARRIED BY THE FLUE GAS INTO THE TAIL-END SCRUBBERS. THIS PROBLEM WAS FURTHER COMPLICATED WHEN THE BOILER WAS FIRED WITH A VARIABLE COMBINATION OF COAL, NATURAL GAS AND OIL.

THE FGD SYSTEM WAS MODIFIED A NUMBER OF TIMES THROUGHOUT ITS LIFE AND WAS LATER ABANDONED FOR A NEW SECOND-GENERATION SCRUBBER DESIGN DEVELOPED BY THE SYSTEM SUPPLIER. THE LIMESTONE INJECTION SYSTEM OPERATED UNTIL MARCH 20, 1978 WHEN IT WAS SHUTDOWN TO TIE THE NEW ROD DECK-VENTURI/SPRAY TOWER SCRUBBING SYSTEM INTO THE FLUE GAS PATH.

8/74	SYSTEM							744		

** PROBLEMS/SOLUTIONS/COMMENTS

ONE MODULE WAS ISOLATED TO PERFORM FLOW DISTRIBUTION TESTS THROUGH THE MARBLE BED IN AUGUST.

THE MIST ELIMINATOR WASH SYSTEM IS NOT EFFECTIVE. THE MIST ELIMINATORS HAVE HAD TO BE CLEANED MANUALLY.

THE BOILER IS CURRENTLY BEING FIRED WITH GAS AND OIL.

9/74	SYSTEM							720		
10/74	SYSTEM							744		

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT OPERATED ON GAS AND OIL UNTIL OCTOBER 12 WHEN COAL WAS BURNED. AGAIN.

POOR GAS DISTRIBUTION THROUGH THE MARBLE BEDS AND AMONG THE EIGHT MODULES IS STILL A PROBLEM AREA. THE SYSTEM SUPPLIER HAS COMPLETED THE GAS DISTRIBUTION TEST AND IS CURRENTLY MODIFYING THE GAS FLOW PATTERN THROUGH THE MODULES.

11/74	SYSTEM							720		

KANSAS POWER & LIGHT: LAWRENCE 5 (CONT.)

PERIOD	MODULE	PERFORMANCE DATA AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE FGD SYSTEM WAS AVAILABLE NEARLY 100% OF NOVEMBER. GAS DISTRIBUTION PROBLEMS ARE CONTINUING.									
12/74	SYSTEM							744			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		SINCE OCTOBER 12 THE UNIT HAS OPERATED ON A BLEND OF KANSAS AND WYOMING COAL. THE FGD SYSTEM HAS BEEN AVAILABLE APPROXIMATELY 97% OF THE OCTOBER-DECEMBER PERIOD. SO2 REMOVAL EFFICIENCY HAS BEEN APPROXIMATELY 75%.									
		MODIFICATIONS TO IMPROVE GAS DISTRIBUTION WITHIN AND AMONG THE MODULES HAVE NOT COMPLETELY SOLVED THE PROBLEM.									
		PUMP RUBBER LINING FAILURES OCCURRED DURING DECEMBER. SCRAPS OF RUBBER WERE DISCOVERED AT THE DISCHARGE PIPE OF THE SLURRY RECYCLE PUMPS.									
1/75	SYSTEM							744			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UNIT BURNED A MIXTURE OF 70% WYOMING AND 30% KANSAS COAL DURING JANUARY.									
2/75	SYSTEM							672			
3/75	SYSTEM							744			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UNIT BURNED WYOMING COAL HAVING 0.5% SULFUR DURING MARCH.									
4/75	SYSTEM							720			
5/75	SYSTEM							744			
6/75	SYSTEM							720			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE FGD SYSTEM SHUTDOWN FOR MOST OF JUNE FOR A MAJOR REBUILD OF THE SPRAY SYSTEMS IN ALL EIGHT MODULES. THE BOILER WAS FIRED WITH OIL AND THE FGD SYSTEM WAS BYPASSED.									
7/75	SYSTEM				.0			744	744	0	
8/75	SYSTEM				.0			744	744	0	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		OIL AND GAS WERE FIRED IN JULY AND AUGUST, RESULTING IN NO FGD OPERATION.									
9/75	SYSTEM							720			
10/75	SYSTEM							744			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING THE SEPTEMBER-OCTOBER PERIOD THE BOILER WAS SHUT DOWN FOR A SHORT TIME TO PERFORM A BOILER INSPECTION AND TO MAKE SOME TURBINE REPAIRS. DURING PART OF THE PERIOD GAS AND OIL WERE BURNED IN THE BOILER FURNACE.									

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR

SLURRY RECYCLE TANK SCREENS WERE REPLACED DURING THE SEPTEMBER-OCTOBER PERIOD.

11/75	SYSTEM								720		

** PROBLEMS/SOLUTIONS/COMMENTS

PROJECTIONS BY THE UTILITY FOR THIS UNIT CALL FOR 330 DAYS OF OPERATION ON 1976 WITH FUEL CONSUMPTION BEING 60% COAL, 25% FUEL OIL, AND 15% NATURAL GAS.

LIKE UNIT 4 THIS UNIT MAY BE CONVERTED TO A ROD-DECK VENTURI AND SPRAY TOWER SCRUBBING SYSTEM.

12/75	SYSTEM								744		
1/76	SYSTEM								744		
2/76	SYSTEM								696		

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY HAS DECIDED TO INSTALL A NEW ROD DECK-VENTURI/SPRAY TOWER FGD SYSTEM AT LAWRENCE 5.

3/76	SYSTEM								744		
4/76	SYSTEM								720		
5/76	SYSTEM								744		
6/76	SYSTEM								720		
7/76	SYSTEM								744		
8/76	SYSTEM								744		
9/76	SYSTEM								720		
10/76	SYSTEM								744		

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE INSTALLATION OF THE NEW ROD AND SPRAY TOWER SCRUBBING SYSTEM IS NOW IN PROGRESS. THE SYSTEM WILL CONSIST OF TWO SCRUBBING TRAINS EACH HANDLING 50% OF THE FLUE GAS CAPACITY. FOUNDATION AND STRUCTURAL STEEL ERECTION HAS BEEN COMPLETED, AND SOME OF THE BREECHING HAS BEEN INSTALLED. THE UNIT WILL OPERATE IN A FULLY AUTOMATIC MODE.

THE BOILER HAS BEEN OPERATING NO. 2 FUEL OIL IN ADDITION TO LOW SULFUR WYOMING COAL WHILE THE NEW SCRUBBING FACILITIES ARE BEING INSTALLED. THE ORIGINAL LIMESTONE INJECTION AND TAIL-END SCRUBBING SYSTEM IS STILL AVAILABLE FOR SERVICE AND IS OPERATED WHEN THE UNIT FIRES COAL. THE SYSTEM TREATS FLUE GAS RESULTING FROM THE BURNING OF LOW SULFUR (0.5%) WYOMING COAL.

THE UTILITY REPORTED THAT C-E HAS ENCOUNTERED SOME PROBLEMS WORKING OUT AND FINE TUNING SOME OF THE INSTRUMENTATION LOGIC CIRCUITS.

11/76	SYSTEM								720		
12/76	SYSTEM								744		

KANSAS POWER & LIGHT: LAWRENCE 5 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS									
		KP&L REPORTED THAT CONSTRUCTION OF THE NEW SCRUBBING SYSTEM IS STILL IN PROGRESS. THE ERECTION OF THE STRUCTURAL STEEL AND BREECHING IS CONTINUING. THE MODULES ARE NOW BEING ERECTED AT THE PLANT SITE, PARALLEL TO THE EXISTING MARBLE-BED SYSTEM.								
1/77	SYSTEM							744		
2/77	SYSTEM							672		
3/77	SYSTEM							744		
4/77	SYSTEM							720		
5/77	SYSTEM							744		
6/77	SYSTEM							720		
	** PROBLEMS/SOLUTIONS/COMMENTS									
		OPERATION OF THE EXISTING MARBLE BED SCRUBBERS HAS BEEN QUITE SATISFACTORY AND NEARLY PROBLEM FREE. THE CONNECTING DUCTWORK IS CURRENTLY BEING INSTALLED AS CONSTRUCTION CONTINUES ON THE NEW FGD SYSTEM. THE TWO PARALLEL SCRUBBING MODULES EACH DESIGNED TO HANDLE 200 MW OF GENERATING CAPACITY ARE INSTALLED, AS ARE THE REHEATER TUBE BUNDLES. THE EXISTING MARBLE BED SCRUBBERS WILL BE REMOVED WHEN THE NEW SCRUBBING SYSTEM IS READY FOR SCRUBBING OPERATION.								
7/77	SYSTEM							744		
8/77	SYSTEM							744		
	** PROBLEMS/SOLUTIONS/COMMENTS									
		SOME OF THE NEW DUCTWORK IS IN PLACE. THE NEW SCRUBBER MODULES ARE IN IN PLACE AS ARE THE REHEATER TUBES. THE NO. 1 AND 8 MARBLE BED MODULES WILL SOON BE REMOVED BECAUSE THE SPACE IS NEEDED FOR FURTHER CONSTRUCTION.								
		OPERATIONS OF THE EXISTING FGD SYSTEM THROUGHOUT AUGUST HAVE BEEN GOOD.								
9/77	SYSTEM							720		
	** PROBLEMS/SOLUTIONS/COMMENTS									
		THE CONSTRUCTION ON THE NEW SCRUBBER PLANT IS CONTINUING ACCORDING TO SCHEDULE AND IS EXPECTED TO BE COMPLETE BY APRIL 1978.								
10/77	SYSTEM							744		
11/77	SYSTEM							720		
	** PROBLEMS/SOLUTIONS/COMMENTS									
		THE SYSTEM OPERATED ACCEPTABLY THROUGHOUT OCTOBER AND NOVEMBER.								
12/77	SYSTEM							744		
1/78	SYSTEM							744		

KANSAS POWER & LIGHT: LAWRENCE 5 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE CONSTRUCTION OF THE ROD-DECK SCRUBBERS IS NOW COMPLETE. THE INLET DUCTWORK IS BEING INSTALLED, AND THE OUTLET DECTWORK WILL BE INSTALLED ALONG WITH ADDITIONAL CONTROLS DURING THE SCHEDULED OUTAGE IN APRIL 1978,									
		THE EXISTING FGD SYSTEM OPERATED WITHOUT SERIOUS PROBLEMS THROUGHOUT DECEMBER AND JANUARY. ONLY SIX MODULES ARE LEFT ON THE EXISTING SYSTEM. TWO WERE REMOVED TO MAKE ROOM FOR THE NEW SYSTEM.									
2/78	SYSTEM								672		
3/78	SYSTEM								744		
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE ORIGINAL FGD SYSTEM WAS PULLED OFF LINE ON MARCH 20 SO THAT THE NEW SCRUBBER-ABSORBER SYSTEM COULD BE TIED INTO THE GAS PATH. THIS NEW SYSTEM CONSISTS OF TWO MODULES EACH WITH A ROD SCCTION FOR PARTICULATE REMOVAL AND A SPRAY TOWER FOR SO2 REMOVAL. THE CAPACITY IS 210 MW EACH MODULE. INITAL OPERATION SHOULD BEGIN BY THE FIRST OF MAY.									
4/78	SYSTEM								720		
5/78	SYSTEM								744		
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE NEW UNIT WENT IN SERVICE ON APRIL 14 AND HAS OPERATED WITH NO OUTAGES SINCE START-UP.									
6/78	SYSTEM	100.0	100.0	100.0					720		
7/78	SYSTEM	100.0	100.0	100.0					744		
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE BOILER OPERATED ALL BUT TWO DAYS OF THE JUNE-JULY PERIOD, WHEN A BOILER DRAIN LINE LEAK CAUSED AN OUTAGE.									
		THE FGD SYSTEM OPERATED THE ENTIRE TIME THE BOILER WAS ON-LINE, WITH NO REPORTED PROBLEMS.									
8/78	SYSTEM								744		
9/78	SYSTEM								720		
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE SYSTEM OPERATED WITH NO FORCED OUTAGES DURING THE AUGUST-SEPTEMBER PERIOD. THE UNIT WAS TAKEN OUT OF SERVICE AT THE END OF SEPTEMBER FOR A SCHEDULED TURBINE/BOILER INSPECTION. ROUTINE MAINTENANCE IS BEING PERFORMED ON THE BOILER AND TURBINE.									
10/78	SYSTEM								744		
11/78	SYSTEM								720		
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE FGD SYSTEM OPERATED THROUGHOUT OCTOBER AND NOVEMBER WITH ONLY ONE OUTAGE IN OCTOBER FOR AN ANNUAL ONE-WEEK BOILER/TURBINE INSPECTION.									
12/78	SYSTEM				95.5				744		642

KANSAS POWER & LIGHT: LAWRENCE 5 (CONT.)

PERIOD	MODULE	PERFORMANCE DATA AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
1/79	SYSTEM							744			
2/79	SYSTEM							672			

** PROBLEMS/SOLUTIONS/COMMENTS

A 30 HOUR OUTAGE WAS REQUIRED IN FEBRUARY TO REPAIR A RUPTURED PIPE IN THE FGD SYSTEM.

3/79	SYSTEM							744			
4/79	SYSTEM							720			
5/79	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS BROUGHT DOWN TO 50% CAPACITY FOR A SCHEDULED THREE WEEK OUTAGE IN MAY TO REBUILD AN AIR PREHEATER FAN MOTOR.

6/79	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE SYSTEM OPERATED WELL THROUGH JUNE. THE ONLY FGD SYSTEM RELATED OUTAGES WERE DUE TO RECYCLE TANK AGITATOR FAILURE AND GENERAL MAINTENANCE.

7/79	SYSTEM							744			
8/79	SYSTEM							744			
9/79	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT OPERATED NORMALLY THROUGHOUT THE THIRD QUARTER OF 1979. THE UNIT WILL BE SHUT DOWN FOR AN ANNUAL FALL OUTAGE ON OCTOBER 15. DURING THE OUTAGE SOME BOILER WORK WILL BE DONE. THE SCRUBBER WILL BE CLEANED AND MAINTENANCE WORK WILL BE PERFORMED ON THE RECYCLE TANK AGITATORS. THE OUTAGE IS TO LAST TWO WEEKS.

10/79	SYSTEM							744			
11/79	SYSTEM							720			
12/79	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS DOWN FOR APPROXIMATELY 10 DAYS OF SCHEDULED OUTAGE FOR FALL MAINTENANCE DURING THE SECOND QUARTER OF 1979.

SOME AGITATOR SHAFT FAILURES OCCURRED IN THE REACTION TANK CAUSING MAINTENANCE ATTENTION DURING THE PERIOD.

1/80	SYSTEM	100.0	100.0					744	744	744	
2/80	SYSTEM	100.0	51.7					696	360	360	
3/80	SYSTEM	100.0	54.8					744	408	408	

KANSAS POWER & LIGHT: LAWRENCE 5 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
				PERFORMANCE DATA							
	** PROBLEMS/SOLUTIONS/COMMENTS										
				THE FGD SYSTEM OPERATED WITHOUT ANY MAJOR PROBLEMS DURING THE FIRST QUARTER OF 1980. THE BOILER WAS DOWN FROM MID-FEBRUARY TO MID-MARCH FOR TURBINE REPAIRS, DURING WHICH TIME GENERAL SCRUBBER MAINTENANCE WAS PERFORMED.						
4/80	SYSTEM	100.0	100.0	100.0	100.0			720	720	720	
5/80	SYSTEM	100.0	100.0	100.0	80.6			744	600	600	
6/80	SYSTEM	100.0	100.0	100.0	100.0			720	720	720	
	** PROBLEMS/SOLUTIONS/COMMENTS										
				THE BOILER WAS DOWN FOR SIX DAYS DURING MAY FOR A SCHEDULED INSPECTION. DURING THIS TIME GENERAL MAINTENANCE WAS PERFORMED ON THE FGD SYSTEM. OTHER THAN THIS TIME, THE FGD SYSTEM OPERATED 100% OF THE TIME DURING THE APRIL-JUNE PERIOD.						
7/80	SYSTEM	100.0	100.0	100.0	96.1			744	715	715	54.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
				A 29 HOUR OUTAGE OCCURRED AS A RESULT OF A REHEATER TUBE LEAK IN THE BOILER. NO FGD SYSTEM-RELATED PROBLEMS OCCURRED DURING JULY.						
8/80	SYSTEM	100.0	100.0	100.0	81.5			744	606	606	43.3
	** PROBLEMS/SOLUTIONS/COMMENTS										
				THE OUTAGE TIME IN AUGUST WAS DUE TO NECESSARY REPAIR OF A BOILER REHEAT TUBE.						
9/80	SYSTEM	100.0	100.0	100.0	95.7			720	689	689	38.7
	** PROBLEMS/SOLUTIONS/COMMENTS										
				THE BOILER WAS OUT OF SERVICE FOR APPROXIMATELY 31 HOURS FOR A SCHEDULED INSPECTION.						
10/80	SYSTEM	100.0	100.0	100.0	65.2			744	485	485	
	** PROBLEMS/SOLUTIONS/COMMENTS										
				DURING OCTOBER THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED.							
				THE BOILER WAS OUT OF SERVICE 259 HOURS DUE TO A SCHEDULED INSPECTION.							
11/80	SYSTEM	100.0	100.0	100.0	100.0			720	720	720	
	** PROBLEMS/SOLUTIONS/COMMENTS										
				THE BOILER WAS OUT OF SERVICE 259 HOURS DUE TO A SCHEDULED INSPECTION.							
12/80	SYSTEM	100.0	100.0	100.0	100.0			744	744	744	
	** PROBLEMS/SOLUTIONS/COMMENTS										
				DURING NOVEMBER AND DECEMBER THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS OCCURRED.							

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	KENTUCKY UTILITIES	
PLANT NAME	GREEN RIVER	
UNIT NUMBER	1-3	
CITY	CENTRAL CITY	
STATE	KENTUCKY	
REGULATORY CLASSIFICATION	E	
PARTICULATE EMISSION LIMITATION - NG/J	42.	(.097 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	718.	(1.670 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	242	
GROSS UNIT GENERATING CAPACITY - MW	64	
NET UNIT GENERATING CAPACITY W/FGD - MW	60	
NET UNIT GENERATING CAPACITY WO/FGD - MW	62	
EQUIVALENT SCRUBBED CAPACITY - MW	64	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	BABCOCK & WILCOX	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	PEAK	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	169.88	(360000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	148.9	(300 F)
STACK HEIGHT - M	50.	(165 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	4.9	(16.0 FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	BITUMINOUS	
AVERAGE HEAT CONTENT - J/G	25586.	(11000 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		******
AVERAGE ASH CONTENT - %	13.40	
RANGE ASH CONTENT - %	******	
AVERAGE MOISTURE CONTENT - %	12.10	
RANGE MOISTURE CONTENT - %	******	
AVERAGE SULFUR CONTENT - %	4.00	
RANGE SULFUR CONTENT - %	******	
AVERAGE CHLORIDE CONTENT - %	********	
RANGE CHLORIDE CONTENT - %	******	
*** PARTICLE CONTROL		
** MECHANICAL COLLECTOR		
TYPE	CYCLONES	
SUPPLIER	WESTERN PRECIPITATION	
INLET FLUE GAS CAPACITY - CU.M/S	49.5	(105000 ACFM)
PRESSURE DROP - KPA	.0	(0. IN-H2O)
PARTICLE REMOVAL EFFICENCY -%	85.0	
** PARTICLE SCRUBBER		
NUMBER	1	
GENERIC TYPE	VENTURI TOWER	
SPECIFIC TYPE	VARIABLE-THROAT/TOP-ENTRY PLUMB BOB	
SUPPLIER	AMERICAN AIR FILTER	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	AISI 1110	
LINER GENERIC MATERIAL	INORGANIC	
LINER SPECIFIC MATERIAL	HYDRAULICALLY-BONDED CEMENT	
GAS CONTACTING DEVICE TYPE	STAINLESS STEEL THROAT	
NUMBER OF CONTACTING ZONES	1	
LIQUID RECIRCULATION RATE - LITER/S	85.7	(1360 GPM)
L/G RATIO - LITER/CU.M	4.6	(34.5 GAL/1000ACF)
PRESSURE DROP - KPA	.0	(.1 IN-H2O)
INLET GAS FLOW RATE - CU.M/S	136.0	(288200 ACFM)
INLET GAS TEMPERATURE - C	52.2	(126 F)
*** FGD SYSTEM		

KENTUCKY UTILITIES: GREEN RIVER 1-3 (CONT.)

** GENERAL DATA		
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT	
SO2 REMOVAL MODE	WET SCRUBBING	
PROCESS TYPE	LIME	
PROCESS ADDITIVES	NONE	
SYSTEM SUPPLIER	AMERICAN AIR FILTER	
A-E FIRM	AMERICAN AIR FILTER	
DEVELOPMENT LEVEL	FULL SCALE	
NEW/RETROFIT	RETROFIT	
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.50	
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	80.00	
CURRENT STATUS	1	
COMMERCIAL START-UP	6/76	
INITIAL START-UP	9/75	
CONTRACT AWARDED	6/73	
** DESIGN AND OPERATING PARAMETERS		
** ABSORBER		
NUMBER	1	
GENERIC TYPE	PACKED TOWER	
SPECIFIC TYPE	ENTRAINED PACKING	
TRADE NAME/COMMON TYPE	MOBILE BED CONTACTOR	
SUPPLIER	AMERICAN AIR FILTER	
DIMENSIONS - FT	20X20X27.5	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	AISI 1110	
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A	
LINER GENERIC MATERIAL	INORGANIC	
LINER SPECIFIC MATERIAL	HYDRAULICALLY-BONDED CEMENT	
LINER MATERIAL TRADE NAME/COMMON TYPE	CALCIUM ALUMINATE CEMENT	
GAS CONTACTING DEVICE TYPE	PVC & POLYETHYLENE SOLID SPHERES	
NUMBER OF CONTACTING ZONES	1	
LIQUID RECIRCULATION RATE - LITER/S	614.	(9750 GPM)
L/G RATIO - L/CU.M	4.5	(34.0 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	1.0	(4.0 IN-H2O)
SUPERFICAL GAS VELOCITY - M/SEC	4.3	(14.0 FT/S)
INLET GAS FLOW - CU. M/S	136.00	(288200 ACFM)
INLET GAS TEMPERATURE - C	52.2	(126 F)
SO2 REMOVAL EFFICIENCY - %	80.0	
** REHEATER		
NUMBER	1	
GENERIC TYPE	INDIRECT HOT AIR	
SPECIFIC TYPE	EXTERNAL HEAT EXCHANGER	
TRADE NAME/COMMON TYPE	STEAM TUBE BUNDLES	
PERCENT GAS BYPASSED - AVG	.0	
TEMPERATURE INCREASE - C	4.4	(40 F)
INLET FLUE GAS FLOW RATE - CU. M/S	136.00	(288200 ACFM)
INLET FLUE GAS TEMPERATURE - C	54.4	(130 F)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	
** FANS		
NUMBER	1	
SUPPLIER	BUFFALO FORGE	
FUNCTION	BOOSTER	
APPLICATION	FORCED DRAFT	
SERVICE	DRY	
FLUE GAS FLOW RATE - CU.M/S	169.88	(360000 ACFM)
FLUE GAS TEMPERATURE - C	148.9	(300 F)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	
** DUCTWORK		
LOCATION	SCRUBBER INLET	
SHELL GENERIC MATERIAL TYPE	CARBON STEEL	
LINER GENERIC MATERIAL TYPE	NONE	

KENTUCKY UTILITIES: GREEN RIVER 1-3 (CONT.)

** TANKS

SERVICE	NUMBER
SLAKED SLURRY DILUTION/HOLDING TANK	****
REACTION/RECYCLE	1
SLAKING TANK	2

** PUMPS

SERVICE	NUMBER
SCRUBBER/ABSORBER RECIRCULATION	3
SLURRY TRANSFER	2
POND RETURN	2
BLEED STREAM	2

*** SLUDGE

** DISPOSAL

NATURE	FINAL
TYPE	LINED POND
LOCATION	ON SITE
SITE TRANSPORTATION METHOD	PUMPED
SITE CAPACITY - CU.M	203629 (166.5 ACRE-FT)

** PROCESS CONTROL AND INSTRUMENTATION

CHEMICAL PARAMETERS	SO2, GAS FLOW PRESSURE DROP, PH, PERCENT SOLIDS
CONTROL LEVELS	PH-5 TO 8.5; 10% SOLIDS IN RECYCLE
MONITOR LOCATION	PH-REACTANT TANK; DENSITY METERS-RECYCLE LINE

** WATER BALANCE

WATER LOOP TYPE	CLOSED
MAKEUP WATER ADDITION - LITERS/S	4.7 (75 GPM)

** CHEMICALS AND CONSUMPTION

FUNCTION	ABSORBENT
NAME	LIME
CONSUMPTION	2 TPH

** FGD SPARE CAPACITY INDICES

ABSORBER - %	.0

** FGD SPARE COMPONENT INDICES

ABSORBER	.0

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
9/75	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

THE SYSTEM BECAME OPERATIONAL SEPTEMBER 13, 1975 ON A HALF-LOAD BASIS BECAUSE OF TURBINE OVERHAUL. LOGGING OF OPERATING DATA BEGAN DECEMBER 1975.

10/75	SYSTEM							744			
11/75	SYSTEM							720			
12/75	SYSTEM	74.0	65.0	78.0	35.0			744	398	257	
1/76	SYSTEM	42.0	11.0	14.0	9.0			744	572	64	

KENTUCKY UTILITIES: GREEN RIVER 1-3 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
			A MAJOR PROBLEM WAS FAILURE OF THE RECYCLE PUMPS.								
			THAWING AND REPAIR OF NUMEROUS FROZEN LINES WAS REQUIRED.								
			SHUTDOWN OF SUMP PUMPS WAS NECESSARY.								
			A MAJOR PROBLEM AREA WAS THE FEED TANK AGITATOR.								
2/76	SYSTEM	70.0	72.0	42.0	30.0			696	499	211	
	** PROBLEMS/SOLUTIONS/COMMENTS										
			REPAIRS WERE MADE TO THE TANK AGITATORS, SLAKE TANKS AND MIX-HOLD TANKS CONTRIBUTING TO OUTAGE TIME.								
			REPAIRS AND CLEANOUT OF REACTANT PUMPS CONTRIBUTATED TO OUTAGE TIME.								
3/76	SYSTEM	97.0	85.0	95.0	52.0			744	458	386	
	** PROBLEMS/SOLUTIONS/COMMENTS										
			ALL RUBBER-LINED IMPELLERS WERE REPLACED IN THE PUMPS.								
4/76	SYSTEM	90.0	100.0	100.0	77.0			720	552	552	
5/76	SYSTEM	81.0	100.0	100.0	61.0			744	456	456	
6/76	SYSTEM	100.0	99.0	99.0	82.0			720	597	589	
7/76	SYSTEM	90.0	98.0	99.0	77.0			744	584	574	
8/76	SYSTEM	97.0	97.0	97.0	97.0			744	744	722	
	** PROBLEMS/SOLUTIONS/COMMENTS										
			VIBRATION IN THE SCRUBBER BOOSTER ID FAN NECESSITATED A 22 HOUR SYSTEM SHUTDOWN FOR REPAIR DURING AUGUST.								
9/76	SYSTEM	86.0	100.0	100.0	79.0			720	571	571	
	** PROBLEMS/SOLUTIONS/COMMENTS										
			MINOR FAN PROBLEMS OCCURRED BUT NO FORCED OUTAGE TIME WAS REQUIRED.								
			HALF-LOAD OPERATIONS WERE CONDUCTED THROUGHOUT THE PERIOD BECAUSE OF BEARING PROBLEMS WITH ONE OF THE TWO TURBINE GENERATING UNITS.								
10/76	SYSTEM	100.0	100.0	100.0	94.0			744	699	699	
	** PROBLEMS/SOLUTIONS/COMMENTS										
			MINOR FAN PROBLEMS OCCURRED BUT NO FORCED OUTAGE TIME WAS REQUIRED.								
			HALF-LOAD OPERATIONS WERE CONDUCTED THROUGHOUT THE PERIOD BECAUSE OF BEARING PROBLEMS WITH ONE OF THE TWO TURBINE GENERATING UNITS.								
11/76	SYSTEM	100.0	100.0	98.0	98.0			720	704	704	
12/76	SYSTEM	73.0	97.0	87.0	70.0			744	536	517	

KENTUCKY UTILITIES: GREEN RIVER 1-3 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
		PERFORMANCE DATA									
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING NOVEMBER AND DECEMBER, 1976 SOME FLUE GAS WAS BY-PASSED AROUND THE SYSTEM WHILE THE UTILITY CONDUCTED A CHECKOUT OF THE SCRUBBER INTERNAL AND REPLACED SOME OF THE PACKING SPHERES IN THE MOBILE BED.									
1/77	SYSTEM	94.0	94.0	94.0	94.0			744	744	698	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING THE MONTH OF JANUARY NO PROBLEMS OCCURRED.									
2/77	SYSTEM	36.0	91.0	91.0	36.0			672	266	243	
3/77	SYSTEM	.0			.0			744	0	0	.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING THE MONTH OF FEBRUARY IT WAS FOUND THAT THE CARBOLINE STACK LINER WAS BADLY DETERIORATED. SCRUBBER AND BOILER OPERATIONS WERE TERMINATED UNTIL THE STACK LINING WAS REPAIRED. THE STACK WAS REPAIRED FIRST BY WELDING A BACKUP METAL PLATE TO THE PORTIONS OF THE STACK WHERE PITTING OCCURRED. THE ENTIRE STACK WAS THEN LINED WITH A REFRACTORY COATING CALLED PRECRETE G-8 BY AAF. THE REPAIRS WERE COMPLETED MARCH 7.									
		THE BOILER IS NOT OPERATED WITHOUT THE SCRUBBER BECAUSE THERE IS NO ESP FOR PARTICULATE CONTROL.									
4/77	SYSTEM	40.0	98.0	98.0	23.0			720	167	164	
5/77	SYSTEM	99.0	98.0	98.0	69.0			744	527	513	
6/77	SYSTEM	100.0	100.0	100.0	5.0			720	34	34	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		WORK ON THE SCRUBBER MODULE INCLUDED REPAIRS TO THE UNDERBED DAMPER SYSTEM AND LEAKING IN THE VENTURI.									
		LIME SLAKING OPERATIONS WAS REPAIRED.									
7/77	SYSTEM	100.0			.0			744	0	0	.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		A STRIKE BY PLANT OPERATING PERSONNEL RESULTED IN BOILER AND FGD SYSTEM SHUTDOWN WHICH CONTINUED THROUGH THE END OF OCTOBER.									
8/77	SYSTEM	100.0			.0			744	0	0	.0
9/77	SYSTEM	100.0			.0			720	0	0	.0
10/77	SYSTEM	100.0			.0			744	0	0	.0
11/77	SYSTEM	86.0	91.0	91.0	41.0			720	332	301	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		PROBLEMS WERE ENCOUNTERED WITH LEAKS IN RECYCLE PUMP IMPELLER COATINGS AND PUMP FAILURES. TWO PUMPS WERE DOWN AND BEING BYPASSED.									
		SUMP PUMP FAILURES WERE NOTED.									

KENTUCKY UTILITIES: GREEN RIVER 1-3 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
			LEAKS IN THE PACKING WERE NOTED.								
12/77	SYSTEM	50.0	63.0	91.0	50.0			744	596	375	
	** PROBLEMS/SOLUTIONS/COMMENTS										
			NUMEROUS FREEZE UPS WERE ENCOUNTERED DURING DECEMBER CAUSING FGD SYSTEM OUTAGE TIME.								
1/78	SYSTEM	31.0	32.0	32.0	23.0			744	537	170	
	** PROBLEMS/SOLUTIONS/COMMENTS										
			THE UNIT WENT DOWN AFTER APPROXIMATELY 170 HOURS OF OPERATION IN JANUARY. THIS WAS CAUSED BY THE FREEZING OF THE SLURRY LINE TO THE POND.								
2/78	SYSTEM	97.0	.0		.0			672	672	0	
3/78	SYSTEM	97.0	.0		.0			744	669	0	
	** PROBLEMS/SOLUTIONS/COMMENTS										
			THE SYSTEM COULD HAVE BEEN CONSIDERED AVAILABLE THROUGHOUT MOST OF THE WINTER PERIOD BUT BECAUSE EMERGENCY CONDITIONS THE UTILITY CHOSE TO CONCENTRATE THEIR MAINTENANCE CREWS ON POWER GENERATION RATHER THAN FGD OPERATION. UNDER NORMAL CONDITIONS THE RELATIVELY MINOR FGD SYSTEM PROBLEMS WOULD HAVE BEEN SOLVED MORE QUICKLY.								
			DURING THE FREEZE UPS NUMEROUS GASKETS WERE TORN THROUGHOUT THE SYSTEM. THE SYSTEM WAS SHUT DOWN COMPLETELY FOR REPAIR WORK DURING FEBRUARY AND MARCH.								
4/78	SYSTEM	41.0	99.0	99.0	41.0			720	296	295	
5/78	SYSTEM	64.0	100.0	98.0	64.0			744	474	474	
	** PROBLEMS/SOLUTIONS/COMMENTS										
			THE SCREENS ON THE SUCTION SIDE OF THE PUMPS THAT PUMP THE SLURRY FROM THE PREP ROOM TO THE NOZZLES EXPERIENCED PLUGGING PROBLEMS. THE SCREENS GET PLUGGED WITH LARGE GRIT IN THE SLURRY AND ARE SUCKED OUT OF POSITION BY THE PUMPS. THE UTILITY REPORTED THAT THIS TENDS TO BE A RECURRING PROBLEM.								
6/78	SYSTEM	73.0	100.0	100.0	73.0			720	525	524	
7/78	SYSTEM	13.0	96.0	100.0	13.0			744	103	99	
	** PROBLEMS/SOLUTIONS/COMMENTS										
			BOILER AND FGD SYSTEM OUTAGES DURING JUNE AND JULY WERE FOR ROUTINE MAINTENANCE.								
8/78	SYSTEM	61.0	99.0	99.0	28.0			744	207	205	
	** PROBLEMS/SOLUTIONS/COMMENTS										
			THE UNIT WAS DOWN FROM AUGUST 1 THROUGH AUGUST 12 AS A RESULT OF BLEED PUMP PROBLEMS.								
9/78	SYSTEM	76.0	98.0	100.0	41.0			720	303	298	

KENTUCKY UTILITIES: GREEN RIVER 1-3 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
		PERFORMANCE DATA									
	** PROBLEMS/SOLUTIONS/COMMENTS										
		BECAUSE OF PLUGGING PROBLEMS THE FGD SYSTEM WAS OPERATED AT APPROXIMATELY ONE THIRD OF TOTAL CAPACITY THE LAST TWO WEEKS OF SEPTEMBER.									
10/78	SYSTEM	30.0	94.0	96.0	30.0			744	236	222	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE FGD SYSTEM EXPERIENCED RECYCLE TANK SCREEN PLUGGING.									
		THE FGD SYSTEM EXPERIENCED VIBRATING FAN PROBLEMS.									
11/78	SYSTEM	24.0	100.0	74.0	24.0			720	175	175	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UNIT WAS DOWN THE LAST TWO WEEKS OF NOVEMBER DUE TO LOW LOAD DEMAND.									
12/78	SYSTEM	.0			.0			744	0	0	.0
1/79	SYSTEM	.0	.0	.0	.0			744	1	0	
2/79	SYSTEM	.0			.0			672	0	0	.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE FGD SYSTEM WAS UNAVAILABLE IN DECEMBER, JANUARY AND FEBRUARY AS A RESULT OF FREEZING WEATHER WHICH CAUSED FROZEN PIPES, ETC.									
3/79	SYSTEM	11.2	100.0	100.0	11.2			744	83	83	
4/79	SYSTEM	18.2	100.0	100.0	18.2			720	131	131	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE LOW OPERATIONAL HOURS FOR MARCH AND APRIL WERE DUE TO RECYCLE PUMP PROBLEMS.									
5/79	SYSTEM	100.0			.0			744	0	0	.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE BOILER WAS TAKEN DOWN IN MAY FOR REPAIRS THAT ARE PROJECTED TO LAST THROUGH THE END OF SEPTEMBER. DURING THIS OUTAGE AN INDIRECT STEAM REHEAT SYSTEM WILL BE INSTALLED TO BOOST THE TEMPERATURE OF THE EXITING FLUE GAS. THIS WAS FOUND TO BE NECESSARY DUE TO EXCESSIVE MOISTURE IN THE AREA.									
6/79	SYSTEM	100.0			.0			720	0	0	.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UNIT REMAINED OUT OF SERVICE DURING JUNE FOR BOILER REPAIRS. IT IS NOT EXPECTED TO RETURN TO SERVICE UNTIL OCTOBER OR NOVEMBER.									
7/79	SYSTEM	100.0			.0			744	0	0	.0
8/79	SYSTEM	100.0			.0			744	0	0	.0
9/79	SYSTEM	100.0			.0			720	0	0	.0

KENTUCKY UTILITIES: GREEN RIVER 1-3 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE BOILER REMAINED OUT OF SERVICE DURING JULY, AUGUST AND SEPTEMBER. THE BOILER TEMPERATURE VALVES AND PIPING BETWEEN THE PRIMARY AND SECONDARY SUPERHEATERS MUST STILL BE REPLACED. THE BOILER IS NOT EXPECTED TO RETURN ON LINE UNTIL THE FIRST OF THE YEAR OR POSSIBLY AS LATE AS MARCH.									
		THE NEW INDIRECT REHEAT SYSTEM IS IN PLACE AND READY FOR OPERATION AS SOON AS THE BOILER RETURNS TO SERVICE.									
10/79	SYSTEM	100.0			.0			744	0	0	.0
11/79	SYSTEM	100.0			.0			720	0	0	.0
12/79	SYSTEM	100.0			.0			744	0	0	.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		WORK IS CONTINUING ON THE REPAIRS OF THE OLD BOILER. THE UNIT MAY BE SHUT DOWN INTO MARCH 1980. THE FGD SYSTEM WAS AVAILABLE THROUGHOUT THE PERIOD BUT WAS NOT OPERATED.									
1/80	SYSTEM	100.0			.0			744	0	0	.0
2/80	SYSTEM	100.0			.0			696	0	0	.0
3/80	SYSTEM	100.0			.0			744	0	0	.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE BOILER REMAINED OUT OF SERVICE DUE TO BOILER REPAIRS. THE UNIT IS EXPECTED TO BE OPERATING IN MAY.									
4/80	SYSTEM	100.0			.0			720	0	0	.0
5/80	SYSTEM	100.0			.0			744	0	0	.0
6/80	SYSTEM	100.0			.0			720	0	0	.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE FGD SYSTEM REMAINED OFF LINE DURING THE SECOND QUARTER OF 1980 AS A RESULT OF THE ON-GOING BOILER REPAIRS. COMPLETION OF THE BOILER REPAIRS HAS BEEN DELAYED BY THE UNAVAILABILITY OF SOME NEEDED PARTS.									
7/80	SYSTEM	100.0			.0			744	0	0	.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE BOILER REPAIRS HAVE BEEN COMPLETED; HOWEVER, THE BOILER DID NOT OPERATE DUE TO REPAIR WORK BEING DONE ON THE TURBINE.									
8/80	SYSTEM	100.0			.0			744	0	0	.0
9/80	SYSTEM	100.0			.0			720	0	0	.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		TURBINE REPAIRS CONTINUED THROUGH AUGUST AND SEPTEMBER. THE FGD SYSTEM WAS AVAILABLE FOR OPERATION.									
10/80	SYSTEM	100.0			.0			744	0	0	.0
11/80	SYSTEM	100.0			.0			720	0	0	.0

KENTUCKY UTILITIES: GREEN RIVER 1-3 (CONT.)

PERIOD	MODULE	PERFORMANCE DATA: AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
12/80	SYSTEM	100.0			.0			744	0	0	.0

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE FOURTH QUARTER THE TURBINE REPAIRS CONTINUED. AN ATTEMPT TO RESTART THE BOILER IN MID-DECEMBER RESULTED IN A BLOWN GENERATOR CAUSED BY FAULTY INSULATORS. THE UTILITY IS PRESENTLY WAITING ON NEW INSULATORS.

DURING THE PERIOD THE BOILER CONTROL VALVES HAD TO BE REPLACED.

THE FGD SYSTEM WAS AVAILABLE 100% OF THE TIME DURING THE FOURTH QUARTER.

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	LOUISVILLE GAS & ELECTRIC	
PLANT NAME	CANE RUN	
UNIT NUMBER	4	
CITY	LOUISVILLE	
STATE	KENTUCKY	
REGULATORY CLASSIFICATION	D	
PARTICULATE EMISSION LIMITATION - NG/J	50.	(.116 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	516.	(1.200 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	992	
GROSS UNIT GENERATING CAPACITY - MW	188	
NET UNIT GENERATING CAPACITY W/FGD - MW	175	
NET UNIT GENERATING CAPACITY WO/FGD - MW	178	
EQUIVALENT SCRUBBED CAPACITY - MW	188	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	COMBUSTION ENGINEERING	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	346.37	(734000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	160.0	(320 F)
STACK HEIGHT - M	76.	(250 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	*******	(***** FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	BITUMINOUS	
AVERAGE HEAT CONTENT - J/G	26749.	(11500 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		10,400-11,900
AVERAGE ASH CONTENT - %	17.10	
RANGE ASH CONTENT - %	15.5-24.5	
AVERAGE MOISTURE CONTENT - %	9.00	
RANGE MOISTURE CONTENT - %	8.0-10.75	
AVERAGE SULFUR CONTENT - %	3.75	
RANGE SULFUR CONTENT - %	3.5-4.0	
AVERAGE CHLORIDE CONTENT - %	.04	
RANGE CHLORIDE CONTENT - %	0.03-0.06	
*** PARTICLE CONTROL		
** ESP		
NUMBER	2	
TYPE	COLD SIDE	
INLET FLUE GAS CAPACITY - CU.M/S	346.4	(734000 ACFM)
INLET FLUE GAS TEMPERATURE - C	160.0	(320 F)
PARTICLE REMOVAL EFFICENCY - %	99.0	
** PARTICLE SCRUBBER		
GENERIC TYPE	NONE	
SPECIFIC TYPE	N/A	
*** FGD SYSTEM		
** GENERAL DATA		
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT	
SO2 REMOVAL MODE	WET SCRUBBING	
PROCESS TYPE	LIME	
SYSTEM SUPPLIER	AMERICAN AIR FILTER	
A-E FIRM	FLUOR - PIONEER	
DEVELOPMENT LEVEL	FULL SCALE	
NEW/RETROFIT	RETROFIT	
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.00	
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	85.00	
CURRENT STATUS	1	
COMMERCIAL START-UP	8/77	
INITIAL START-UP	8/76	
CONTRACT AWARDED	4/74	

LOUISVILLE GAS & ELECTRIC: CANE RUN 4 (CONT.)

** DESIGN AND OPERATING PARAMETERS

** ABSORBER			
NUMBER	2		
GENERIC TYPE	PACKED TOWER		
SPECIFIC TYPE	ENTRAINED PACKING		
TRADE NAME/COMMON TYPE	MOBILE BED CONTACTOR		
SUPPLIER	AMERICAN AIR FILTER		
DIMENSIONS - FT	20 X 20 X 87.5		
SHELL GENERIC MATERIAL	CARBON STEEL		
SHELL SPECIFIC MATERIAL	AISI 1110		
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A		
LINER GENERIC MATERIAL	INORGANIC,ORGANIC		
LINER SPECIFIC MATERIAL	HYDRAULICALLY-BONDED CEMENT,VINYL ESTER		
LINER MATERIAL TRADE NAME/COMMON TYPE	PREKRETE,PLASITE		
GAS CONTACTING DEVICE TYPE	1.25 IN. DIA. POLYURETHANE BALLS		
NUMBER OF CONTACTING ZONES	1		
LIQUID RECIRCULATION RATE - LITER/S	1110.	(17625 GPM)	
L/G RATIO - L/CU.M	8.0	(60.0 GAL/1000 ACF)	
GAS-SIDE PRESSURE DROP - KPA	1.0	(4.0 IN-H2O)	
SUPERFICAL GAS VELOCITY - M/SEC	3.5	(11.5 FT/S)	
INLET GAS FLOW - CU. M/S	173.52	(367700 ACFM)	
INLET GAS TEMPERATURE - C	160.0	(320 F)	
SO2 REMOVAL EFFICIENCY - %	87.5		
** MIST ELIMINATOR			
PRE-MIST ELIMINATOR/MIST ELIMINATOR	MIST ELIMINATOR		
NUMBER PER SYSTEM	4		
GENERIC TYPE	IMPINGEMENT		
SPECIFIC TYPE	BAFFLE		
TRADE NAME/COMMON TYPE	CHEVRON VANE		
CONFIGURATION	HORIZONTAL		
NUMBER OF STAGES	2		
NUMBER OF PASSES PER STAGE	3		
FREEBOARD DISTANCE - M	1.83	(6.0 FT)	
DISTANCE BETWEEN VANES - CM	3.0	(1.20 IN)	
PRESSURE DROP - KPA	.2	(.8 IN-H2O)	
SUPERFICAL GAS VELOCITY - M/S	3.0	(10.0 FT/S)	
CONSTRUCTION MATERIAL GENERIC TYPE	SS, PLASITE 4005 LINING (DUCT AREA)		
WASH WATER SOURCE	FRESH MAKEUP (RIVER)		
WASH RATE - L/S	5.0	(80 GAL/MIN)	
** REHEATER			
NUMBER	2		
GENERIC TYPE	DIRECT COMBUSTION		
SPECIFIC TYPE	EXTERNAL COMBUSTION CHAMBER		
TRADE NAME/COMMON TYPE	OIL		
PERCENT GAS BYPASSED - AVG	.0		
TEMPERATURE INCREASE - C	10.0	(50 F)	
INLET FLUE GAS FLOW RATE - CU. M/S	275.12	(583000 ACFM)	
INLET FLUE GAS TEMPERATURE - C	52.8	(127 F)	
** FANS			
NUMBER	2		
SUPPLIER	BUFFALO FORGE/AMERICAN STANDARD FLUID DRIVES		
FUNCTION	BOOSTER		
APPLICATION	FORCED DRAFT		
SERVICE	DRY		
FLUE GAS FLOW RATE - CU.M/S	173.19	(367000 ACFM)	
FLUE GAS TEMPERATURE - C	162.8	(325 F)	
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL		
** DUCTWORK			
LOCATION	SCRUBBER INLET		
SHELL GENERIC MATERIAL TYPE	CARBON STEEL		
LINER GENERIC MATERIAL TYPE	NONE		
** DUCTWORK			
LOCATION	SCRUBBER TO STACK		
SHELL GENERIC MATERIAL TYPE	CARBON STEEL		

LOUISVILLE GAS & ELECTRIC: CANE RUN 4 (CONT.)

LINER GENERIC MATERIAL TYPE	PLASITE 4005

** TANKS

SERVICE	NUMBER
REACTION, RECIRCULATION AND BLEED	****

** PUMPS

SERVICE	NUMBER
ABSORBER RECIRCULATION	6
THICKENER UNDERFLOW	2
THICKENER OVERFLOW	2
******	6

** SOLIDS CONCENTRATING/DEWATERING

DEVICE	THICKENER
NUMBER	1
NUMBER OF SPARES	0
CONFIGURATION	CIRCULAR
DIMENSIONS - FT	85 (DIA) X 14 (DEPTH)
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
LINER SPECIFIC MATERIAL TYPE	RUBBER
FEED STREAM CHARACTERISTICS	10% SOLIDS
OUTLET STREAM CHARACTERISTICS	25% SOLIDS

*** SLUDGE

** TREATMENT

PROPRIETARY PROCESS	IUCS

** DISPOSAL

NATURE	FINAL
TYPE	LINED POND
LOCATION	ON SITE
SITE TRANSPORTATION METHOD	PIPELINE

** PROCESS CONTROL AND INSTRUMENTATION

CHEMICAL PARAMETERS	PH
CONTROL LEVELS	4-6; REACTION TANK RETURN
MONITOR LOCATION	REACTION TANK
PROCESS CONTROL MANNER	AUTOMATIC

** WATER BALANCE

WATER LOOP TYPE	OPEN
MAKEUP WATER ADDITION - LITERS/S	6.3 (100 GPM)

** FGD SPARE CAPACITY INDICES

ABSORBER - %	.0

** FGD SPARE COMPONENT INDICES

ABSORBER	.0

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
8/76	SYSTEM	90.0		89.5				744	740	666	

** PROBLEMS/SOLUTIONS/COMMENTS

INITIAL OPERATIONS OF THE CANE RUN 4 FGD SYSTEM BEGAN IN AUGUST WITH THE SYSTEM OPERATING 90% OF THE 740 HOURS THE BOILER WAS ON LINE.

OUTAGE TIME DURING THE MONTH WAS DUE PRIMARILY TO EQUIPMENT INSPECTIONS, REPAIR/REPLACEMENT OF AUXILIARY MOTOR PARTS, AND DEPLETION OF ABSORBENT

LOUISVILLE GAS & ELECTRIC: CANE RUN 4 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
				SUPPLY BECAUSE OF A LATE BARGE DELIVERY.							
				THE SCRUBBING SYSTEM HAS BEEN GENERALLY OPERATING AT APPROXIMATELY 50 TO 80% FLUE GAS CAPACITY.							
				SOME MINOR PROBLEMS HAVE BEEN ENCOUNTERED WITH AUXILIARY EQUIPMENT MOTORS.							
				SOME MINOR PROBLEMS HAVE BEEN ENCOUNTERED WITH SPRAY NOZZLES IN THE MOBILE BED CONTACTOR. THE SPRAY NOZZLES ARE SPINNER-VANE COMPONENTS ORIGINALLY CONSTRUCTED OF PLASTIC. OPERATING TEMPERATURES AND PRESSURES HAVE CAUSED THE PLASTIC HOUSING TO EXPAND RESULTING IN THE VANES EXTRUDING OUT THE FRONT END, SUBSEQUENTLY CAUSING A BLOCKAGE OF THE SLURRY FEED. THE NOZZLES HAVE BEEN REPLACED WITH CERAMIC CONSTRUCTED COMPONENTS.							
9/76	SYSTEM		90.0	90.0				720	720	648	
10/76	SYSTEM		90.0	72.6				744	600	540	
	** PROBLEMS/SOLUTIONS/COMMENTS										
				THE UNIT WAS TAKEN OUT OF SERVICE ON OCTOBER 25, 1976 TO IMPLEMENT ADDITIONAL MODIFICATIONS TO THE SCRUBBING SYSTEM. MAJOR SYSTEM MODIFICATIONS INCLUDE INCREASING PUMP CAPACITY AND DECREASING PRESSURE DROP. THESE TWO PROBLEMS HAVE HINDERED OPERATION OF THE UNIT AT FULL LOAD CAPACITY.							
11/76	SYSTEM		95.0	79.2				720	600	570	
12/76	SYSTEM		90.0	72.3				744	598	538	
	** PROBLEMS/SOLUTIONS/COMMENTS										
				THE UNIT OPERATED ON CARBIDE LIME DURING THE NOVEMBER-DECEMBER PERIOD.							
1/77	SYSTEM		37.7	33.7				744	666	251	
	** PROBLEMS/SOLUTIONS/COMMENTS										
				DUE TO OHIO RIVER FREEZE UP BARGE DELIVERIES OF LIME CEASED CAUSING THE THE FGD SYSTEM TO BE TAKEN OFF LINE ON JANUARY 12.							
2/77	SYSTEM			1.2				672	0	8	.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
				DURING FEBRUARY, THE SCRUBBER WAS ONLY OPERATED FOR TWO 4-HOUR PERIODS TO PREVENT TOTAL FREEZE-UP.							
3/77	SYSTEM		82.9	48.1				744	432	358	
	** PROBLEMS/SOLUTIONS/COMMENTS										
				THE SCRUBBER CAME BACK ON-LINE ON MARCH 14, 1977.							
				DC POWER SUPPLY TO THE BYPASS DAMPER FAILED. THE SCRUBBER SYSTEM WAS BYPASSED WHILE REPAIRS WERE MADE.							
4/77	SYSTEM		92.7	60.0				720	466	432	
5/77	SYSTEM			.0				744		0	
6/77	SYSTEM			.0				720		0	

LOUISVILLE GAS & ELECTRIC: CANE RUN 4 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
				PERFORMANCE DATA							
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE SCRUBBING SYSTEM WAS DOWN FOR MODIFICATIONS FROM APRIL 19 TO JULY 17, 1977.									
		A CHEVRON TYPE MIST ELIMINATOR WAS INSTALLED DURING THE OUTAGE.									
		A NEW SPRAY HEADER WAS ADDED TO INCREASE THE L/G RATIO DURING THE OUTAGE.									
		DIRECT OIL-FIRED REHEAT WAS ADDED.									
		THE LINING IN THE SYSTEM FROM THE MIST ELIMINATOR TO THE STACK WAS REPLACED WITH PLASITE 4005 (THE ORIGINAL LINING WAS BUBBLING, BUT HAD NOT YET FAILED, FAILURE SEEMED IMMINENT WITHIN 4-5 MONTHS). THE NEW LINING WAS INSTALLED BY GENERAL COATINGS.									
7/77	SYSTEM		90.0		43.5	80.70		744	360	324	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE SYSTEM WAS PLACED BACK IN SERVICE ON JULY 17, 1977 AFTER SYSTEM MODIFICATIONS WERE COMPLETED.									
8/77	SYSTEM	79.0	89.5		79.0	83.90		744	657	588	
9/77	SYSTEM	98.9	99.1		72.8			720	529	524	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		COMPLIANCE TESTING OCCURED DURING AUGUST AND SEPTEMBER 1977 BY EPA PERSONNEL AND WAS OFFICIALLY APPROVED TO HAVE ACHIEVED COMPLIANCE.									
10/77	SYSTEM	98.1	97.8	99.0	89.0	84.30		744	677	662	
11/77	SYSTEM	69.9	94.0	94.0	62.9	83.70		720	483	453	
12/77	SYSTEM	85.0	85.0	100.0	81.7			744	715	608	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING DECEMBER, "AIRCO", THE LIME SUPPLIER, HAD 1200 FT OF THEIR FEED LINE FREEZE UP CAUSING LIME TO BECOME UNAVAILABLE FOR A SHORT TIME.									
1/78	SYSTEM	66.4	66.6	87.0	66.4			744	742	494	
2/78	SYSTEM	100.0			.0			672	0	0	.0
3/78	SYSTEM	100.0	33.5		33.5			744	744	249	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UNIT WAS DOWN THE ENTIRE MONTH OF FEBRUARY DUE TO A COAL SHORTAGE AND A LACK OF AVAILABLE LIME RESULTING FROM THE SEVERE WINTER WEATHER. THE UNIT CAME BACK ON LINE MARCH 21, 1978.									
4/78	SYSTEM	100.0	100.0	100.0	42.1			720	303	303	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE BOILER WAS DOWN PART OF APRIL FOR REPAIRS.									
5/78	SYSTEM	31.0	32.7	35.0	15.5			744	352	115	

LOUISVILLE GAS & ELECTRIC: CANE RUN 5 (CONT.)

** DESIGN AND OPERATING PARAMETERS

** ABSORBER			
NUMBER	2		
GENERIC TYPE	SPRAY TOWER		
SPECIFIC TYPE	OPEN COUNTERCURRENT SPRAY		
SUPPLIER	COMBUSTION ENGINEERING		
DIMENSIONS - FT	26 (DIA) X 31		
SHELL GENERIC MATERIAL	STAINLESS STEEL		
SHELL SPECIFIC MATERIAL	AUSTENITIC		
SHELL MATERIAL TRADE NAME/COMMON TYPE	TYPE 316L		
LINER GENERIC MATERIAL	INORGANIC		
LINER SPECIFIC MATERIAL	HYDRAULICALLY-BONDED CEMENT		
LINER MATERIAL TRADE NAME/COMMON TYPE	PREKRETE		
GAS CONTACTING DEVICE TYPE	NONE		
NUMBER OF CONTACTING ZONES	3		
LIQUID RECIRCULATION RATE - LITER/S	1102.	(17500 GPM)	
L/G RATIO - L/CU.M	7.4	(55.0 GAL/1000 ACF)	
GAS-SIDE PRESSURE DROP - KPA	.1	(.5 IN-H2O)	
SUPERFICAL GAS VELOCITY - M/SEC	2.1	(7.0 FT/S)	
INLET GAS FLOW - CU. M/S	153.37	(325000 ACFM)	
INLET GAS TEMPERATURE - C	162.8	(325 F)	
SO2 REMOVAL EFFICIENCY - %	91.0		
** MIST ELIMINATOR			
PRE-MIST ELIMINATOR/MIST ELIMINATOR	MIST ELIMINATOR		
NUMBER PER SYSTEM	2		
GENERIC TYPE	IMPINGEMENT		
SPECIFIC TYPE	BAFFLE		
TRADE NAME/COMMON TYPE	CHEVRON VANE		
CONFIGURATION	HORIZONTAL		
NUMBER OF STAGES	2		
NUMBER OF PASSES PER STAGE	2		
PRESSURE DROP - KPA	.1	(.5 IN-H2O)	
SUPERFICAL GAS VELOCITY - M/S	2.1	(7.0 FT/S)	
CONSTRUCTION MATERIAL GENERIC TYPE	FIBERGLASS REINFORCED PLASTIC		
WASH WATER SOURCE	RIVER		
WASH RATE - L/S	31.5	(500 GAL/MIN)	
** REHEATER			
NUMBER	2		
GENERIC TYPE	IN-LINE		
SPECIFIC TYPE	STEAM		
TRADE NAME/COMMON TYPE	FIN TUBE		
PERCENT GAS BYPASSED - AVG	.0		
TEMPERATURE INCREASE - C	4.4	(40 F)	
INLET FLUE GAS FLOW RATE - CU. M/S	265.21	(562000 ACFM)	
INLET FLUE GAS TEMPERATURE - C	52.2	(126 F)	
NUMBER OF TUBES PER BUNDLE	34		
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL		
** FANS			
NUMBER	2		
FUNCTION	BALANCED DRAFT		
APPLICATION	FORCED DRAFT		
SERVICE	DRY		
FLUE GAS FLOW RATE - CU.M/S	165.16	(350000 ACFM)	
FLUE GAS TEMPERATURE - C	154.4	(310 F)	
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL		
** FANS			
NUMBER	2		
FUNCTION	BOOSTER		
APPLICATION	INDUCED DRAFT		
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL		

LOUISVILLE GAS & ELECTRIC: CANE RUN 5 (CONT.)

** TANKS

SERVICE	NUMBER
RECYCLE	1
REACTION	1
LIME FEED	****

** PUMPS

SERVICE	NUMBER
ABSORBER RECIRCULATION	2
SPRAY PUMP	2
LIME FEED	2
THICKENER UNDERFLOW	2
WATER RECYCLE	2
MIST ELIMINATOR WASH	****

** SOLIDS CONCENTRATING/DEWATERING

DEVICE	THICKENER
NUMBER	1
NUMBER OF SPARES	0
CONFIGURATION	CIRCULAR
DIMENSIONS - FT	110 DIA
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
LINER SPECIFIC MATERIAL TYPE	RUBBER
FEED STREAM CHARACTERISTICS	10% SOLIDS
OUTLET STREAM CHARACTERISTICS	25% SOLIDS

*** SLUDGE

** TREATMENT

METHOD	POZ-O-TEC
PROPRIETARY PROCESS	IUCS

** DISPOSAL

NATURE	FINAL
TYPE	LINED POND
LOCATION	ON SITE
SITE TRANSPORTATION METHOD	PIPELINE

** PROCESS CONTROL AND INSTRUMENTATION

CHEMICAL PARAMETERS	PH
CONTROL LEVELS	9-10 (RECYCLE SLURRY)
MONITOR LOCATION	REACTION TANK
PROCESS CONTROL MANNER	AUTOMATIC

** WATER BALANCE

WATER LOOP TYPE	OPEN

** FGD SPARE CAPACITY INDICES

ABSORBER - %	.0

** FGD SPARE COMPONENT INDICES

ABSORBER	.0

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
12/77	SYSTEM							744			

LOUISVILLE GAS & ELECTRIC: CANE RUN 5 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
		PERFORMANCE DATA									
	** PROBLEMS/SOLUTIONS/COMMENTS										
		OPERATION OF THE FGD SYSTEM, ON A TRIAL BASIS, BEGAN ON DECEMBER 29, 1977. INITIAL OPERATIONS WERE NOT CONTINUOUS AND THE SYSTEM WAS TAKEN OFF LINE FOR NECESSARY MODIFICATIONS.									
1/78	SYSTEM							744			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		MODIFICATIONS, ESPECIALLY TO CONTROLS THAT WERE NOT OPERATING PROPERLY, CONTINUED THROUGH JANUARY AND THE FGD SYSTEM REMAINED OFF LINE.									
2/78	SYSTEM							672			
3/78	SYSTEM		50.0		12.2			744	182	91	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE PLANT REMAINED OFF LINE THROUGHOUT FEBRUARY AND RESTARTED ON MARCH 24.									
		VARIOUS INITIAL START-UP PROBLEMS WERE STILL BEING ENCOUNTERED CAUSING FGD SYSTEM OUTAGES.									
4/78	SYSTEM		96.9		90.0			720	669	648	
5/78	SYSTEM		84.3		48.9			744	432	364	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		FGD SYSTEM MODIFICATIONS WERE MADE DURING THE APRIL-MAY PERIOD IN PREPARATION FOR PERFORMANCE TESTS. THE TESTS WERE PERFORMED; HOWEVER, THE TEST METHODS WERE NOT FOLLOWED ACCURATELY AND THE DATA WAS INCONCLUSIVE.									
6/78	SYSTEM	86.8	36.1		81.9			720	685	590	
7/78	SYSTEM	83.1	80.1		68.0			744	632	506	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE STEAM REHEAT COIL INSTALLATION HAS BEEN A CHRONIC PROBLEM AREA. WELDS HAVE BEEN FAILING EVER SINCE INITIAL OPERATIONS.									
8/78	SYSTEM		85.9		62.4			744	540	464	
9/78	SYSTEM		79.6		67.4			720	609	485	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		PROBLEMS CONTINUED WITH THE REHEAT COILS.									
10/78	SYSTEM		96.2		68.5			744	530	510	
11/78	SYSTEM		93.7		32.9			720	253	237	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE SYSTEM WAS SHUTDOWN IN NOVEMBER FOR REPAIRS TO THE STEAM REHEATER COILS. THE OUTAGE LASTED ABOUT TWO WEEKS.									
12/78	SYSTEM	52.7	46.2		40.6			744	654	302	
1/79	SYSTEM	69.6	67.2		62.8			744	693	467	

LOUISVILLE GAS & ELECTRIC: CANE RUN 5 (CONT.)

PERIOD	MODULE	PERFORMANCE DATA AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
2/79	SYSTEM	70.6		50.1				672	477	337	
	** PROBLEMS/SOLUTIONS/COMMENTS										
	DURING FEBRUARY FREEZING CAUSED PROBLEMS WITH LIME DELIVERY.										
3/79	SYSTEM	71.8		57.5				744	596	428	
4/79	SYSTEM	99.2		49.6				720	360	357	
	** PROBLEMS/SOLUTIONS/COMMENTS										
	SOME PROBLEMS WERE EXPERIENCED WITH DAMPERS AND THERE WERE PUMP FAILURES.										
5/79	SYSTEM	84.3		49.1				744	433	365	
	** PROBLEMS/SOLUTIONS/COMMENTS										
	COMPLIANCE TESTING WAS AGAIN PERFORMED AT THIS UNIT ON MAY 15 AND 19 AND A SO2 REMOVAL EFFICIENCY OF 93% WAS DEMONSTRATED. THE UNIT WAS DECLARED COMMERCIAL UPON COMPLETION OF THE TESTS.										
6/79	SYSTEM	77.0		58.2				720	544	419	
	** PROBLEMS/SOLUTIONS/COMMENTS										
	THE ONLY PROBLEMS REPORTED BY THE UTILITY FOR THE MAY-JUNE PERIOD WERE SPRAY PUMP PACKING FAILURES AND WELDING FAILURES ON THE REHEATER.										
7/79	SYSTEM	72.0		56.5				744	583	420	
8/79	SYSTEM	88.1		72.6				744	613	540	
9/79	SYSTEM	83.6		54.4				720	469	392	
	** PROBLEMS/SOLUTIONS/COMMENTS										
	THE WELDING PROBLEMS WITH THE REHEATER WERE ENCOUNTERED IN JULY AND SEPTEMBER. THE FAILURES ARE CONTINUING AND ARE EXPECTED TO BE RESOLVED BY THIS WINTER.										
10/79	SYSTEM	83.7		65.6				744	583	488	
11/79	SYSTEM	95.2		46.4				720	351	334	
12/79	SYSTEM	82.2		63.4				744	574	472	
	** PROBLEMS/SOLUTIONS/COMMENTS										
	DURING THE FOURTH QUARTER OF 1979 THE UTILITY REPORTED THAT NO MAJOR PROBLEMS OCCURRED. THE UNIT REQUIRED ONLY NORMAL MAINTENANCE.										
1/80	SYSTEM	92.1		72.2				744	583	537	
	** PROBLEMS/SOLUTIONS/COMMENTS										
	DURING JANUARY NO OPERATIONAL PROBLEMS WERE ENCOUNTERED.										
2/80	SYSTEM	71.9		49.7				696	481	346	

LOUISVILLE GAS & ELECTRIC: CANE RUN 4 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
		PERFORMANCE DATA									
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE BOILER WAS DOWN AGAIN DURING PART OF MAY FOR REPAIRS.									
		DURING THE MAY BOILER OUTAGE A NUMBER OF MODIFICATIONS WERE MADE TO THE DAMPERS IN THE FGD SYSTEM.									
6/78	SYSTEM	99.3	99.3	99.3	99.3			720	720	715	
7/78	SYSTEM	98.8	98.7	98.7	91.1			744	687	678	
8/78	SYSTEM		94.2		94.2			744	744	701	
9/78	SYSTEM		100.0		19.2			720	138	138	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THERE WERE NO FGD FORCED OUTAGES DURING THE AUGUST-SEPTEMBER PERIOD.									
		THE BOILER WENT DOWN IN SEPTEMBER AFTER 138 HOURS OF OPERATION FOR TUBE REPAIRS.									
10/78	SYSTEM	100.0			.0			744	0	0	.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE BOILER REMAINED OFF LINE DURING OCTOBER FOR CONTINUATION OF THE TUBE REPAIRS.									
11/78	SYSTEM		97.2		58.3			720	432	420	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE BOILER AND FGD SYSTEM CAME BACK ON LINE DURING THE SECOND WEEK OF NOVEMBER WITH NO OPERATIONAL PROBLEMS REPORTED FOR THE FGD SYSTEM.									
12/78	SYSTEM	100.0			.0			744	0	0	.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING DECEMBER A TURBINE BECAME UNOPERATIONAL. THE UNIT IS EXPECTED TO BE OFF LINE UNTIL APRIL.									
1/79	SYSTEM	100.0			.0			744	0	0	.0
2/79	SYSTEM	100.0			.0			672	0	0	.0
3/79	SYSTEM	100.0			.0			744	0	0	.0
4/79	SYSTEM	100.0			.0			720	0	0	.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UNIT DID NOT OPERATE DURING THESE MONTHS BECAUSE THE BOILER WAS STILL DOWN FOR TURBINE REPAIR AND TUBE LEAK REPAIRS.									
5/79	SYSTEM	100.0			.0			744	0	0	.0
6/79	SYSTEM		46.2		17.1			720	266	123	

LOUISVILLE GAS & ELECTRIC: CANE RUN 4 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
				PERFORMANCE DATA							
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UNIT REMAINED DOWN DURING MAY FOR CONTINUED TURBINE AND BOILER TUBE REPAIRS. THE UNIT WAS PLACED BACK IN SERVICE IN JUNE.									
7/79	SYSTEM		98.7		93.0			744	701	692	
8/79	SYSTEM		89.2		89.2			744	744	664	
9/79	SYSTEM		.0		.0			720	168	0	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE ONLY MAJOR PROBLEMS OCCURRED DURING SEPTEMBER. TUBE FAILURES WERE ENCOUNTERED CAUSING THE BOILER OUTAGE AND MECHANICAL FAILURE WITH THE DAMPER GATES CAUSED THE SCRUBBER TO BE OFF LINE DURING THE MONTH.									
10/79	SYSTEM		30.1		12.0			744	296	89	
11/79	SYSTEM		93.9		58.1			720	445	418	
12/79	SYSTEM		38.5		20.2			744	390	150	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING THE FOURTH QUARTER 1979 THERE WERE NO MAJOR PROBLEMS. THE LOW SCRUBBER HOURS WERE A RESULT OF NECESSARY MAINTENANCE.									
1/80	SYSTEM		100.0		95.6			744	711	711	
2/80	SYSTEM		99.8		66.7			696	465	464	
3/80	SYSTEM		80.5		74.3			744	687	553	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		NO MAJOR OPERATIONAL PROBLEMS WERE REPORTED FOR THE FIRST QUARTER OF 1980 WITH EITHER THE BOILER OR THE FGD SYSTEM.									
4/80	SYSTEM	99.0	98.8	98.8	79.9			720	582	575	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING APRIL SPRAY PUMP PROBLEMS CAUSED SEVEN HOURS OF OUTAGE TIME.									
5/80	SYSTEM	96.8	100.0	100.0	7.0			744	52	52	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE BOILER WAS NOT NEEDED MOST OF MAY, THIS ACCOUNTS FOR THE LOW UTILIZATION OF THE FGD SYSTEM.									
		ONE DAY OF OUTAGE TIME IN MAY WAS CAUSED BY A LEAK IN A SPRAY PUMP SEAL.									
6/80	SYSTEM	.0	.0		.0			720	350	0	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING PART OF JUNE THE BOILER WAS ON RESERVE, IN WHICH TIME THE SCRUBBER DUCTWORK AND LININGS WERE REPAIRED.									
		REPAIRS WERE MADE TO MODULE LININGS AND DUCTWORK. DUCTWORK REPAIRS/									

LOUISVILLE GAS & ELECTRIC: CANE RUN 4 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
				PERFORMANCE DATA							
			REPLACEMENTS WERE MADE WITH 316 SS.								
			ALSO DURING THE DOWN TIME THE EXPANSION JOINT LOCATED AT THE DISCHARGE OF THE BOOSTER PUMP WAS REPLACED.								
7/80	A	85.7	92.8	92.8	85.7						
	B	85.7	92.8	92.8	85.7						
	SYSTEM	85.7	92.8	92.8	85.7	87.00	99.00	744	687	638	
	** PROBLEMS/SOLUTIONS/COMMENTS										
			PROBLEMS WERE ENCOUNTERED WITH THE OIL REHEAT SYSTEM DURING JULY.								
			SPRAY PUMP AND VALVE FAILURES ENCOUNTERED DURING THE MONTH ACCOUNTED FOR SOME OF THE FGD SYSTEM DOWN TIME.								
8/80	SYSTEM	100.0	99.3	99.3	76.9	86.00	99.00	744	576	572	50.0
9/80	SYSTEM	100.0	100.0	100.0	35.7	86.00	99.00	720	257	257	50.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
			THE UTILITY REPORTED THAT NO MAJOR OUTAGES OCCURRED DURING AUGUST AND SEPTEMBER.								
10/80	SYSTEM	100.0	100.0	100.0	82.1			744	611	611	50.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
			THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE MONTH OF OCTOBER.								
11/80	SYSTEM	71.8	52.8	52.8	35.2			720	572	254	50.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
			DURING NOVEMBER DUCTWORK FAILURE CAUSED SOME OUTAGE TIME.								
			ALSO DURING THE MONTH PROBLEMS WERE ENCOUNTERED WHEN THE MIST ELIMINATORS FAILED.								
12/80	SYSTEM	100.0	100.0	100.0	76.8			744	572	572	50.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
			DURING DECEMBER THE UTILITY REPORTED THAT NO FGD-RELATED PROBLEMS OCCURRED.								

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	LOUISVILLE GAS & ELECTRIC	
PLANT NAME	CANE RUN	
UNIT NUMBER	5	
CITY	LOUISVILLE	
STATE	KENTUCKY	
REGULATORY CLASSIFICATION	D	
PARTICULATE EMISSION LIMITATION - NG/J	50.	(.116 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	516.	(1.200 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	992	
GROSS UNIT GENERATING CAPACITY - MW	200	
NET UNIT GENERATING CAPACITY W/FGD - MW	192	
NET UNIT GENERATING CAPACITY WO/FGD - MW	195	
EQUIVALENT SCRUBBED CAPACITY - MW	200	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	RILEY STOKER	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	306.73	(650000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	162.8	(325 F)
STACK HEIGHT - M	76.	(250 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	*******	(***** FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	BITUMINOUS	
AVERAGE HEAT CONTENT - J/G	26749.	(11500 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		10,400-11,900
AVERAGE ASH CONTENT - %	17.10	
RANGE ASH CONTENT - %	15.5-24.5	
AVERAGE MOISTURE CONTENT - %	9.00	
RANGE MOISTURE CONTENT - %	8.0-10.75	
AVERAGE SULFUR CONTENT - %	3.75	
RANGE SULFUR CONTENT - %	3.5-4.0	
AVERAGE CHLORIDE CONTENT - %	.04	
RANGE CHLORIDE CONTENT - %	0.03-0.06	
*** PARTICLE CONTROL		
** ESP		
NUMBER	2	
TYPE	COLD SIDE	
INLET FLUE GAS CAPACITY - CU.M/S	306.7	(650000 ACFM)
INLET FLUE GAS TEMPERATURE - C	162.8	(325 F)
PARTICLE REMOVAL EFFICENCY - %	99.0	
** PARTICLE SCRUBBER		
GENERIC TYPE	NONE	
SPECIFIC TYPE	N/A	
*** FGD SYSTEM		
** GENERAL DATA		
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT	
SO2 REMOVAL MODE	WET SCRUBBING	
PROCESS TYPE	LIME	
SYSTEM SUPPLIER	COMBUSTION ENGINEERING	
A-E FIRM	FLUOR - PIONEER	
DEVELOPMENT LEVEL	FULL SCALE	
NEW/RETROFIT	RETROFIT	
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.00	
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	85.00	
CURRENT STATUS	1	
COMMERCIAL START-UP	7/78	
INITIAL START-UP	12/77	
CONTRACT AWARDED	4/75	

LOUISVILLE GAS & ELECTRIC: CANE RUN 5 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
						IN FEBRUARY THE UTILITY RAN OUT OF CARBIDE LIME CAUSING INTERRUPTION OF THE FGD SYSTEM OPERATION. THE UNAVAILABILITY OF LIME WAS CAUSED BY FREEZE UPS ENCOUNTERED BY AIRCO, THE LIME SUPPLIER.					
3/80	SYSTEM		44.5		27.2			744	454	202	
	** PROBLEMS/SOLUTIONS/COMMENTS										
						REHEATER TUBE PROBLEMS WERE ENCOUNTERED IN FEBRUARY AND CONTINUED THROUGH MARCH. THE UTILITY HOPES TO REPLACE THE TUBE BUNDLES IN THE SUMMER.					
4/80	SYSTEM	.0			.0			720	0	0	.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
						THE FGD SYSTEM WAS OFF LINE THE ENTIRE MONTH OF APRIL TO INSTALL STAINLESS STEEL (316 SS) IN THE DUCTWORK AND IN THE MODULES.					
5/80	SYSTEM	95.3	94.5	94.5	80.2			744	632	597	
	** PROBLEMS/SOLUTIONS/COMMENTS										
						DURING MAY ONE DAY OF OUTAGE TIME WAS NECESSARY TO COMPLETE THE INSTALLATION OF THE STAINLESS STEEL IN THE DUCTWORK AND MODULES. A PUMP SEAL ON THE RECIRCULATION PUMP FAILED CAUSING APPROXIMATELY 10 HOURS OF OUTAGE TIME.					
6/80	SYSTEM	78.8	74.4	74.4	61.8			720	598	445	
	** PROBLEMS/SOLUTIONS/COMMENTS										
						DURING JUNE THE SYSTEM HAD TO BE TAKEN OFF LINE FOR 153 HOURS DUE TO THE POOR WELDS ON THE TUBE BUNDLES IN THE REHEATER. THE TUBE BUNDLES HAVE BEEN A CONSTANT PROBLEM AND THE MANUFACTURER IS SCHEDULED TO REPLACE THEM IN THE FALL.					
7/80	SYSTEM	78.7	87.6	87.6	78.7	85.00	99.00	744	669	586	
	** PROBLEMS/SOLUTIONS/COMMENTS										
						DURING JULY THE REHEAT TUBE EXCHANGERS FAILED. TWO NEW EXCHANGERS ARE NOW ON SITE AND ARE SCHEDULED TO BE INSTALLED IN NOVEMBER OR DECEMBER 1980. A THREE DAY OUTAGE OCCURRED IN JULY DUE TO A LIMESTONE ROCK DISABLING THE THICKENER.					
8/80	SYSTEM	49.6	58.4	58.4	49.6	90.00	99.00	744	632	369	50.0
9/80	SYSTEM	87.2	97.5	97.5	87.2	90.00	99.00	720	644	628	50.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
						THE OUTAGE TIME DURING AUGUST AND SEPTEMBER WAS CAUSED BY A REHEAT TUBE BUNDLE FAILURE. THE BUNDLES ARE PRESENTLY BEING REPLACED IN BOTH MODULES.					
10/80	SYSTEM	100.0	100.0	100.0	10.0			744	72	72	50.0
11/80	SYSTEM	100.0	100.0	100.0	25.0			720	177	177	50.0
12/80	SYSTEM	100.0	100.0	100.0	99.8			744	743	742	50.0

LOUISVILLE GAS & ELECTRIC: CANE RUN 5 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
					PERFORMANCE DATA						

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE FOURTH QUARTER 1980.

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	LOUISVILLE GAS & ELECTRIC	
PLANT NAME	CANE RUN	
UNIT NUMBER	6	
CITY	LOUISVILLE	
STATE	KENTUCKY	
REGULATORY CLASSIFICATION	D	
PARTICULATE EMISSION LIMITATION - NG/J	50.	(.116 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	516.	(1.200 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	992	
GROSS UNIT GENERATING CAPACITY - MW	299	
NET UNIT GENERATING CAPACITY W/FGD - MW	277	
NET UNIT GENERATING CAPACITY WO/FGD - MW	280	
EQUIVALENT SCRUBBED CAPACITY - MW	299	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	COMBUSTION ENGINEERING	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	502.57	(1065000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	148.9	(300 F)
STACK HEIGHT - M	158.	(518 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	4.9	(16.0 FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	BITUMINOUS	
AVERAGE HEAT CONTENT - J/G	25586.	(11000 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		10,400-11,900
AVERAGE ASH CONTENT - %	17.06	
RANGE ASH CONTENT - %	15.5-24.5	
AVERAGE MOISTURE CONTENT - %	8.95	
RANGE MOISTURE CONTENT - %	8.0-10.75	
AVERAGE SULFUR CONTENT - %	4.80	
RANGE SULFUR CONTENT - %	3.5-6.3	
AVERAGE CHLORIDE CONTENT - %	.04	
RANGE CHLORIDE CONTENT - %	0.03-0.06	
*** PARTICLE CONTROL		
** MECHANICAL COLLECTOR		
NUMBER	0	
TYPE	NONE	
** FABRIC FILTER		
NUMBER	0	
TYPE	NONE	
** ESP		
NUMBER	2	
TYPE	COLD SIDE	
INLET FLUE GAS CAPACITY - CU.M/S	502.6	(1065000 ACFM)
INLET FLUE GAS TEMPERATURE - C	148.9	(300 F)
PARTICLE REMOVAL EFFICENCY - %	99.4	
** PARTICLE SCRUBBER		
GENERIC TYPE	NONE	
SPECIFIC TYPE	N/A	
*** FGD SYSTEM		
** GENERAL DATA		
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT	
SO2 REMOVAL MODE	WET SCRUBBING	
PROCESS TYPE	DUAL ALKALI	
SYSTEM SUPPLIER	COMBUSTION EQUIP ASSOCIATES	
A-E FIRM	FLUOR - PIONEER	
DEVELOPMENT LEVEL	DEMONSTRATION	

LOUISVILLE GAS & ELECTRIC: CANE RUN 6 (CONT.)

NEW/RETROFIT	RETROFIT		
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.00		
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	95.00		
CURRENT STATUS	1		
INITIAL START-UP	4/79		
CONTRACT AWARDED	10/76		
** DESIGN AND OPERATING PARAMETERS			
** ABSORBER			
NUMBER	2		
GENERIC TYPE	TRAY TOWER		
SPECIFIC TYPE	SIEVE TRAY		
SUPPLIER	COMBUSTION EQUIP ASSOCIATES		
DIMENSIONS - FT	32 DIA X 45		
SHELL GENERIC MATERIAL	CARBON STEEL		
SHELL SPECIFIC MATERIAL	A-283		
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A		
LINER GENERIC MATERIAL	ORGANIC		
LINER SPECIFIC MATERIAL	MICA FLAKE-FILLED POLYESTER		
GAS CONTACTING DEVICE TYPE	SIEVE TRAY		
NUMBER OF CONTACTING ZONES	2		
LIQUID RECIRCULATION RATE - LITER/S	272.	(4318 GPM)	
L/G RATIO - L/CU.M	1.3	(10.0 GAL/1000 ACF)	
GAS-SIDE PRESSURE DROP - KPA	2.5	(9.9 IN-H2O)	
SUPERFICAL GAS VELOCITY - M/SEC	2.7	(9.0 FT/S)	
INLET GAS FLOW - CU. M/S	251.52	(533000 ACFM)	
INLET GAS TEMPERATURE - C	148.9	(300 F)	
SO2 REMOVAL EFFICIENCY - %	94.2		
** MIST ELIMINATOR			
PRE-MIST ELIMINATOR/MIST ELIMINATOR	MIST ELIMINATOR		
NUMBER PER SYSTEM	2		
GENERIC TYPE	IMPINGEMENT		
SPECIFIC TYPE	BAFFLE		
TRADE NAME/COMMON TYPE	CHEVRON VANE		
CONFIGURATION	HORIZONTAL		
NUMBER OF STAGES	1		
NUMBER OF PASSES PER STAGE	4		
FREEBOARD DISTANCE - M	1.52	(5.0 FT)	
PRESSURE DROP - KPA	.2	(1.0 IN-H2O)	
SUPERFICAL GAS VELOCITY - M/S	2.7	(9.0 FT/S)	
CONSTRUCTION MATERIAL GENERIC TYPE	POLYPROPYLENE		
** REHEATER			
NUMBER	2		
GENERIC TYPE	DIRECT COMBUSTION		
SPECIFIC TYPE	EXTERNAL COMBUSTION CHAMBER		
TRADE NAME/COMMON TYPE	OIL		
PERCENT GAS BYPASSED - AVG	.0		
TEMPERATURE INCREASE - C	10.0	(50 F)	
INLET FLUE GAS FLOW RATE - CU. M/S	205.98	(436500 ACFM)	
INLET FLUE GAS TEMPERATURE - C	51.7	(125 F)	
** FANS			
NUMBER	2		
FUNCTION	BOOSTER		
APPLICATION	FORCED DRAFT		
SERVICE	DRY		
FLUE GAS FLOW RATE - CU.M/S	251.52	(533000 ACFM)	
FLUE GAS TEMPERATURE - C	148.9	(300 F)	
CONSTRUCTION MATERIAL GENERIC TYPE	A441 CARBON STEEL		
** DUCTWORK			
LOCATION	SCRUBBER INLET		
SHELL GENERIC MATERIAL TYPE	CARBON STEEL		
LINER GENERIC MATERIAL TYPE	NONE		
** DUCTWORK			
LOCATION	SCRUBBER TO REHEATER		
SHELL GENERIC MATERIAL TYPE	CARBON STEEL		

LOUISVILLE GAS & ELECTRIC: CANE RUN 6 (CONT.)

LINER GENERIC MATERIAL TYPE	FRP
** DUCTWORK	
LOCATION	REHEATER TO STACK
SHELL GENERIC MATERIAL TYPE	317L SS
LINER GENERIC MATERIAL TYPE	NONE
** DUCTWORK	
LOCATION	BYPASS/TRANSITION DUCT
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
LINER GENERIC MATERIAL TYPE	NONE
** TANKS	
SERVICE	NUMBER
-------	------
PRIMARY REACTION TANK	2
SECONDARY REACTION TANK	2
FEED FORWARD TANK	****
FILTRATE SUMP	3
THICKENER HOLD TANK	1
SODA ASH SOLUTION TANK	1
SODA ASH SILO	1
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	VACUUM FILTER
NUMBER	3
NUMBER OF SPARES	1
CAPACITY	3 TON/DAY
BELT SPECIFIC MATERIAL TYPE	FIBER-REINFORCED POLYESTER
FEED STREAM CHARACTERISTICS	25% SOLIDS
OUTLET STREAM CHARACTERISTICS	63% SOLIDS
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	THICKENER
NUMBER	1
CONFIGURATION	CYLINDRICAL
DIMENSIONS - FT	125 (DIA) X 23 (DEPTH)
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
OUTLET STREAM CHARACTERISTICS	25% SOLIDS
*** SLUDGE	
** TREATMENT	
PROPRIETARY PROCESS	IUCS
** DISPOSAL	
NATURE	FINAL
TYPE	LANDFILL
LOCATION	ON SITE
SITE TRANSPORTATION METHOD	TRUCK
** PROCESS CONTROL AND INSTRUMENTATION	
PHYSICAL VARIABLES	PH
MONITOR LOCATION	ABSORBER BLEED LIQUOR
PROCESS CONTROL MANNER	AUTOMATIC
PROCESS CHEMISTRY MODE	FEED FORWARD
** WATER BALANCE	
WATER LOOP TYPE	CLOSED
EVAPORATION WATER LOSS - LITER/S	17.5 (278 GPM)
** FGD SPARE CAPACITY INDICES	
ABSORBER - %	20.0
FAN - %	.0
RECIRCULATION PUMP - %	100.0
** FGD SPARE COMPONENT INDICES	
ABSORBER	.3
FAN	.0

LOUISVILLE GAS & ELECTRIC: CANE RUN 6 (CONT.)

RECIRCULATION PUMP 1.0

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
4/79	SYSTEM		49.9		32.9			720	475	237	

** PROBLEMS/SOLUTIONS/COMMENTS

THIS UNIT STARTED OPERATING ON APRIL 4, 1979. COMPLIANCE TESTING IS SCHEDULED FOR THE WEEK OF JUNE 3.

5/79	SYSTEM		21.5		14.7			744	506	109	
6/79	SYSTEM		12.3		10.3			720	601	74	

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE SYSTEM IS STILL CONSIDERED IN START-UP AND THAT NO UNUSUAL PROCESS PROBLEMS HAVE BEEN ENCOUNTERED. HOWEVER THE SYSTEM IS NOW OUT OF SERVICE DUE TO THE COMPLETE FAILURE OF THE MIST ELIMINATORS. IT IS EXPECTED TO BE DOWN FOR A MONTH.

7/79	SYSTEM		.0		.0			744	529	0	

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT DID NOT OPERATE IN JULY AS PROCEDURES CONTINUED TO REPLACE THE MIST ELIMINATORS.

8/79	SYSTEM		7.0		7.0			744	683	51	
9/79	SYSTEM		60.0		44.0			720	531	317	

** PROBLEMS/SOLUTIONS/COMMENTS

DURING AUGUST AND SEPTEMBER THE UNIT DOWNTIME WAS DUE TO THE COMPLETE FAILURE OF FIVE PUMPS. THE PUMP PROBLEMS WERE THE LOSS OF THE IMPELLERS OFF OF THE SHAFTS.

10/79	SYSTEM		81.4		28.9			744	246	215	
11/79	SYSTEM		97.7		63.5			720	468	457	
12/79	SYSTEM		94.9		89.7			744	703	667	

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR PROBLEMS OCCURRED DURING THE FOURTH QUARTER OF 1979. THE UNIT REQUIRED ONLY NORMAL MAINTENANCE.

1/80	SYSTEM		49.0		13.8			744	210	103	

** PROBLEMS/SOLUTIONS/COMMENTS

FGD SYSTEM OUTAGE TIME IN JANUARY WAS CAUSED BY A THICKENER FAILURE. THE RAKE BECAME INOPERABLE BECAUSE OF HIGH SOLIDS AND THE THICKENER HAD TO BE CLEANED OUT.

2/80	SYSTEM		84.7		47.0			696	386	327	
3/80	SYSTEM		70.0		64.5			744	686	480	

LOUISVILLE GAS & ELECTRIC: CANE RUN 6 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
		PERFORMANCE DATA									
	** PROBLEMS/SOLUTIONS/COMMENTS										
		IN FEBRUARY AND MARCH OUTAGE TIME WAS CAUSED BY PROBLEMS WITH THE RECYCLE PUMPS.									
4/80	SYSTEM	98.8	91.5	97.7	73.9	95.00	99.00	720	581	531	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE BOILER OUTAGES IN APRIL WERE A RESULT OF THE LOSS OF ONE OF THE BOILER FEED PUMPS AND BECAUSE THE LOAD WAS NOT NEEDED.									
		THE FGD OUTAGES WERE A RESULT OF HIGH BOOSTER FAN SUCTION TRIPS, REPAIRS TO THE IUCS SYSTEM, REPAIRS TO THE THICKENER UNDERFLOW LINE AND A PLANNED INSPECTION OF THE TRAYS. THE TRAY PLUGGING PROBLEM WAS SOLVED BY A SLIGHT PH ADJUSTMENT IN THE REACTORS.									
5/80	SYSTEM	99.9	99.9	99.9	99.5			744	741	740	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING MAY THE PRESSURE RELIEF VALVE ON THE BOOSTER FAN MALFUNCTIONED FORCING THE FGD SYSTEM OUT OF SERVICE.									
6/80	SYSTEM	99.9	99.7	99.9	88.9			720	642	640	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		A SPRAY PUMP MALFUNCTION CAUSED THE SYSTEM TO SHUTDOWN. APPROXIMATELY ONE HOUR WAS NEEDED TO PUT THE SPARE INTO SERVICE.									
		THE BOILER WAS OFF FOR REPAIRS TO THE CLINKER GRINDER AND TO REPAIR A BOILER TUBE LEAK.									
		IMPROVEMENTS TO THE PH CONTROL CIRCUITRY HAVE LEAD TO IMPROVED CARBIDE LIME UTILIZATION.									
		EXPERIMENTATION WITH A NEW FILTER CLOTH HAS SHOWN AN IMPROVEMENT IN SODA ASH CONSUMPTION.									
		SULFUR DIOXIDE EMISSIONS AVERAGED LESS THAN 200 PPM FOR JUNE.									
7/80	SYSTEM	99.9	99.7	99.9	82.9			744	618	617	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING THE PERIOD FROM JULY 17 THROUGH JULY 28 AN ACCEPTANCE TEST WAS RUN. DURING THE TEST THE FGD SYSTEM EXPERIENCED NO MAJOR PROBLEMS OR OUTAGE TIME. THE AVERAGE SO2 REMOVAL EFFICIENCY DURING THE TEST WAS 93.9%.									
		DURING NORMAL OPERATION IN JULY NO MAJOR FGD RELATED PROBLEMS WERE ENCOUNTERED.									
8/80	SYSTEM	99.3	94.6	94.6	84.5	95.00	99.00	744	665	628	50.0
9/80	SYSTEM	94.0	98.6	98.7	86.9	95.00	99.00	720	635	626	50.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UTILITY REPORTED THAT NO MAJOR PROBLEMS OCCURRED DURING THE MONTHS OF AUGUST AND SEPTEMBER.									
10/80	SYSTEM	99.8	99.8	99.8	99.8			744	743	743	33.0

LOUISVILLE GAS & ELECTRIC: CANE RUN 6 (CONT.)

PERIOD	MODULE	PERFORMANCE DATA AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UTILITY REPORTED THAT NO MAJOR PROBLEMS OCCURRED DURING THE MONTHS OF									
11/80	SYSTEM	85.1	96.8	96.8	55.1			720	409	397	33.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING OCTOBER AND NOVEMBER THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED.									
12/80	SYSTEM	60.0	6.0	6.0	1.9			744	240	14	50.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING DECEMBER THE THICKENER RACK SHAFT WAS SHEARED-OFF CAUSING THE SYSTEM TO SHUTDOWN FOR APPROXIMATELY 226 HOURS.									

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	LOUISVILLE GAS & ELECTRIC	
PLANT NAME	MILL CREEK	
UNIT NUMBER	1	
CITY	LOUISVILLE	
STATE	KENTUCKY	
REGULATORY CLASSIFICATION	E	
PARTICULATE EMISSION LIMITATION - NG/J	43.	(.100 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	516.	(1.200 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	*****	
GROSS UNIT GENERATING CAPACITY - MW	358	
NET UNIT GENERATING CAPACITY W/FGD - MW	334	
NET UNIT GENERATING CAPACITY WO/FGD - MW	339	
EQUIVALENT SCRUBBED CAPACITY - MW	358	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	COMBUSTION ENGINEERING	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	********	(******* ACFM)
BOILER FLUE GAS TEMPERATURE - C	*******	(**** F)
STACK HEIGHT - M	******	(**** FT)
STACK SHELL	******	
STACK TOP DIAMETER - M	*******	(***** FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	******	
AVERAGE HEAT CONTENT - J/G	26749.	(11500 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		******
AVERAGE ASH CONTENT - %	11.50	
RANGE ASH CONTENT - %	******	
AVERAGE MOISTURE CONTENT - %	********	
RANGE MOISTURE CONTENT - %	******	
AVERAGE SULFUR CONTENT - %	3.75	
RANGE SULFUR CONTENT - %	3.5-4.0	
AVERAGE CHLORIDE CONTENT - %	.06	
RANGE CHLORIDE CONTENT - %	******	
*** PARTICLE CONTROL		
** PARTICLE SCRUBBER		
GENERIC TYPE	NONE	
SPECIFIC TYPE	N/A	
*** FGD SYSTEM		
** GENERAL DATA		
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT	
SO2 REMOVAL MODE	WET SCRUBBING	
PROCESS TYPE	LIME	
SYSTEM SUPPLIER	COMBUSTION ENGINEERING	
A-E FIRM	FLUOR - PIONEER	
DEVELOPMENT LEVEL	FULL SCALE	
NEW/RETROFIT	RETROFIT	
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	85.00	
CURRENT STATUS	1	
COMMERCIAL START-UP	4/81	
INITIAL START-UP	12/80	
** DESIGN AND OPERATING PARAMETERS		
** ABSORBER		
SUPPLIER	COMBUSTION ENGINEERING	
L/G RATIO - L/CU.M	12.7	(95.0 GAL/1000 ACF)
SO2 REMOVAL EFFICIENCY - %	86.6	

LOUISVILLE GAS & ELECTRIC: MILL CREEK 1 (CONT.)

** REHEATER
TEMPERATURE INCREASE - C 10.0 (50 F)

*** SLUDGE

** TREATMENT
PROPRIETARY PROCESS IUCS

** DISPOSAL
LOCATION ON SITE

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
12/80	SYSTEM	45.2	98.5	98.5	44.5			744	336	331	60.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM IS PRESENTLY IN THE STARTUP PHASE. OPERATIONS BEGAN ON DECEMBER 17, 1980 AND NO MAJOR PROBLEMS WERE REPORTED.

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	LOUISVILLE GAS & ELECTRIC	
PLANT NAME	MILL CREEK	
UNIT NUMBER	3	
CITY	LOUISVILLE	
STATE	KENTUCKY	
REGULATORY CLASSIFICATION	D	
PARTICULATE EMISSION LIMITATION - NG/J	43.	(.100 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	516.	(1.200 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	1079	
GROSS UNIT GENERATING CAPACITY - MW	442	
NET UNIT GENERATING CAPACITY W/FGD - MW	420	
NET UNIT GENERATING CAPACITY WO/FGD - MW	427	
EQUIVALENT SCRUBBED CAPACITY - MW	442	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	BABCOCK & WILCOX	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	********	(******* ACFM)
BOILER FLUE GAS TEMPERATURE - C	*******	(**** F)
STACK HEIGHT - M	183.	(600 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	6.4	(21.0 FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	BITUMINOUS	
AVERAGE HEAT CONTENT - J/G	26749.	(11500 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		******
AVERAGE ASH CONTENT - %	11.50	
RANGE ASH CONTENT - %	******	
AVERAGE MOISTURE CONTENT - %	********	
RANGE MOISTURE CONTENT - %	******	
AVERAGE SULFUR CONTENT - %	3.75	
RANGE SULFUR CONTENT - %	3.5-4.0	
AVERAGE CHLORIDE CONTENT - %	.04	
RANGE CHLORIDE CONTENT - %	******	
*** PARTICLE CONTROL		
** ESP		
NUMBER	1	
TYPE	COLD SIDE	
SUPPLIER	AMERICAN AIR FILTER	
** PARTICLE SCRUBBER		
GENERIC TYPE	NONE	
SPECIFIC TYPE	N/A	
*** FGD SYSTEM		
** GENERAL DATA		
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT	
SO2 REMOVAL MODE	WET SCRUBBING	
PROCESS TYPE	LIME	
SYSTEM SUPPLIER	AMERICAN AIR FILTER	
A-E FIRM	FLUOR - PIONEER	
DEVELOPMENT LEVEL	FULL SCALE	
NEW/RETROFIT	NEW	
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.00	
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	85.00	
CURRENT STATUS	1	
COMMERCIAL START-UP	3/79	
INITIAL START-UP	8/78	
CONTRACT AWARDED	7/74	

LOUISVILLE GAS & ELECTRIC: MILL CREEK 3 (CONT.)

** DESIGN AND OPERATING PARAMETERS

** ABSORBER		
NUMBER	4	
GENERIC TYPE	PACKED TOWER	
SPECIFIC TYPE	ENTRAINED PACKING	
TRADE NAME/COMMON TYPE	MOBILE BED CONTACTOR	
SUPPLIER	AMERICAN AIR FILTER	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	AISI 1110	
SHELL MATERIAL TRADE NAME, COMMON TYPE	N/A	
LINER GENERIC MATERIAL	INORGANIC	
LINER SPECIFIC MATERIAL	HYDRAULICALLY-BONDED CEMENT	
LINER MATERIAL TRADE NAME/COMMON TYPE	PREKRETE	
GAS CONTACTING DEVICE TYPE	POLYURETHANE SPHERES, SOLID	
L/G RATIO - L/CU.M	8.7	(65.0 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	1.6	(6.5 IN-H2O)
INLET GAS FLOW - CU. M/S	212.35	(450000 ACFM)
INLET GAS TEMPERATURE - C	148.9	(300 F)
SO2 REMOVAL EFFICIENCY - %	85.7	
** MIST ELIMINATOR		
PRE-MIST ELIMINATOR/MIST ELIMINATOR	MIST ELIMINATOR	
NUMBER PER SYSTEM	4	
GENERIC TYPE	IMPINGEMENT	
SPECIFIC TYPE	BAFFLE	
TRADE NAME/COMMON TYPE	CHEVRON VANE	
CONFIGURATION	HORIZONTAL	
NUMBER OF STAGES	2	
NUMBER OF PASSES PER STAGE	2	
CONSTRUCTION MATERIAL GENERIC TYPE	PLASTIC	
** REHEATER		
GENERIC TYPE	IN-LINE	
SPECIFIC TYPE	STEAM	
TRADE NAME/COMMON TYPE	FIN TUBE	
TEMPERATURE INCREASE - C	10.0	(50 F)
INLET FLUE GAS TEMPERATURE - C	54.4	(130 F)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL TUBES;316 SS TUBE SHEETS	
** FANS		
NUMBER	4	
FUNCTION	BALANCED DRAFT	
APPLICATION	FORCED DRAFT	
SERVICE	DRY	
FLUE GAS FLOW RATE - CU.M/S	212.35	(450000 ACFM)
** DUCTWORK		
LOCATION	SCRUBBER INLET	
SHELL GENERIC MATERIAL TYPE	CARBON STEEL	
LINER GENERIC MATERIAL TYPE	PRECRETE	
** DUCTWORK		
LOCATION	SCRUBBER OUTLET	
SHELL GENERIC MATERIAL TYPE	CARBON STEEL	
LINER GENERIC MATERIAL TYPE	PRECRETE	

*** SLUDGE

** TREATMENT	
METHOD	FLYASH/LIME STABILIZATION
** DISPOSAL	
NATURE	FINAL
TYPE	POND
LOCATION	ON SITE

LOUISVILLE GAS & ELECTRIC: MILL CREEK 3 (CONT.)

** WATER BALANCE
WATER LOOP TYPE OPEN
MAKEUP WATER ADDITION - LITERS/S 9.4 (150 GPM)

** FGD SPARE CAPACITY INDICES
ABSORBER - % .0

** FGD SPARE COMPONENT INDICES
ABSORBER .0

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
8/78	SYSTEM							744			
	** PROBLEMS/SOLUTIONS/COMMENTS: INITIAL FGD OPERATIONS BEGAN ON AUGUST 13, 1978. OPERATIONAL HOURS WERE NOT AVAILABLE FOR AUGUST.										
9/78	SYSTEM		80.7	80.0				720	714	576	
	** PROBLEMS/SOLUTIONS/COMMENTS: FRP PIPING PROBLEMS WERE ENCOUNTERED. SOME BEARING AND SHAFT RELATED PUMP PROBLEMS WERE ALSO ENCOUNTERED DURING SEPTEMBER.										
10/78	SYSTEM		85.5	81.6				744	710	607	
11/78	SYSTEM		85.2	41.5				720	351	299	
	** PROBLEMS/SOLUTIONS/COMMENTS: THE UNIT WAS SHUT DOWN NOVEMBER 18, 1978 FOR SCHEDULED INSPECTION. RESTART IS PROJECTED FOR FEBRUARY 1, 1979.										
12/78	SYSTEM			.0				744	0	0	.0
1/79	SYSTEM			.0				744	0	0	.0
	** PROBLEMS/SOLUTIONS/COMMENTS: THE UNIT DID NOT OPERATE DURING DECEMBER OR JANUARY.										
2/79	SYSTEM		18.0	17.4				672	651	117	
3/79	SYSTEM		53.1	52.4				744	735	390	
	** PROBLEMS/SOLUTIONS/COMMENTS: COMPLIANCE TESTING WAS PERFORMED DURING MARCH AND THE UNIT WAS DECLARED COMMERCIAL.										
4/79	SYSTEM		63.6	44.4				720	503	320	
	** PROBLEMS/SOLUTIONS/COMMENTS: THE ONLY PROBLEMS REPORTED WERE WITH DAMPERS AND PUMP FAILURES.										
5/79	SYSTEM		97.8	64.7				744	492	481	
6/79	SYSTEM		51.9	47.9				720	665	345	

LOUISVILLE GAS & ELECTRIC: MILL CREEK 3 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UTILITY REPORTED THAT NO UNUSUAL OPERATING PROBLEMS WERE ENCOUNTERED DURING MAY OR JUNE.									
7/79	SYSTEM		59.9		55.2			744	686	411	
8/79	SYSTEM		68.0		50.3			744	550	374	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		IN JULY AND AUGUST REHEATER PROBLEMS WERE ENCOUNTERED. THE REHEATER WILL HAVE TO BE REPLACED DURING EITHER NOVEMBER OR DECEMBER OF THIS YEAR.									
9/79	SYSTEM		90.6		83.9			720	667	604	
10/79	SYSTEM		82.0		76.1			744	690	566	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		AT THE END OF OCTOBER THE UNIT WENT DOWN FOR A TURBINE OVERHAUL AND IS SCHEDULED TO BE DOWN UNTIL LATE JANUARY OR EARLY FEBRUARY.									
11/79	SYSTEM				.0			720	0	0	.0
12/79	SYSTEM				.0			744	0	0	.0
1/80	SYSTEM				.0			744	0	0	.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING THE OVERHAUL GENERAL SCRUBBER MAINTENANCE WAS DONE BUT NO MAJOR MODIFICATIONS WERE MADE.									
2/80	SYSTEM		36.1		26.6			696	512	185	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UNIT CAME BACK ON LINE ON FEBRUARY 10 AFTER THE TURBINE OVERHAUL WORK WAS COMPLETED.									
3/80	SYSTEM		36.9		30.6			744	618	228	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		PROBLEMS ENCOUNTERED DURING FEBRUARY AND MARCH WITH THE FGD SYSTEM OPERATION INCLUDED FROZEN WATER LINES AND WORN GASKETS BLOWING IN THE REHEATER FLANGES.									
		THE UTILITY IS IN THE PROCESS OF REPLACING THE REHEATER TUBES.									
4/80	SYSTEM	42.9	42.5	42.5	42.2	85.00	99.40	720	715	304	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE REHEATER TUBE REPLACEMENT CONTINUED INTO APRIL.									
		THE OTHER OUTAGE TIME ENCOUNTERED DURING APRIL WAS CAUSED BY A BLOWN GASKET IN THE CONDENSATE PUMP.									
5/80	SYSTEM	67.5	51.4	51.4	34.4			744	498	256	

LOUISVILLE GAS & ELECTRIC: MILL CREEK 3 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
				PERFORMANCE DATA							
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING MAY THE PLASTIC MIST ELIMINATOR COMPONENTS WERE REPLACED WITH STAINLESS STEEL. THIS KEPT THE SYSTEM OFF LINE FOR APPROXIMATELY 10 DAYS.									
		REHEATER TUBE LEAKS WERE ALSO ENCOUNTERED IN MAY.									
6/80	SYSTEM	88.2	.0	.0	.0			720	85	0	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		IN LATE MAY THE TURBINE LOST TWO BLADES CAUSING THE SYSTEM TO SHUTDOWN UNTIL THE LATTER PART OF JUNE. DURING THE OUTAGE THE UTILITY DECIDED TO REPLACE THE LIME STORAGE TANK LINES WITH LARGER ONES TO SERVICE THE NEW UNITS. THE WORK WAS NOT COMPLETED WHEN THE BOILER WAS RETURNED TO SERVICE; THUS, THE FGD UNIT DID NOT OPERATE DURING THE MONTH.									
7/80	SYSTEM	92.0	91.3	91.3	83.9			744	684	625	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		RECYCLE PUMP FAILURES CAUSED THE FGD SYSTEM TO SHUTDOWN FOR PART OF JULY.									
8/80	SYSTEM	58.7	81.7	81.7	58.7	80.00	99.00	744	535	437	60.0
9/80	SYSTEM	57.2	60.4	60.4	57.2	80.00	99.00	720	682	412	60.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING THE AUGUST THROUGH SEPTEMBER PERIOD THE PUMP HOUSE WAS FLOODED DUE TO THE FAILURE OF THE BLEED PUMP FRP PIPE LINE. BECAUSE OF THIS FAILURE, 23 PUMPS AND 23 PUMP MOTORS WERE DAMAGED.									
10/80	SYSTEM	100.0	97.1	97.1	96.9			744	742	721	99.7
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE MONTH OF OCTOBER.									
11/80	SYSTEM	57.1	49.4	49.4	41.9			720	611	302	60.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING NOVEMBER OPERATION OF THE FGD SYSTEM WAS LOW DUE TO PUMP DAMAGES WHICH RESULTED FROM THE PUMP HOUSE FLOODING IN AUGUST.									
12/80	SYSTEM	100.0	100.0	100.0	61.1			744	455	455	60.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE MONTH OF DECEMBER.									

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	LOUISVILLE GAS & ELECTRIC	
PLANT NAME	PADDY'S RUN	
UNIT NUMBER	6	
CITY	LOUISVILLE	
STATE	KENTUCKY	
REGULATORY CLASSIFICATION	E	
PARTICULATE EMISSION LIMITATION - NG/J	43.	(.100 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	516.	(1.200 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	302	
GROSS UNIT GENERATING CAPACITY - MW	72	
NET UNIT GENERATING CAPACITY W/FGD - MW	67	
NET UNIT GENERATING CAPACITY WO/FGD - MW	69	
EQUIVALENT SCRUBBED CAPACITY - MW	72	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	FOSTER WHEELER	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	PEAK	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	188.76	(400000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	179.4	(355 F)
STACK HEIGHT - M	76.	(250 FT)
STACK SHELL	******	
STACK TOP DIAMETER - M	*******	(***** FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	BITUMINOUS	
AVERAGE HEAT CONTENT - J/G	26749.	(11500 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		******
AVERAGE ASH CONTENT - %	11.50	
RANGE ASH CONTENT - %	******	
AVERAGE MOISTURE CONTENT - %	********	
RANGE MOISTURE CONTENT - %	******	
AVERAGE SULFUR CONTENT - %	2.50	
RANGE SULFUR CONTENT - %	2.0-3.5	
AVERAGE CHLORIDE CONTENT - %	********	
RANGE CHLORIDE CONTENT - %	******	
*** PARTICLE CONTROL		
** ESP		
NUMBER	1	
SUPPLIER	RESEARCH-COTTRELL	
PARTICLE REMOVAL EFFICENCY - %	99.1	
** PARTICLE SCRUBBER		
GENERIC TYPE	NONE	
SPECIFIC TYPE	N/A	
*** FGD SYSTEM		
** GENERAL DATA		
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT	
SO2 REMOVAL MODE	WET SCRUBBING	
PROCESS TYPE	LIME	
SYSTEM SUPPLIER	COMBUSTION ENGINEERING	
A-E FIRM	FLUOR - PIONEER	
DEVELOPMENT LEVEL	FULL SCALE	
NEW/RETROFIT	RETROFIT	
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.10	
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	90.00	
CURRENT STATUS	1	
INITIAL START-UP	4/73	
CONTRACT AWARDED	7/71	
** DESIGN AND OPERATING PARAMETERS		

LOUISVILLE GAS & ELECTRIC: PADDY'S RUN 6 (CONT.)

** ABSORBER			
NUMBER	2		
GENERIC TYPE	PACKED TOWER		
SPECIFIC TYPE	STATIC BED PACKING		
TRADE NAME/COMMON TYPE	MARBLE BED SCRUBBER		
SUPPLIER	COMBUSTION ENGINEERING		
DIMENSIONS - FT	17X18X50 HIGH		
SHELL GENERIC MATERIAL	CARBON STEEL		
SHELL SPECIFIC MATERIAL	AISI 1110		
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A		
LINER GENERIC MATERIAL	ORGANIC		
LINER SPECIFIC MATERIAL	FIBER-REINFORCED POLYESTER		
GAS CONTACTING DEVICE TYPE	1 INCH DIA MARBLES (GLASS)		
NUMBER OF CONTACTING ZONES	2		
DISTANCE BETWEEN GAS CONTACTING ZONES - CM	7.6	(3.0IN)	
L/G RATIO - L/CU.M	2.2	(16.5 GAL/1000 ACF)	
GAS-SIDE PRESSURE DROP - KPA	2.9	(11.5 IN-H2O)	
SUPERFICAL GAS VELOCITY - M/SEC	2.7	(9.0 FT/S)	
INLET GAS FLOW - CU. M/S	82.58	(175000 ACFM)	
INLET GAS TEMPERATURE - C	176.7	(350 F)	
SO2 REMOVAL EFFICIENCY - %	90.0		
** MIST ELIMINATOR			
PRE-MIST ELIMINATOR/MIST ELIMINATOR	MIST ELIMINATOR		
NUMBER PER SYSTEM	2		
GENERIC TYPE	IMPINGEMENT		
SPECIFIC TYPE	BAFFLE		
TRADE NAME/COMMON TYPE	CHEVRON VANE		
CONFIGURATION	HORIZONTAL		
NUMBER OF STAGES	2		
NUMBER OF PASSES PER STAGE	3		
FREEBOARD DISTANCE - M	1.37	(4.5 FT)	
DISTANCE BETWEEN STAGES - CM	12.70	(5.0 IN)	
DISTANCE BETWEEN VANES - CM	4.3	(1.70 IN)	
VANE ANGLES - DEGREES	45		
PRESSURE DROP - KPA	.4	(1.5 IN-H2O)	
SUPERFICAL GAS VELOCITY - M/S	3.0	(10.0 FT/S)	
CONSTRUCTION MATERIAL GENERIC TYPE	FIBERGLASS		
WASH RATE - L/S	8.8	(140 GAL/MIN)	
** REHEATER			
GENERIC TYPE	DIRECT COMBUSTION		
SPECIFIC TYPE	IN-LINE BURNER		
TRADE NAME/COMMON TYPE	NATURAL GAS		
TEMPERATURE INCREASE - C	3.9	(39 F)	
INLET FLUE GAS TEMPERATURE - C	52.2	(126 F)	
** FANS			
NUMBER	2		
SUPPLIER	GREEN FAN		
SERVICE	DRY		
FLUE GAS FLOW RATE - CU.M/S	82.58	(175000 ACFM)	
FLUE GAS TEMPERATURE - C	71.1	(160 F)	

** TANKS	
SERVICE	NUMBER
-------	------
REACTION	****
SCRUBBER RECYCLE	****
REACTION SURGE TANK	****
ADDITIVE SLURRY TANK	****

** PUMPS	
SERVICE	NUMBER
-------	------
******	3

** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	VACUUM FILTER
NUMBER	2

LOUISVILLE GAS & ELECTRIC: PADDY'S RUN 6 (CONT.)

CAPACITY	240 TON/DAY
BELT SPECIFIC MATERIAL TYPE	NYLON
FEED STREAM CHARACTERISTICS	22% SOLIDS
OUTLET STREAM CHARACTERISTICS	45% SOLIDS

** SOLIDS CONCENTRATING/DEWATERING

DEVICE	THICKENER
NUMBER	1
DIMENSIONS - FT	50 DIA
FEED STREAM CHARACTERISTICS	10% SOLIDS
OUTLET STREAM CHARACTERISTICS	22% SOLIDS

*** SLUDGE

** TREATMENT

METHOD	LIME STABILIZATION

** DISPOSAL

NATURE	FINAL
TYPE	POND
SITE TRANSPORTATION METHOD	TRUCK
SITE CAPACITY - CU.M	30575 (25.0 ACRE-FT)

** WATER BALANCE

WATER LOOP TYPE	CLOSED
MAKEUP WATER ADDITION - LITERS/S	3.1 (50 GPM)

** FGD SPARE CAPACITY INDICES

ABSORBER - %	.0

** FGD SPARE COMPONENT INDICES

ABSORBER	.0

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
4/73	6A	18.0			8.0						
	6B	56.0			24.9						
	SYSTEM	37.0			16.5			720	320	118	

** PROBLEMS/SOLUTIONS/COMMENTS

INITIAL OPERATION OF THE FGD SYSTEM AT PADDY'S RUN BEGAN IN APRIL. THE MODULES WERE OPERATED ONE AT A TIME, WITH FREQUENT SHUTDOWNS FOR INSPECTION OF EQUIPMENT AND MINOR REPAIRS.

5/73	6A	11.0			3.9						
	6B	65.0			23.1						
	SYSTEM	38.0			13.5			744	265	101	

** PROBLEMS/SOLUTIONS/COMMENTS

SINGLE-MODULE OPERATION CONTINUED THROUGH MAY 19, WHEN THE UNIT WAS SHUT DOWN FOR MODIFICATIONS.

EQUIPMENT WAS INSTALLED FOR INJECTION OF A FLOCCULATING AGENT INTO THE CLARIFIER TANK.

6/73	6A	.1			.0						
	6B	6.0			2.1						
	SYSTEM	3.1			1.1			720	255	8	
7/73	6A	21.0			6.7						
	6B	21.0			6.7						
	SYSTEM	21.0			6.7			744	240	50	

LOUISVILLE GAS & ELECTRIC: PADD''S RUN 6 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
		PERFORMANCE DATA									
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING A SCHEDULED OUTAGE FROM JULY 12 TROUGH AUGUST 1, SEVERAL REPAIRS WERE MADE TO THE LIME SLURRY MAKE-UP SYSTEM. A DISINTEGRATOR UNIT WAS INSTALLED TO REDUCE PLUGGING OF STRAINERS AND SLURRY CONTROL VALVES.									
		OPERATION WAS INTERMITTENT FROM JUNE 19 TO JULY 11 BECAUSE OF MECHANICAL PROBLEMS WITH THE SLURRY PUMPS.									
8/73	6A		53.0		23.5						
	6B		64.0		28.4						
	SYSTEM		58.5		26.0			744	330	193	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE OPERATION WAS CONTINUOUS FROM AUGUST 2 TO AUGUST 18 EXCEPT FOR A BRIEF SHUTDOWN DUE TO A BOILER-RELATED PROBLEM.									
		FROM AUGUST 19 TO SEPTEMBER 5, THE SYSTEM WAS SHUT DOWN TO REPLACE THE CLARIFIER UNDERFLOW LINE WITH ONE OF LARGER DIAMETER AND TO INSTALL ADDITIONAL PUMP CAPACITY IN THE CLARIFIER OVERFLOW SYSTEM.									
9/73	6A		85.0		46.1						
	6B		72.0		39.0						
	SYSTEM		78.5		42.6			720	390	306	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UNIT OPERATED CONTINUOUSLY BETWEEN SEPTEMBER 6 AND 20 EXCEPT FOR A 7-HOUR SHUTDOWN TO REPAIR A MARBLE BED SUPPORT PLATE.									
		THE UNIT WAS SHUT DOWN FROM SEPTEMBER 20 TO THE END OF THE MONTH.									
10/73	6A		49.0		45.4						
	6B		94.0		87.2						
	SYSTEM		71.5		66.3			744	690	493	
11/73	6A		35.0		35.0						
	6B		100.0		100.0						
	SYSTEM		67.5		67.5			720	720	486	
12/73	6A		44.0		11.3						
	6B		78.0		19.9						
	SYSTEM		61.0		15.6			744	190	116	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE FGD SYSTEM WAS OPERATED UNTIL DECEMBER 20 AFTER WHICH THE BOILER AND THE SCRUBBER MODULES WERE SHUT DOWN BECAUSE OF A LACK OF DEMAND (THIS IS A PEAKING-LOAD BOILER).									
1/74	SYSTEM				.0			744	0	0	.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE BOILER WAS SHUT DOWN DUE TO A LACK OF DEMAND.									
2/74	SYSTEM				.0			672	0	0	.0
3/74	SYSTEM				.0			744	0	0	.0
4/74	SYSTEM				.0			720	0	0	.0
5/74	SYSTEM				.0			744	0	0	.0

LOUISVILLE GAS & ELECTRIC: PADDY'S RUN 6 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
				PERFORMANCE DATA							
6/74	SYSTEM				.0			720	0	0	.0
7/74	6A		51.0		21.0						
	6B		61.0		33.3						
	SYSTEM		56.0		27.2			744	306	202	
8/74	6A		50.0		2.1						
	6B		77.0		3.2						
	SYSTEM		63.5		2.7			744	31	20	
	** PROBLEMS/SOLUTIONS/COMMENTS										
	THE UNIT HAS BEEN ON AND OFF FREQUENTLY DUE TO FLUCTUATION IN POWER DEMAND.										
9/74	SYSTEM		.0		.0			720	43	0	
	** PROBLEMS/SOLUTIONS/COMMENTS										
	THE BOILER WAS SHUT DOWN BECAUSE OF A LACK OF DEMAND.										
10/74	6A		100.0		32.9						
	6B		100.0		32.9						
	SYSTEM		100.0		32.9			744	245	245	
	** PROBLEMS/SOLUTIONS/COMMENTS										
	THE BOILER WAS OPERATED TO PERFORM LIMESTONE TESTS ON THE FGD SYSTEM.										
11/74	SYSTEM		.0		.0			720	122	0	
	** PROBLEMS/SOLUTIONS/COMMENTS										
	THE BOILER WAS SHUT DOWN BECAUSE OF A LACK OF DEMAND.										
12/74	SYSTEM				.0			744	0	0	.0
1/75	SYSTEM				.0			744	0	0	.0
2/75	SYSTEM				.0			672	0	0	.0
3/75	SYSTEM				.0			744	0	0	.0
4/75	SYSTEM				.0			720	0	0	.0
5/75	SYSTEM				.0			744	0	0	.0
6/75	SYSTEM				.0			720	0	0	.0
7/75	SYSTEM				.0			744	0	0	.0
8/75	SYSTEM				.0			744	0	0	.0
9/75	6A		100.0		100.0						
	6B		100.0		100.0						
	SYSTEM		100.0		100.0			720	720	720	
10/75	6A		100.0		100.0						
	6B		100.0		100.0						
	SYSTEM		100.0		100.0			744	744	744	

LOUISVILLE GAS & ELECTRIC: PADDY'S RUN 6 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE BOILER AND FGD SYSTEM WERE OPERATIONAL ALL OF SEPTEMBER AND THE FIRST TWO WEEKS IN OCTOBER. OPERABILITY FOR BOTH MODULES DURING THE OPERATIONAL PERIOD WAS 100% (BASED UPON LG&E'S PEAK LOAD DETERMINATION). SO2 REMOVAL WAS REPORTED TO BE OVER 98%.									
		SYSTEM OUTAGE IN THE LAST TWO WEEKS OF OCTOBER WAS DUE PRIMARILY TO PROBLEMS WITH THE BREECHING IN THE BOILER SECTION.									
11/75	6A		100.0		100.0						
	6B		100.0		100.0						
	SYSTEM		100.0		100.0			720	720	720	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE BOILER AND SCRUBBER SYSTEM OPERATED MOST OF THE REPORT PERIOD ON A MONDAY-FRIDAY BASIS.									
12/75	6A		90.1		90.1						
	6B		90.1		90.1						
	SYSTEM		90.1		90.1			744	744	670	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		TWO MINOR OUTAGES IN DECEMBER WERE DUE TO MALFUNCTION AND REPAIR OF THE DUAL STRAINER SWITCH SHAFT IN THE BOTTOM OF THE SCRUBBER MODULE.									
1/76	SYSTEM		53.5		18.7			744	260	139	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		SO2 REMOVAL EFFICIENCY WAS REPORTED TO BE 99% DURING JANUARY.									
2/76	SYSTEM		66.7		9.8			696	102	68	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE SYSTEM WAS SHUTDOWN IN EARLY FEBRUARY IN PREPARATION FOR AN EXTENSIVE SLUDGE STUDY TO MONITOR FIXATION, LEACHATES, AND SEASONAL VARIATIONS. THE STUDY IS SCHEDULED TO BEGIN IN JUNE OR JULY. THE SCRUBBER WILL NOT BE OPERATED UNTIL THE START OF THE PROGRAM UNLESS THE BOILER IS REQUIRED FOR PEAKING POWER DEMANDS. HIGHLIGHTS OF THE SCRUBBER/SLUDGE STUDY PROGRAM ARE AS FOLLOWS: -SIX MONTHS DURATION. -ONE SCHEDULED SHUTDOWN FOR TEST MODIFICATIONS. -DELIBERATE HIGH CHLORIDE CONCENTRATION OPERATION. -MGO INNOCULATION.									
3/76	SYSTEM				.0			744	0	0	.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UNIT REMAINED OFF LINE DURING MARCH IN PREPARATION FOR THE EPA SCRUBBER/SLUDGE STUDY. THE UTILITY IS NOW COMPLETING SYSTEM MODIFICATIONS NECESSARY FOR THE OPERATION OF THE TEST PROGRAM.									
4/76	SYSTEM		.0		.0			720	2	0	
5/76	SYSTEM		85.0		2.3			744	20	17	
6/76	SYSTEM		95.0		21.3			720	161	153	

LOUISVILLE GAS & ELECTRIC: PADDY'S RUN 6 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
				PERFORMANCE DATA							
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THIS PEAK LOAD UNIT WAS OPERATED PART OF THE TIME DURING THE REPORT PERIOD (APPROXIMATELY 2 WEEKS IN MAY AND TWO WEEKS IN JUNE). THE SCRUBBER WAS AVAILABLE TO THE BOILER 100% OF THE TIME AND SO2 REMOVAL EFFICIENCY WAS 98 TO 99% DURING THIS OPERATING SEGMENT.									
7/76	SYSTEM	87.7		30.8				744	261	229	
8/76	SYSTEM	92.8		8.6				744	69	64	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THIS UNIT WAS OPERATIONAL PART OF THE TIME DURING THE JULY-AUGUST PERIOD. THE SCRUBBING SYSTEM WAS AVAILABLE TO THE BOILER ON A 100% BASIS. NO MAJOR SCRUBBER-RELATED PROBLEMS WERE ENCOUNTERED.									
9/76	SYSTEM			.0				720	0	0	.0
10/76	SYSTEM	94.6		21.2				744	167	158	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UNIT DID NOT OPERATE THROUGHOUT SEPTEMBER AND THE FIRST THREE WEEKS IN OCTOBER. THE EPA-FUNDED SCRUBBER/SLUDGE STUDY PROGRAM COMMENCED OCTOBER 25. THE INITIAL PHASE OF THE PROGRAM CALLS FOR OPERATIONS TO PROCEED FOR A 20-30 DAY PERIOD WITH CARBIDE LIME SCRUBBING ABSORBENT. FOLLOWING COMPLETION OF THIS RUN, THE UNIT WILL BE SHUT DOWN AND MODIFICATIONS WILL BE INCORPORATED INTO THE SYSTEM FOR OPERATION WITH COMMERCIAL GRADE (HIGH CALCIUM) LIME.									
11/76	SYSTEM	99.3		99.3				720	720	715	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UNIT WAS IN SERVICE DURING THE REPORT PERIOD. THE SCRUBBING SYSTEM OPERATED 99.5% OF THE TIME THAT THE BOILER WAS IN SERVICE. CARBIDE LIME WAS EMPLOYED AS THE SO2 ABSORBENT. THE HIGH CALCIUM (VIRGIN) LIME RUN, SCHEDULED AS PART OF THE SCRUBBER/SLUDGE STUDY, WILL COMMENCE ON MARCH 1, 1977.									
12/76	SYSTEM	98.5		71.4				744	539	531	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UNIT WAS IN SERVICE DURING THE REPORT PERIOD. THE SCRUBBING SYSTEM OPERATED 99.5% OF THE TIME THAT THE BOILER WAS IN SERVICE. CARBIDE LIME WAS EMPLOYED AS THE SO2 ABSORBENT. THE HIGH CALCIUM (VIRGIN) LIME RUN, SCHEDULED AS PART OF THE SCRUBBER/SLUDGE STUDY, WILL COMMENCE ON MARCH 1, 1977.									
1/77	SYSTEM	.0		.0				744	103	0	
2/77	SYSTEM	.0		.0				672	62	0	
3/77	SYSTEM	79.2		41.4				744	389	308	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		BECAUSE OF SEVERE WEATHER CONDITIONS THERE WERE NO BOILER OPERATIONS AND NO SCRUBBER OPERATIONS (SINCE DECEMBER 31) UNTIL MARCH 15, 1977.									
4/77	SYSTEM	93.6		42.6				720	328	307	

LOUISVILLE GAS & ELECTRIC: PADDY'S RUN 6 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
				PERFORMANCE DATA							
5/77	SYSTEM		42.5	16.0				744	280	119	

** PROBLEMS/SOLUTIONS/COMMENTS

IN MID MARCH LG&E BEGAN TESTS FOR EPA WITH REGULAR LIME SINCE ONE OF THE OBJECTIVES OF THE TEST WAS TO DETERMINE WHETHER THERE WERE APPRECIABLE DIFFERENCES BETWEEN REGULAR LIME AND CARBIDE LIME AT THIS FACILITY. DURING OPERATION WITH REGULAR LIME, SCALING PROBLEMS OCCURRED, INDICATING THAT THE SCALING RESULTED FROM INCREASED OXIDATION LEVELS. AVAILABLE OPTIONS FOR CONTROLLING SCALING WERE LIMITED BY THE FIXED DESIGN FEATURES OF THE SCRUBBER HARDWARE. THE OPTION SELECTED WAS ADDITION OF MGO TO THE SCRUBBING MEDIUM. WHEN MGO WAS ADDED, THE SCALING PROBLEM WAS ELIMINATED, ALLOWING COMPLETION OF THE TEST PROGRAM.

6/77	SYSTEM		93.4	43.3				720	334	312	

** PROBLEMS/SOLUTIONS/COMMENTS

THE SCRUBBER/SLUDGE EVALUATION STUDY CONTINUED DURING THE PERIOD. THE SCRUBBER PLANT (ONE MODULE IS BEING UTILIZED FOR THIS EXPERIMENTAL PROGRAM) WAS IN SERVICE ON A VIRTUALLY CONTINUOUS BASIS FROM JUNE 18 TO AUGUST 8 OPERATING ON MAGNESIUM INNOCULATED COMMERCIAL LIME. SYSTEM OPERABILITY DURING THIS PERIOD WAS APPROXIMATELY 96%. SO2 REMOVAL EFFICIENCY WAS MEASURED IN EXCESS OF 99.5%. THE SYSTEM WAS SHUT DOWN AT THIS POINT TO PERFORM A NUMBER OF SCHEDULED MODIFICATIONS TO THE SYSTEM FOR TEST PURPOSES. SPECIFICALLY, MODIFICATIONS ARE BEING IMPLEMENTED TO THE SYSTEM IN ORDER TO BYPASS THE REACTION TANK SO A SHORT TERM RETENTION TIME TEST COULD BE CONDUCTED. THE TESTING WAS COMPLETED IN AUGUST 1977 AFTER THE MODIFICATIONS WERE MADE.

7/77	SYSTEM		96.9	95.8				744	736	713	
8/77	SYSTEM		94.0	73.5				744	582	547	
9/77	SYSTEM		25.9	5.8				720	162	42	

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT IS CURRENTLY NOT OPERATING DUE TO THE LACK OF POWER REQUIREMENT.

10/77	SYSTEM		46.9	2.0				744	32	15	
11/77	SYSTEM			.0				720	0	0	.0
12/77	SYSTEM			.0				744	0	0	.0
1/78	SYSTEM			.0				744	0	0	.0
2/78	SYSTEM			.0				672	0	0	.0
3/78	SYSTEM			.0				744	0	0	.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS OUT OF SERVICE FROM NOVEMBER THROUGH MARCH IN PART BECAUSE OF LOW DEMAND AND IN PART AS A RESULT OF PROBLEMS RELATED TO COLD WEATHER.

4/78	SYSTEM			.0				720	0	0	.0
5/78	SYSTEM			.0				744	0	0	.0
6/78	SYSTEM		98.1	7.1				720	52	51	

LOUISVILLE GAS & ELECTRIC: PADDY'S RUN 6 (CONT.)

PERIOD	MODULE	PERFORMANCE DATA: AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
		PADDY'S RUN WAS ON LINE ONLY A FEW HOURS DURING THIS PERIOD. NO OPERATIONAL PROBLEMS WERE REPORTED BY THE UTILITY.									
7/78	SYSTEM	99.5		25.4				744	190	189	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UNIT RAN INTERMITTENTLY FOR ABOUT EIGHT TO TEN DAYS OVER THIS PERIOD.									
8/78	SYSTEM			.0				744	0	0	.0
9/78	SYSTEM	100.0		47.1				720	339	339	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THIS UNIT WAS OPERATED FOR TWO WEEKS IN SEPTEMBER SO THAT TESTING OF A NEW FLOCCULANT COULD BE CARRIED OUT. THE RESULTS OF THESE TESTS WILL DETERMINE THE TYPE OF FLOCCULANT THAT WILL BE USED IN THE FUTURE AT THE OTHER LG&E UNITS.									
10/78	SYSTEM			.0				744	0	0	.0
11/78	SYSTEM			.0				720	0	0	.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE BOILER WAS NOT OPERATED DURING OCTOBER OR NOVEMBER.									
12/78	SYSTEM			.0				744	0	0	.0
1/79	SYSTEM			.0				744	0	0	.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UNIT WAS NOT OPERATED DURING DECEMBER OR JANUARY.									
2/79	SYSTEM			.0				672	0	0	.0
3/79	SYSTEM			.0				744	0	0	.0
4/79	SYSTEM			.0				720	0	0	.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UNIT WAS NOT OPERATED DURING THESE MONTHS BECAUSE OF LACK OF DEMAND.									
5/79	SYSTEM			.0				744	0	0	.0
6/79	SYSTEM			.0				720	0	0	.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UTILITY REPORTED THAT THE UNIT DID NOT OPERATE DURING MAY OR JUNE DUE TO INSUFFICIENT DEMAND.									
7/79	SYSTEM	.0		.0				744	19	0	.0
8/79	SYSTEM	45.0		13.0				744	218	99	.0
9/79	SYSTEM	.0		.0				720	36	0	.0

LOUISVILLE GAS & ELECTRIC: PADDY'S RUN 6 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
				PERFORMANCE DATA							
	** PROBLEMS/SOLUTIONS/COMMENTS										
		NO PROBLEMS WERE REPORTED WITH RESPECT TO OPERATION AT THIS UNIT DURING THE THIRD QUARTER 1979.									
10/79	SYSTEM				.0			744	0	0	.0
11/79	SYSTEM				.0			720	0	0	.0
12/79	SYSTEM				.0			744	0	0	.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UNIT DID NOT OPERATE DURING THE FOURTH QUARTER OF 1979 BECAUSE OF THE LACK OF DEMAND.									
1/80	SYSTEM				.0			744	0	0	.0
2/80	SYSTEM				.0			696	0	0	.0
3/80	SYSTEM				.0			744	0	0	.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THIS UNIT DID NOT OPERATE DURING THE FOURTH QUARTER OF 1979 OR THE FIRST QUARTER OF 1980 DUE TO A LACK OF DEMAND. THIS UNIT IS USED AS A PEAKING UNIT AND WILL BE RETIRED SOMETIME IN 1987.									
4/80	SYSTEM	100.0			.0			720	0	0	.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING APRIL THE FGD SYSTEM WAS AVAILABLE 100% OF THE TIME BUT WAS NOT OPERATED DUE TO A BOILER RELATED PROBLEM.									
5/80	SYSTEM	100.0	86.6	86.6	7.8			744	67	58	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING MAY, NINE HOURS OF OUTAGE TIME RESULTED FROM THE UNAVAILABLITY OF THE LIME SLURRY.									
6/80	SYSTEM	100.0	94.1	94.1	6.7			720	51	48	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE THREE HOURS THE SCRUBBERS DID NOT OPERATE IN JUNE WAS DUE TO THE FACT THAT THE BOILER WAS BROUGHT ON LINE BEFORE THE SCRUBBER OPERATORS WERE ON DUTY.									
7/80	A	100.0			.0						
	B	100.0			.0						
	SYSTEM	100.0			.0			744	0	0	.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE BOILER AND FGD SYSTEM DID NOT OPERATE DURING THE MONTH OF JULY DUE TO A LACK OF DEMAND.									
8/80	SYSTEM	100.0			.0	90.00	99.00	744	0	0	.0
9/80	SYSTEM	100.0			.0	90.00	99.00	720	0	0	.0

LOUISVILLE GAS & ELECTRIC: PADDY'S RUN 6 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
		PERFORMANCE DATA									
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE BOILER DID NOT OPERATE DURING AUGUST AND SEPTEMBER. THE FGD SYSTEM WAS AVAILABLE 100% OF THE TIME.									
10/80	SYSTEM	100.0			.0			744	0	0	.0
11/80	SYSTEM	100.0			.0			720	0	0	.0
12/80	SYSTEM	100.0			.0			744	0	0	.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UNIT WAS NOT OPERATED DURING THE FOURTH QUARTER 1980 DUE TO THE LACK OF DEMAND.									

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	MINNESOTA POWER & LIGHT	
PLANT NAME	CLAY BOSWELL	
UNIT NUMBER	4	
CITY	COHASSET	
STATE	MINNESOTA	
REGULATORY CLASSIFICATION	B	
PARTICULATE EMISSION LIMITATION - NG/J	43.	(.100 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	516.	(1.200 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	1000	
GROSS UNIT GENERATING CAPACITY - MW	554	
NET UNIT GENERATING CAPACITY W/FGD - MW	504	
NET UNIT GENERATING CAPACITY WO/FGD - MW	511	
EQUIVALENT SCRUBBED CAPACITY - MW	475	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	COMBUSTION ENGINEERING	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	1086.40	(2302181 ACFM)
BOILER FLUE GAS TEMPERATURE - C	148.9	(300 F)
STACK HEIGHT - M	183.	(600 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	11.3	(37.0 FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	SUBBITUMINOUS	
AVERAGE HEAT CONTENT - J/G	19276.	(8287 BTU/LB)
RANGE HEAT CONTENT - BTU/LB	7509 - 9923	
AVERAGE ASH CONTENT - %	9.40	
RANGE ASH CONTENT - %	4.81 - 15.99	
AVERAGE MOISTURE CONTENT - %	24.50	
RANGE MOISTURE CONTENT - %	20.30 - 28.31	
AVERAGE SULFUR CONTENT - %	.94	
RANGE SULFUR CONTENT - %	0 - 4.55	
AVERAGE CHLORIDE CONTENT - %	.01	
RANGE CHLORIDE CONTENT - %	0 - 0.07	
*** PARTICLE CONTROL		
** ESP		
NUMBER	1	
TYPE	HOT SIDE	
SUPPLIER	WESTERN PREC. DIVISION, JOY	
INLET FLUE GAS CAPACITY - CU.M/S	94.4	(200000 ACFM)
INLET FLUE GAS TEMPERATURE - C	398.9	(750 F)
PRESSURE DROP - KPA	.6	(3. IN-H2O)
PARTICLE REMOVAL EFFICENCY - %	99.7	
** PARTICLE SCRUBBER		
NUMBER	4	
GENERIC TYPE	VENTURI TOWER	
SPECIFIC TYPE	VARIABLE-THROAT/ADJUSTABLE DRUM	
SUPPLIER	PEABODY PROCESS SYSTEMS	
DIMENSIONS - FT	30 FT. DIA; 40 FT. HIGH	
SHELL GENERIC MATERIAL	STAINLESS STEEL	
SHELL SPECIFIC MATERIAL	AUSTENITIC	
LINER GENERIC MATERIAL	ORGANIC	
LINER SPECIFIC MATERIAL	RUBBER	
GAS CONTACTING DEVICE TYPE	STAINLESS STEEL	
NUMBER OF CONTACTING ZONES	1	
LIQUID RECIRCULATION RATE - LITER/S	841.7	(13360 GPM)
L/G RATIO - LITER/CU.M	2.7	(20.0 GAL/1000ACF)
PRESSURE DROP - KPA	3.0	(12.0 IN-H2O)
INLET GAS FLOW RATE - CU.M/S	394.4	(835840 ACFM)
INLET GAS TEMPERATURE - C	148.9	(300 F)
SO2 REMOVAL EFFICENCY - %	89.0	
PARTICLE REMOVAL EFFICIENCY - %	99.7	

MINNESOTA POWER & LIGHT: CLAY BOSWELL 4 (CONT.)

*** FGD SYSTEM

** GENERAL DATA

SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT
SO2 REMOVAL MODE	WET SCRUBBING
PROCESS TYPE	LIME/ALKALINE FLYASH
PROCESS ADDITIVES	NONE
SYSTEM SUPPLIER	PEABODY PROCESS SYSTEMS
A-E FIRM	EBASCO
DEVELOPMENT LEVEL	FULL SCALE
NEW/RETROFIT	NEW
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.73
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	84.55
CURRENT STATUS	1
INITIAL START-UP	4/80

** DESIGN AND OPERATING PARAMETERS

** ABSORBER

NUMBER	4	
NUMBER OF SPARES	1	
GENERIC TYPE	SPRAY TOWER	
SPECIFIC TYPE	OPEN COUNTERCURRENT SPRAY	
SUPPLIER	PEABODY PROCESS SYSTEMS	
DIMENSIONS - FT	DIA 35' HT 60'	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	AISI 1110	
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A	
LINER GENERIC MATERIAL	ORGANIC	
LINER MATERIAL TRADE NAME/COMMON TYPE	RUBBER	
NUMBER OF CONTACTING ZONES	4	
LIQUID RECIRCULATION RATE - LITER/S	2104.	(33400 GPM)
L/G RATIO - L/CU.M	6.7	(50.0 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	5.0	(20.0 IN-H2O)
SUPERFICAL GAS VELOCITY - M/SEC	3.7	(12.0 FT/S)
INLET GAS FLOW - CU. M/S	302.08	(640130 ACFM)
INLET GAS TEMPERATURE - C	53.3	(128 F)
SO2 REMOVAL EFFICIENCY - %	89.0	

** MIST ELIMINATOR

PRE-MIST ELIMINATOR/MIST ELIMINATOR	PRE-MIST ELIMINATOR
GENERIC TYPE	BULK SEPARATION
SPECIFIC TYPE	PERFORATED PLATE
TRADE NAME/COMMON TYPE	SIEVE TRAY

** REHEATER

NUMBER	4	
GENERIC TYPE	BYPASS	
SPECIFIC TYPE	HOT SIDE	
TRADE NAME/COMMON TYPE	N/A	
PERCENT GAS BYPASSED - AVG	5.0	
TEMPERATURE INCREASE - C	-3.3	(26 F)
INLET FLUE GAS FLOW RATE - CU. M/S	74.02	(156850 ACFM)
INLET FLUE GAS TEMPERATURE - C	426.7	(800 F)
CONSTRUCTION MATERIAL GENERIC TYPE	INCONEL 625	

** FANS

NUMBER	4	
NUMBER OF SPARES	1	
SUPPLIER	GREEN FAN	
FUNCTION	BALANCED DRAFT	
APPLICATION	CENTRIFUGAL RADIAL TIP	
SERVICE	WET	
FLUE GAS FLOW RATE - CU.M/S	320.33	(678800 ACFM)
FLUE GAS TEMPERATURE - C	62.2	(144 F)
CONSTRUCTION MATERIAL GENERIC TYPE	INCONEL 625 & INCOLY 825	

** DUCTWORK

LOCATION	ABSORBER TO REHEATER
DIMENSIONS	12 DIA.

MINNESOTA POWER & LIGHT: CLAY BOSWELL 4 (CONT.)

SHELL GENERIC MATERIAL TYPE	CARBON STEEL
LINER GENERIC MATERIAL TYPE	FLAKE GLASS LINED

** REAGENT PREPARATION EQUIPMENT

FUNCTION	LIME SLAKING
DEVICE	SLAKER
MANUFACTURER	PEABODY PROCESS SYSTEMS
NUMBER	4
PRODUCT QUALITY - % SOLIDS	20.0

** TANKS

SERVICE	NUMBER
RECYCLE	4
ALKALI STORAGE	1
WASH WATER	1
FLY ASH STORAGE	1

** PUMPS

SERVICE	NUMBER
ALKALI FEED	2
FLY ASH SLURRY FEED	2
VENTURI RECYCLE	8
ABSORBER RECYCLE	12
WASH WATER	2

*** SLUDGE

** DISPOSAL

NATURE	FINAL
TYPE	LINED POND
LOCATION	1 MILE WNW OF UNIT
SITE TRANSPORTATION METHOD	PIPE
SITE DIMENSIONS	4000 X 3000 FT
SITE CAPACITY - CU.M	9556522 (7814.0 ACRE-FT)
SITE SERVICE LIFE - YRS	35

** PROCESS CONTROL AND INSTRUMENTATION

CHEMICAL PARAMETERS	PH-DENSITY IN RECYCLE TANKS
CONTROL LEVELS	3-6 PH; 7-9% DENSITY
MONITOR LOCATION	RECYCLE TANKS
PROCESS CONTROL MANNER	AUTOMATIC
PROCESS CHEMISTRY MODE	FEEDBACK

** WATER BALANCE

WATER LOOP TYPE	CLOSED
EVAPORATION WATER LOSS - LITER/S	23.9 (380 GPM)
MAKEUP WATER ADDITION - LITERS/S	56.4 (895 GPM)

** FGD SPARE CAPACITY INDICES

ABSORBER - %	33.0

** FGD SPARE COMPONENT INDICES

ABSORBER	1.0

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
4/80	SYSTEM							720			

MINNESOTA POWER & LIGHT: CLAY BOSWELL 4 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE BOILER BEGAN OPERATIONS ON FEBRUARY 26, 1980 AND FIRED OIL THROUGH THE MONTH OF MARCH. INITIAL FGD SYSTEM OPERATIONS BEGAN IN EARLY APRIL WITH THE BOILER FIRING COAL FOR TESTING PURPOSES. THE UNIT WAS SHUTDOWN IN MID-APRIL TO RECTIFY MINOR SHAKEDOWN PROBLEMS. A TRIAL RUN OF THE FGD SYSTEM IN AN INTEGRATED MODE OCCURRED IN LATE APRIL.									
5/80	SYSTEM							744			
6/80	SYSTEM							720			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		SHAKEDOWN OPERATIONS CONTINUED THROUGH THE SECOND QUARTER OF 1980. THE FGD SYSTEM WILL BE FINE TUNED TO MEET DESIGN CRITERIA THROUGH JULY. TO DATE THE UTILITY REPORTED THAT, ALTHOUGH MANY TYPICAL STARTUP PROBLEMS ATTRIBUTABLE TO OPERATOR ERROR AS WELL AS MECHANICAL MALFUNCTIONS HAVE OCCURRED, NO UNUSUAL PROBLEMS HAVE OCCURRED. THE COMPLIANCE TEST IS SCHEDULED FOR EARLY SEPTEMBER.									
7/80	1				87.8	100.0	86.8				
	2				97.8	100.0	96.7				
	3				100.0	100.0	100.0				
	4				.0		.0				
	SYSTEM				96.1	100.0	95.0	720	712	684	79.0
8/80	1				71.8	100.0	62.9				
	2				75.5	100.0	66.1				
	3				29.4	100.0	25.8				
	4				49.7	100.0	43.5				
	SYSTEM				75.5	100.0	66.1	744	652	492	61.7
9/80	1				71.6	100.0	71.0				
	2				89.6	100.0	88.7				
	3				14.7	100.0	14.5				
	4				65.1	100.0	64.5				
	SYSTEM				80.3	100.0	79.6	744	737	592	73.7
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE FGD SYSTEM IS STILL IN THE DEBUGGING PHASE OF OPERATION. MUCH OF THE EQUIPMENT IS STILL BEING WORKED ON AND TESTED.									
10/80	1				31.6	100.0	22.6				
	2				38.4	100.0	27.4				
	3				.0		.0				
	4				83.6	100.0	59.7				
	SYSTEM				51.2	100.0	36.6	744	531	272	59.1
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UTILITY REPORTED THAT THE AVAILABLE HOURS AND UNAVAILABLE HOURS DURING OCTOBER WERE NOT RECORDED.									
		THE UNIT OUTAGE TIME WAS DUE TO MISCELLANEOUS MAINTENANCE AND AN INSPECTION.									
11/80	1	94.4	67.2	100.0	60.7						
	2	85.6	55.5	100.0	50.1						
	3	98.1	59.1	100.0	53.3						
	4	55.4	26.0	100.0	23.4						
	SYSTEM	100.0	69.2	100.0	62.5			720	650	450	60.8

MINNESOTA POWER & LIGHT: CLAY BOSWELL 4 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
		MODULE A OUTAGE TIME DURING NOVEMBER WAS DUE TO NECESSARY CLEANING AND GENERAL REPAIRS.									
12/80	1	100.0	100.0	100.0	100.0						
	2	93.4	62.0	100.0	61.3						
	3	19.4	2.4	100.0	2.4						
	4	96.5	87.6	100.0	86.6						
	SYSTEM	100.0	87.6	100.0	83.5			744	735	621	89.7
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING DECEMBER MODULE 3 OUTAGE TIME WAS DUE TO GENERAL MAINTENANCE AND REPAIRS TO THE VENTURI LINER.									

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	MINNKOTA POWER COOPERATIVE	
PLANT NAME	MILTON R. YOUNG	
UNIT NUMBER	2	
CITY	CENTER	
STATE	NORTH DAKOTA	
REGULATORY CLASSIFICATION	D	
PARTICULATE EMISSION LIMITATION - NG/J	43.	(.100 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	516.	(1.200 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	690	
GROSS UNIT GENERATING CAPACITY - MW	440	
NET UNIT GENERATING CAPACITY W/FGD - MW	402	
NET UNIT GENERATING CAPACITY WO/FGD - MW	409	
EQUIVALENT SCRUBBED CAPACITY - MW	185	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	BABCOCK & WILCOX	
BOILER TYPE	CYCLONE	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	953.90	(2021400 ACFM)
BOILER FLUE GAS TEMPERATURE - C	179.4	(355 F)
STACK HEIGHT - M	168.	(550 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	7.6	(25.0 FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	LIGNITE	
AVERAGE HEAT CONTENT - J/G	15119.	(6500 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		5800-7200
AVERAGE ASH CONTENT - %	6.50	
RANGE ASH CONTENT - %	5-8	
AVERAGE MOISTURE CONTENT - %	38.00	
RANGE MOISTURE CONTENT - %	32-43	
AVERAGE SULFUR CONTENT - %	.70	
RANGE SULFUR CONTENT - %	.35-1.3	
AVERAGE CHLORIDE CONTENT - %	.01	
RANGE CHLORIDE CONTENT - %	******	
*** PARTICLE CONTROL		
** FABRIC FILTER		
NUMBER	2	
** ESP		
NUMBER	2	
TYPE	COLD SIDE	
SUPPLIER	WHEELABRATOR-FRYE	
INLET FLUE GAS CAPACITY - CU.M/S	1038.2	(2200000 ACFM)
INLET FLUE GAS TEMPERATURE - C	193.3	(380 F)
PRESSURE DROP - KPA	.1	(1. IN-H2O)
PARTICLE REMOVAL EFFICENCY - %	99.6	
** PARTICLE SCRUBBER		
GENERIC TYPE	NONE	
SPECIFIC TYPE	N/A	
*** FGD SYSTEM		
** GENERAL DATA		
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT	
SO2 REMOVAL MODE	WET SCRUBBING	
PROCESS TYPE	LIME/ALKALINE FLYASH	
PROCESS ADDITIVES	NONE	
SYSTEM SUPPLIER	COMBUSTION EQUIP ASSOCIATES	
A-E FIRM	SANDERSON & PORTER	
DEVELOPMENT LEVEL	FULL SCALE	
NEW/RETROFIT	NEW	
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.60	

MINNKOTA POWER COOPERATIVE: MILTON R. YOUNG 2 (CONT.)

UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	36.13		
CURRENT STATUS	1		
COMMERCIAL START-UP	6/78		
INITIAL START-UP	9/77		
CONTRACT AWARDED	4/75		

** DESIGN AND OPERATING PARAMETERS

** ABSORBER

NUMBER	2		
NUMBER OF SPARES	1		
GENERIC TYPE	SPRAY TOWER		
SPECIFIC TYPE	OPEN COUNTERCURRENT SPRAY		
SUPPLIER	COMBUSTION EQUIP ASSOCIATES		
DIMENSIONS - FT	40 DIA X 120		
SHELL GENERIC MATERIAL	CARBON STEEL		
SHELL SPECIFIC MATERIAL	AISI 1110		
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A		
LINER GENERIC MATERIAL	ORGANIC		
LINER MATERIAL TRADE NAME/COMMON TYPE	FLAKEGLASS		
NUMBER OF CONTACTING ZONES	6		
LIQUID RECIRCULATION RATE - LITER/S	2740.	(43500 GPM)	
L/G RATIO - L/CU.M	10.7	(80.0 GAL/1000 ACF)	
GAS-SIDE PRESSURE DROP - KPA	2.0	(8.0 IN-H2O)	
SUPERFICAL GAS VELOCITY - M/SEC	2.8	(9.1 FT/S)	
INLET GAS FLOW - CU. M/S	405.36	(859000 ACFM)	
INLET GAS TEMPERATURE - C	168.3	(335 F)	
SO2 REMOVAL EFFICIENCY - %	85.0		
PARTICLE REMOVAL EFFICENCY - %	70.0		

** MIST ELIMINATOR

PRE-MIST ELIMINATOR/MIST ELIMINATOR	MIST ELIMINATOR		
NUMBER PER SYSTEM	2		
GENERIC TYPE	IMPINGEMENT		
SPECIFIC TYPE	BAFFLE		
TRADE NAME/COMMON TYPE	CHEVRON VANE		
CONFIGURATION	HORIZONTAL		
NUMBER OF STAGES	1		
NUMBER OF PASSES PER STAGE	4		
FREEBOARD DISTANCE - M	2.44	(8.0 FT)	
DISTANCE BETWEEN STAGES - CM	5.08	(2.0 IN)	
PRESSURE DROP - KPA	.2	(1.0 IN-H2O)	
SUPERFICAL GAS VELOCITY - M/S	2.8	(9.1 FT/S)	
CONSTRUCTION MATERIAL GENERIC TYPE	FLAKELINED 316L SS		
CONSTRUCTION MATERIAL SPECIFIC TYPE	POLYETHELYNE		
WASH WATER SOURCE	PART FRESH - PART TRAY		
WASH RATE - L/S	44.2	(700 GAL/MIN)	

** REHEATER

NUMBER	2		
GENERIC TYPE	BYPASS		
SPECIFIC TYPE	COLD SIDE		
TRADE NAME/COMMON TYPE	N/A		
PERCENT GAS BYPASSED - AVG	15.0		
TEMPERATURE INCREASE - C	4.4	(40 F)	
INLET FLUE GAS FLOW RATE - CU. M/S	70.78	(150000 ACFM)	
INLET FLUE GAS TEMPERATURE - C	176.7	(350 F)	
NUMBER OF TUBES PER BUNDLE	0		
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL		

** FANS

NUMBER	2		
NUMBER OF SPARES	1		
SUPPLIER	BUFFALO FORGE		
FUNCTION	BOOSTER		
APPLICATION	BOILER ID, AXIAL		
SERVICE	DRY		
FLUE GAS FLOW RATE - CU.M/S	519.09	(1100000 ACFM)	
FLUE GAS TEMPERATURE - C	176.7	(350 F)	
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL		

MINNKOTA POWER COOPERATIVE: MILTON R. YOUNG 2 (CONT.)

** REAGENT PREPARATION EQUIPMENT	
FUNCTION	LIME SLAKING
DEVICE	SLAKER
MANUFACTURER	WALLACE & TIERNAN
NUMBER	1
PRODUCT QUALITY - % SOLIDS	12.0
** TANKS	
SERVICE	NUMBER
-------	------
REACTION/RECYCLE	2
MIX TANK	1
******	4
** PUMPS	
SERVICE	NUMBER
-------	------
ABSORBER RECIRCULATION	10
SPRAY RECIRCULATION	10
TRAY RECIRCULATION	4
TRAY SPRAY (CLARIFIER OVERFLOW)	2
THICKENER UNDERFLOW	2
THICKENER OVERFLOW	2
LIME SLAKER TRANSFER	2
LIME SLURRY FEED	2
FLYASH SLURRY FEED	2
MIST ELIMINATOR SPRAY	2
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	CENTRIFUGE
NUMBER	2
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	THICKENER
NUMBER	2
SHELL SPECIFIC MATERIAL TYPE	CONCRETE
FEED STREAM CHARACTERISTICS	12% SOLIDS
OUTLET STREAM CHARACTERISTICS	40% SOLIDS
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	VACUUM FILTER
NUMBER	2
NUMBER OF SPARES	0
CAPACITY	750 TON/DAY
SHELL GENERIC MATERIAL TYPE	MILD STEEL
FEED STREAM CHARACTERISTICS	30% SOLIDS
OUTLET STREAM CHARACTERISTICS	60% SOLIDS
*** SLUDGE	
** DISPOSAL	
NATURE	FINAL
TYPE	MINEFILL
LOCATION	OFF SITE
SITE TRANSPORTATION METHOD	TRUCK
** PROCESS CONTROL AND INSTRUMENTATION	
CHEMICAL PARAMETERS	PH, SOLIDS
CONTROL LEVELS	SOLIDS 5.5-12%; PH 4.0-5.5
PROCESS CONTROL MANNER	MANUAL
** WATER BALANCE	
WATER LOOP TYPE	CLOSED
EVAPORATION WATER LOSS - LITER/S	34.6 (550 GPM)
MAKEUP WATER ADDITION - LITERS/S	44.1 (700 GPM)

MINNKOTA POWER COOPERATIVE: MILTON R. YOUNG 2 (CONT.)

** FGD SPARE CAPACITY INDICES
ABSORBER - % 100.0

** FGD SPARE COMPONENT INDICES
ABSORBER 1.0

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
0/77	SYSTEM										

** PROBLEMS/SOLUTIONS/COMMENTS

ALTHOUGH THE MILTON R YOUNG 2 SCRUBBING SYSTEM ORIGINAL DESIGN DID NOT INCLUDE SPARE FGD CAPACITY, THE SYSTEM DOES, IN ACTUALITY, GENERALLY HAVE A SPARE MODULE AS A CONSEQUENCE OF THE VARIABILITY IN LIGNITE SULFUR CONTENT. THE LIGNITE BLEND AT M.R.YOUNG 2 VARIES IN SULFUR CONTENT FROM 0.35 TO 1.3%. WHEN THE SULFUR CONTENT RISES TO 1.3% BOTH SCRUBBING TOWERS ARE REQUIRED (WITH 5 TO 15% OF THE FLUE GAS BYPASSED FOR REHEAT). WHEN THE SULFUR CONTENT DROPS TO 0.7% OR BELOW ONLY ONE TOWER IS REQUIRED. 0.7% SULFUR IS TYPICAL FOR THE M.R.YOUNG 2 LIGNITE BLEND. BECAUSE OF THE EFFECTIVE SPARE MODULE THE SYSTEM DEPENDABILITY FIGURES THAT APPEAR IN THIS SECTION WILL GENERALLY NOT BE EQUIVALENT TO THE AVERAGE OF THE MODULAR DEPENDABILITIES (E.G. WITH 0.7% SULFUR LIGNITE THERE IS 100% SPARE CAPACITY. IF A-MODULE OPERATES THE FIRST HALF OF THE MONTH (50%) AND B-MODULE THE SECOND HALF OF THE MONTH (50%) THE TOTAL SYSTEM UTILIZATION WILL BE 100%).

9/77	SYSTEM									720	

** PROBLEMS/SOLUTIONS/COMMENTS

INITIAL SCRUBBING OPERATIONS BEGAN IN SEPTEMBER. THE FGD SYSTEM IS EXPECTED TO BE OPERATING IN AN INTEGRATED MODE IN LATE OCTOBER, HOWEVER, A SCRUBBER LINING FAILURE MAY RESULT IN SOME DELAYS. THE UTILITY EXPECTS THE SYSTEM OPERATIONS TO STABILIZE BY MID-NOVEMBER.

10/77	SYSTEM									744	
11/77	SYSTEM									720	

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED INTERMITTENT FGD SYSTEM OPERATIONS SINCE START-UP.

MAJOR OPERATIONAL PROBLEMS HAVE OCCURRED AS A RESULT OF SEVERE WINTER WEATHER CONDITIONS, PARTICULARLY NUMEROUS INSTANCES OF FROZEN AND RUPTURED LINES. THE SYSTEM WAS SHUT DOWN DURING THE FIRST PART OF THE MONTH OF DECEMBER TO INSTALL HEAT TRACING IN THE LIQUID CIRCUIT.

SOME MINOR PROBLEMS HAVE OCCURRED WITH THE FLOW METERS (ROTAMETERS).

THE UTILITY ENCOUNTERED PROBLEMS WITH GUILLOTINE GAS DAMPER GUIDES DURING OCTOBER AND NOVEMBER.

12/77	SYSTEM									744	

** PROBLEMS/SOLUTIONS/COMMENTS

THERE WAS AN EMERGENCY SHUTDOWN ON DECEMBER 5 AS A RESULT OF TURBINE BEARING DAMAGE. THE SHUTDOWN CONTINUED SO THAT A COMPLETE TURBINE INSPECTION COULD BE MADE.

WORK CONTINUED ON INSTALLATION OF ELECTRICAL HEAT TRACING ON SLURRY LINES AND WATER PIPING.

1/78	SYSTEM									744	

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
		BECAUSE OF THE TURBINE BEARING PROBLEMS THE COMPLIANCE TEST ORIGINALLY SCHEDULED FOR THE DECEMBER-JANUARY PERIOD WAS TENTATIVELY RESCHEDULED WITH THE EPA FOR THE END OF MARCH. THE UTILITY EXPECTS THE FGD SYSTEM TO ACHIEVE EQUILIBRIUM (WATER BALANCE) WHEN THE UNIT COMES BACK ON LINE IN FEBRUARY.									
2/78	SYSTEM							672			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		BOTH THE BOILER AND FGD SYSTEM CAME BACK ON LINE FEBRUARY 21 AFTER COMPLETION OF THE TURBINE REPAIRS. THE COMPLIANCE TEST HAS AGAIN BEEN RESCHEDULED WITH EPA FOR THE END OF MAY.									
		ONE FORCED-DRAFT FAN (UPSTREAM OF THE FGD SYSTEM) HAD AN OIL LEAK AND A SHAFT ALIGNMENT PROBLEM. THE FAN WAS TAKEN OFF LINE AND SHIPPED TO BUFFALO FORGE FOR REPAIRS.									
		THE VACUUM FILTER MALFUNCTIONED, ALLOWING LARGER SIZE PARTICLES TO ESCAPE THE FILTER. THIS CAUSED THE RUBBER LINING DOWN STREAM TO PEEL WHICH, IN TURN, CREATED A PLUGGING PROBLEM. EIMCO ENGINEERS ARE PRESENTLY STUDYING THE PROBLEM AND HOPE TO INCORPORATE MODIFICATIONS TO IMPROVE THE PERFORMANCE OF THE FILTERS.									
3/78	SYSTEM							744			
4/78	SYSTEM							720			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE DAMAGED FD FAN WAS REINSTALLED DURING APRIL. THE AFFECTED MODULE WAS DOWN FROM FEBRUARY 23 THROUGH APRIL 10.									
5/78	SYSTEM							744			
6/78	SYSTEM							720			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		COMPLIANCE TESTING TOOK PLACE DURING THE WEEK OF JUNE 5. THE REPORT SHOULD BE AVAILABLE TO THE UTILITY BY THE END OF JUNE.									
		THE UNIT WAS DOWN WITH DAMPER PROBLEMS (DOWN ON THE 24TH OF JUNE). APPARENTLY THE CHAINS THAT PULL THE GUILLOTINE DAMPERS WERE UNDERDESIGNED AND PRONE TO FAILURE. THE CHAINS ARE CURRENTLY BEING REPLACED.									
7/78	SYSTEM							744			
8/78	SYSTEM							744			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		OFFICIAL RESULTS OF THE COMPLIANCE TEST PERFORMED ON JUNE 6 ARE STILL NOT AVAILABLE. BECAUSE OF INTERMITTENT OPERATION, FGD SYSTEM PERFORMANCE FIGURES ARE NOT YET AVAILABLE.									
9/78	SYSTEM							720			
10/78	SYSTEM							744			

MINNKOTA POWER COOPERATIVE: MILTON R. YOUNG 2 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE THICKENER HAS BEEN A MAJOR PROBLEM AREA. THE POLYETHYLENE LINER WAS ACCIDENTLY PIERCED WHILE REPAIRS WERE BEING MADE TO SOME OTHER COMPONENTS. THE LINER IS CURRENTLY BEING PATCHED.									
		THE UTILITY REPORTED THAT OPERATION OF THE BOILER AND FGD SYSTEM CONTINUED ON AN INTERMITTENT BASIS THROUGHOUT THE PERIOD.									
11/78	SYSTEM							720			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THICKENER PROBLEMS ARE CONTINUING. THE RUBBER LINER HAS BEEN DETATCHING FROM THE THICKENER CONE. THE THICKENER MUST BE DRAINED TO MAKE THE REPAIRS.									
		FAN PROBLEMS OCCURRED DURING THE PERIOD. THERE IS NO DAMPER BETWEEN THE MODULE AND FAN. UNDER SOME OPERATING CONDITIONS WET GAS CAN BACK INTO THE FAN AREA RESULTING IN CORROSION AND OTHER MOISTURE RELATED PROBLEMS.									
12/78	A	4.6	5.1		4.6						
	B	37.7	28.4		25.7						
	SYSTEM	42.3	33.5	33.8	30.3			744	673	225	54.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		MINNKOTA POWER COOP REPORTED THE FOLLOWING STATISTICS FOR THE YEAR OF 1978: TOTAL PERIOD HOURS: 8760 TOTAL BOILER HOURS: 6926 TOTAL A-MODULE HOURS: 1790 TOTAL B-MODULE HOURS: 2110 ANNUAL BOILER CAPACITY FACTOR: 66.7% FGD SYSTEM PERFORMANCE:									
			A-MODULE	B-MODULE	SYSTEM						
		AVAILABILITY	92.3	28.5	46.1						
		OPERABILITY	28.0	25.9	52.7						
		RELIABILITY			53.9						
		UTILIZATION	22.2	20.4	41.7						
		THE B-TOWER WAS OUT OF SERVICE DURING DECEMBER DUE TO PLUGGING OF THE THICKENER UNDERFLOW BY RUBBER LINING. THE THICKENER WAS PUMPED OUT AND REPAIRED.									
1/79	A	4.6	5.1		4.6						
	B	37.7	28.4		25.7						
	SYSTEM	42.3	33.5	33.8	30.3			744	673	225	54.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		SOME WEATHER-RELATED PROBLEMS OCCURRED WITH FGD SYSTEM PIPING FREEZE-UPS.									
		THE UTILITY REPORTED THAT THE A-TOWER WAS OUT OF SERVICE FOR A PERIOD IN JANUARY DUE TO BROKEN INLET ISOLATION DAMPER CHAINS.									
		THE A-TOWER WAS OUT OF SERVICE TO REPAIR A BOOSTER FAN SERVO MECHANISM THROUGH JANUARY 28.									
		THE B-TOWER WAS OUT OF SERVICE FROM DECEMBER 27 THROUGH JANUARY 31 DUE TO A FAN MOTOR FAILURE.									
		THE UTILITY REPORTED THAT EROSION PROBLEMS IN THE SCRUBBER TOWERS ARE									

MINNKOTA POWER COOPERATIVE: MILTON R. YOUNG 2 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
				PERFORMANCE DATA							
			SEVERE ENOUGH THAT HOLES HAVE BEEN DISCOVERED IN TOWER WALLS.								
2/79	A	19.4	26.5		19.4						
	B	32.1	44.0		32.1						
	SYSTEM	51.5	70.5	70.5	51.5			672	491	346	58.1
3/79	A	19.4	26.5		19.4						
	B	32.1	44.0		32.1						
	SYSTEM	51.5	70.5	70.5	51.5			744	543	383	58.1

** PROBLEMS/SOLUTIONS/COMMENTS

TWO DAYS OF DOWN TIME WERE REQUIRED TO REMOVE LOOSE RUBBER FROM THE THICKENER PIPING DURING THE FEBRUARY-MARCH PERIOD.

A BOOSTER FAN MOTOR FIRE OCCURRED IN THE A-MODULE.

HOLES IN THE B-SIDE ABSORBER TOWER WERE REPAIRED DURING THE PERIOD.

COLD WEATHER INHIBITED SCRUBBER STARTUPS AFTER REPAIRS WERE MADE DURING THE PERIOD.

4/79	A	3.0	3.2		3.0						
	B	57.1	61.6		57.1						
	SYSTEM	60.1	64.8	65.4	60.1			720	668	432	69.4
5/79	A	3.0	3.2		3.0						
	B	57.1	61.6		57.1						
	SYSTEM	60.1	64.8	65.4	60.1			744	690	448	88.4

** PROBLEMS/SOLUTIONS/COMMENTS

THE A-MODULE IS STILL EXPERIENCING FAN PROBLEMS. DURING APRIL AND MAY THE FAN HAD ALIGNMENT PROBLEMS POSSIBLY RELATED TO THE FAN FOUNDATION.

DURING APRIL AND MAY HOLES WERE REPAIRED IN THE ABSORBER WALLS, VALVE REPAIRS WERE MADE, AND REPAIRS WERE MADE ON A THICKENER DRIVE GEAR.

6/79	A	17.2	17.2		17.2						
	B	36.3	36.3		36.3						
	SYSTEM	52.8	52.8	52.8	52.8			720	720	380	88.7

** PROBLEMS/SOLUTIONS/COMMENTS

THE A-TOWER WAS DOWN FOR REPAIR TO THE FLAKE LINING.

THE FGD SYSTEM WAS DOWN FOR PART OF THE MONTH FOR REPAIRS AFTER EXCESS SOLIDS ENTERING THE TRAY RECYCLE LOOP OVERLOADED THE CLARIFIER.

AN A-TOWER TRAY RECYCLE DISTRIBUTION HEADER WAS CLEANED DURING JUNE.

THE SYSTEM WAS FORCED OUT OF SERVICE WHEN BOILER PROBLEMS CAUSED AN EXCESSIVE AMOUNT OF HEAVY PARTICLES (SLAG CARRYOVER) TO ENTER THE FGD SYSTEM RESULTING IN THE PLUGGING OF SEVERAL LINES AND STOPPING THE THICKENER RAKE. SLUDGE HAD TO BE DREDGED AND HAULED OUT FROM THE TOP OF THE THICKENER.

THE A-TOWER WAS OUT OF SERVICE DUE TO PROBLEMS WITH THE WATER BALANCE AND THE VACUUM FILTERS AS WELL AS TO UNPLUG THE ABSORBER BLEED LINE. LIME WAS USED FOR SEVERAL DAYS AS MAKE UP CHEMICAL (AS OPPOSED TO PRIMARILY ALKALINE FLYASH) TO EASE THE HIGH SOLIDS PROBLEM.

A-TOWER AGITATOR GEARS WHICH FAILED AS A RESULT OF A CLARIFIER OVERLOAD WERE REPLACED DURING THE PERIOD.

MINNKOTA POWER COOPERATIVE: MILTON R. YOUNG 2 (CONT.)

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
7/79	A	44.5	44.5		44.5						
	B	.0	.0		.0						
	SYSTEM	44.0	44.0	44.0	44.0			744	744	331	86.7

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY HAS REPORTED THAT A TRAY RECYCLE CONTROL VALVE AND AN ABSORBER TRAIN VALVE FAILED DURING JULY.

THE UTILITY REPORTED PROBLEMS WITH PLUGGING IN THE MIST ELIMINATORS, THE THICKENER AND IN THE ABSORBER FEED LINE.

THE UNIT EXPERIENCED A BOOSTER FAN TRIP IN JULY.

PROBLEMS WITH THE VACUUM FILTERS AND THE SEAL WATER PUMP WERE ENCOUNTERED.

THE ABSORBER AGITATOR WAS REPLACED DURING JULY.

8/79	A	28.7	28.7		28.7						
	B	10.6	10.6		10.6						
	SYSTEM	39.0	39.0	39.0	39.0			744	744	293	92.3

** PROBLEMS/SOLUTIONS/COMMENTS

DURING AUGUST EXCESSIVE VIBRATION AND HIGH BEARING TEMPERATURE IN THE A-SIDE BOOSTER FAN WERE ENCOUNTERED CAUSING SOME DOWN TIME.

THE INABILITY TO ADD ALKALI (FLYASH OR LIME) TO THE SYSTEM CAUSED SOME OPERATIONAL PROBLEMS ON THE A-SIDE SCRUBBER.

DURING AUGUST THE B-SIDE THICKENER RAKE WAS BURIED IN THE SLUDGE. THE SLUDGE HAD TO BE REMOVED BY MINING IT FROM THE TOP.

PLUGGING OF THE FLYASH TANK AND THE LIME SLURRY FEED LINE CAUSED SOME B-SIDE OUTAGE TIME DURING AUGUST.

DUE TO A LACK OF LIME (THE UTILITY SUPPLY WAS EXHAUSTED) THE FGD SYSTEM HAD TO SHUT DOWN.

THE HOLES IN THE SIDES OF THE B-SIDE ABSORBER TOWER HAD TO BE REPAIRED CAUSING SOME OUTAGE TIME IN AUGUST.

9/79	A	21.4	21.5		21.4						
	B	1.2	1.2		1.2						
	SYSTEM	23.0	23.0	23.0	23.0			720	717	163	96.6

** PROBLEMS/SOLUTIONS/COMMENTS

DURING SEPTEMBER THE A-SIDE WAS DOWN DUE TO HEAVY SOLIDS IN THE THICKENER AND CLARIFIER. HIGH VIBRATIONS WERE EXPERIENCED WITH THE BOOSTER FAN.

THE B-SIDE REMAINED OUT OF SERVICE DUE TO PROBLEMS WITH THE THICKENER AND CLARIFIER.

10/79	A	.0	.0		.0						
	B	31.3	31.4		31.3						
	SYSTEM	31.3	31.4	31.4	31.3			744	743	233	89.7

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY IS IN THE PROCESS OF CLEANING THE CLARIFIER.

THE CLARIFIER AGITATOR DRIVE GEAR FAILED CAUSING DOWN TIME FOR REPAIR IN

MINNKOTA POWER COOPERATIVE: MILTON R. YOUNG 2 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
				PERFORMANCE DATA							
			OCTOBER.								
			THE BLEED LINE TO THE THICKENER PLUGGED AND NEEDED MAINTENANCE.								
			THE GEAR HOUSING FAILED ON THE THICKENER LIFT MECHANISM CAUSING OUTAGE TIME FOR REPAIR.								
11/79	A	.6	.7		.6						
	B	15.4	16.7		15.4						
	SYSTEM	16.0	17.4	17.4	16.0			720	661	115	80.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
			AN EXCESS OF SOLIDS CAUSED PLUGGING IN THE THICKENER AND THE CLARIFIER DURING NOVEMBER.								
12/79	A	26.6	31.5		26.6						
	B	9.7	11.5		9.7						
	SYSTEM	36.3	43.0	43.0	36.3			744	628	270	67.2
	** PROBLEMS/SOLUTIONS/COMMENTS										
			PLUGGING OF THE SEAL WATER SYSTEM RESULTED IN SOME OUTAGE TIME DURING DECEMBER.								
			BOOSTER FAN PROBLEMS RELATED TO EXCESSIVE VIBRATION WERE ENCOUNTERED ON MODULE B IN DECEMBER.								
			A HOLE IN A BLOCKING VALVE RESULTED IN SOME DOWNTIME.								
			THE GEAR HOUSING FAILED ON THE THICKENER LIFT MECHANISM.								
1/80	A	7.1	10.5		7.1						
	B	.0	.0		.0						
	SYSTEM	7.1	10.5	10.5	7.1			744	504	53	58.5
	** PROBLEMS/SOLUTIONS/COMMENTS										
			DURING JANUARY A COLD WEATHER CAUSED SOME PIPE LINES AND A BOOSTER FAN ICE UP.								
			A HIGH PERCENTAGE OF COARSE SOLIDS IN THE THICKENER CAUSED SOME OUTAGE TIME. THE WORM GEAR ON THE THICKENER FAILED ADDING TO THE OUTAGE TIME.								
			CLEANING AND REPAIR OF THE THICKENER WAS COMPLICATED BY SUB-ZERO AMBIENT TEMPERATURES.								
2/80	SYSTEM	.0	.0		.0			696	696	0	97.1
	** PROBLEMS/SOLUTIONS/COMMENTS										
			PROBLEMS RELATED TO THE COLD WEATHER CONTINUED THROUGH FEBRUARY. ICE ON THE BOOSTER FAN HAD TO BE MELTED BEFORE IT COULD BE OPERATED.								
			SHAFT SLEEVES ON SEVERAL SPRAY RECYCLE PUMPS WERE REPLACED DURING FEBRUARY.								
			THE GEAR REDUCER FAILED ON THE B-SIDE ABSORBER AGITATOR PREVENTING SCRUBBER OPERATION.								
			THE ISOLATION DAMPER CHAINS BROKE DURING THE MONTH.								
3/80	A	22.6	22.6		22.6						

MINNKOTA POWER COOPERATIVE: MILTON R. YOUNG 2 (CONT.)

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	B	6.2	6.2		6.2						
	SYSTEM	28.9	28.8	28.8	28.8			744	743	214	89.1

** PROBLEMS/SOLUTIONS/COMMENTS

DURING MARCH COLD WEATHER CONTINUED TO BE A PROBLEM.

THE TORQUE SWITCHES ON THE ISOLATION DAMPERS WERE REPLACED. THE DAMPER PROBLEMS CAUSED THE BOOSTER FAN TO TRIP. THE OUTAGE TIME WAS EXTENDED BECAUSE THE UTILITY HAD TO WAIT FOR THE SWITCHES TO BE DELIVERED.

AN EXCESSIVE AMOUNT OF COARSE PARTICLES IN THE THICKENER CONTINUED TO BE A PROBLEM. PLUGGED BLEED LINES FROM THE ABSORBER TO THE THICKENER WERE ALSO ENCOUNTERED.

THE A-SIDE ABSORBER AGITATOR ANCHOR BOLTS SHEARED DURING MARCH CAUSING MODULE DOWN TIME.

THE SHAFT SLEEVES ON THE SPRAY RECYCLE PUMPS WOULD NOT HOLD THE PUMP GLAND PACKING. THE SHAFT SLEEVES ARE CURRENTLY BEING REPLACED.

4/80	A	100.0	.0		.0						
	B	.0	.0	.0	.0						
	SYSTEM	100.0	.0	.0	.0			720	154	0	

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS DOWN FOR APPROXIMATELY 3 WEEKS FOR THE ANNUAL UNIT OUTAGE DURING APRIL.

PLUGGED BLEED LINES AND THE REPLACEMENT OF THE SHAFT SLEEVES ON THE RECYCLE PUMPS CAUSED THE FGD SYSTEM TO REMAIN OFF LINE DURING THE TIME THE BOILER OPERATED.

5/80	A	.0	.0		.0						
	B	47.2	48.4	50.6	45.6						
	SYSTEM	47.2	48.4	50.6	45.6			744	700	339	

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE B WAS OPERATED DURING MAY WHILE REPAIR WORK WAS BEING DONE ON MODULE A.

THE REPAIRS ON MODULE A INCLUDED WORK ON THE SPRAY RECYCLE NOZZLE PIPING, AND THE RECYCLE HEADER.

THE VALVES ON BOTH THE SPRAY RECYCLE PUMP AND THE DISCHARGE SPRAY CYCLE PUMP WERE REPAIRED.

THE ABSORBER LINING HAS STARTED TO WEAR AND IS NOW BEING REPAIRED.

HIGH SOLIDS RESULTED IN THICKNER LINE PLUGGING. HIGH SOLIDS ALSO CAUSED PROBLEMS WITH THE RAKE AND CONE. BOTH THE THICKNER AND THE CLARIFIER HAD TO BE DRAINED AND CLEANED.

THE ABSORBER AGITATOR TUNNEL WAS ALSO CLEANED DURING THE MONTH.

6/80	A	.0	.0		.0						
	B	41.8	40.4	41.4	39.3						
	SYSTEM	41.8	40.4	41.4	39.3			720	701	283	

MINNKOTA POWER COOPERATIVE: MILTON R. YOUNG 2 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
		MODULE B CONTINUED TO OPERATE THROUGH JUNE.									
		PROBLEMS WITH THE THICKNER CONTINUED THROUGH THE MONTH. HIGH SOLIDS CAUSED PROBLEMS WITH THE RAKE MECHANISM AND THE LIMIT SWITCH.									
		TROUBLE WAS ENCOUNTERED DURING JUNE WITH THE VACUUM FILTER.									
		THE REPAIR WORK CONTINUED ON THE ABSORBER FLAKE LININGS.									
		MODULE A REPAIR WORK CONTINUED DURING JUNE.									
7/80	A	.0	.0		.0						
	B	65.3	64.5	65.8	52.0						
	SYSTEM	65.3	64.5	65.8	52.0			744	600	387	60.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		PROBLEMS WITH THE RAKE MECHANISM AND UNDERFLOW PUMPS IN THE THICKENER CONTINUED IN JULY. HIGH SOLIDS IN THE THICKENER ARE CAUSED WHEN FLY ASH IS ADDED TO THE LIME IN THE ABSORBER TOWER. THE ABSORBER REAGENT IS CHANGED TO STRAIGHT LIME WHEN THIS OCCURS.									
		PROBLEMS WERE ENCOUNTERED WITH THE TWO VACUUM FILTER PUMPS. ONE WAS BEING REBUILT WHILE THE OTHER FUNCTIONED POORLY.									
		REPAIRS WERE MADE TO THE LEAK IN THE ABSORBER TOWER.									
		PROBLEMS WERE REPORTED WITH THE MOTOR AND DISCHARGE VALVE ON THE TRAY RECYCLE PUMPS.									
		THE FGD SYSTEM WAS NOT PLACED IN SERVICE WHEN THE BOILER WAS RUN AT REDUCED LOAD DURING THE MONTH.									
8/80	A	90.7	54.3	98.8	53.9						
	B	56.9	44.2	99.4	44.0						
	SYSTEM	99.2	98.6	99.2	98.0			744	739	729	92.8
	** PROBLEMS/SOLUTIONS/COMMENTS										
		BOTH MODULES WERE OPERATED DURING AUGUST.									
		DURING THE MONTH, MAINTENANCE WORK WAS DONE ON THE TEFLON PACKING OF THE SPRAY RECYCLE PUMPS. THE VACUUM FILTER DRUM, SPRAY NOZZLES, THE ABSORBER AGITATOR, THE CLARIFIER CONE, AND THE THICKNER RAKE MECHANISM.									
9/80	A	70.1	72.6	100.0	66.9						
	B	66.7	25.1	100.0	23.2						
	SYSTEM	100.0	97.9	100.0	90.3			720	664	650	78.5
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE FGD SYSTEM WAS AVAILABLE DURING ALL OF SEPTEMBER.									
		BOTH MODULES WERE OPERATED DURING THE MONTH.									
10/80	A	90.4	85.4	87.1	76.2						
	B	17.7	.0		.0						
	SYSTEM	100.0	85.4	87.1	76.2			744	664	744	75.7

MINNKOTA POWER COOPERATIVE: MILTON R. YOUNG 2 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING OCTOBER AVAILABILITY FOR MODULE B WAS LOW DUE TO LEAKS IN THE TOWER.									
11/80	A	42.2	40.4	100.0	38.7						
	B	98.6	94.0	96.4	50.1						
	SYSTEM	100.0	94.5	99.1	90.6			720	690	720	88.6
	** PROBLEMS/SOLUTIONS/COMMENTS										
		AVAILABILITY WAS LOW FOR MODULE A DUE TO LEAKS IN THE TOWER DURING THE MONTH OF NOVEMBER.									
12/80	A	41.5	33.2	54.5	40.0						
	B	30.0	29.5	88.6	28.4						
	SYSTEM	71.5	62.8	66.7	60.5			744	716	450	92.4
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING DECEMBER AVAILABILITY WAS LOW DUE TO DOWN TIME NECESSARY TO CONVERT FROM A THICKENER TO SLUDGE PONDS AND PROBLEMS WITH THE OVERFLOW LEVEL CONTROL OF THE ABSORBER.									
		ISOLATION DAMPER PROBLEMS DURING THE MONTH DELAYED THE STARTUP OF THE FGD SYSTEM.									

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	MONONGAHELA POWER	
PLANT NAME	PLEASANTS	
UNIT NUMBER	1	
CITY	BELMONT	
STATE	WEST VIRGINIA	
REGULATORY CLASSIFICATION	B	
PARTICULATE EMISSION LIMITATION - NG/J	21.	(.050 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	516.	(1.200 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	1250	
GROSS UNIT GENERATING CAPACITY - MW	618	
NET UNIT GENERATING CAPACITY W/FGD - MW	580	
NET UNIT GENERATING CAPACITY WO/FGD - MW	*****	
EQUIVALENT SCRUBBED CAPACITY - MW	618	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	FOSTER WHEELER	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	1152.85	(2443000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	132.2	(270 F)
STACK HEIGHT - M	366.	(1200 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	6.1	(20.0 FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	BITUMINOUS	
AVERAGE HEAT CONTENT - J/G	27912.	(12000 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		11,000-13,300
AVERAGE ASH CONTENT - %	********	
RANGE ASH CONTENT - %	******	
AVERAGE MOISTURE CONTENT - %	15.00	
RANGE MOISTURE CONTENT - %	10-20	
AVERAGE SULFUR CONTENT - %	3.70	
RANGE SULFUR CONTENT - %	2-4.5	
AVERAGE CHLORIDE CONTENT - %	********	
RANGE CHLORIDE CONTENT - %	******	
*** PARTICLE CONTROL		
** ESP		
NUMBER	1	
TYPE	COLD SIDE	
SUPPLIER	AIR CORRECTION DIVISION, UOP	
INLET FLUE GAS CAPACITY - CU.M/S	1152.9	(2443000 ACFM)
INLET FLUE GAS TEMPERATURE - C	132.2	(270 F)
** PARTICLE SCRUBBER		
GENERIC TYPE	NONE	
SPECIFIC TYPE	N/A	
*** FGD SYSTEM		
** GENERAL DATA		
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT	
SO2 REMOVAL MODE	WET SCRUBBING	
PROCESS TYPE	LIME	
PROCESS ADDITIVES	MG PROMOTED	
SYSTEM SUPPLIER	BABCOCK & WILCOX	
A-E FIRM	UNITED ENGINEERS & CONSTRUCTORS	
DEVELOPMENT LEVEL	FULL SCALE	
NEW/RETROFIT	NEW	
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.55	
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	90.00	
CURRENT STATUS	1	
COMMERCIAL START-UP	3/79	
INITIAL START-UP	3/79	
CONTRACT AWARDED	9/75	

MONONGAHELA POWER: PLEASANTS 1 (CONT.)

** DESIGN AND OPERATING PARAMETERS

** ABSORBER

NUMBER	4	
GENERIC TYPE	TRAY TOWER	
SPECIFIC TYPE	SIEVE TRAY	
SUPPLIER	BABCOCK & WILCOX	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	AISI 1110	
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A	
LINER GENERIC MATERIAL	ORGANIC	
LINER MATERIAL TRADE NAME/COMMON TYPE	RUBBER	
GAS CONTACTING DEVICE TYPE	SIEVE TRAY	
NUMBER OF CONTACTING ZONES	1	
L/G RATIO - L/CU.M	7.4	(55.0 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	1.2	(5.0 IN-H2O)
INLET GAS FLOW - CU. M/S	242.10	(513030 ACFM)
INLET GAS TEMPERATURE - C	132.2	(270 F)
SO2 REMOVAL EFFICIENCY - %	90.0	

** MIST ELIMINATOR

PRE-MIST ELIMINATOR/MIST ELIMINATOR	MIST ELIMINATOR	
NUMBER PER SYSTEM	4	
GENERIC TYPE	IMPINGEMENT	
SPECIFIC TYPE	BAFFLE	
TRADE NAME/COMMON TYPE	CHEVRON VANE	
CONFIGURATION	HORIZONTAL	
CONSTRUCTION MATERIAL GENERIC TYPE	FIBERGLASS REINFORCED PLASTIC	
WASH WATER SOURCE	BLENDED FRESH MAKEUP AND THICKENER OVERFLOW	
WASH RATE - L/S	107.2	(1700 GAL/MIN)

** REHEATER

GENERIC TYPE	BYPASS	
SPECIFIC TYPE	COLD SIDE	
TRADE NAME/COMMON TYPE	N/A	
PERCENT GAS BYPASSED - AVG	16.5	
TEMPERATURE INCREASE - C	-6.7	(20 F)

*** SLUDGE

** DISPOSAL

TYPE	POND
LOCATION	ON SITE

** WATER BALANCE

WATER LOOP TYPE	CLOSED

** FGD SPARE CAPACITY INDICES

ABSORBER - %	.0

** FGD SPARE COMPONENT INDICES

ABSORBER	.0

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
3/79	SYSTEM							744			
4/79	SYSTEM							720			

MONONGAHELA POWER: PLEASANTS 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UNIT STARTED ON MARCH 7, 1979. NO HOURS ARE YET AVAILABLE BECAUSE OF THE RECENT OPERATING STATUS.									
		THE A-MODULE HAS BEEN REMOVED FROM SERVICE DUE TO A WELD FAILURE ON THE ABSORBER DOWNCOMER SECTION.									
5/79	SYSTEM							744			
6/79	SYSTEM							720			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UTILITY REPORTED THAT THE UNIT WAS TAKEN OUT OF SERVICE ON JUNE 19 DUE TO SEVERE STACK LINER FAILURE. THE UNIT IS PROJECTED TO BE OUT OF SERVICE UNTIL THE MIDDLE OF AUGUST.									
7/79	SYSTEM	.0			.0			744	0	0	.0
8/79	SYSTEM	.0			.0			744	0	0	.0
9/79	SYSTEM	.0			.0			720	0	0	.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UNIT RESTARTED IN LATE SEPTEMBER AFTER COMPLETION OF THE STACK RELINING.									
10/79	SYSTEM							744			
11/79	SYSTEM							720			
12/79	SYSTEM							744			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		NO INFORMATION WAS AVAILABLE FOR THIS REPORT PERIOD.									
1/80	SYSTEM							744			
2/80	SYSTEM							690			
3/80	SYSTEM							744			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		NO INFORMATION WAS AVAILABLE ON THE OPERATIONS AT PLEASANTS 1 FOR THE FIRST QUARTER OF 1980.									
4/80	SYSTEM							720			
5/80	SYSTEM							744			
6/80	SYSTEM							720			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		INFORMATION WAS UNAVAILABLE FOR THE SECOND QUARTER 1980 REPORT PERIOD.									
7/80	SYSTEM							744			
8/80	A		96.3		27.9						

MONONGAHELA POWER: PLEASANTS 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	B		98.1		28.5						
	C		.0		.0						
	D		98.1		28.5						
	SYSTEM		73.1		21.2			744	216	158	23.2
9/80	SYSTEM		.0		.0			720	0	0	.0

** PROBLEMS/SOLUTIONS/COMMENTS

AN EIGHT WEEK BOILER AND FGD SYSTEM SCHEDULED OUTAGE BEGAN DURING THE WEEK OF AUGUST 11. THE FGD SYSTEM WAS EXPECTED TO BE OUT OF SERVICE FOR 8-12 WEEKS. DURING THE OUTAGE THE FOLLOWING REPAIRS WERE TO BE PERFORMED:

1. REPLACE FABRIC EXPANSION JOINTS WITH ELASTOMER JOINTS
2. REPLACE GUNITE LININGS ON OUTLET DUCTWORK
3. BEGIN RE-LINING SO2 MODULES RUBBER LINING DUE TO SEVERE BLISTERING
4. COAT THICKENER OVERFLOW TANK WITH COAL TAR EPOXY
5. MISCELLANEOUS PUMP AND VALVE MAINTENANCE
6. UPGRADE THE ISOLATION DAMPERS

10/80	SYSTEM		.0		.0			744	0	0	.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE PLEASANTS 1 FGD SYSTEM REMAINED OFF LINE THROUGH THE MONTH OF OCTOBER.

11/80	SYSTEM							720			
12/80	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

INFORMATION FOR THE MONTHS OF NOVEMBER AND DECEMBER WAS NOT AVAILABLE.

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	MONONGAHELA POWER	
PLANT NAME	PLEASANTS	
UNIT NUMBER	2	
CITY	BELMONT	
STATE	WEST VIRGINIA	
REGULATORY CLASSIFICATION	B	
PARTICULATE EMISSION LIMITATION - NG/J	21.	(.050 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	516.	(1.200 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	*****	
GROSS UNIT GENERATING CAPACITY - MW	618	
NET UNIT GENERATING CAPACITY W/FGD - MW	580	
NET UNIT GENERATING CAPACITY WO/FGD - MW	*****	
EQUIVALENT SCRUBBED CAPACITY - MW	618	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	FOSTER WHEELER	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	1152.85	(2443000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	132.2	(270 F)
STACK HEIGHT - M	366.	(1200 FT)
STACK SHELL	******	
STACK TOP DIAMETER - M	*******	(***** FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	BITUMINOUS	
AVERAGE HEAT CONTENT - J/G	******	(****** BTU/LB)
RANGE HEAT CONTENT - BTU/LB		11,000-13,300
AVERAGE ASH CONTENT - %	********	
RANGE ASH CONTENT - %	******	
AVERAGE MOISTURE CONTENT - %	********	
RANGE MOISTURE CONTENT - %	10-20	
AVERAGE SULFUR CONTENT - %	4.50	
RANGE SULFUR CONTENT - %	2-4.5	
AVERAGE CHLORIDE CONTENT - %	.03	
RANGE CHLORIDE CONTENT - %	******	
*** PARTICLE CONTROL		
** ESP		
NUMBER	1	
TYPE	COLD SIDE	
SUPPLIER	AIR CORRECTION DIVISION, UOP	
INLET FLUE GAS CAPACITY - CU.M/S	1132.6	(2400000 ACFM)
INLET FLUE GAS TEMPERATURE - C	132.2	(270 F)
** PARTICLE SCRUBBER		
GENERIC TYPE	NONE	
SPECIFIC TYPE	N/A	
*** FGD SYSTEM		
** GENERAL DATA		
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT	
SO2 REMOVAL MODE	WET SCRUBBING	
PROCESS TYPE	LIME	
PROCESS ADDITIVES	MG PROMOTED	
SYSTEM SUPPLIER	BABCOCK & WILCOX	
A-E FIRM	UNITED ENGINEERS & CONSTRUCTORS	
DEVELOPMENT LEVEL	FULL SCALE	
NEW/RETROFIT	NEW	
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.55	
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	90.00	
CURRENT STATUS	1	
COMMERCIAL START-UP	0/81	
INITIAL START-UP	10/80	
CONTRACT AWARDED	9/75	

MONONGAHELA POWER: PLEASANTS 2 (CONT.)

** DESIGN AND OPERATING PARAMETERS

** ABSORBER		
NUMBER	4	
GENERIC TYPE	TRAY TOWER	
SPECIFIC TYPE	SIEVE TRAY	
SHELL SPECIFIC MATERIAL	AISI 1110	
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A	
LINER GENERIC MATERIAL	ORGANIC	
LINER MATERIAL TRADE NAME/COMMON TYPE	RUBBER	
NUMBER OF CONTACTING ZONES	1	
L/G RATIO - L/CU.M	7.4	(55.0 GAL/1000 ACF)
INLET GAS TEMPERATURE - C	132.2	(270 F)
SO2 REMOVAL EFFICIENCY - %	90.0	
** MIST ELIMINATOR		
PRE-MIST ELIMINATOR/MIST ELIMINATOR	MIST ELIMINATOR	
GENERIC TYPE	IMPINGEMENT	
SPECIFIC TYPE	BAFFLE	
TRADE NAME/COMMON TYPE	CHEVRON VANE	
** REHEATER		
GENERIC TYPE	BYPASS	
SPECIFIC TYPE	COLD SIDE	
TRADE NAME/COMMON TYPE	N/A	
PERCENT GAS BYPASSED - AVG	16.5	
TEMPERATURE INCREASE - C	-6.7	(20 F)

*** SLUDGE

** DISPOSAL		
TYPE	POND	
LOCATION	ON SITE	
** WATER BALANCE		
WATER LOOP TYPE	OPEN	

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
10/80	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

INITIAL OPERATION OF THE FGD SYSTEM COMMENCED IN LATE OCTOBER 1980.

11/80	SYSTEM							720			
12/80	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD PROBLEMS HAVE BEEN ENCOUNTERED.

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	MONTANA POWER	
PLANT NAME	COLSTRIP	
UNIT NUMBER	1	
CITY	COLSTRIP	
STATE	MONTANA	
REGULATORY CLASSIFICATION	B	
PARTICULATE EMISSION LIMITATION - NG/J	43.	(.100 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	516.	(1.200 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	664	
GROSS UNIT GENERATING CAPACITY - MW	360	
NET UNIT GENERATING CAPACITY W/FGD - MW	332	
NET UNIT GENERATING CAPACITY WO/FGD - MW	344	
EQUIVALENT SCRUBBED CAPACITY - MW	360	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	COMBUSTION ENGINEERING	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	674.82	(1430000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	143.9	(291 F)
STACK HEIGHT - M	152.	(500 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	5.0	(16.5 FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	SUBBITUMINOUS	
AVERAGE HEAT CONTENT - J/G	20569.	(8843 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		8,162-8,8967
AVERAGE ASH CONTENT - %	8.60	
RANGE ASH CONTENT - %	6.1-12.6	
AVERAGE MOISTURE CONTENT - %	23.90	
RANGE MOISTURE CONTENT - %	21.6-28.8	
AVERAGE SULFUR CONTENT - %	.77	
RANGE SULFUR CONTENT - %	0.4-1.0	
AVERAGE CHLORIDE CONTENT - %	.01	
RANGE CHLORIDE CONTENT - %	******	
*** PARTICLE CONTROL		
** PARTICLE SCRUBBER		
NUMBER	3	
GENERIC TYPE	VENTURI TOWER	
SPECIFIC TYPE	VARIABLE-THROAT/TOP-ENTRY PLUMB BOB	
SUPPLIER	COMBUSTION EQUIPMENT ASSOCIATES	
DIMENSIONS - FT	15 DIA THROAT	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	AISI 1110	
LINER GENERIC MATERIAL	INORGANIC	
LINER SPECIFIC MATERIAL	ACID-RESISTANT BRICK & MORTAR	
GAS CONTACTING DEVICE TYPE	316 SS PLUMB BOB, CERAMIC NOZZLES	
NUMBER OF CONTACTING ZONES	1	
LIQUID RECIRCULATION RATE - LITER/S	415.8	(6600 GPM)
L/G RATIO - LITER/CU.M	2.0	(15.0 GAL/1000ACF)
PRESSURE DROP - KPA	4.2	(17.0 IN-H2O)
SUPERFICIAL GAS VELOCITY - M/S	61.0	(200.0 FT/S)
INLET GAS FLOW RATE - CU.M/S	224.9	(476667 ACFM)
INLET GAS TEMPERATURE - C	143.9	(291 F)
PARTICLE REMOVAL EFFICIENCY - %	99.5	
*** FGD SYSTEM		
** GENERAL DATA		
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT	
SO2 REMOVAL MODE	WET SCRUBBING	
PROCESS TYPE	LIME/ALKALINE FLYASH	
PROCESS ADDITIVES	NONE	
SYSTEM SUPPLIER	COMBUSTION EQUIP ASSOCIATES	

MONTANA POWER: COLSTRIP 1 (CONT.)

A-E FIRM	BECHTEL	
DEVELOPMENT LEVEL	FULL SCALE	
NEW/RETROFIT	NEW	
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.50	
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	60.00	
CURRENT STATUS	1	
COMMERCIAL START-UP	11/75	
INITIAL START-UP	9/75	
CONTRACT AWARDED	10/72	

** DESIGN AND OPERATING PARAMETERS

** ABSORBER

NUMBER	3	
GENERIC TYPE	COMBINATION	
SPECIFIC TYPE	VENTURI/SPRAY	
SUPPLIER	COMBUSTION EQUIP ASSOCIATES	
DIMENSIONS - FT	70.5 X 35 DIA.	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	AISI 1110	
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A	
LINER GENERIC MATERIAL	ORGANIC	
LINER SPECIFIC MATERIAL	GLASS FLAKE-FILLED POLYESTER,VINYL ESTER	
LINER MATERIAL TRADE NAME/COMMON TYPE	FLAKEGLASS,PLASITE	
GAS CONTACTING DEVICE TYPE	CLEAR WATER TRAY (KOCH VALVE TRAY)	
NUMBER OF CONTACTING ZONES	1	
LIQUID RECIRCULATION RATE - LITER/S	479.	(7600 GPM)
L/G RATIO - L/CU.M	2.4	(18.0 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	.1	(.5 IN-H2O)
SUPERFICAL GAS VELOCITY - M/SEC	2.7	(8.7 FT/S)
INLET GAS FLOW - CU. M/S	201.31	(426600 ACFM)
INLET GAS TEMPERATURE - C	48.9	(120 F)
SO2 REMOVAL EFFICIENCY - %	60.0	
PARTICLE REMOVAL EFFICENCY - %	99.5	

** MIST ELIMINATOR

PRE-MIST ELIMINATOR/MIST ELIMINATOR	MIST ELIMINATOR	
NUMBER PER SYSTEM	1	
GENERIC TYPE	IMPINGEMENT	
SPECIFIC TYPE	BAFFLE	
TRADE NAME/COMMON TYPE	CHEVRON VANE	
CONFIGURATION	HORIZONTAL	
NUMBER OF STAGES	1	
NUMBER OF PASSES PER STAGE	4	
FREEBOARD DISTANCE - M	3.96	(13.0 FT)
DISTANCE BETWEEN STAGES - CM	2.54	(1.0 IN)
DISTANCE BETWEEN VANES - CM	2.5	(1.00 IN)
VANE ANGLES - DEGREES	120	
PRESSURE DROP - KPA	.6	(2.3 IN-H2O)
SUPERFICAL GAS VELOCITY - M/S	2.7	(8.7 FT/S)
CONSTRUCTION MATERIAL GENERIC TYPE	NORYL PLASTIC	
WASH WATER SOURCE	POND OVERFLOW, RIVER WATER AND FRESH WATER	
WASH RATE - L/S	26.5	(420 GAL/MIN)

** REHEATER

NUMBER	3	
GENERIC TYPE	IN-LINE	
SPECIFIC TYPE	STEAM	
TEMPERATURE INCREASE - C	10.0	(50 F)
INLET FLUE GAS FLOW RATE - CU. M/S	201.31	(426600 ACFM)
INLET FLUE GAS TEMPERATURE - C	48.9	(120 F)
CONSTRUCTION MATERIAL GENERIC TYPE	INLET;INCONEL 625 - OUTLET;HASTELLOY G	

** FANS

NUMBER	6	
FUNCTION	BALANCED DRAFT	
APPLICATION	INDUCED DRAFT	
SERVICE	DRY	
FLUE GAS FLOW RATE - CU.M/S	223.21	(473000 ACFM)
FLUE GAS TEMPERATURE - C	76.7	(170 F)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL IMPELLER, RUBBER-LINED HOUSING	

MONTANA POWER: COLSTRIP 1 (CONT.)

** DUCTWORK	
LOCATION	SCRUBBER INLET
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
LINER GENERIC MATERIAL TYPE	NONE
** DUCTWORK	
LOCATION	SCRUBBER TO REHEATER AND REHEATER TO STACK
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
LINER GENERIC MATERIAL TYPE	HEIL FLAKEGLASS
** TANKS	
SERVICE	NUMBER
-------	------
VENTURI/ABSORBER RECYCLE TANK	3
** PUMPS	
SERVICE	NUMBER
-------	------
VENTURI RECIRCULATION	6
ABSORBER RECIRCULATION	6
*** SLUDGE	
** DISPOSAL	
NATURE	INTERIM
TYPE	DIKED LINED POND
LOCATION	ON SITE
SITE TRANSPORTATION METHOD	PUMPED
SITE DIMENSIONS	20 FT. DEEP
SITE CAPACITY - CU.M	635960 (520.0 ACRE-FT)
SITE SERVICE LIFE - YRS	10
** DISPOSAL	
NATURE	INTERIM
TYPE	DIKED LINED POND
LOCATION	ON SITE
SITE TRANSPORTATION METHOD	PUMPED
SITE DIMENSIONS	20 FT. DEEP
SITE CAPACITY - CU.M	635960 (520.0 ACRE-FT)
** DISPOSAL	
NATURE	FINAL
TYPE	POND
LOCATION	OFF SITE
SITE TRANSPORTATION METHOD	PUMPED
SITE DIMENSIONS	20 FT. DEEP
SITE CAPACITY - CU.M	2590314 (2118.0 ACRE-FT)
SITE SERVICE LIFE - YRS	18
** PROCESS CONTROL AND INSTRUMENTATION	
CHEMICAL PARAMETERS	PH
CONTROL LEVELS	4.0 TO 5.0
MONITOR LOCATION	RECIRCULATION TANK
PROCESS CONTROL MANNER	MANUAL
PROCESS CHEMISTRY MODE	FEEDBACK
** WATER BALANCE	
WATER LOOP TYPE	CLOSED
EVAPORATION WATER LOSS - LITER/S	18.9 (300 GPM)
POND SEEPAGE/RUNOFF WATER LOSS - LITERS/S	0
MAKEUP WATER ADDITION - LITERS/S	23.3 (370 GPM)
** FGD SPARE CAPACITY INDICES	
ABSORBER - %	20.0
** FGD SPARE COMPONENT INDICES	
ABSORBER	.5

MONTANA POWER: COLSTRIP 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
				PERFORMANCE DATA							
9/75	SYSTEM	.0						720	72		.5
10/75	SYSTEM	.0						744	456		19.4
11/75	SYSTEM	.0						720	576		42.2
12/75	SYSTEM	.0						744	720		59.9
1/76	SYSTEM	90.0						744	672		63.8
2/76	SYSTEM	98.0						696	624		65.4
3/76	SYSTEM	97.6						744	576		57.0
4/76	SYSTEM	74.2						720	672		49.9
5/76	SYSTEM	96.8						744	336		26.0
6/76	SYSTEM	.0			.0			720	0	0	.0
7/76	SYSTEM	93.2						744	480		28.0
8/76	SYSTEM	94.7						744	552		37.8
9/76	SYSTEM	88.6						720	720		64.5
10/76	SYSTEM	79.9						744	720		73.1

** PROBLEMS/SOLUTIONS/COMMENTS

A TEMPERATURE EXCURSION RESULTED IN DAMAGE TO SYSTEM COMPONENTS CAUSING SYSTEM DOWNTIME.

THE EMERGENCY SCRUBBER QUENCH WATER SUPPLY SYSTEM FAILED TO OPERATE DURING A TEMPERATURE EXCURSION RESULTING IN INTERNAL DAMAGE.

THE LININGS WERE DAMAGED DURING THE OCTOBER TEMPERATURE EXCURSION.

MIST ELIMINATOR DAMAGE OCCURRED AS THE RESULT OF THE TEMPERATURE EXCURSION IN OCTOBER.

11/76	SYSTEM	62.7						720	720		55.6

** PROBLEMS/SOLUTIONS/COMMENTS

A FAILURE OF AN ID FAN MOTOR OCCURRED IN NOVEMBER.

12/76	SYSTEM	73.8						744	744		67.2
1/77	SYSTEM	92.5						744	744		72.9
2/77	SYSTEM	95.4						672	48		3.0
3/77	SYSTEM	.0			.0			744	0	0	.0
4/77	SYSTEM	83.0						720	600		49.9
5/77	SYSTEM	85.4						744	624		64.1
6/77	SYSTEM	87.4						720	672		68.6
7/77	SYSTEM	85.1						744	696		71.8
8/77	SYSTEM	93.3						744			

MONTANA POWER: COLSTRIP 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
		PERFORMANCE DATA									
9/77	SYSTEM	92.5						720			
10/77	SYSTEM	95.6						744			
11/77	SYSTEM	96.3						720			
12/77	SYSTEM	98.3						744			
1/78	SYSTEM	95.7						744			
2/78	SYSTEM	99.5						672			
3/78	SYSTEM	92.0						744			
4/78	SYSTEM	99.8						720			
5/78	SYSTEM	66.0			1.3			744		10	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE 66% MAY AVAILABILITY IS BASED UPON 9.92 HOURS OF OPERATION ON TWO SCRUBBERS WHILE THE UNIT WAS BEING BROUGHT BACK ON LINE AFTER COMPLETION OF ITS ANNUAL OVERHAUL.									
		THE ID FAN MOTOR FOR MODULE 1A WAS NOT AVAILABLE DURING UNIT RESTART IN MAY.									
6/78	SYSTEM	76.0						720			
7/78	SYSTEM	95.7						744			
8/78	SYSTEM	97.0						744			
9/78	SYSTEM	96.0						720			
10/78	SYSTEM	95.0						744			
11/78	SYSTEM	91.0						720			
12/78	SYSTEM	96.7						744			
1/79	SYSTEM	97.6						744			
2/79	SYSTEM	90.3						672			
3/79	SYSTEM	97.3						744			
4/79	SYSTEM	98.9		38.4	80.2			720		597	
5/79	SYSTEM	89.7						744			
6/79	SYSTEM	95.2						720			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING MAY AND JUNE THE UNIT WAS BEING OVERHAULED. THE AVAILABILITY FOR THESE PERIODS IS BASED UPON OPERATIONS BEFORE AND AFTER OVERHAUL.									
7/79	SYSTEM	98.0						744			
8/79	SYSTEM	97.3						744			
9/79	SYSTEM	95.2						720			

MONTANA POWER: COLSTRIP 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
10/79	SYSTEM	92.9						744			
11/79	SYSTEM	97.5						720			
	** PROBLEMS/SOLUTIONS/COMMENTS										
	THE ROUTINE MAINTENANCE CAN BE PERFORMED WHILE THE MODULES ARE ON LINE SO THE AVAILABILITY REMAINS HIGH.										
12/79	SYSTEM	95.9						744			
1/80	SYSTEM	96.5						744			
2/80	SYSTEM	97.4						696			
3/80	SYSTEM	95.4						744			
	** PROBLEMS/SOLUTIONS/COMMENTS										
	TOTAL SYSTEM AVAILABILITY CONTINUES TO BE HIGH WITH NO MAJOR FGD SYSTEM PROBLEMS REPORTED DURING THE FIRST QUARTER OF 1980.										
4/80	SYSTEM	99.8						720			
	** PROBLEMS/SOLUTIONS/COMMENTS										
	NO MAJOR PROBLEMS WITH THE FGD SYSTEM WERE REPORTED BY THE UTILITY DURING APRIL.										
5/80	SYSTEM							744			
	** PROBLEMS/SOLUTIONS/COMMENTS										
	NO AVAILABILITY DATA WERE REPORTED BY THE UTILITY BECAUSE OF A SCHEDULED BOILER AND FGD SYSTEM OUTAGE FOR ROUTINE MAINTENANCE.										
6/80	SYSTEM	77.7						720			
	** PROBLEMS/SOLUTIONS/COMMENTS										
	LOW AVAILABILITY DURING JUNE WAS A RESULT OF THE ANNUAL BOILER AND FGD SYSTEM MAINTENANCE OUTAGE.										
7/80	SYSTEM	98.6						744			
	** PROBLEMS/SOLUTIONS/COMMENTS										
	THE UTILITY REPORTED THAT NO MAJOR PROBLEMS WERE ENCOUNTERED DURING JULY.										
8/80	SYSTEM	99.3						744			
9/80	SYSTEM	98.3						720			
	** PROBLEMS/SOLUTIONS/COMMENTS										
	THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED FOR THE MONTHS OF AUGUST AND SEPTEMBER.										
10/80	SYSTEM							744			
11/80	SYSTEM							720			
12/80	SYSTEM							744			

EPA UTILITY FGD SURVEY: OCTOBER - DECEMBER 1980

MONTANA POWER: COLSTRIP 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	PERFORMANCE DATA % REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR

** PROBLEMS/SOLUTIONS/COMMENTS

INFORMATION FOR THE FOURTH QUARTER 1980 IS NOT AVAILABLE AT THIS TIME.

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	MONTANA POWER	
PLANT NAME	COLSTRIP	
UNIT NUMBER	2	
CITY	COLSTRIP	
STATE	MONTANA	
REGULATORY CLASSIFICATION	B	
PARTICULATE EMISSION LIMITATION - NG/J	43.	(.100 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	516.	(1.200 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	664	
GROSS UNIT GENERATING CAPACITY - MW	360	
NET UNIT GENERATING CAPACITY W/FGD - MW	332	
NET UNIT GENERATING CAPACITY WO/FGD - MW	344	
EQUIVALENT SCRUBBED CAPACITY - MW	360	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	COMBUSTION ENGINEERING	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	674.82	(1430000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	143.9	(291 F)
STACK HEIGHT - M	152.	(500 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	5.0	(16.5 FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	SUBBITUMINOUS	
AVERAGE HEAT CONTENT - J/G	20569.	(8843 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		8,162-8,8967
AVERAGE ASH CONTENT - %	8.60	
RANGE ASH CONTENT - %	6.1-12.6	
AVERAGE MOISTURE CONTENT - %	23.90	
RANGE MOISTURE CONTENT - %	21.6-28.8	
AVERAGE SULFUR CONTENT - %	.77	
RANGE SULFUR CONTENT - %	0.4-1.0	
AVERAGE CHLORIDE CONTENT - %	.01	
RANGE CHLORIDE CONTENT - %	******	
*** PARTICLE CONTROL		
** PARTICLE SCRUBBER		
NUMBER	3	
GENERIC TYPE	VENTURI TOWER	
SPECIFIC TYPE	VARIABLE-THROAT/TOP-ENTRY PLUMB BOB	
SUPPLIER	COMBUSTION EQUIPMENT ASSOCIATES	
DIMENSIONS - FT	15 DIA THROAT	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	AISI 1110	
LINER GENERIC MATERIAL	INORGANIC	
LINER SPECIFIC MATERIAL	ACID-RESISTANT BRICK & MORTAR	
GAS CONTACTING DEVICE TYPE	316 SS PLUMB BOB, CERAMIC NOZZLES	
NUMBER OF CONTACTING ZONES	1	
LIQUID RECIRCULATION RATE - LITER/S	415.8	(6600 GPM)
L/G RATIO - LITER/CU.M	2.0	(15.0 GAL/1000ACF)
PRESSURE DROP - KPA	4.2	(17.0 IN-H2O)
SUPERFICIAL GAS VELOCITY - M/S	61.0	(200.0 FT/S)
INLET GAS FLOW RATE - CU.M/S	224.9	(476667 ACFM)
INLET GAS TEMPERATURE - C	143.9	(291 F)
PARTICLE REMOVAL EFFICIENCY - %	99.5	
*** FGD SYSTEM		
** GENERAL DATA		
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT	
SO2 REMOVAL MODE	WET SCRUBBING	
PROCESS TYPE	LIME/ALKALINE FLYASH	
PROCESS ADDITIVES	NONE	
SYSTEM SUPPLIER	COMBUSTION EQUIP ASSOCIATES	

MONTANA POWER: COLSTRIP 2 (CONT.)

A-E FIRM	BECHTEL	
DEVELOPMENT LEVEL	FULL SCALE	
NEW/RETROFIT	NEW	
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.50	
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	60.00	
CURRENT STATUS	1	
COMMERCIAL START-UP	10/76	
INITIAL START-UP	5/76	
CONTRACT AWARDED	10/72	

** DESIGN AND OPERATING PARAMETERS

** ABSORBER

NUMBER	3	
GENERIC TYPE	COMBINATION	
SPECIFIC TYPE	VENTURI/SPRAY	
SUPPLIER	COMBUSTION EQUIP ASSOCIATES	
DIMENSIONS - FT	70.5 X 35 DIA.	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	AISI 1110	
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A	
LINER GENERIC MATERIAL	ORGANIC	
LINER SPECIFIC MATERIAL	GLASS FLAKE-FILLED POLYESTER,VINYL ESTER	
LINER MATERIAL TRADE NAME/COMMON TYPE	FLAKEGLASS,PLASITE	
GAS CONTACTING DEVICE TYPE	CLEAR WATER TRAY (KOCH VALVE TRAY)	
NUMBER OF CONTACTING ZONES	1	
LIQUID RECIRCULATION RATE - LITER/S	479.	(7600 GPM)
L/G RATIO - L/CU.M	2.4	(18.0 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	.1	(.5 IN-H2O)
SUPERFICAL GAS VELOCITY - M/SEC	2.7	(8.7 FT/S)
INLET GAS FLOW - CU. M/S	201.31	(426600 ACFM)
INLET GAS TEMPERATURE - C	48.9	(120 F)
SO2 REMOVAL EFFICIENCY - %	60.0	
PARTICLE REMOVAL EFFICENCY - %	99.5	

** MIST ELIMINATOR

PRE-MIST ELIMINATOR/MIST ELIMINATOR	MIST ELIMINATOR	
NUMBER PER SYSTEM	1	
GENERIC TYPE	IMPINGEMENT	
SPECIFIC TYPE	BAFFLE	
TRADE NAME/COMMON TYPE	CHEVRON VANE	
CONFIGURATION	HORIZONTAL	
NUMBER OF STAGES	1	
NUMBER OF PASSES PER STAGE	4	
FREEBOARD DISTANCE - M	3.96	(13.0 FT)
DISTANCE BETWEEN STAGES - CM	2.54	(1.0 IN)
DISTANCE BETWEEN VANES - CM	2.5	(1.00 IN)
VANE ANGLES - DEGREES	120	
PRESSURE DROP - KPA	.6	(2.3 IN-H2O)
SUPERFICAL GAS VELOCITY - M/S	2.7	(8.7 FT/S)
CONSTRUCTION MATERIAL GENERIC TYPE	NORYL PLASTIC	
WASH WATER SOURCE	POND OVERFLOW, RIVER WATER AND FRESH WATER	

** REHEATER

NUMBER	3	
GENERIC TYPE	IN-LINE	
SPECIFIC TYPE	STEAM	
TEMPERATURE INCREASE - C	10.0	(50 F)
INLET FLUE GAS FLOW RATE - CU. M/S	201.31	(426600 ACFM)
INLET FLUE GAS TEMPERATURE - C	48.9	(120 F)
CONSTRUCTION MATERIAL GENERIC TYPE	INLET INCONEL 625/OUTLET HASTELLOY G	

** FANS

NUMBER	6	
FUNCTION	BALANCED DRAFT	
APPLICATION	INDUCED DRAFT	
SERVICE	DRY	
FLUE GAS FLOW RATE - CU.M/S	223.21	(473000 ACFM)
FLUE GAS TEMPERATURE - C	76.7	(170 F)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL IMPELLER, RUBBER-LINED HOUSING	

MONTANA POWER: COLSTRIP 2 (CONT.)

** DUCTWORK	
LOCATION	SCRUBBER INLET
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
LINER GENERIC MATERIAL TYPE	NONE
** DUCTWORK	
LOCATION	SCRUBBER TO REHEATER AND REHEATER TO STACK
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
LINER GENERIC MATERIAL TYPE	HEIL FLAKEGLASS
** TANKS	
SERVICE	NUMBER
-------	------
VENTURI/ABSORBER RECYCLE TANK	3
** PUMPS	
SERVICE	NUMBER
-------	------
VENTURI RECIRCULATION	6
ABSORBER RECIRCULATION	6

*** SLUDGE

** DISPOSAL	
NATURE	INTERIM
TYPE	DIKED LINED POND
LOCATION	ON SITE
SITE TRANSPORTATION METHOD	PUMPED
SITE DIMENSIONS	20 FT. DEEP
SITE CAPACITY - CU.M	635960 (520.0 ACRE-FT)
SITE SERVICE LIFE - YRS	10
** DISPOSAL	
NATURE	INTERIM
TYPE	DIKED LINED POND
LOCATION	ON SITE
SITE TRANSPORTATION METHOD	PUMPED
SITE DIMENSIONS	20 FT. DEEP
SITE CAPACITY - CU.M	635960 (520.0 ACRE-FT)
** DISPOSAL	
NATURE	FINAL
TYPE	POND
LOCATION	OFF SITE
SITE TRANSPORTATION METHOD	PUMPED
SITE DIMENSIONS	20 FT. DEEP
SITE CAPACITY - CU.M	2590314 (2118.0 ACRE-FT)
SITE SERVICE LIFE - YRS	18
** PROCESS CONTROL AND INSTRUMENTATION	
CHEMICAL PARAMETERS	PH
CONTROL LEVELS	4.0 TO 5.0
MONITOR LOCATION	RECIRCULATION TANK
PROCESS CONTROL MANNER	MANUAL
PROCESS CHEMISTRY MODE	FEEDBACK
** WATER BALANCE	
WATER LOOP TYPE	CLOSED
EVAPORATION WATER LOSS - LITER/S	18.9 (300 GPM)
POND SEEPAGE/RUNOFF WATER LOSS - LITERS/S	0
MAKEUP WATER ADDITION - LITERS/S	23.3 (370 GPM)
** FGD SPARE CAPACITY INDICES	
ABSORBER - %	20.0
** FGD SPARE COMPONENT INDICES	
ABSORBER	.5

EPA UTILITY FGD SURVEY: OCTOBER - DECEMBER 1980

MONTANA POWER: COLSTRIP 2 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
				PERFORMANCE DATA							
5/76	SYSTEM	100.0						744	72		1.3
6/76	SYSTEM	99.7						720	384		23.2
7/76	SYSTEM	98.7						744	312		19.5
8/76	SYSTEM	95.8						744	240		13.0
9/76	SYSTEM	98.3						720	720		64.6
10/76	SYSTEM	90.3						744	744		77.0
11/76	SYSTEM	94.1						720	720		79.7
12/76	SYSTEM	92.5						744	744		82.3
1/77	SYSTEM	83.4						744	720		68.2
2/77	SYSTEM	93.8						672	648		75.3
3/77	SYSTEM	96.7						744	672		71.3
4/77	SYSTEM	84.5						720	696		68.2
5/77	SYSTEM	63.0						744	312		23.3
6/77	SYSTEM	87.8						720	672		61.4
7/77	SYSTEM	90.6						744	672		57.5
8/77	SYSTEM	81.0						744			
9/77	SYSTEM	89.8						720			
10/77	SYSTEM	77.0						744			

** PROBLEMS/SOLUTIONS/COMMENTS

THE 77% OCTOBER AVAILABILITY FOR THIS SYSTEM INCLUDES NON-AVAILABLE HOURS DURING A BOILER OUTAGE. SCRUBBER MAINTENANCE WAS PERFORMED FOR PART OF THIS OUTAGE TIME. THE FIGURE COMES TO 98.1% WHEN THE BOILER OUTAGE OUTAGE TIME IS EXCLUDED FROM THE AVERAGING PERIOD.

11/77	SYSTEM	98.0						720			
12/77	SYSTEM	98.4						744			
1/78	SYSTEM	97.3						744			
2/78	SYSTEM	94.5						672			
3/78	SYSTEM	89.1						744			

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER WAS SHUT DOWN FOR AN ANNUAL OVERHAUL ON APRIL 18.

THE UTILITY REPORTED AN AVAILABILITY OF 89.1% FOR MARCH BASED ON 17 DAYS OF OPERATION BEFORE THE UNIT SHUTDOWN FOR THE ANNUAL BOILER OVERHAUL. IF THE SCRUBBING SYSTEM IS ASSUMED TO BE AVAILABLE, I.E. NOT UNDERGOING MAJOR REPAIRS DURING THE BOILER OVERHAUL, THE AVAILABILITY COMES TO 93.8%.

4/78	SYSTEM	86.9						720			

MONTANA POWER: COLSTRIP 2 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
		PERFORMANCE DATA									
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UTILITY REPORTED AN AVAILABILITY OF 86.9% FOR APRIL BASED ON EIGHT DAYS OF OPERATION AFTER THE UNIT SHUTDOWN FOR THE ANNUAL BOILER OVERHAUL. IF THE SCRUBBING SYSTEM IS ASSUMED TO BE AVAILABLE, I.E. NOT UNDERGOING MAJOR REPAIRS DURING THE BOILER OVERHAUL, THE AVAILABILITY COMES TO 96.5%.									
5/78	SYSTEM	99.1						744			
6/78	SYSTEM	97.4						720			
7/78	SYSTEM	96.4						744			
8/78	SYSTEM	99.0				.0		744	0	0	
9/78	SYSTEM	94.0				.0		720	0	0	
10/78	SYSTEM	99.0				.0		744	0	0	
11/78	SYSTEM	99.0				.0		720	0	0	
12/78	SYSTEM	91.2						744			
1/79	SYSTEM	94.3						744			
2/79	SYSTEM	98.3						672			
3/79	SYSTEM	94.3						744			
4/79	SYSTEM	100.0						720			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING APRIL THE UNIT WAS BEING OVERHAULED. THE AVAILABILITY FOR THIS TIME IS BASED UPON OPERATIONS BEFORE AND AFTER THE OVERHAUL.									
5/79	SYSTEM	94.4						744			
6/79	SYSTEM	98.4						720			
7/79	SYSTEM	96.4						744			
8/79	SYSTEM	99.3						744			
9/79	SYSTEM	92.3						720			
10/79	SYSTEM	92.9						744			
11/79	SYSTEM	98.4						720			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE ROUTINE MAINTENANCE CAN BE PERFORMED WHILE THE MODULES ARE ON LINE SO THE AVAILABILITY REMAINS HIGH.									
12/79	SYSTEM	95.8						744			
1/80	SYSTEM	92.7						744			
2/80	SYSTEM	98.1						696			
3/80	SYSTEM	98.2						744			

MONTANA POWER: COLSTRIP 2 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
		PERFORMANCE DATA									
	** PROBLEMS/SOLUTIONS/COMMENTS										
		TOTAL FGD SYSTEM AVAILABILITY CONTINUES TO BE HIGH WITH NO MAJOR PROBLEMS REPORTED FOR THE FIRST QUARTER OF 1980.									
4/80	SYSTEM							720			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		NO AVAILABILITY DATA WERE REPORTED BY THE UTILITY BECAUSE OF A BOILER AND FGD SYSTEM OUTAGE THAT WAS SCHEDULED FOR ROUTINE MAINTENANCE.									
5/80	SYSTEM	93.5						744			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		NO MAJOR PROBLEMS WITH THE FGD SYSTEM WERE REPORTED BY THE UTILITY DURING MAY.									
6/80	SYSTEM	96.0						720			
7/80	SYSTEM	99.7						744			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		NO MAJOR PROBLEMS WERE ENCOUNTERED DURING THE JUNE-JULY PERIOD.									
8/80	SYSTEM	96.2						744			
9/80	SYSTEM	90.5						720			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE MONTHS OF AUGUST AND SEPTEMBER.									
10/80	SYSTEM							744			
11/80	SYSTEM							720			
12/80	SYSTEM							744			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		INFORMATION FOR THE FOURTH QUARTER 1980 IS NOT AVAILABLE AT THIS TIME.									

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	NEVADA POWER	
PLANT NAME	REID GARDNER	
UNIT NUMBER	1	
CITY	MOAPA	
STATE	NEVADA	
REGULATORY CLASSIFICATION	B	
PARTICULATE EMISSION LIMITATION - NG/J	43.	(.100 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	516.	(1.200 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	111	
GROSS UNIT GENERATING CAPACITY - MW	125	
NET UNIT GENERATING CAPACITY W/FGD - MW	110	
NET UNIT GENERATING CAPACITY WO/FGD - MW	*****	
EQUIVALENT SCRUBBED CAPACITY - MW	125	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	FOSTER WHEELER	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	223.21	(473000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	176.7	(350 F)
STACK HEIGHT - M	61.	(200 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	3.8	(12.6 FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	BITUMINOUS	
AVERAGE HEAT CONTENT - J/G	28959.	(12450 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		11500-12500
AVERAGE ASH CONTENT - %	8.00	
RANGE ASH CONTENT - %	8.-10.	
AVERAGE MOISTURE CONTENT - %	5.50	
RANGE MOISTURE CONTENT - %	5.5	
AVERAGE SULFUR CONTENT - %	.50	
RANGE SULFUR CONTENT - %	0.5-1.0	
AVERAGE CHLORIDE CONTENT - %	.05	
RANGE CHLORIDE CONTENT - %	******	
*** PARTICLE CONTROL		
** MECHANICAL COLLECTOR		
TYPE	MULTICLONES	
SUPPLIER	RESEARCH-COTTRELL	
PARTICLE REMOVAL EFFICENCY -%	75.0	
** PARTICLE SCRUBBER		
NUMBER	1	
GENERIC TYPE	VENTURI TOWER	
SPECIFIC TYPE	FIXED-THROAT	
SUPPLIER	ADL/COMBUSTION EQUIP ASSOCIATES	
DIMENSIONS - FT	1.5 DIA. X 18 LONG AT THROAT	
SHELL GENERIC MATERIAL	CARBON STEEL, HIGH ALLOY	
SHELL SPECIFIC MATERIAL	AISI 1110, AUSTENITIC	
LINER GENERIC MATERIAL	NONE, ORGANIC	
LINER SPECIFIC MATERIAL	N/A, RUBBER	
GAS CONTACTING DEVICE TYPE	TWIN VARIABLE THROATS	
NUMBER OF CONTACTING ZONES	1	
LIQUID RECIRCULATION RATE - LITER/S	157.5	(2500 GPM)
L/G RATIO - LITER/CU.M	1.3	(10.0 GAL/1000ACF)
PRESSURE DROP - KPA	4.6	(18.5 IN-H2O)
SUPERFICIAL GAS VELOCITY - M/S	50.3	(165.0 FT/S)
INLET GAS FLOW RATE - CU.M/S	223.2	(473000 ACFM)
INLET GAS TEMPERATURE - C	176.7	(350 F)
PARTICLE REMOVAL EFFICIENCY - %	97.0	
*** FGD SYSTEM		

EPA UTILITY FGD SURVEY: OCTOBER - DECEMBER 1980

NEVADA POWER: REID GARDNER 1 (CONT.)

** GENERAL DATA	
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT
SO2 REMOVAL MODE	WET SCRUBBING
PROCESS TYPE	SODIUM CARBONATE
PROCESS ADDITIVES	NONE
SYSTEM SUPPLIER	COMBUSTION EQUIP ASSOCIATES
A-E FIRM	BECHTEL
DEVELOPMENT LEVEL	FULL SCALE
NEW/RETROFIT	RETROFIT
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	97.00
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	90.00
CURRENT STATUS	1
COMMERCIAL START-UP	4/74
INITIAL START-UP	3/74
CONTRACT AWARDED	7/71
** DESIGN AND OPERATING PARAMETERS	
** ABSORBER	
NUMBER	1
GENERIC TYPE	TRAY TOWER
SPECIFIC TYPE	SIEVE TRAY
SUPPLIER	COMBUSTION EQUIP ASSOCIATES
DIMENSIONS - FT	30 DIA.
SHELL GENERIC MATERIAL	CARBON STEEL
SHELL SPECIFIC MATERIAL	AISI 1110
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A
LINER GENERIC MATERIAL	ORGANIC
LINER MATERIAL TRADE NAME/COMMON TYPE	RUBBER
GAS CONTACTING DEVICE TYPE	SINGLE SIEVE TRAY WITH 3/16 IN HOLES
NUMBER OF CONTACTING ZONES	1
LIQUID RECIRCULATION RATE - LITER/S	38. (600 GPM)
L/G RATIO - L/CU.M	.2 (1.6 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	.7 (3.0 IN-H2O)
SUPERFICAL GAS VELOCITY - M/SEC	3.4 (11.0 FT/S)
** MIST ELIMINATOR	
PRE-MIST ELIMINATOR/MIST ELIMINATOR	MIST ELIMINATOR
NUMBER PER SYSTEM	1
GENERIC TYPE	CENTRIFUGAL
SPECIFIC TYPE	RADIAL VANE
CONFIGURATION	HORIZONTAL
NUMBER OF STAGES	1
NUMBER OF PASSES PER STAGE	1
PRESSURE DROP - KPA	.1 (.5 IN-H2O)
CONSTRUCTION MATERIAL GENERIC TYPE	316L SS (BOTH ME AND WASH TRAY)
** REHEATER	
GENERIC TYPE	INDIRECT HOT AIR
SPECIFIC TYPE	EXTERNAL HEAT EXCHANGER
TRADE NAME/COMMON TYPE	STEAM TUBE BUNDLES
TEMPERATURE INCREASE - C	10.0 (50 F)
INLET FLUE GAS TEMPERATURE - C	48.3 (119 F)
NUMBER OF TUBES PER BUNDLE	24
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL
** FANS	
NUMBER	1
SUPPLIER	BUFFALO FORGE
FUNCTION	BALANCED DRAFT
APPLICATION	FORCED DRAFT
SERVICE	DRY
FLUE GAS FLOW RATE - CU.M/S	223.21 (473000 ACFM)
FLUE GAS TEMPERATURE - C	176.7 (350 F)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL
** DUCTWORK	
LOCATION	SCRUBBER INLET
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
LINER GENERIC MATERIAL TYPE	NONE

NEVADA POWER: REID GARDNER 1 (CONT.)

** DUCTWORK

LOCATION	SCRUBBER OUTLET
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
LINER GENERIC MATERIAL TYPE	PLASITE 4004-S

** TANKS

SERVICE	NUMBER
VENTURI RECYCLE	1

** PUMPS

SERVICE	NUMBER
SCRUBBER RECIRCULATION	3
ABSORBER RECIRCULATION	3

*** SLUDGE

** DISPOSAL

NATURE	INTERIM
TYPE	LINED POND
LOCATION	ON SITE

** DISPOSAL

NATURE	FINAL
TYPE	LINED POND
LOCATION	ON SITE
SITE TRANSPORTATION METHOD	GRAVITY FLOW FROM INTERIM SLUDGE POND

** WATER BALANCE

WATER LOOP TYPE	CLOSED
MAKEUP WATER ADDITION - LITERS/S	9.8 (155 GPM)

** FGD SPARE CAPACITY INDICES

ABSORBER - %	.0

** FGD SPARE COMPONENT INDICES

ABSORBER	.0

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
4/74	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

THE SYSTEM WAS FIRST PLACED IN SERVICE IN APRIL 1974. THE SCRUBBING UNIT DESIGN WAS BASED ON INFORMATION AND DATA OBTAINED FROM AN 8000-ACFM PILOT PLANT PROGRAM CONDUCTED AT REID GARDNER STATION IN 1971 AND 1972.

5/74	SYSTEM							744			
6/74	SYSTEM							720			
7/74	SYSTEM							744			
8/74	SYSTEM							744			
9/74	SYSTEM							720			
10/74	SYSTEM							744			
11/74	SYSTEM							720			
12/74	SYSTEM							744			

NEVADA POWER: REID GARDNER 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE FGD SYSTEM HAS PERFORMED ACCEPTABLY SINCE START UP IN APRIL 1974. SYSTEM AVAILABILITY HAS BEEN GREATER THAN 90% AND OPERATIONS HAVE ONLY BEEN INTERRUPTED BY LACK OF TRONA. SO2 REMOVAL EFFICIENCY HAS BEEN APPROXIMATELY 85%. BECAUSE OF A COAL STRIKE THE BOILER ONLY OPERATED ABOUT TWO WEEKS IN NOVEMBER AND DURING THOSE TWO WEEKS IT OPERATED AT LOW LOAD. DELIVERY OF TRONA WAS SUFFICIENT TO MAINTAIN FGD SYSTEM OPERATION. THERE ARE NO OUTSTANDING MECHANICAL OR PROCESS PROBLEMS.								
1/75	SYSTEM		65.0					744			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		FROZEN SODIUM CARBONATE FEED LINES ACCOUNTED FOR MOST OF THE JANUARY OUTAGE TIME. THE FGD SYSTEM HAS BEEN OPERATING WITH TRONA SUPPLEMENTED BY SODIUM CARBONATE BRINE.									
2/75	SYSTEM		95.0					672			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		A 2-DAY LACK OF CHEMICALS RESULTED IN OUTAGE TIME DURING FEBRUARY.									
3/75		100.0	100.0								
	SYSTEM							744			
4/75	SYSTEM	100.0	100.0					720			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE BOILER WAS SHUT DOWN APRIL 13 FOR ROUTINE MAINTENANCE. THE UNIT IS SCHEDULED TO BE BACK IN SERVICE IN EARLY MAY.									
5/75	SYSTEM							744			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE BOILER AND FGD SYSTEM WERE PLACED BACK IN SERVICE ON MAY 12.									
		THE UTILITY REPORTED THAT A HIGH ASH CONTENT OF UP TO 20% BY WEIGHT OF THE COAL BURNED RECENTLY HAD NO EFFECT ON EMISSIONS.									
		THE UTILITY REPORTED PROBLEMS WITH ABRASION OF THE PIPING RUBBER LINING AND ROUTINE MECHANICAL PROBLEMS.									
		INSTRUMENTATION PROBLEMS WERE ENCOUNTERED OVER THE APRIL-MAY PERIOD.									
6/75	SYSTEM							720			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		ROUTINE MECHANICAL PROBLEMS CONTINUED THROUGH JUNE.									
		MINOR INSTRUMENTATION PROBLEMS CONTINUED THROUGH JUNE.									
		THE UTILITY HAS REPORTED THAT A SECOND PERFORMANCE TEST WAS RECENTLY COMPLETED AND PASSED.									
7/75	SYSTEM		85.0					744			
8/75	SYSTEM							744			
9/75	SYSTEM		78.1		77.6			720	716	559	

NEVADA POWER: REID GARDNER 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
		FOUR FORCED OUTAGES OCCURED DURING SEPTEMBER. THREE OF THE FOUR WERE SCRUBBER-RELATED. DETAILS WERE NOT AVAILABLE FROM THE UTILITY.									
10/75	SYSTEM		35.0		14.0			744	303		106
	** PROBLEMS/SOLUTIONS/COMMENTS										
		LOW OPERATING TIME DURING OCTOBER WAS DUE TO SCHEDULED BOILER MAINTENANCE.									
		ONE OUTAGE WAS DUE TO THE MALFUNCTION OF A SODA ASH BLOWER.									
11/75	SYSTEM		60.3		54.7			720	654		394
	** PROBLEMS/SOLUTIONS/COMMENTS										
		OPERABILITY WAS LOW FOR THE MONTH OF NOVEMBER BECAUSE OF DELAYS IN THE DELIVERY OF REPAIR MATERIALS.									
12/75	SYSTEM							744			
1/76	SYSTEM	26.7	30.6	30.6	26.7			744	647		198
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE COLLAPSE OF A VENTURI STRAINER RESULTED IN FGD SYSTEM OUTAGE DURING JANUARY.									
		REHEATER STEAM LEAKS CAUSED AN OUTAGE DURING JANUARY. REPAIRS COULD NOT BE MADE WITH THE BOILER IN SERVICE.									
		A FROZEN CARBONATE LINE RESULTED IN AN FGD SYSTEM OUTAGE DURING JANUARY.									
		THE SYSTEM WAS SHUT DOWN FOR 16 DAYS IN JANUARY FOR COMPLETION OF PIPING CONVERSION. THIS OUTAGE WAS NOT DUE TO A SCRUBBER MALFUNCTION.									
2/76	SYSTEM	89.3	74.6	80.7	71.2			696	664		496
	** PROBLEMS/SOLUTIONS/COMMENTS										
		A DEPLETION OF CHEMICALS DURING FEBRUARY ACCOUNTED FOR NEARLY 44 HOURS OF SCRUBBER OUTAGE TIME.									
		FIVE SCRUBBER INOPERATIVE PERIODS WERE REPORTED DURING FEBRUARY. THREE OF THESE OUTAGES WERE NOT RELATED TO THE FGD SYSTEM.									
		SEAL WATER PROBLEMS WERE REPORTED DURING FEBRUARY.									
		CHEMICAL LINE PLUGGING PROBLEMS WERE NOTED DURING FEBRUARY.									
3/76	SYSTEM	99.2	71.9	99.2	38.5			744	398		287
	** PROBLEMS/SOLUTIONS/COMMENTS										
		ONE FORCED SCRUBBER OUTAGE WAS CAUSED BY A VENTURI LEAK.									
4/76	SYSTEM	100.0	91.1	100.0	13.4			720	106		97

NEVADA POWER: REID GARDNER 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
				THE BOILER WAS TAKEN OUT OF SERVICE IN APRIL FOR INSPECTION OF VALVES AND COAL CONDUITS.							
5/76	SYSTEM	100.0			.0			744	0	0	
6/76	SYSTEM	100.0			.0			720	0	0	
7/76	SYSTEM	100.0			.0			744	0	0	
	** PROBLEMS/SOLUTIONS/COMMENTS										
				THE UNIT WAS SHUT DOWN FOR A SCHEDULED TURBINE OVERHAUL AND BURNER LINE CONDUIT REPLACMENT THROUGH MAY, JUNE, AND JULY.							
8/76	SYSTEM	96.6	65.7	93.3	46.9			744	531	349	
	** PROBLEMS/SOLUTIONS/COMMENTS										
				TURBINE VIBRATION CHECKS CONTINUED THROUGH AUGUST 8. THE SCRUBBER WAS NOT OPERATED UNTIL AUGUST 12.							
				PLUGGING IN THE THICKNER CAUSED AN OUTAGE DURING AUGUST.							
				PLUGGING IN THE TRAY RECYCLE TANK DURING AUGUST RESULTED IN AN FGD OUTAGE.							
9/76	SYSTEM	96.6	96.4	96.4	91.3			720	681	656	
	** PROBLEMS/SOLUTIONS/COMMENTS										
				BOILER-RELATED PROBLEMS ACCOUNTED FOR APPROXIMATELY 40 HOURS OF THE FGD SYSTEM DOWNTIME IN SEPTEMBER.							
				PLUGGING IN THE VENTURI SPRAY HEADERS CAUSED A SCRUBBER OUTAGE.							
				AN ID FAN MALFUNCTION RESULTED IN SCRUBBER OUTAGE DURING SEPTEMBER.							
10/76	SYSTEM	97.9	96.5	97.7	87.9			744	678	654	
	** PROBLEMS/SOLUTIONS/COMMENTS										
				THE BOILER WAS OUT OF SERVICE FOR 75 HOURS IN OCTOBER TO REPLACE A BURNER.							
				SCRUBBER OUTAGE TIME WAS REQUIRED FOR INSTALLATION OF A NEW CARBONATE FEED LINE.							
				A MINOR SCRUBBER TRIP WAS CAUSED BY PLUGGING IN THE SCRUBBER EFFLUENT SUCTION LINE.							
11/76	SYSTEM	86.5	84.2	84.8	75.3			720	644	542	
	** PROBLEMS/SOLUTIONS/COMMENTS										
				ONE 97 HOUR SCRUBBER OUTAGE OCCURED BECAUSE OF A SCREW CONVEYOR FAILURE, RESULTING IN AN INABILITY TO MIX THE CHEMICAL ABSORBENT.							
12/76	SYSTEM	92.8	90.6	91.9	82.1			744	675	611	

NEVADA POWER: REID GARDNER 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
		PERFORMANCE DATA									
	** PROBLEMS/SOLUTIONS/COMMENTS										
		BOILER RELATED PROBLEMS ACCOUNTED FOR 79 HOURS OF THE DECEMBER OUTAGE TIME.									
		A FORCED FGD OUTAGE RESULTED FROM CHEMICAL DEPLETION.									
		A PLUGGED SENSING LINE FORCED AN FGD OUTAGE DURING DECEMBER.									
1/77	SYSTEM	68.4	62.8	63.9	56.0			744	663	416	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		RUBBER LINING REPAIRS WERE INITIATED IN THE SEPARATOR SECTION OF THE SCRUBBING MODULE ON JANUARY 22. THE LINING WAS DAMAGED BY A HIGH TEMPERATURE EXCURSION RESULTING FROM A MALFUNCTION IN THE BOILER AIR PREHEATER.									
2/77	SYSTEM	.0	.0	.0	.0			672	599	0	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		RUBBER LINING WORK CONTINUED ON THE SCRUBBER DURING FEBRUARY. THE BOILER WAS DOWN PART OF THE PERIOD BECAUSE OF A STRIKE.									
3/77	SYSTEM	.0	.0	.0	.0			744	669	0	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		SCRUBBER RUBBER LINING REPAIRS CONTINUED.									
4/77	SYSTEM	.0	.0	.0	.0			720	400	0	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		SCRUBBER RUBBER LINING REPAIRS CONTINUED.									
5/77	SYSTEM	.0	.0	.0	.0			744	705	0	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		SCRUBBER RUBBER LINING REPAIRS CONTINUED.									
6/77	SYSTEM	47.1	48.4	48.4	47.1			720	701	339	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		REPAIRS ON THE DAMAGED RUBBER LINING WERE COMPLETED BY MID-JUNE AND THE SYSTEM REMAINED IN SERVICE THROUGHOUT THE MAJORITY OF THE MONTH.									
		A MINOR FORCED OUTAGE RESULTED FROM A HIGH-LOW PRESSURE TRIP CAUSED BY A PLUGGED SENSING LINE.									
7/77	SYSTEM	99.5	99.5	99.5	99.5			744	744	740	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE SYSTEM WAS TAKEN OUT OF THE GAS PATH ONLY ONCE DURING THE MONTH BECAUSE OF A SCHEDULED INSPECTION OF THE NEWLY REPLACED RUBBER LINER IN THE SCRUBBER SEPARATOR SECTION.									
8/77	SYSTEM	13.8	15.5	15.5	13.8			744	662	102	

NEVADA POWER: REID GARDNER 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
				PERFORMANCE DATA							
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE SCRUBBER WAS OUT OF SERVICE MOST OF AUGUST FOR ID FAN VIBRATION PROBLEMS.									
		INSTALLATION OF ID FAN RELAYS ACCOUNTED FOR SOME DOWNTIME DURING AUGUST.									
9/77	SYSTEM	84.4	73.4	69.3	35.0			720	344	252	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE BOILER WAS OUT OF SERVICE FOR MOST OF SEPTEMBER FOR NON-SCRUBBER RELATED PROBLEMS.									
		THE SCRUBBER HAD LIMIT SWITCH PROBLEMS WITH 14 A & B GULLOTINE DAMPERS.									
10/77	SYSTEM	99.3	94.4	99.2	84.7			744	668	630	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UNIT WAS DOWN FOR FIVE HOURS DURING OCTOBER TO REPAIR AN ID FAN LEAK.									
11/77	SYSTEM	78.7	81.5	81.5	78.1			720	690	562	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		SCREEN PLUGGING IN THE RECYCLE TANK WAS A PROBLEM DURING NOVEMBER.									
		SCRUBBER INSTRUMENTATION DIFFICULTY WAS EXPERIENCED DURING NOVEMBER.									
		THE SYSTEM WAS DOWN FOR THE INSTALLATION OF AN OUTLET NOZZLE IN THE BOOSTER TANK.									
12/77	SYSTEM	85.4	80.6	82.8	70.2			744	648	522	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE SCRUBBER WAS OFF-LINE FOR APPROXIMATELY 109 HOURS DUE TO HIGH TRAY DIFFERENTIAL PRESSURE AND SOME PLUGGING IN THE ID FAN SENSING LINE.									
		THE BOILER WAS DOWN ABOUT 113 HOURS IN DECEMBER FOR NON-SCRUBBER RELATED PROBLEMS.									
1/78	SYSTEM	67.7	67.5	67.5	55.9			744	616	416	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		TWO OUTAGES WERE CAUSED BY PROBLEMS RELATED TO HIGH TRAY DIFFERENTIAL PRESSURES.									
		ELECTRICAL PROBLEMS IN THE 1A FORCED DRAFT FAN CAUSED AN FGD SYSTEM OUTAGE.									
		AIR PRESSURE FAILURE TO AN ID FAN DAMPER ACCOUNTED FOR SOME JANUARY DOWNTIME.									
2/78	SYSTEM	97.4	74.9	94.3	43.4			672	389	292	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		A DUCT HI-LO PRESSURE TRIP CONTRIBUTED TO THE FEBRUARY OUTAGE TIME.									
		THE BOILER WENT OUT OF SERVICE ON FEBRUARY 17 FOR A THREE WEEK OUTAGE.									

NEVADA POWER: REID GARDNER 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
				PERFORMANCE DATA							
			PLUGGED SENSING LINES CONTRIBUTED TO THE OUTAGE TIME DURING FEBRUARY.								
3/78	SYSTEM	76.2	58.3	58.3	27.8			744	355	207	
	** PROBLEMS/SOLUTIONS/COMMENTS										
			THE BOILER WAS OFF LINE UNTIL MARCH 16.								
			A PROBLEM WAS ENCOUNTERED WITH THE REHEAT STEAM REGULATOR DURING MARCH.								
			PROBLEMS WITH THE GUILLOTINE SWITCHES DELAYED START-UP OF THE FGD SYSTEM UNTIL MARCH 22.								
4/78	SYSTEM	100.0	96.7	100.0	75.2			720	560	541	
	** PROBLEMS/SOLUTIONS/COMMENTS										
			THERE WERE NO FGD SYSTEM FORCED OUTAGES. ALL DOWNTIME WAS BOILER RELATED (179 HOURS).								
5/78	SYSTEM	97.0	92.4	96.3	78.2			744	630	582	
	** PROBLEMS/SOLUTIONS/COMMENTS										
			THE REPAIRS TO THE CONDENSER AND PRODUCTION CONTROL CONTRIBUTED TO THE BOILER OUTAGES.								
			HIGH TEMPERATURE ON AN ID FAN BEARING CAUSED AN OUTAGE.								
6/78	SYSTEM	91.8	91.8	91.8	91.8			720	720	661	
	** PROBLEMS/SOLUTIONS/COMMENTS										
			A 31 HOUR OUTAGE WAS REQUIRED TO CHANGE THE OIL ON THE ID FAN.								
			A HIGH DUCT PRESSURE TRIP OCCURED DURING JUNE ACCOUNTING FOR SOME DOWNTIME.								
			OUTAGE TIME WAS REQUIRED TO CLEAN AN ABSORBER TRAY.								
7/78	SYSTEM	99.0	99.0	99.0	99.0			744	744	736	
	** PROBLEMS/SOLUTIONS/COMMENTS										
			FGD OUTAGE TIME WAS REQUIRED TO RECTIFY A HIGH TRAY DIFFERENTIAL PRESSURE PROBLEM. THE TRAY WAS CLEANED OUT DURING THE OUTAGE.								
8/78	SYSTEM	94.5	93.6	94.2	88.8			744	706	661	
	** PROBLEMS/SOLUTIONS/COMMENTS										
			THE SCRUBBER WAS FORCED OFF LINE ON AUGUST 5 BECAUSE OF A LOSS OF THE ASH PANEL CONTROL POWER. THIS LEFT THE UNIT WITHOUT EMERGENCY SPRAY TO THE SCRUBBERS.								
			A FORCED OUTAGE OCCURED ON AUGUST 20 WHEN THERE WAS A SCRUBBER VENTURI HIGH TEMPERATURE ALARM. THE EXACT CAUSE WAS NOT KNOWN BUT A BOILER TUBE LEAK WAS SUSPECTED.								
			THERE WAS ONE SCHEDULED OUTAGE DURING THE MONTH TO CLEAN AN ABSORBER TRAY.								
9/78	SYSTEM	99.3	97.2	99.2	86.9			720	644	626	

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
		PERFORMANCE DATA									
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THERE WERE THREE BOILER RELATED OUTAGES DURING SEPTEMBER. A BOILER TUBE LEAK AND BOILER BURNER WERE REPAIRED.									
		DURING THE MONTH A BOILER TRIP OCCURRED WHICH WAS CAUSED BY SCRUBBER HIGH DUCT PRESSURE. SCRUBBER PRESSURE SENSING LINES WERE CLEANED.									
10/78	SYSTEM	100.0	99.8	100.0	89.6			744	668	667	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE BOILER WAS OFF LINE FOR ABOUT 77 HOURS FOR REMOVAL OF AN ASH CLINKER.									
11/78	SYSTEM	90.4	88.9	89.9	84.7			720	686	610	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE FGD SYSTEM WAS DOWN FOR 9 HOURS TO REPAIR SCRUBBER OUTLET TEMPERATURE PROBES.									
		OUTAGE TIME RESULTED FROM BOILER BOTTOM HOPPER PROBLEMS. A HIGH TEMPERATURE TRIP AT THE VENTURI GAS OUTLET OCCURRED BECAUSE OF THE BOILER PROBLEMS.									
		SOME OUTAGE TIME RESULTED FROM A HIGH SCRUBBER EFFLUENT SOLIDS LEVEL.									
12/78	SYSTEM	95.6	92.8	95.4	92.0			744	738	685	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE SCRUBBING SYSTEM WAS OUT OF SERVICE TO REPAIR A LEAK IN A VENTURI LINE.									
		THE FGD SYSTEM WAS DOWN TO CLEAN THE VENTURI SPRAY COLLAR (RACE TRACK) AND CLEAN PRESSURE SENSING LINES.									
		THE BOILER WAS OFF LINE APPROXIMATELY ONE DAY FOR PULVERIZER REPAIRS.									
1/79	SYSTEM	83.9	73.7	80.8	67.5			744	682	502	73.7
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE BOILER WAS DOWN ABOUT FIVE DAYS TO REMOVE A CLINKER FROM THE BOTTOM HOPPER.									
		A 58 HOUR SCRUBBER OUTAGE WAS CAUSED WHEN A SCRUBBER POWER CIRCUIT TRIPPED RESULTING IN LOSS OF POWER TO TRAY SPRAY PUMP. REPAIRS WERE MADE ON THE TRAY AND SPRAY SYSTEMS.									
		THE FGD SYSTEM WAS DOWN FOR A SHORT PERIOD TO INSPECT THE ID FAN BEARINGS.									
		THE FGD SYSTEM WAS DOWN FOR 48 HOURS TO REPAIR A LEAK IN THE VENTURI LINE.									
2/79	SYSTEM	85.6	85.9	85.9	85.6			672	670	575	79.7
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE FGD SYSTEM WAS DOWN TO CLEAN THE VENTURI SPRAY COLLAR (RACE TRACK) NOZZLES, CLEAN THE EFFLUENT LINE AND REPAIR A LEAK IN THE VENTURI LINE.									
		A BREAK IN THE BOTTOM ASH CIRCULATING WATER LINE RESULTING IN LOSS OF EMERGENCY COOLING WATER FORCED THE FGD SYSTEM OFF LINE.									
3/79	SYSTEM	97.9	96.5	97.4	78.3			744	604	583	84.9

NEVADA POWER: REID GARDNER 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
					THE FGD SYSTEM WAS OFF TO UNPLUG VENTURI NOZZLES AND TO CLEAN SENSING LINES. THE DOWNTIME WAS ABOUT 15 HOURS.						
					THE FGD SYSTEM WAS OFF FOR ABOUT 146 HOURS FOR REPAIR OF BOILER TUBE LEAKS.						
4/79	SYSTEM	100.0	98.6	100.0	25.7			720	188	185	86.1
	** PROBLEMS/SOLUTIONS/COMMENTS										
					THE BOILER AND FGD SYSTEM WERE OFF FOR APPROXIMATELY 535 HOURS FOR SCHEDULED MAINTENANCE.						
5/79	SYSTEM	99.8	74.4	99.4	27.5			744	275	204	84.8
	** PROBLEMS/SOLUTIONS/COMMENTS										
					THE BOILER AND SCRUBBER WERE RETURNED TO SERVICE MAY 22 AFTER COMPLETING SCHEDULED MAINTENANCE.						
					THE BOILER WAS FORCED OUT OF SERVICE TO REPAIR A COAL LEAK ON THE #8 BURNER LINE.						
					THE SCRUBBER WAS OFF LINE APPROXIMATELY ONE HOUR TO CLEAN A RECYCLE TANK RETURN LINE.						
6/79	SYSTEM	97.9	95.2	97.6	84.7			720	641	610	86.9
	** PROBLEMS/SOLUTIONS/COMMENTS										
					A 94 HOUR OUTAGE WAS REQUIRED TO REPAIR A BOILER TUBE LEAK.						
					OUTAGE TIME WAS REQUIRED TO UNPLUG A VENTURI LINE.						
					TRAY SPRAY VALVES WERE REPLACED DURING JUNE.						
7/79	SYSTEM	82.1	80.5	81.0	80.3			744	742	597	85.7
	** PROBLEMS/SOLUTIONS/COMMENTS										
					THE BOILER AND FGD SYSTEM WAS FORCED OFF LINE DURING A TURBINE OVERSPEED GOVERNOR TEST. THE DOWNTIME WAS ABOUT SEVEN HOURS.						
					THE SCRUBBER WAS OFF ABOUT 67 HOURS TO CLEAN THE SCRUBBER TRAYS.						
					THE LOSS OF INSTRUMENT AIR TO THE SCRUBBER CONTROLS RESULTED FROM A SCRUBBER AIR COMPRESSOR POWER FAILURE. THE SCRUBBER WAS OFF-LINE FOR ABOUT 74 HOURS.						
8/79	SYSTEM	96.9	96.9	96.9	96.9			744	744	721	87.5
	** PROBLEMS/SOLUTIONS/COMMENTS										
					THE SCRUBBER WAS REMOVED FROM SERVICE TO CLEAN THE SCRUBBER PRESSURE SENSING LINES. THE SCRUBBER WAS DOWN FOR ABOUT 11 HOURS.						
					THE SCRUBBER WAS DOWN AT THE END OF THE MONTH AGAIN TO CLEAN THE PRESSURE SENSING LINE ON THE SCRUBBER. THE SCRUBBER WAS OFF LINE FOR ABOUT THREE HOURS.						
9/79	SYSTEM	100.0	100.0	100.0	53.2			720	383	383	88.5

NEVADA POWER: REID GARDNER 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE BOILER, TURBINE, AND SCRUBBER WERE SHUT DOWN FOR SCHEDULED MAINTENANCE ON SEPTEMBER 16.									
10/79	SYSTEM	79.6	58.2	71.0	49.9			744	545	372	85.8
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE SCRUBBER WAS OFF LINE WITH THE BOILER AND TURBINE FOR SCHEDULED MAINTENANCE THROUGH OCTOBER 8.									
		PLUGGING OF THE VENTURI AND EFFLUENT LINE CAUSED THREE OUTAGES DURING THE MONTH.									
		THE SCRUBBER WAS SHUT DOWN SO THAT REPAIRS COULD BE MADE TO THE ID FAN DAMPER.									
		THE SCRUBBER WAS SHUT DOWN BECAUSE OF A BOILER TURBINE PROBLEM.									
11/79	SYSTEM	99.4	96.8	99.4	88.2			720	656	635	87.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE SCRUBBER WENT OFF-LINE WITH THE BOILER TO REPAIR TURBINE POWER SWITCHES.									
		TWO OUTAGES DURING NOVEMBER WERE CAUSED BY A BOILER TUBE LEAK.									
		THE SCRUBBER WAS SHUT DOWN SO THAT THE VENTURI SPRAY COLLECTOR (RACE TRACK) NOZZLES COULD BE CLEANED.									
		TWICE DURING THE MONTH THE TURBINE TRIPPED CAUSING THE SECTION 1B BREAKER TO BE LOST. ON THE SECOND TRIP A COOLING TOWER FAN MOTOR SHORTED TO GROUND.									
12/79	SYSTEM	98.5	98.5	98.5	98.5			744	744	733	88.2
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING DECEMBER THE SCRUBBER WAS TAKEN OFF LINE TO REPAIR A MALFUNCTIONING VALVE ON THE EMERGENCY SPRAY SYSTEM.									
1/80	SYSTEM	100.0	100.0	100.0	100.0			744	744	744	100.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE BOILER AND FGD SYSTEM OPERATED THE ENTIRE MONTH OF JANUARY WITH NO OUTAGES.									
2/80	SYSTEM	100.0	100.0	100.0	100.0			696	696	696	100.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE BOILER AND FGD SYSTEM OPERATED THE ENTIRE MONTH OF FEBRUARY WITH NO OUTAGES.									
3/80	SYSTEM	93.8	83.3	84.4	33.6			744	300	250	97.0

NEVADA POWER: REID GARDNER 1 (CONT.)

PERIOD	MODULE	PERFORMANCE DATA AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
4/80	SYSTEM	97.3	96.4	96.8	82.7			720	618	596	97.5

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE FIRST OF MARCH THE FGD SYSTEM WAS OFF LINE FOR A SCHEDULED OVERHAUL.

THE FGD UNIT WAS FORCED DOWN ONCE TO REPAIR A VENTURI PUMP AND SIX OTHER TIMES DUE TO RESTRICTED VENTURI GAS FLOW.

5/80	SYSTEM	97.7	93.9	97.4	84.7			744	672	630	96.7

** PROBLEMS/SOLUTIONS/COMMENTS

LEAKS IN THE VENTURI LINE FORCED THE FGD SYSTEM OUT OF SERICE TWICE DURING APRIL.

A THERMOCOUPLE SHORTED OUT DUE TO HIGH VENTURI GAS OUTLET TEMPERATURES. THIS FORCED THE FGD SYSTEM OUT OF SERVICE FOR SEVERAL HOURS.

THE BOILER WAS OUT OF SERVICE FOR 117 HOURS DUE TO BOILER TUBE LEAKS.

6/80	SYSTEM	92.1	92.7	92.7	88.3			720	686	636	95.9

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS DOWN THREE TIMES IN MAY BECAUSE OF LOW FLOW THROUGH THE VENTURI.

A BOILER TRIP CAUSED THE FGD SYSTEM TO BE OUT APPROXIMATELY 97 HOURS.

7/80	SYSTEM	87.1	94.9	86.7	84.0			744	658	625	95.8

** PROBLEMS/SOLUTIONS/COMMENTS

THE NOZZLES IN THE VENTURI RACE TRACK HAD TO BE CLEANED SEVERAL TIMES THIS MONTH. TOTAL OUTAGE FOR THIS WAS APPROXIMATELY 48 HOURS.

THE FGD SYSTEM WAS FORCED OUT OF SERVICE WHEN THE EMERGENCY SPRAY SYSTEM FAILED.

THE FGD SYSTEM WAS OUT OF SERVICE TWICE DURING JUNE DUE TO BOILER OUTAGES.

8/80	SYSTEM	86.1	85.5	83.7	71.5			744	622	532	94.3

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS RETURNED TO SERVICE ON JULY 3, 1980 AFTER THE BOILER TRIPPED THE SYSTEM OFF LINE. THE GUILLOTINE DAMPER HAD TO BE REPAIRED BEFORE THE FGD SYSTEM COULD RETURN TO SERVICE.

THE FGD SYSTEM WAS OFF LINE FOR SEVERAL HOURS TO UNPLUG THE VENTURI TRAY AND RACETRACK. MAINTENANCE WORK WAS ALSO DONE ON THE VENTURI LINE.

A SCHEDULED BOILER OUTAGE CAUSED THE FGD SYSTEM TO BE OFF LINE FOR ONE DAY.

THE FGD SYSTEM WAS FORCED OUT OF SERVICE WHEN THE EMERGENCY SPRAY SYSTEM FAILED. THE ASH SLUICE PUMP SHAFT WAS REPAIRED DURING THIS TIME.

NEVADA POWER: REID GARDNER 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
		PERFORMANCE DATA									
9/80	SYSTEM	91.3	91.0	91.1	89.6			720	709	645	93.9
10/80	SYSTEM	98.2	97.6	97.9	93.0			744	708	692	
11/80	SYSTEM	100.0	100.0	100.0	36.3			720	262	262	
12/80	SYSTEM	80.7	77.4	74.8	52.5			744	505	391	

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS OUT OF SERVICE FOR ALMOST 60 HOURS FOR ROUTINE CLEANING AND MAINTENANCE.

LOSS OF EMERGENCY SPRAY KEPT THE FGD SYSTEM OFF LINE FOR SEVERAL HOURS.

BOILER RELATED OUTAGES CAUSED THE FGD SYSTEM NOT TO OPERATE FOR OVER 100 HOURS.

THE TRAY SPRAY PUMP BELTS WERE REPAIRED.

A DAMPER THAT FAILED TO CLOSE TRIPPED THE FGD SYSTEM OFF LINE DURING THE MONTH.

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WENT OFF LINE SEVERAL TIMES IN SEPTEMBER FOR ROUTINE CLEANING AND MAINTENANCE. THIS ROUTINE WORK INCLUDED CLEANING THE TRAYS AND REPAIRING VENTURI, ASH, AND EFFLUENT LINES.

A BOILER OUTAGE KEPT THE FGD SYSTEM OFF LINE FOR SEVERAL HOURS.

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS FORCED OUT OF SERVICE DUE TO A FAILURE OF THE ASH SLUICE SYSTEM WHICH LEAVES THE SYSTEM WITH NO FIRE PROTECTION.

REPAIRS TO THE ID FAN EXPANSION JOINT CAUSED APPROXIMATELY SEVEN HOURS OF OUTAGE TIME.

DURING NOVEMBER THE FGD SYSTEM WAS SHUTDOWN WITH THE BOILER FOR A SCHEDULED OUTAGE THAT LASTED SIX HOURS.

THE UNIT WAS FORCED OFF-LINE ONCE DURING THE MONTH FOR APPROXIMATELY TWO HOURS.

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM AND THE BOILER WERE SHUTDOWN ON NOVEMBER 11 FOR A SCHEDULED OVERHAUL.

** PROBLEMS/SOLUTIONS/COMMENTS

FORCED OUTAGE TIME DURING DECEMBER WAS CAUSED BY A VENTURI LINE LEAK, AND A POWER INTERRUPTION.

A SCHEDULED OUTAGE KEPT THE UNIT OFF LINE UNTIL DECEMBER 9. ANOTHER OUTAGE WAS SCHEDULED TO RESET THE ID FAN WHICH LASTED APPROXIMATELY TWO HOURS.

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	NEVADA POWER	
PLANT NAME	REID GARDNER	
UNIT NUMBER	2	
CITY	MOAPA	
STATE	NEVADA	
REGULATORY CLASSIFICATION	B	
PARTICULATE EMISSION LIMITATION - NG/J	43.	(.100 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	516.	(1.200 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	331	
GROSS UNIT GENERATING CAPACITY - MW	125	
NET UNIT GENERATING CAPACITY W/FGD - MW	110	
NET UNIT GENERATING CAPACITY WO/FGD - MW	*****	
EQUIVALENT SCRUBBED CAPACITY - MW	125	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	FOSTER WHEELER	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	223.21	(473000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	176.7	(350 F)
STACK HEIGHT - M	61.	(200 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	3.8	(12.6 FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	BITUMINOUS	
AVERAGE HEAT CONTENT - J/G	28959.	(12450 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		******
AVERAGE ASH CONTENT - %	8.00	
RANGE ASH CONTENT - %	8.-10.	
AVERAGE MOISTURE CONTENT - %	5.50	
RANGE MOISTURE CONTENT - %	5-6	
AVERAGE SULFUR CONTENT - %	.50	
RANGE SULFUR CONTENT - %	0.5-1.0	
AVERAGE CHLORIDE CONTENT - %	.05	
RANGE CHLORIDE CONTENT - %	******	
*** PARTICLE CONTROL		
** MECHANICAL COLLECTOR		
TYPE	MULTICLONES	
SUPPLIER	RESEARCH-COTTRELL	
PARTICLE REMOVAL EFFICENCY -%	75.0	
** PARTICLE SCRUBBER		
NUMBER	1	
GENERIC TYPE	VENTURI TOWER	
SPECIFIC TYPE	FIXED-THROAT	
SUPPLIER	ADL/COMBUSTION EQUIP ASSOCIATES	
DIMENSIONS - FT	1.5 DIA. X 18 LONG AT THROAT	
SHELL GENERIC MATERIAL	CARBON STEEL, HIGH ALLOY	
SHELL SPECIFIC MATERIAL	AISI 1110, AUSTENITIC	
LINER GENERIC MATERIAL	NONE, ORGANIC	
LINER SPECIFIC MATERIAL	N/A, RUBBER	
GAS CONTACTING DEVICE TYPE	TWIN VARIABLE THROATS	
NUMBER OF CONTACTING ZONES	1	
LIQUID RECIRCULATION RATE - LITER/S	157.5	(2500 GPM)
L/G RATIO - LITER/CU.M	1.3	(10.0 GAL/1000ACF)
PRESSURE DROP - KPA	4.6	(18.5 IN-H2O)
SUPERFICIAL GAS VELOCITY - M/S	50.3	(165.0 FT/S)
INLET GAS FLOW RATE - CU.M/S	223.2	(473000 ACFM)
INLET GAS TEMPERATURE - C	176.7	(350 F)
PARTICLE REMOVAL EFFICIENCY - %	97.0	
*** FGD SYSTEM		

NEVADA POWER: REID GARDNER 2 (CONT.)

** GENERAL DATA			
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT		
SO2 REMOVAL MODE	WET SCRUBBING		
PROCESS TYPE	SODIUM CARBONATE		
PROCESS ADDITIVES	NONE		
SYSTEM SUPPLIER	COMBUSTION EQUIP ASSOCIATES		
A-E FIRM	BECHTEL		
DEVELOPMENT LEVEL	FULL SCALE		
NEW/RETROFIT	RETROFIT		
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	97.00		
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	90.00		
CURRENT STATUS	1		
INITIAL START-UP	4/74		
CONTRACT AWARDED	9/71		
** DESIGN AND OPERATING PARAMETERS			
** ABSORBER			
NUMBER	1		
GENERIC TYPE	TRAY TOWER		
SPECIFIC TYPE	SIEVE TRAY		
SUPPLIER	COMBUSTION EQUIP ASSOCIATES		
DIMENSIONS - FT	30 DIA.		
SHELL GENERIC MATERIAL	CARBON STEEL		
SHELL SPECIFIC MATERIAL	AISI 1110		
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A		
LINER GENERIC MATERIAL	ORGANIC		
LINER MATERIAL TRADE NAME/COMMON TYPE	RUBBER		
GAS CONTACTING DEVICE TYPE	SINGLE SIEVE TRAY WITH 3/16 INCH HOLES		
NUMBER OF CONTACTING ZONES	1		
LIQUID RECIRCULATION RATE - LITER/S	38.	(600 GPM)	
L/G RATIO - L/CU.M	.2	(1.6 GAL/1000 ACF)	
GAS-SIDE PRESSURE DROP - KPA	.7	(3.0 IN-H2O)	
SUPERFICAL GAS VELOCITY - M/SEC	3.4	(11.0 FT/S)	
SO2 REMOVAL EFFICIENCY - %	91.2		
** MIST ELIMINATOR			
PRE-MIST ELIMINATOR/MIST ELIMINATOR	MIST ELIMINATOR		
NUMBER PER SYSTEM	1		
GENERIC TYPE	CENTRIFUGAL		
SPECIFIC TYPE	RADIAL VANE		
CONFIGURATION	HORIZONTAL		
NUMBER OF STAGES	1		
NUMBER OF PASSES PER STAGE	1		
PRESSURE DROP - KPA	.1	(.5 IN-H2O)	
CONSTRUCTION MATERIAL GENERIC TYPE	316L SS (BOTH ME AND WASH TRAY)		
** REHEATER			
GENERIC TYPE	INDIRECT HOT AIR		
SPECIFIC TYPE	EXTERNAL HEAT EXCHANGER		
TRADE NAME/COMMON TYPE	STEAM TUBE BUNDLES		
TEMPERATURE INCREASE - C	10.0	(50 F)	
INLET FLUE GAS TEMPERATURE - C	48.3	(119 F)	
NUMBER OF TUBES PER BUNDLE	24		
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL		
** FANS			
NUMBER	1		
SUPPLIER	BUFFALO FORGE		
FUNCTION	BALANCED DRAFT		
APPLICATION	FORCED DRAFT		
SERVICE	DRY		
FLUE GAS FLOW RATE - CU.M/S	223.21	(473000 ACFM)	
FLUE GAS TEMPERATURE - C	176.7	(350 F)	
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL		
** DUCTWORK			
LOCATION	SCRUBBER INLET		
SHELL GENERIC MATERIAL TYPE	CARBON STEEL		
LINER GENERIC MATERIAL TYPE	NONE		

NEVADA POWER: REID GARDNER 2 (CONT.)

** DUCTWORK

LOCATION	SCRUBBER OUTLET
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
LINER GENERIC MATERIAL TYPE	PLASITE 4004-S

** TANKS

SERVICE	NUMBER
VENTURI RECYCLE	1

** PUMPS

SERVICE	NUMBER
SCRUBBER RECIRCULATION	3
ABSORBER RECIRCULATION	3

*** SLUDGE

** DISPOSAL

NATURE	FINAL
TYPE	LINED POND
LOCATION	ON SITE
SITE TRANSPORTATION METHOD	GRAVITY FLOW FROM INTERIM SLUDGE POND

** DISPOSAL

NATURE	INTERIM
TYPE	LINED POND
LOCATION	ON SITE

** WATER BALANCE

WATER LOOP TYPE	CLOSED
MAKEUP WATER ADDITION - LITERS/S	9.8 (155 GPM)

** FGD SPARE CAPACITY INDICES

ABSORBER - %	.0

** FGD SPARE COMPONENT INDICES

ABSORBER	.0

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
4/74	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS PLACED IN SERVICE IN APRIL 1974. THE SCRUBBING SYSTEM DESIGN WAS BASED ON INFORMATION AND DATA OBTAINED FROM AN 8000-ACPM PILOT PLANT PROGRAM CONDUCTED AT REID GARDNER IN 1971 AND 1972.

5/74	SYSTEM							744			
6/74	SYSTEM							720			
7/74	SYSTEM							744			
8/74	SYSTEM							744			
9/74	SYSTEM							720			
10/74	SYSTEM							744			

NEVADA POWER: REID GARDNER 2 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
					THE UTILITY REPORTED THAT NO MAJOR PROBLEMS OCCURED SINCE STARTUP IN APRIL. CURRENT OPERABILITIES ARE GREATER THAN 90% WHEN TRONA IS AVAILABLE. WHEN THE TRONA SUPPLY IS EXHAUSTED THE SCRUBBER IS SHUT DOWN.						
11/74	SYSTEM								720		
	** PROBLEMS/SOLUTIONS/COMMENTS										
					FGD SYSTEM OPERATIONS HAVE ONLY BEEN INTERRUPTED BY INSUFFICIENT TRONA SUPPLIES. SO2 REMOVAL EFFICENCIES HAVE BEEN IN THE 85% RANGE. BECAUSE OF A COAL STRIKE THE BOILER ONLY OPERATED TWO WEEKS IN NOVEMBER AND THEN AT REDUCED LOAD. THERE ARE NO OUTSTANDING MECHANICAL OR PROCESS PROBLEMS.						
12/74	SYSTEM								744		
1/75	SYSTEM		94.0						744		
	** PROBLEMS/SOLUTIONS/COMMENTS										
					DURING JANUARY THE FGD SYSTEM OPERATED WITH A 94% OPERABILITY ON TRONA SUPPLEMENTED WITH SODIUM CARBONATE-BRINE. THE UTILITY REPORTED NO MAJOR PROBLEMS FOR THE DECEMBER-JANUARY PERIOD. THERE WAS, HOWEVER, A MINOR PROBLEM WITH FREEZING SODIUM CARBONATE FEED LINES.						
2/75	SYSTEM		90.0						672		
	** PROBLEMS/SOLUTIONS/COMMENTS										
					ROUTINE MECHANICAL PROBLEMS WERE ENCOUNTERED DURING FEBRUARY.						
					ROUTINE INSTRUMENTAL PROBLEMS WERE EXPERIENCED.						
					ABRASION OF RUBBER-LINED PIPES ACCOUNTED FOR SOME DOWNTIME.						
					THE FGD SYSTEM PASSED A SECOND PERFORMANCE TEST DURING THE PERIOD.						
					SEAL WATER FILTERS WERE REPLACED IN FEBRUARY.						
					BOILER CONTROLS ACCOUNTED FOR SOME DOWNTIME IN FEBRUARY.						
					RECYCLE LINE STRAINER PLUGGING WAS A PROBLEM DURING THE PERIOD.						
3/75	SYSTEM	100.0					.0		744	0	
	** PROBLEMS/SOLUTIONS/COMMENTS										
					THE BOILER WAS OUT OF SERVICE THROUGHOUT MARCH FOR A TURBINE OVERHAUL.						
4/75	SYSTEM	100.0					.0		720	0	
5/75	SYSTEM	100.0					.0		744	0	
6/75	SYSTEM	100.0							720		
	** PROBLEMS/SOLUTIONS/COMMENTS										
					THE BOILER AND SCRUBBER WERE PLACED BACK IN SERVICE IN LATE JUNE AFTER THE TURBINE OVERHAUL. THE FGD SYSTEM ACCEPTANCE TEST HAS BEEN SCHEDULED FOR JULY.						
7/75	SYSTEM		85.0						744		

NEVADA POWER: REID GARDNER 2 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PERFORMANCE DATA PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
8/75	SYSTEM							744			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		A BROKEN BUCKET ELEVATOR CAUSED A FORCED FGD OUTAGE.									
		WORN RECIRCULATION PIPING CONTRIBUTED TO THE FORCED FGD OUTAGE TIME.									
		A FORCED FGD OUTAGE WAS CAUSED BY A PUMP RUBBER LINER FAILURE.									
		STRAINER PLUGGING CONTRIBUTED TO THE FORCED FGD OUTAGE TIME.									
9/75	SYSTEM		76.9		69.0			720	645	496	
10/75	SYSTEM		87.4		62.0			744	531	464	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THREE FORCED OUTAGES OCCURED DURING SEPTEMBER AND OCTOBER.									
		A NECESSARY PUMP REPAIR FORCED THE FGD SYSTEM OUT OF SERVICE DURING THE OCTOBER - NOVEMBER PERIOD.									
		INSTRUMENT PLUGGING CAUSED AN FGD OUTAGE.									
		REPAIR OF PIPING LEAKAGE NECESSITATED AN FGD OUTAGE.									
11/75	SYSTEM		98.8		82.7			720	603	596	
12/75	SYSTEM							744			
1/76	SYSTEM	68.7	66.3	66.3	61.6			744	691	458	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		FROZEN CARBONATE LINES CONTRIBUTED TO FGD OUTAGE TIME.									
		A FGD OUTAGE WAS CAUSED BY A PLUGGED PRESSURE-SENSING LINES.									
		DUCT PRESSURE TRIPS CONTRIBUTED TO FGD OUTAGE TIME.									
		AN OVERHAUL OF A TRAY RECYCLE PUMP WAS NECESSARY DURING DECEMBER.									
2/76	SYSTEM	90.4	85.6	85.6	83.1			696	675	578	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UTILITY REPORTED FOUR SCRUBBER INACTIVE PERIODS DURING FEBRUARY, THREE OF WHICH WERE SCRUBBER-RELATED OUTAGES.									
		34 HOURS OF OUTAGE TIME WERE REQUIRED TO UNPLUG A VENTURI PUMP.									
		CHEMICAL DEPLETION CONTRIBUTED TO FGD OUTAGE TIME.									
		SEAL WATER PROBLEMS WERE ENCOUNTERED DURING FEBRUARY.									
3/76	SYSTEM	68.1	59.9	62.5	53.1			744	660	395	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		TWO FGD FORCED OUTAGES OCCURED DURING MARCH.									
		AN ELECTRICAL FAILURE RESULTED IN A 16 HOUR FGD SYSTEM OUTAGE.									

PERIOD	MODULE	PERFORMANCE DATA: AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
		PLUGGING IN THE TRAY SYSTEM RESULTED IN A SUBSEQUENT OVERHAUL OF THE TRAY CYCLE PUMPS, REQUIRING 221 HOURS OF DOWNTIME.									
4/76	SYSTEM	86.6	77.5	83.4	67.7			720	630	488	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		FOUR FORCED SCRUBBER OUTAGES WERE REPORTED BY THE UTILITY FOR APRIL.									
		PLUGGED SENSING LINES RESULTED IN FGD OUTAGE TIME.									
		A REHEATER LEAK DURING APRIL CAUSED DOWN TIME FOR REPAIRS.									
		A VENTURI RECYCLE PUMP SPOOL REPLACEMENT REQUIRED FGD OUTAGE TIME.									
		A VENTURI RECYCLE TANK NEEDED PATCHING DURING THE MONTH.									
5/76	SYSTEM	99.0	83.0	98.0	79.0			744			
6/76	SYSTEM	95.3	86.8	87.0	82.2			720	682	592	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		PLUGGED VENTURI LINES ACCOUNTED FOR 6 HOURS DURING MAY.									
		A 6 HOUR OUTAGE RESULTED FROM PLUGGED SENSING LINES.									
		THE SCRUBBING SYSTEM WAS SHUTDOWN FOR 54 HOURS WHILE CEMENT WAS BEING POURED IN THE SCRUBBER AREA.									
7/76	SYSTEM	94.2	82.3	91.2	59.9			744	542	446	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		A PROBLEM WITH A HIGH SOLIDS CONCENTRATION IN THE VENTURI SCRUBBING CYCLE CONTRIBUTED TO FGD OUTAGE TIME.									
		THE REPLACMENT OF A RUBBER-LINED PIPE IN THE VENTURI SCRUBBER WAS NECESSARY DURING JULY.									
		BOILER RELATED OUTAGES ACCOUNTED FOR 256 HOURS OF FGD SYSTEM DOWNTIME.									
8/76	SYSTEM	91.7	69.1	70.8	65.8			744	709	490	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DEPLETION OF CHEMICAL ABSORBENT (TRONA) CONTRIBUTED TO FGD OUTAGE TIME (141 HOURS).									
		THE FGD SYSTEM WAS OUT OF SERVICE 52 HOURS FOR BOILER RELATED PROBLEMS.									
		VENTURI RECYCLE LINE LEAKING ACCOUNTED FOR 27 HOURS OF SCRUBBER OUTAGE TIME.									
		THE THICKENER PLUGGED CAUSING 34 HOURS OF FGD SYSTEM DOWN TIME.									
9/76	SYSTEM	92.4	90.2	91.9	85.2			720	681	614	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		PLUGGING IN THE ID FAN REFERENCE LINES RESULTED IN 36 HOURS OF OUTAGE TIME.									
		A 19 HOUR FGD SYSTEM SHUTDOWN WAS CAUSED BY A FALSE HIGH TEMPERATURE READING IN THE VENTURI DUE TO WATER IN THE INSTRUMENT.									

NEVADA POWER: REID GARDNER 2 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
10/76	SYSTEM	95.2	92.6	94.7	86.4			744	694	643	

** PROBLEMS/SOLUTIONS/COMMENTS

FIVE HOURS OF SCRUBBER OUTAGE TIME WAS CAUSED BY VENTURI GAS DAMPER PROBLEMS.

REPLACEMENT OF THE CARBONATE FEED LINE ACCOUNTED FOR 16 HOURS OF FGD SYSTEM OUTAGE.

PLUGGING IN THE SCRUBBER EFFLUENT LINE CONTRIBUTED TO FGD SYSTEM DOWN TIME.

SCRUBBER OUTAGE TIME DUE TO BOILER-RELATED PROBLEMS AMOUNTED TO APPROXIMATELY 66 HOURS.

11/76	SYSTEM	51.9	60.1	60.1	51.9			720	621	374	

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER WAS DOWN FOR REPAIR OF A CONDENSER TUBE LEAK AND BOTTOM ASH NOZZLE.

DURING THE BOILER OUTAGE THE SCRUBBER GUILLOTINE DAMPERS WERE BADLY DAMAGED WHEN LIMIT SWITCH ADJUSTMENTS WERE BEING MADE. THE SCRUBBER REMAINED OUT OF SERVICE FROM NOVEMBER 16 THROUGH THE END OF THE MONTH.

12/76	SYSTEM	.0			.0			744	275	0	

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER WAS DOWN THE ENTIRE MONTH OF DECEMBER FOR A SCHEDULED OVERHAUL.

THE FGD SYSTEM WAS UNAVAILABLE THROUGH DECEMBER AS DAMPER REPAIRS HAD NOT YET BEEN MADE. FGD SYSTEM SERVICES WERE NOT REQUIRED DURING THE PERIOD.

1/77	SYSTEM	100.0			.0			744	0	0	

** PROBLEMS/SOLUTIONS/COMMENTS

THE SCHEDULED BOILER OVERHAUL CONTINUED THROUGH JANUARY.

2/77	SYSTEM	92.7	79.0	89.3	60.8			672	517	409	

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS PUT BACK IN SERVICE ON FEBRUARY 7 AFTER COMPLETION OF THE SCHEDULED BOILER OVERHAUL.

A MINOR SCRUBBER OUTAGE RESULTED FROM A VENTURI PIPING LEAK.

DURING THE LAST TWO DAYS OF FEBRUARY SOME FGD SYSTEM ELECTRICAL PROBLEMS OCCURRED.

A MINOR SCRUBBER OUTAGE WAS REQUIRED TO CLEAN THE RECYCLE TANK WASH TRAY.

3/77	SYSTEM	88.5	86.3	86.9	76.4			744	659	569	

NEVADA POWER: REID GARDNER 2 (CONT.)

PERIOD	MODULE	PERFORMANCE DATA AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER BOILER HOURS	FGD HOURS	CAP. FACTOR
4/77	SYSTEM	94.8	94.8	94.8	94.8			720	720	683
5/77	SYSTEM	98.7	89.8	96.1	63.2			744	524	470
6/77	SYSTEM	95.1	93.3	94.4	82.8			720	639	596
7/77	SYSTEM	40.0	41.6	40.6	40.0			744	733	298
8/77	SYSTEM	88.0	91.3	86.8	79.4			744	646	591
9/77	SYSTEM	67.7	64.4	66.5	64.1			720	716	461

** PROBLEMS/SOLUTIONS/COMMENTS

A PLUGGED ABSORBER TRAY CONTRIBUTED TO THE FGD SYSTEM OUTAGE TIME.

ELECTRICAL PROBLEMS IN THE FGD SYSTEM WERE EXPERIENCED DURING MARCH.

DUCT HI/LO PRESSURE SENSORS TRIGGERED A NINE HOUR FGD SYSTEM SHUTDOWN.

ID FAN PRESSURE SENSORS FORCED THE FGD SYSTEM OFF LINE FOR 28 HOURS IN MARCH.

** PROBLEMS/SOLUTIONS/COMMENTS

37 HOURS OF FORCED FGD SYSTEM OUTAGE TIME RESULTED FROM A LEAK IN THE VENTURI DISCHARGE LINE.

** PROBLEMS/SOLUTIONS/COMMENTS

BOILER-RELATED OUTAGES ACCOUNTED FOR 255 HOURS OF FGD SYSTEM DOWNTIME IN MAY.

BOILER ASH SLUICE PUMPS WERE OUT OF SERVICE FOR APPROXIMATELY 10 HOURS IN MAY. BECAUSE THE EMERGENCY SPRAY SYSTEM WAS UNAVAILABLE THE FGD SYSTEM WAS FORCED OUT OF SERVICE.

** PROBLEMS/SOLUTIONS/COMMENTS

ID FAN SENSING LINE PLUGGING FORCED THE SYSTEM OUT OF SERVICE FOR SEVEN HOURS IN JUNE.

A BREAKER TRIP RESULTED IN A LOSS OF BOILER CONTROL POWER FOR FIVE HOURS.

THE SPRAY NOZZLES IN THE VENTURI PLUGGED CAUSING 28 HOURS OF FGD SYSTEM OUTAGE.

** PROBLEMS/SOLUTIONS/COMMENTS

SEVEN FORCED FGD OUTAGES WERE DUE TO SCRUBBER DUCT HI/LO PRESSURE TRIPS DURING JULY.

ONE TWO HOUR OUTAGE WAS REQUIRED TO CORRECT A PLUGGING PROBLEM IN THE VENTURI SPRAY NOZZLES DURING JULY.

** PROBLEMS/SOLUTIONS/COMMENTS

A LEAK IN THE VENTURI RECYCLE HEADER RESULTED IN AN FGD SYSTEM OUTAGE.

A SCRUBBER DUCT HIGH/LOW BOILER TRIP OCCURRED RESULTING IN 35 HOURS OF SCRUBBER OUTAGE TIME.

THERE WAS ONE 64 HOUR BOILER-RELATED OUTAGE DURING AUGUST.

NEVADA POWER: REID GARDNER 2 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
		PERFORMANCE DATA									
	** PROBLEMS/SOLUTIONS/COMMENTS										
		A LEAK IN THE VENTURI RECYCLE LINES RESULTED IN FORCED FGD SYSTEM OUTAGE TIME.									
		TRAY RECYCLE PUMP REPAIR NECESSITATED NEARLY SIX HOURS OF FGD SYSTEM OUTAGE TIME.									
		DUCT HI/LO PRESSURE SENSOR LINE PLUGGING PROBLEMS ACCOUNTED FOR 58 HOURS OF FORCED FGD SYSTEM OUTAGE.									
		26 HOURS OF OUTAGE TIME OCCURRED WHEN THE ASH SLUICE SYSTEM WENT OUT OF SERVICE. THE FGD SYSTEM IS LEFT WITHOUT EMERGENCY SPRAYS WHEN THIS OCCURRS SINCE THEY ARE INTEGRATED SYSTEMS.									
		TRAY PLUGGING RESULTED IN 96 HOURS OF FGD SYSTEM OUTAGE WHICH BEGAN ON SEPTEMBER 27 AND CONTINUED THROUGH THE END OF THE MONTH.									
		THE FGD SYSTEM WAS TAKEN OFF-LINE TO ALLOW CLEANING OF A SUCTION SCREEN IN THE TRAY RECYCLE TANK.									
10/77	SYSTEM	79.2	83.2	79.1	78.8			744	704	586	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		FGD SYSTEM OUTAGE TIME WAS NEEDED TO CLEAN A PLUGGED ABSORBER RECYCLE TANK SCREEN.									
		A VENTURI TANK SEPARATOR REQUIRED CLEANING CAUSING FGD SYSTEM DOWN TIME.									
		A HIGH SOLIDS LEVEL IN THE VENTURI RECYCLE SYSTEM REQUIRED THREE HOURS OF DOWNTIME TO MAKE CORRECTIONS.									
		A SCRUBBER DUCT HIGH/LOW PRESSURE TRIP FORCED THE BOILER AND SCRUBBER OUT OF SERVICE FOR 42 HOURS.									
		ID FAN LEAKS WERE PATCHED DURING OCTOBER.									
11/77	SYSTEM	80.7	.0	.0	.0			720	98	0	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE BOILER WAS OUT OF SERVICE FROM OCTOBER 31 UNTIL NOVEMBER 26 TO INSTALL A NEW PRIMARY AIR FAN.									
		THE SCRUBBER WAS OUT OF SERVICE FOR AN ID FAN ROTOR REPAIR.									
12/77	SYSTEM	.0	.0	.0	.0			744	742	0	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE SCRUBBER MODULE WAS OUT OF SERVICE TO INSTALL NEW WEAR PLATES ON AN ID FAN ROTOR.									
1/78	SYSTEM	71.7	73.9	73.9	67.0			744	675	499	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE SCRUBBER WENT BACK ON LINE JANUARY 4 AFTER THE INSTALLATION OF WEAR PLATES ON AN ID FAN ROTOR.									
		REPAIRS ON THE THICKNER OVERFLOW PUMP CONTRIBUTED TO FGD SYSTEM OUTAGE TIME.									

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR

SOME SOLIDS BUILD UP IN THE VENTURI WAS ENCOUNTERED DURING JANUARY.

2/78	SYSTEM	92.9	91.9	92.5	87.0			672	636	585	

** PROBLEMS/SOLUTIONS/COMMENTS

A DUCT HIGH/LOW PRESSURE TRIP CONTRIBUTED TO THE FGD SYSTEM OUTAGE TIME.

THE BOILER WAS OUT OF SERVICE FOR 40 HOURS DURING FEBRUARY.

3/78	SYSTEM	100.0	88.7	100.0	80.2			744	672	596	

** PROBLEMS/SOLUTIONS/COMMENTS

THERE WERE NO FORCED FGD SYSTEM OUTAGES DURING MARCH HOWEVER, THE SYSTEM WAS SHUTDOWN FOR 18 HOURS WHEN THE BOILER OPERATED AT LOW LOAD AND STABLE FGD SYSTEM OPERATIONS WERE NOT ATTAINABLE.

4/78	SYSTEM	100.0	98.7	100.0	44.1			720	321	317	

** PROBLEMS/SOLUTIONS/COMMENTS

THERE WERE NO FGD SYSTEM RELATED OUTAGES DURING APRIL. THE BOILER WAS OUT OF SERVICE FOR 403 HOURS IN APRIL.

5/78	SYSTEM	99.8	99.7	99.8	97.4			744	727	724	

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER WAS OFF FOR APPROXIMATELY 18 HOURS FOR REPAIRS ON THE COAL MILL SPOKES.

A SCRUBBER CIRCUIT BREAKER TRIPPED AND CAUSED AN FGD SYSTEM OUTAGE OF ABOUT ONE HOUR.

6/78	SYSTEM	89.4	89.4	89.4	89.4			720	720	644	

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS OUT OF SERVICE FOR 76 HOURS FOR REPAIR OF A VENTURI WATER BOX LEAK.

7/78	SYSTEM	80.1	81.8	78.9	74.3			744	676	553	

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER WAS OUT OF SERVICE FOR 43 HOURS DUE TO A BOILER TUBE LEAK.

HIGH DUCT PRESSURE WAS THE CAUSE OF A BOILER TRIP. THE HIGH DUCT PRESSURE WAS CAUSED BY A FAULTY POSITIONER ON THE ID FAN CONTROLLER.

THE ID FAN EXPANSION JOINT ON THE SCRUBBER SIDE WAS REPLACED.

AN FGD OUTAGE OCCURRED WHEN A BOLT, WHICH FELL FROM THE FAN, CAUSED VIBRATIONS.

A SECOND BOILER TRIP DURING JULY WAS CAUSED BY AN UNDETERMINED SOURCE.

THE SUCTION LINE FROM THE VENTURI DISCHARGE LINE TO THE EFFLUENT PUMPS HAD TO BE CLEANED BECAUSE OF PLUGGING.

8/78	SYSTEM	81.4	82.2	82.4	81.1			744	733	403	

NEVADA POWER: REID GARDNER 2 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
					TWO SCHEDULED OUTAGES DURING AUGUST WERE NECESSARY TO CLEAN THE SCRUBBER TRAY.						
					A SCHEDULED OUTAGE WAS NECESSARY TO CLEAN THE NOZZLES ON THE SCRUBBER SPRAY RACK. THE STAINLESS STEEL PIPE TO THE TRAY SPRAY NOZZLES WAS ALSO REPLACED.						
					ON AUGUST 1 THE SCRUBBER EXPERIENCED HIGH DUCT PRESSURE. DURING THE SUBSEQUENT OUTAGE A CLINKER WAS REMOVED FROM THE BOILER BOTTOM HOPPER.						
					ON AUGUST 3 IT WAS NECESSARY TO TAKE THE SCRUBBER OFF LINE TO REPACK THE VENTURI PUMPS.						
					A THIRD OUTAGE IN AUGUST WAS CAUSED BY A LOSS OF THE BOILER ASH PANEL CONTROL POWER. THIS LEFT THE SCRUBBER WITHOUT EMERGENCY SPRAY.						
9/78	SYSTEM	98.5	97.4	98.4	93.8			720	693	675	
	** PROBLEMS/SOLUTIONS/COMMENTS										
					A SCRUBBER OUTAGE WAS NECESSARY DURING SEPTEMBER IN ORDER TO CLEAN THE TRAY RECYCLE TANK AS WELL AS THE TRAY AND SOME OF THE LINES.						
					THREE BOILER RELATED OUTAGES WERE CAUSED BY PROBLEMS WITH A 10-KW GENERATOR. CONTROL POWER SURGES WERE BEING CAUSED BY OVERVOLTAGE MOTOR TRIPS.						
10/78	SYSTEM	96.2	95.0	96.0	92.1			744	722	685	
	** PROBLEMS/SOLUTIONS/COMMENTS										
					DURING OCTOBER SCRUBBER INSTRUMENTATION REPAIRS WERE PERFORMED.						
					THE BOILER WAS FORCED OUT OF SERVICE FOR ABOUT 28 HOURS BECAUSE OF BOILER DRUM WATER LEVEL PROBLEMS.						
11/78	SYSTEM	97.5	93.2	93.6	35.9			720	277	259	
	** PROBLEMS/SOLUTIONS/COMMENTS										
					A FORCED FGD SYSTEM OUTAGE OCCURRED DUE TO HIGH DUCT PRESSURE.						
					WORK WAS DONE ON ID FAN CONTROLS DURING NOVEMBER.						
					THE UNIT WAS SHUTDOWN ON NOVEMBER 12 FOR SCHEDULED BOILER MAINTENANCE. THE UNIT REMAINED OUT OF SERVICE THROUGH THE END OF THE MONTH.						
12/78	SYSTEM	95.9	44.9	100.0	13.3			744	221	99	
	** PROBLEMS/SOLUTIONS/COMMENTS										
					THE BOILER WAS OFF LINE UNTIL DECEMBER 26 WHEN A SCHEDULED MAINTENANCE OUTAGE WAS COMPLETED.						
					THE SCRUBBER WAS TAKEN OUT OF SERVICE FOR 30 HOURS TO UNPLUG AN EFFLUENT LINE.						
					WHILE THE SCRUBBER WAS DOWN THE BOILER WAS OUT OF SERVICE SO THAT PULVERIZER REPAIRS COULD BE MADE.						
1/79	SYSTEM	82.9	81.3	81.3	73.9			744	676	550	81.3

NEVADA POWER: REID GARDNER 2 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
					THE FGD SYSTEM WAS TAKEN OUT OF SERVICE TO CLEAN A TRAY SCREEN.						
					THE FGD SYSTEM WAS TAKEN OUT OF SERVICE TO REPAIR A LEAK IN THE VENTURI RECYCLE LINE.						
					THE BOILER WAS DOWN 67 HOURS FOR TUBE LEAK REPAIRS.						
					REPAIRS WERE MADE ON THE TRAY AND SPRAY PUMP SYSTEMS.						
					A HIGH DUCT PRESSURE TRIP WAS RESPONSIBLE FOR A SIX HOUR OUTAGE. THE PRESSURE SENSING LINES WERE CLEANED.						
					THE SCRUBBER TRAY PUMP MOTOR SHORTED TO GROUND. THE 2C LOAD TRIPPED AND POWER TO THE VENTURI RECYCLE PUMP WAS LOST. THERE WAS AN ADDITIONAL SCRUBBER TRIP DUE TO HIGH DUCT PRESSURE DURING THIS SAME PERIOD.						
2/79	SYSTEM	96.2	93.1	93.2	87.9			672	634	591	87.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
					THE FGD SYSTEM WAS TAKEN OUT OF SERVICE TO REPAIR A LEAK IN THE VENTURI LINE.						
					THE FGD SYSTEM WAS FORCED OUT OF SERVICE BY A SCRUBBER POWER FAILURE.						
					THE SCRUBBER WAS TAKEN OUT OF SERVICE BECAUSE A BREAK IN THE ASH WATER CIRCULATING WATER LINE RESULTED IN A LOSS OF EMERGENCY COOLING WATER.						
					THE FGD SYSTEM WAS FORCED OUT OF SERVICE BY A LEAK ON THE VENTURI RACE TRACK SPRAY SECTION. THE VENTURI RACE TRACK NOZZLES WERE CLEANED DURING THE OUTAGE.						
					THE BOILER WAS OUT OF SERVICE 38 HOURS FOR TUBE LEAK REPAIRS.						
3/79	SYSTEM	97.9	96.7	100.0	89.4			744	688	665	90.3
	** PROBLEMS/SOLUTIONS/COMMENTS										
					THE SCRUBBER WAS OUT OF SERVICE 63 HOURS WHILE BOILER TUBE LEAK REPAIRS WERE MADE.						
					THE BOILER WAS FORCED OUT BY A HIGH FURNACE PRESSURE TRIP. WHILE THE BOILER WAS DOWN, SENSING LINES WERE CLEANED ON THE SCRUBBER.						
4/79	SYSTEM	89.1	96.0	98.9	88.8			720	666	639	91.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
					A HIGH PRESSURE ALARM ON THE SCRUBBER DUCT TRIPPED THE SCRUBBER OFF LINE. THE SCRUBBER PRESSURE SENSING LINES WERE CLEANED. THIS OCCURRED TWICE DURING THE MONTH OF APRIL AND ACCOUNTED FOR 79 HOURS OF OUTAGE TIME.						
					A BOILER FURNACE BURNER WAS CLEANED DURING A 71 HOUR SCRUBBER OUTAGE RESULTING FROM A HIGH PRESSURE ALARM.						
					A CONTROL POWER FAILURE OCCURRED CAUSING A SCRUBBER TRIP WHEN A 10 KW GENERATOR WAS PUT BACK IN SERVICE.						
5/79	SYSTEM	99.8	99.5	99.7	83.9			744	627	624	93.2

NEVADA POWER: REID GARDNER 2 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
					THE BOILER WAS OUT OF SERVICE FOR ABOUT FIVE DAYS TO REPAIR TUBE LEAKS.						
					PRESSURE SENSING LINES ON THE SCRUBBER CONTROLS WERE CLEANED DURING A TWO HOUR OUTAGE AFTER THE SCRUBBER BEGAN HAVING CONTROL PROBLEMS.						
6/79	SYSTEM	91.1	87.1	89.2	73.5			720	607	529	92.2
	** PROBLEMS/SOLUTIONS/COMMENTS										
					THE SCRUBBER WAS FORCED OUT OF SERVICE DUE TO A VENTURI PUMP POWER LOSS.						
					20 HOURS OF SCRUBBER OUTAGE TIME WAS REQUIRED TO REPAIR VENTURI PUMP DISCHARGE VALVES.						
					THE BOILER WAS OUT OF SERVICE 127 HOURS DURING JUNE TO REPAIR HIGH PRESSURE HEATER TUBE LEAKS, TO WELD A CAP ON THE HIGH PRESSURE HEATER, TO WORK ON PRIMARY AIR FANS, AND TO REPAIR A BOILER TUBE LEAK.						
					SCRUBBER OUTAGE TIME WAS REQUIRED TO CLEAN PRESSURE SENSING LINES.						
					THE SCRUBBER WAS FORCED OUT OF SERVICE JUNE 30 BY A HIGH VENTURI OUTLET TEMPERATURE TRIP.						
7/79	SYSTEM	84.3	90.0	93.4	77.6			744	642	578	92.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
					THE SCRUBBER OUTAGE WHICH BEGAN JUNE 30 CONTINUED UNTIL JULY 4. DURING THE OUTAGE A BAD VENTURI TEMPERATURE PROBE WAS REPLACED. SOME BOILER TUBE REPAIRS WERE MADE AT THIS TIME.						
					THE BOILER AND SCRUBBER WERE OFF FOR 50 HOURS TO REPAIR A BOILER TUBE LEAK.						
					SCRUBBER AND BOILER TRIPPED OFF FOR ABOUT 50 HOURS. THIS OUTAGE WAS CAUSED BY A LOSS OF CONTROL AIR TO THE SCRUBBER AND A POWER LOSS TO THE SCRUBBER AIR COMPRESSOR.						
					THE SENSING LINES ON THE SCRUBBER WERE CLEANED TO PREVENT HIGH SCRUBBER DUCT PRESSURE. THE SYSTEM WAS OUT FOR ABOUT 33 HOURS.						
8/79	SYSTEM	98.5	98.9	98.4	93.2			744	701	693	92.9
	** PROBLEMS/SOLUTIONS/COMMENTS										
					THE BOILER WAS SHUTDOWN FOR ABOUT 40 HOURS TO REPAIR A BOILER TUBE LEAK.						
					THE SCRUBBER WAS OFF TO REPAIR A LEAK IN A VENTURI PUMP DISCHARGE BODY. THE REPAIR REQUIRED ABOUT 9 HOURS.						
					HIGH PRESSURE IN SCRUBBER DUCT FORCED THE SCRUBBER OUT OF SERVICE. THE SCRUBBER PRESSURE SENSING LINES WERE CLEANED.						
9/79	SYSTEM	86.0	83.8	82.5	66.2			720	569	477	92.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
					DURING SEPTEMBER THE SCRUBBER WENT OFF LINE WITH THE BOILER TO REPAIR BOILER TUBE LEAKS. THIS OCCURRED TWICE CAUSING A TOTAL OF 126 HOURS OF DOWN TIME.						
					SOME OUTAGE TIME WAS REQUIRED TO UNPLUG EFFLUENT AND VENTURI LINES AND						

NEVADA POWER: REID GARDNER 2 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR

TO CLEAN THE VENTURI RACE TRACK SPRAY SECTIONS.

HIGH PRESSURE WAS ENCOUNTERED TWICE IN THE SCRUBBER DUCT AND ONCE IN THE BOILER FURNACE. THIS CAUSED SOME OUTAGE TIME TO CLEAN THE SCRUBBER PRESSURE SENSING LINES.

THE SCRUBBER WAS DOWN WITH THE BOILER SO REPAIRS TO THE MAIN STEAM DRAIN LINE COULD BE CONDUCTED.

THE SCRUBBER WAS DOWN FOR APPROXIMATELY SEVEN HOURS TO MAKE REPAIRS ON THE CONTROL SYSTEM.

10/79	SYSTEM	100.0	88.3	100.0	31.3			744	263	233	91.8

** PROBLEMS/SOLUTIONS/COMMENTS

THE SCRUBBER WAS DOWN FOR 13 HOURS WITH THE BOILER DUE TO A MASTER FUEL TRIP ON THE BOILER AND LATER FOR 41 HOURS FOR BOILER TUBE REPAIRS.

A BOILER TRIP OCCURRED ON OCTOBER 12 BECAUSE OF HIGH FURNACE PRESSURE. AN EXPLOSION BLEW AN EXPANSION JOINT ON THE DISCHARGE OF A PRIMARY AIR FAN. THE BOILER OUTAGE CONTINUED THROUGH THE END OF THE MONTH AS GENERAL MAINTENANCE WAS PERFORMED.

11/79	SYSTEM	98.8	96.0	97.3	43.3			720	325	312	92.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE SCRUBBER AND BOILER DID NOT OPERATE UNTIL NOVEMBER 17 WHEN THE SCHEDULED MAINTENANCE WAS COMPLETED.

THE SCRUBBER WAS FORCED OUT OF SERVICE FOR APPROXIMATELY THREE HOURS TO RECTIFY A VIBRATIONS PROBLEM IN THE REHEATER FAN.

THE SCRUBBER WENT OFF LINE WHEN A TRAY SPRAY PUMP SHORTED TO GROUND TRIPPING A SCRUBBER POWER LOAD CENTER.

12/79	SYSTEM	97.9	97.7	97.9	97.7			744	744	727	92.6

** PROBLEMS/SOLUTIONS/COMMENTS

A BOILER/SCRUBBER HIGH DUCT PRESSURE TRIP OCCURRED. THE SCRUBBER PRESSURE SENSING LINES WERE CLEANED. THE TRIP ACCOUNTED FOR A LITTLE OVER AN HOUR OF OUTAGE TIME.

THE CONTROL SYSTEM ON THE VENTURI DAMPER REQUIRED REPAIRS WHICH RESULTED IN APPROXIMATELY THREE HOURS OF DOWN TIME.

THE SCRUBBER WAS SHUT DOWN TO MAKE REPAIRS ON THE EMERGENCY SPRAY SYSTEM AND A REHEATER FAN BEARING.

DURING A MAINTENANCE CHECK FOR D. C. GROUNDING THE BOILER AND SCRUBBER WERE FORCED OUT OF SERVICE FOR TWO HOURS.

1/80	SYSTEM	97.4	94.5	96.9	81.6			744	642	607	94.5

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JANUARY THE SCRUBBER WAS TAKEN OFF LINE WITH THE BOILER TO REPLACE THE REBUILT BOILER HIGH PRESSURE HEATER. THIS OUTAGE LASTED APPROXIMATELY 112 HOURS.

REPAIRS WERE NEEDED ON THE LEFT HAND INTERCEPT VALVE ON THE TURBINE CAUSING THE SCRUBBER TO BE TAKEN OFF LINE ONCE AGAIN WITH THE BOILER.

NEVADA POWER: REID GARDNER 2 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR

THE CLEANING OF THE VENTURI RACE TRACK NOZZLES ACCOUNTED FOR TWO SCRUBBER OUTAGES TOTALLING 15 HOURS.

THE SCRUBBER WAS TAKEN OFF LINE FOR FOUR HOURS SO MAINTENANCE COULD BE PERFORMED ON THE ID FAN DAMPER CONTROLS.

2/80	SYSTEM	96.9	96.9	96.9	96.9			696	696	675	95.7

** PROBLEMS/SOLUTIONS/COMMENTS

THE SCRUBBER WAS TAKEN OFF-LINE TWICE DURING FEBRUARY DUE TO A MALFUNCTION OF THE ID FAN CONTROLS. THE PRESSURE SENSING LINES WERE CLEANED DURING THE OUTAGE.

THE SCRUBBER RACE TRACK NOZZLES HAD TO BE CLEANED TWICE, REQUIRING APPROXIMATELY FOUR HOURS OF OUTAGE TIME.

THE DISCHARGE VALVE ON THE VENTURI RECYCLE PUMP WAS REPLACED DURING FEBRUARY.

REPAIRS WERE MADE ON THE SCRUBBER EMERGENCY SPRAY LINE RESULTING IN ABOUT FOUR HOURS OF OUTAGE TIME.

THE SCRUBBER HAD TO BE SHUT DOWN SO REPAIRS ON THE ID FAN DAMPER CONTROLS COULD BE MADE.

3/80	SYSTEM	98.4	97.5	97.5	97.5			744	744	725	96.3

** PROBLEMS/SOLUTIONS/COMMENTS

DURING MARCH THE SCRUBBER WAS TAKEN OFF LINE DUE TO THE UNAVAILABILITY OF THE EMERGENCY SPRAY SYSTEM. DURING THIS TIME MAINTENANCE WAS DONE ON THE A AND B ASH SLUICE PUMPS.

LATER IN THE MONTH AN OUTAGE WAS CAUSED BY A LEAK IN THE EMERGENCY SPRAY LINE.

PROBLEMS RELATED TO A LOW VENTURI FLOW CAUSED FOUR HOURS OF OUTAGE TIME IN MARCH. NO CAUSE FOR THE FLOW PROBLEM WAS REPORTED.

4/80	SYSTEM	99.0	99.0	99.0	93.5			720	680	673	97.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS UNAVAILABLE FOR 7 HOURS TO UNPLUG THE VENTURI RACE TRACK.

THE BOILER WAS OUT OF SERVICE FOR 40 HOURS DUE TO BOILER TUBE LEAKS.

5/80	SYSTEM	100.0	86.3	100.0	14.3			744	124	107	96.5

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD OVERHAUL WAS COMPLETED EARLY IN MAY.

A BOILER OVERHAUL WAS STARTED AND COMPLETED DURING MAY. THIS OUTAGE LASTED ALMOST 23 DAYS.

6/80	SYSTEM	99.6	97.5	99.5	73.4			720	541	528	96.6

NEVADA POWER: REID GARDNER 2 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
		PERFORMANCE DATA									
7/80	SYSTEM	88.1	77.2	86.2	74.5			744	718	554	93.3
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE BOILER WAS OUT OF SERVICE SEVERAL TIMES DURING JUNE. THIS CAUSED THE FGD SYSTEM TO BE OUT APPROXIMATELY 80 HOURS.									
		VENTURI RACE TRACK NOZZLES NEEDED TO BE UNPLUGGED CAUSING THE FGD SYSTEM OUT OF SERVICE FOR SEVERAL HOURS.									
8/80	SYSTEM	97.0	96.3	96.4	79.7			744	613	591	93.9
	** PROBLEMS/SOLUTIONS/COMMENTS										
		BOILER RELATED OUTAGES KEPT THE FGD SYSTEM OUT OF SERVICE FOR OVER 100 HOURS DURING JUNE. OVER HALF OF THIS OUTAGE TIME WAS A RESULT OF CONTROL PROBLEMS WITH THE BOILER AND FGD SYSTEM. THE BOILER WAS RUN WITHOUT THE FGD SYSTEM IN ORDER TO DETERMINE IF THE CONTROL PROBLEMS WERE FGD OR BOILER RELATED. PROBLEMS WERE REPAIRED IN BOTH CONTROL SYSTEMS. THIS ALSO CAUSED OVER 60 HOURS OF FGD SYSTEM RELATED DOWN TIME.									
		PROBLEMS WITH THE BOTTOM HOPPER SEALS CAUSED THE FGD SYSTEM TO GO DOWN.									
		THE FGD SYSTEM NEEDED TO BE OFF LINE FOR 13 HOURS FOR INSTRUMENT CHECKS AND MAINTENANCE.									
		THE FGD SYSTEM WAS FORCED OUT OF SERVICE WHEN THE EMERGENCY SPRAY SYSTEM FAILED. THE ASH SLUICE PUMP SHAFT WAS REPAIRED DURING THIS TIME.									
9/80	SYSTEM	100.0			.0			720	0	0	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		LOSS OF EMERGENCY SPRAY KEPT THE FGD SYSTEM OFF LINE FOR ALMOST 20 HOURS.									
		BOILER RELATED OUTAGES CAUSED THE FGD SYSTEM NOT TO OPERATE FOR OVER 130 HOURS.									
10/80	SYSTEM	100.0	.0		.0			744	0	0	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE FGD SYSTEM WAS 100% AVAILABLE DURING A SCHEDULED BOILER OVERHAUL IN SEPTEMBER.									
11/80	SYSTEM	94.5	93.6	91.9	62.0			720	273	447	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UNIT OVERHAUL CONTINUED THROUGH THE MONTH OF OCTOBER.									
12/80	SYSTEM	99.5	99.2	99.5	97.8			744	733	728	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE SCHEDULED OUTAGE CONTINUED UNTIL NOVEMBER 10. THE UNIT WAS BROUGHT ON LINE AND REMAINED ON LINE UNTIL NOVEMBER 26 WHEN THE BOILER AND FGD SYSTEM WERE FORCED OUT OF SERVICE TWICE.									

NEVADA POWER: REID GARDNER 2 (CONT.)

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR

** PROBLEMS/SOLUTIONS/COMMENTS

DURING DECEMBER THE SYSTEM WAS SHUTDOWN APPROXIMATELY 12 HOURS FOR SCHEDULED OUTAGES.

TWO FORCED OUTAGES OCCURRED DURING THE MONTH WHICH CAUSED THE SYSTEM TO SHUT DOWN FOR APPROXIMATELY FOUR HOURS.

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	NEVADA POWER	
PLANT NAME	REID GARDNER	
UNIT NUMBER	3	
CITY	MOAPA	
STATE	NEVADA	
REGULATORY CLASSIFICATION	B	
PARTICULATE EMISSION LIMITATION - NG/J	43.	(.100 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	516.	(1.200 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	105	
GROSS UNIT GENERATING CAPACITY - MW	125	
NET UNIT GENERATING CAPACITY W/FGD - MW	110	
NET UNIT GENERATING CAPACITY WO/FGD - MW	*****	
EQUIVALENT SCRUBBED CAPACITY - MW	125	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	FOSTER WHEELER	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	223.21	(473000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	176.7	(350 F)
STACK HEIGHT - M	61.	(200 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	6.3	(20.6 FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	BITUMINOUS	
AVERAGE HEAT CONTENT - J/G	28959.	(12450 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		******
AVERAGE ASH CONTENT - %	8.00	
RANGE ASH CONTENT - %	8.-10.	
AVERAGE MOISTURE CONTENT - %	9.00	
RANGE MOISTURE CONTENT - %	5.5	
AVERAGE SULFUR CONTENT - %	.50	
RANGE SULFUR CONTENT - %	0.5-1.0	
AVERAGE CHLORIDE CONTENT - %	.05	
RANGE CHLORIDE CONTENT - %	******	
*** PARTICLE CONTROL		
** MECHANICAL COLLECTOR		
TYPE	MULTICLONES	
SUPPLIER	RESEARCH-COTTRELL	
PARTICLE REMOVAL EFFICENCY -%	75.0	
** PARTICLE SCRUBBER		
NUMBER	1	
GENERIC TYPE	VENTURI TOWER	
SPECIFIC TYPE	FIXED-THROAT	
SUPPLIER	ADL/COMBUSTION EQUIP ASSOCIATES	
DIMENSIONS - FT	1.5 DIA. X 18 LONG AT THROAT	
SHELL GENERIC MATERIAL	CARBON STEEL, HIGH ALLOY	
SHELL SPECIFIC MATERIAL	AISI 1110, AUSTENITIC	
LINER GENERIC MATERIAL	NONE, ORGANIC	
LINER SPECIFIC MATERIAL	N/A, RUBBER	
GAS CONTACTING DEVICE TYPE	TWIN VARIABLE THROATS	
NUMBER OF CONTACTING ZONES	1	
LIQUID RECIRCULATION RATE - LITER/S	157.5	(2500 GPM)
L/G RATIO - LITER/CU.M	1.3	(10.0 GAL/1000ACF)
PRESSURE DROP - KPA	.8	(3.3 IN-H2O)
SUPERFICIAL GAS VELOCITY - M/S	50.3	(165.0 FT/S)
INLET GAS FLOW RATE - CU.M/S	223.2	(473000 ACFM)
INLET GAS TEMPERATURE - C	176.7	(350 F)
PARTICLE REMOVAL EFFICIENCY - %	97.0	
*** FGD SYSTEM		

NEVADA POWER: REID GARDNER 3 (CONT.)

** GENERAL DATA		
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT	
SO2 REMOVAL MODE	WET SCRUBBING	
PROCESS TYPE	SODIUM CARBONATE	
PROCESS ADDITIVES	NONE	
SYSTEM SUPPLIER	COMBUSTION EQUIP ASSOCIATES	
A-E FIRM	BECHTEL	
DEVELOPMENT LEVEL	FULL SCALE	
NEW/RETROFIT	NEW	
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.00	
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	85.00	
CURRENT STATUS	1	
COMMERCIAL START-UP	7/76	
INITIAL START-UP	7/76	
CONTRACT AWARDED	7/73	
** DESIGN AND OPERATING PARAMETERS		
** ABSORBER		
NUMBER	1	
GENERIC TYPE	TRAY TOWER	
SPECIFIC TYPE	SIEVE TRAY	
SUPPLIER	COMBUSTION EQUIP ASSOCIATES	
DIMENSIONS - FT	30 DIA.	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	AISI 1110	
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A	
LINER GENERIC MATERIAL	ORGANIC	
LINER MATERIAL TRADE NAME/COMMON TYPE	RUBBER	
GAS CONTACTING DEVICE TYPE	SINGLE SIEVE TRAY WITH 3/16 IN HOLES	
NUMBER OF CONTACTING ZONES	1	
LIQUID RECIRCULATION RATE - LITER/S	38.	(600 GPM)
L/G RATIO - L/CU.M	.2	(1.6 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	.7	(3.0 IN-H2O)
SUPERFICAL GAS VELOCITY - M/SEC	3.4	(11.0 FT/S)
SO2 REMOVAL EFFICIENCY - %	91.2	
** MIST ELIMINATOR		
PRE-MIST ELIMINATOR/MIST ELIMINATOR	MIST ELIMINATOR	
NUMBER PER SYSTEM	1	
GENERIC TYPE	CENTRIFUGAL	
SPECIFIC TYPE	RADIAL VANE	
CONFIGURATION	HORIZONTAL	
NUMBER OF STAGES	1	
NUMBER OF PASSES PER STAGE	1	
PRESSURE DROP - KPA	.1	(.5 IN-H2O)
CONSTRUCTION MATERIAL GENERIC TYPE	316L SS (BOTH ME AND WASH TRAY)	
** REHEATER		
GENERIC TYPE	INDIRECT HOT AIR	
SPECIFIC TYPE	EXTERNAL HEAT EXCHANGER	
TRADE NAME/COMMON TYPE	STEAM TUBE BUNDLES	
TEMPERATURE INCREASE - C	10.0	(50 F)
INLET FLUE GAS TEMPERATURE - C	48.3	(119 F)
NUMBER OF TUBES PER BUNDLE	24	
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	
** FANS		
NUMBER	1	
SUPPLIER	BUFFALO FORGE	
FUNCTION	BALANCED DRAFT	
APPLICATION	FORCED DRAFT	
SERVICE	DRY	
FLUE GAS FLOW RATE - CU.M/S	223.21	(473000 ACFM)
FLUE GAS TEMPERATURE - C	176.7	(350 F)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	
** DUCTWORK		
LOCATION	SCRUBBER INLET	
SHELL GENERIC MATERIAL TYPE	CARBON STEEL	

NEVADA POWER: REID GARDNER 3 (CONT.)

LINER GENERIC MATERIAL TYPE	NONE
** DUCTWORK	
LOCATION	SCRUBBER OUTLET
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
LINER GENERIC MATERIAL TYPE	PLASITE 4004-S
** TANKS	
SERVICE	NUMBER
VENTURI RECYCLE	1
** PUMPS	
SERVICE	NUMBER
SCRUBBER RECIRCULATION	3
ABSORBER RECIRCULATION	3
*** SLUDGE	
** DISPOSAL	
NATURE	INTERIM
TYPE	LINED POND
LOCATION	ON SITE
** DISPOSAL	
NATURE	FINAL
TYPE	LINED POND
LOCATION	ON SITE
SITE TRANSPORTATION METHOD	GRAVITY FLOW FROM INTERIM SLUDGE POND
** WATER BALANCE	
WATER LOOP TYPE	CLOSED
MAKEUP WATER ADDITION - LITERS/S	9.8 (155 GPM)
** FGD SPARE CAPACITY INDICES	
ABSORBER - %	.0
** FGD SPARE COMPONENT INDICES	
ABSORBER	.0

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
7/76	SYSTEM	82.0	45.9	70.4	42.7			744	692	318	

** PROBLEMS/SOLUTIONS/COMMENTS

INITIAL BOILER TESTING OPERATIONS BEGAN IN EARLY APRIL 1976. INITIAL FLUE GAS SCRUBBING SYSTEM TESTING BEGAN IN LATE JUNE 1976.

THE UNIT 3 SCRUBBING SYSTEM WAS PLACED IN OPERATION ON JULY 12, 1976. THE SYSTEM DESIGN WAS BASED ON INFORMATION AND DATA OBTAINED FROM AN 8000-ACFM PILOT PLANT PROGRAM CONDUCTED AT THIS STATION IN 1971 AND 1972.

A HIGH SOLIDS CONCENTRATION IN THE VENTURI SCRUBBING SOLUTION CYCLE WAS A PROBLEM DURING JULY.

FOUR OUTAGES WERE REPORTED FOR THE MONTH, THREE OF WHICH WERE FORCED SCRUBBER OUTAGES.

A BUCKET ELEVATOR MALFUNCTION WAS A PROBLEM DURING JULY FORCING THE SYSTEM OUT OF SERVICE FOR 109 HOURS.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
8/76	SYSTEM	43.2	43.2	43.2	43.2			744	744	321	

NEVADA POWER: REID GARDNER 3 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
		A REHEATER MOTOR BURNOUT OCCURRED IN AUGUST.									
		THE VENTURI FLOOR WAS EFFECTIVELY DESTROYED DURING AUGUST.									
		SCRUBBER OUTAGE TIME WAS REQUIRED TO REPAIR AN ID FAN ELECTRICAL MALFUNCTION AND TO INSTALL ID FAN INSULATION.									
		THICKENER TANK PLUGGING CAUSED FGD DOWN TIME.									
		SCRUBBER OUTAGES TOTALLED 423 HOURS IN AUGUST.									
9/76	SYSTEM	50.6	46.2	46.9	43.6			720	679	314	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE SYSTEM WAS PLACED BACK IN SERVICE ON SEPTEMBER 14 IN FOLLOWING EXTENSIVE REPAIRS AND MODIFICATIONS FROM THE PRECEEDING MONTH.									
		A VENTURI VIBRATION TRIP RESULTED IN NEARLY 14 HOURS OF FGD SYSTEM OUTAGE TIME.									
		TWO REHEATER FAN TRIPS OCCURRED IN SEPTEMBER ACCOUNTING FOR 14 HOURS OF FGD SYSTEM OUTAGE TIME.									
10/76	SYSTEM	21.0	28.4	28.4	20.9			744	548	155	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		HIGH SOLIDS CONTENT IN THE VENTURI RECYCLE SOLUTION RESULTED IN 26 HOURS OF SCRUBBER OUTAGE TIME.									
		A SCRUBBER GAS DAMPER MALFUNCTION FORCED THE FGD SYSTEM OUT OF SERVICE FOR FOUR HOURS.									
		VENTURI BOX LEAKS WERE ENCOUNTERED FORCING THE SCRUBBER OUT OF SERVICE FROM OCTOBER 8 THROUGH THE END OF THE MONTH.									
11/76	SYSTEM	28.5	68.7	68.7	28.5			720	298	205	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE SCRUBBING SYSTEM WAS OUT OF SERVICE THE FIRST HALF OF NOVEMBER AS REPAIRS OF LEAKS IN THE VENTURI SCRUBBER BOX CONTINUED. THE SYSTEM WAS RESTARTED ON NOVEMBER 19.									
		A SCREW CONVEYOR MALFUNCTION (PREVENTING CHEMICAL MIXING) RESULTING IN 68 HOURS OF SCRUBBER OUTAGE TIME.									
12/76	SYSTEM	99.0	97.0	98.9	97.0			744	744	722	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		A BOILER HIGH TEMPERATURE TRIP FORCED THE SCRUBBER OUT OF SERVICE FOR 14 HOURS EARLY IN DECEMBER.									
		ONE MINOR EIGHT HOUR SCRUBBER OUTAGE OCCURRED WHEN REPAIRS WERE MADE ON THE ID FAN EXPANSION JOINT.									
1/77	SYSTEM	98.3	98.3	98.3	97.1			744	735	723	

NEVADA POWER: REID GARDNER 3 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
		PERFORMANCE DATA									
2/77	SYSTEM	74.5	69.7	70.0	59.6			672	575	400	

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS OUT OF SERVICE NEARLY NINE HOURS FOR BOILER-RELATED PROBLEMS.

A PLUGGED TRAY OCCURRED IN JANUARY RESULTING IN 3.5 HOURS OF FGD SYSTEM OUTAGE TIME.

A REHEATER STEAM LEAK RESULTED IN A MINOR NINE HOUR FGD SYSTEM FORCED OUTAGE.

3/77	SYSTEM	43.5	51.6	51.6	43.5			744	627	324	

** PROBLEMS/SOLUTIONS/COMMENTS

THE RUBBER LINING IN THE SEPARATOR REQUIRED 167 HOURS OF DOWNTIME IN MARCH FOR CURING.

THE SCRUBBER FAN EXPANSION JOINT BLEW OUT CAUSING 225 HOURS OF OUTAGE TIME.

A 25 HOUR OUTAGE WAS REQUIRED TO CLEAN A PLUGGED TRAY.

A SCRUBBER LIMIT SWITCH TRIPPED THE SCRUBBER OFF FOR THREE HOURS DURING MARCH.

4/77	SYSTEM	85.8	84.6	85.5	83.3			720	709	600	

** PROBLEMS/SOLUTIONS/COMMENTS

A HIGH TRAY DIFFERENTAL PRESSURE RESULTED IN 86 HOURS OF FGD SYSTEM DOWN TIME.

A PLUGGED STRAINER IN THE TRAY RECYCLE TANK OCCURRED CAUSING 16 HOURS OF OUTAGE TIME.

THE SCRUBBER WAS OFF LINE 18 HOURS FOR BOILER-RELATED PROBLEMS IN EARLY APRIL.

5/77	SYSTEM	62.8	26.3	97.7	16.6			744	470	124	

** PROBLEMS/SOLUTIONS/COMMENTS

THE MODULE WAS UNAVAILABLE DURING THE FIRST THREE WEEKS OF THE MONTH BECAUSE OF A FORCED OUTAGE REQUIRED FOR THE REPLACEMENT OF THE FRP LINER IN THE SCRUBBER SEPARATOR SECTION. MOST OF THIS SCRUBBER OUTAGE TIME COINCIDED WITH A BOILER OUTAGE.

APPROXIMATELY 1.4 HOURS OF SCRUBBER OUTAGE TIME WERE REQUIRED TO REWIRE A REHEATER FAN CIRCUIT BREAKER.

REPAIR OF VENTURI DAMPER CONTROLS REQUIRED 1.5 HOURS OF SCRUBBER OUTAGE TIME.

6/77	SYSTEM	65.6	64.5	64.8	63.1			720	705	455	

NEVADA POWER: REID GARDNER 3 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
		PERFORMANCE DATA									
	** PROBLEMS/SOLUTIONS/COMMENTS										
		HIGH TRAY DIFFERENTIAL PRESSURE READINGS RESULTED IN 192 HOURS OF SCRUBBER OUTAGE TIME TO MAKE CORRECTIONS.									
		A VENTURI RECYCLE LINE THROTTLE VALVE MALFUNCTIONED DURING JANUARY FORCING THE SCRUBBER OUT OF SERVICE 56 HOURS.									
		THE SCRUBBER WAS OUT OF SERVICE 18 HOURS BECAUSE OF BOILER-RELATED PROBLEMS.									
7/77	SYSTEM	72.9	72.9	72.9	72.9			744	744	542	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		PROBLEMS RELATED TO HIGH DIFFERENTIAL TRAY PRESSURE ACCOUNTED FOR 160 HOURS OF THE JULY SCRUBBER OUTAGE TIME.									
		REPAIRS TO A VENTURI DISCHARGE VALVE CONTRIBUTED 19 HOURS TO FGD SYSTEM OUTAGE TIME.									
		SCRUBBER FAN VIBRATION PROBLEMS CAUSED 23 HOURS OF SCRUBBER OUTAGE TIME.									
8/77	SYSTEM	69.7	59.7	62.5	50.4			744	629	375	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		PROBLEMS RELATED TO HIGH DIFFERENTIAL PRESSURE READINGS AT THE SCRUBBER TRAY SECTION CONTINUED INTO EARLY AUGUST AND ACCOUNTED FOR 59 HOURS OF SCRUBBER OUTAGE TIME.									
		THE SCRUBBING SYSTEM WAS FORCED OUT OF SERVICE 147 HOURS IN AUGUST TO MAKE REPAIRS MADE NECESSARY BY A VENTURI RECYCLE LINE LEAK.									
		A SCRUBBER OUTLET HIGH TEMPERATURE FALSE ALARM CAUSED A 19 HOUR SYSTEM SHUTDOWN.									
		THE BOILER WAS OUT OF SERVICE FOR 144 HOURS DURING AUGUST.									
9/77	SYSTEM	89.7	89.7	98.8	89.7			720	720	646	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		HIGH SOLIDS IN THE VENTURI RECYCLE SYSTEM CAUSED EIGHT HOURS OF SCRUBBER OUTAGE TIME IN SEPTEMBER.									
		NEW EFFLUENT AND POST NEUTRALIZATION LINES WERE INSTALLED DURING SEPTEMBER REQUIRING 66 HOURS OF SCHEDULED SCRUBBER OUTAGE TIME.									
10/77	SYSTEM	99.4	90.0	99.0	61.2			744	506	455	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE SCRUBBER WAS DOWN 284 HOURS DURING OCTOBER BECAUSE OF A SCHEDULED BOILER OUTAGE.									
		4.5 HOURS OF OUTAGE TIME OCCURRED AS A RESULT OF HIGH VIBRATION PROBLEMS ON A SCRUBBER FAN.									
11/77	SYSTEM	88.8	88.0	88.6	86.7			720	710	624	

NEVADA POWER: REID GARDNER 3 (CONT.)

PERIOD	MODULE	PERFORMANCE DATA: AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
12/77	SYSTEM	84.8	90.1	93.1	83.8			744	692	623	

** PROBLEMS/SOLUTIONS/COMMENTS

THE SCRUBBER WAS OUT OF SERVICE 80 HOURS FOR THE INSTALLATION OF AN OUTLET NOZZLE IN THE BOOSTER TANK.

THE BOILER WAS OUT OF SERVICE APPROXIMATELY 15 HOURS IN NOVEMBER.

1/78	SYSTEM	99.5	99.5	99.5	99.5			744	744	740	

** PROBLEMS/SOLUTIONS/COMMENTS

A FAULTY SYSTEM THERMOCOUPLE FORCED THE SCRUBBER OUT OF SERVICE 4.4 HOURS.

BOILER OUTAGE TIME AMOUNTED TO 75 HOURS IN DECEMBER.

THE INSTALLATION OF TRAY SPRAY STRAINER REQUIRED SOME SCRUBBER OUTAGE TIME.

THE FGD SYSTEM WAS OFF LINE TO INSTALL NEW SENSING LINES.

2/78	SYSTEM	95.5	95.0	95.1	87.5			672	619	588	

** PROBLEMS/SOLUTIONS/COMMENTS

A PLUGGED VENTURI NOZZLE RESULTED IN FOUR HOURS OF SCRUBBER OUTAGE TIME DURING JANUARY.

3/78	SYSTEM	97.3	96.9	97.2	96.5			744	741	718	

** PROBLEMS/SOLUTIONS/COMMENTS

A 16 HOUR FGD SYSTEM OUTAGE DUE TO A HIGH VENTURI TEMPERATURE READING (CAUSED BY FAULTY WIRING) OCCURRED DURING FEBRUARY.

A MINOR 13 HOUR OUTAGE WAS NECESSARY TO CHECK THE VENTURI TEMPERATURE INDICATOR.

THE FGD SYSTEM WAS FORCED OUT OF SERVICE BY MIX TANK PLUGGING WHICH MADE IT IMPOSSIBLE TO MIX CHEMICALS IN LATE FEBRUARY.

4/78	SYSTEM	97.1	89.3	96.8	87.3			720	705	629	

** PROBLEMS/SOLUTIONS/COMMENTS

THE MIX TANK PROBLEM WHICH BEGAN IN LATE FEBRUARY CONTINUED INTO MARCH CAUSING THE ONLY FGD DOWNTIME FOR THE MONTH. THE MIX TANK OUTAGE FOR BOTH MONTHS COMBINED TOTALLED 22 HOURS.

A FURNACE HIGH/LOW PRESSURE TRIP CAUSED A BOILER OUTAGE OF SIX HOURS.

5/78	SYSTEM	97.4	76.5	96.2	66.4			744	646	494	

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS DOWN 21 HOURS FOR REPAIRS ON THE VENTURI EMERGENCY SPRAY SYSTEM.

THE BOILER WAS DOWN APPROXIMATELY 70 HOURS DURING APRIL FOR NON-SCRUBBER RELATED PROBLEMS.

NEVADA POWER: REID GARDNER 3 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
				PERFORMANCE DATA							
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THERE WAS A SCHEDULED OUTAGE OF 230 HOURS FOR BOILER MAINTENANCE DURING MAY.									
		A 20 HOUR SCRUBBER FORCED OUTAGE RESULTED FROM A FAULTY TEMPERATURE PROBE AT THE VENTURI DURING MAY.									
6/78	SYSTEM	95.9	95.6	95.9	95.2			720	715	686	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		A HIGH/LOW FURNACE PRESSURE TRIP RESULTED IN A FIVE HOUR BOILER OUTAGE.									
		A 29 HOUR FGD SYSTEM OUTAGE OCCURRED WHEN THE FIRE SPRAY SYSTEM WAS OUT OF SERVICE.									
7/78	SYSTEM	81.1	80.3	80.5	78.4			744	726	583	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		LOW VENTURI FLOW CAUSED A 16 HOUR FGD OUTAGE. THIS WAS CORRECTED WHEN THE RACE TRACK SPRAY COLLAR AND NOZZLES WERE CLEANED.									
		A SCHEDULED OUTAGE TO CLEAN THE BOILER TURBINE LUBE OIL COOLERS OCCURRED DURING JULY TAKING THE SCRUBBER AND BOILER OUT OF SERVICE FOR 20 HOURS.									
		AN OUTAGE WAS REQUIRED FOR INSPECTION OF THE VENTURI TANK AND VENTURI RACE TRACK COLLAR. DURING THE OUTAGE THE TANK AND RACE TRACK NOZZLES WERE CLEANED AND THE RUBBER LINING ON THE VENTURI SPOOL WAS REPLACED.									
		A 36 HOUR SCRUBBER OUTAGE WAS REQUIRED TO CLEAN THE VENTURI RACE TRACK SPRAY COLLAR.									
8/78	SYSTEM	98.2	97.1	98.2	97.1			744	744	722	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		ONE EIGHT HOUR FORCED BOILER OUTAGE OCCURRED DUE TO HIGH FURNACE PRESSURE READING.									
		THE SCRUBBER WAS FORCED OFF LINE ON AUGUST 28 DUE TO HIGH SCRUBBER FAN OUTLET PRESSURE FOR APPROXIMATELY NINE HOURS. THE SCRUBBER PRESSURE SENSING LINE WAS CLEANED.									
		ON AUGUST 29 THE SCRUBBER EFFLUENT SOLIDS LEVEL WAS HIGH CAUSING AN OUTAGE OF APPROXIMATELY FIVE HOURS. THE SYSTEM WAS FLUSHED TO CORRECT THE PROBLEM.									
9/78	SYSTEM	100.0	96.4	100.0	31.6			720	236	228	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UNIT WAS TAKEN OUT OF SERVICE ON SEPTEMBER 10 FOR A TURBINE OVERHAUL WHICH LASTED THROUGH THE END OF THE MONTH.									
10/78	SYSTEM	100.0			.0			744	0	0	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UNIT WAS DOWN THE ENTIRE MONTH OF OCTOBER AS THE TURBINE OVERHAUL CONTINUED.									
11/78	SYSTEM	98.4	92.6	97.6	66.3			720	515	477	

NEVADA POWER: REID GARDNER 3 (CONT.)

PERIOD	MODULE	PERFORMANCE DATA AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
12/78	SYSTEM	100.0	100.0	100.0	100.0			744	744	744	

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS BROUGHT BACK ON LINE NOVEMBER 10 AFTER COMPLETION OF THE SCHEDULED TURBINE OVERHAUL.

THE FGD SYSTEM WAS OUT OF SERVICE FOR ABOUT 12 HOURS FOR REPAIRING VENTURI TEMPERATURE PROBES.

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO FGD SYSTEM OUTAGES OCCURRED DURING DECEMBER.

PERIOD	MODULE	PERFORMANCE DATA AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
1/79	SYSTEM	66.4	67.2	67.2	66.4			744	735	494	67.2

** PROBLEMS/SOLUTIONS/COMMENTS

95 HOURS OF SCRUBBER OUTAGE TIME WAS NECESSARY TO REPAIR A HOLE IN THE VENTURI BOX.

TWO FORCED OUTAGES OCCURRED BECAUSE OF A HIGH EFFLUENT SOLIDS LEVEL. THE RECYCLE SYSTEM WAS CLEANED. PROBLEMS WITH HIGH EFFLUENT SOLIDS ACCOUNTED FOR 154 HOURS OF OUTAGE TIME.

PERIOD	MODULE	PERFORMANCE DATA AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
2/79	SYSTEM	48.7	45.7	46.7	44.9			672	661	302	57.0

** PROBLEMS/SOLUTIONS/COMMENTS

A STEAM LEAK IN THE SCRUBBER REHEATER COIL RESULTED IN A 54 HOUR SCRUBBER OUTAGE.

THE FGD SYSTEM WAS OFF FOR A FEW HOURS TO REPAIR A LEAK IN THE VENTURI LINE.

THE SCRUBBER WAS OUT OF SERVICE 139 HOURS TO REPAIR LEAKS IN EFFLUENT AND VENTURI LINES.

THE SCRUBBER WAS OFF WITH THE BOILER BECAUSE OF A HIGH FURNACE PRESSURE BOILER TRIP.

THE VENTURI RACE TRACK NOZZLES WERE CLEANED DURING THE 25 HOUR FEBRUARY BOILER OUTAGE.

REPAIRS RESULTING FROM A REHEATER FAN BURN UP ACCOUNTED FOR 151 HOURS OF THE FEBRUARY SCRUBBER OUTAGE TIME.

PERIOD	MODULE	PERFORMANCE DATA AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
3/79	SYSTEM	100.0	97.9	100.0	32.3			744	246	241	63.1

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER AND FGD SYSTEM WERE OFF-LINE FOR 39 HOURS SO THAT A BOILER ID FAN COULD BE REPAIRED AND BALANCED.

THE BOILER AND FGD SYSTEM WERE OFF-LINE 465 HOURS FOR SCHEDULED MAINTENANCE.

PERIOD	MODULE	PERFORMANCE DATA AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
4/79	SYSTEM	100.0	100.0	100.0	100.0			720	720	720	74.3

NEVADA POWER: REID GARDNER 3 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UTILITY REPORTED THAT NO SCRUBBER OUTAGES OCCURRED DURING APRIL.									
5/79	SYSTEM	98.8	97.7	97.7	97.5			744	742	725	79.9
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE SCRUBBER WAS INADVERTENTLY REMOVED FROM SERVICE. SINCE THE SCRUBBER WAS NOT OPERATING THE UTILITY TOOK THE OPPORTUNITY TO CLEAN THE SCRUBBER PRESSURE SENSING LINES. THE SYSTEM WAS OUT OF SERVICE FOR ABOUT 10 HOURS. THE SCRUBBER PRESSURE SENSING LINES WERE CLEANED AGAIN AFTER A BOILER TRIP ON HIGH FURNACE PRESSURE. THIS OUTAGE LASTED ABOUT NINE HOURS.									
6/79	SYSTEM	94.2	91.3	93.5	83.5			720	659	602	81.9
	** PROBLEMS/SOLUTIONS/COMMENTS										
		77 HOURS OF BOILER OUTAGE TIME WAS REQUIRED DURING JUNE TO REPAIR A BOILER TUBE LEAK. THE SCRUBBER WAS OUT OF SERVICE WHILE REPAIRS WERE MADE ON THE FIRE WATER EMERGENCY SPRAY SYSTEM.									
7/79	SYSTEM	93.2	93.2	93.2	93.2			744	744	694	83.8
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE 3A VENTURI RECYCLE PUMP HAD A BAD PUMP CASING LEAK CAUSING ABOUT 50 HOURS OF OFF TIME. THE 3B VENTURI PUMP WAS OUT OF SERVICE FOR MAINTENANCE.									
8/79	SYSTEM	87.6	93.0	92.6	87.6			744	701	652	84.5
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE SCRUBBER AND BOILER WERE BOTH SHUT DOWN 52 HOURS. THE EXPANSION JOINTS ON THE BOILER CIRCULATING WATER PUMPS WERE REPLACED. THE SCRUBBER WAS OFF TO CLEAN TRAY AND VENTURI RACE TRACK NOZZLES. THE SCRUBBER WAS DOWN FOR ABOUT 31 HOURS. THE SCRUBBER WAS OFF TO REPAIR BROKEN FIRE LINES. THE SCRUBBER WAS LEFT WITHOUT AN EMERGENCY SPRAY SYSTEM.									
9/79	SYSTEM	100.0	98.8	100.0	90.2			720	658	650	86.1
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING SEPTEMBER THE SCRUBBER WENT OFF LINE WITH THE BOILER TO REPAIR BOILER TUBE LEAKS.									
10/79	SYSTEM	97.2	97.2	97.2	97.2			744	744	723	87.4
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING OCTOBER THE SCRUBBER WENT OFF LINE BECAUSE THERE WAS NO EMERGENCY SPRAY TO THE SCRUBBER. THE 2A LOAD CENTER WAS OUT FOR MAINTENANCE AND THERE WAS NO POWER TO OPERATE THE FIRE PUMP.									
11/79	SYSTEM	100.0	98.7	100.0	80.4			720	587	579	88.0

NEVADA POWER: REID GARDNER 3 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PERIOD HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
		PERFORMANCE DATA									
	** PROBLEMS/SOLUTIONS/COMMENTS										
		TWO OUTAGES OCCURRED DURING NOVEMBER DUE TO HIGH FURNACE PRESSURE CAUSING A BOILER TRIP. THE BOILER TRIP OUTAGES TOTALLED 32 HOURS.									
		THE SCRUBBER AND BOILER WERE TAKEN OFF LINE ON NOVEMBER 25 FOR SCHEDULED MAINTENANCE.									
12/79	SYSTEM	86.6	72.4	74.8	39.7			744	408	295	87.1
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UNIT WAS OFF FOR THE FIRST TWO WEEKS OF DECEMBER FOR SCHEDULED MAINTENANCE.									
		TWO SCRUBBER OUTAGES OCCURRED LATER IN THE MONTH DUE TO THE REHEATER BLOWER MOTOR BURN OUTS. THESE OUTAGES TOTALLED 100 HOURS.									
1/80	SYSTEM	100.0	99.8	100.0	91.4			744	681	680	99.7
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING JANUARY THE SCRUBBER AND BOILER WERE OFF LINE FOR APPROXIMATELY 64 HOURS SO THAT THE BOILER ID FAN COULD BE REPAIRED AND BALANCED.									
2/80	SYSTEM	100.0	98.1	100.0	77.9			696	552	542	99.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING FEBRUARY THE BOILER AND SCRUBBER WERE OFF LINE ONCE AT THE BEGINNING AND ONCE AT THE END OF THE MONTH TO BALANCE THE BOILER ID FAN. BOILER ID FAN BALANCING ACCOUNTED FOR 121 HOURS OF THE SCRUBBER OUTAGE TIME.									
		THE SCRUBBER AND BOILER WERE TAKEN OFF LINE SO THAT COAL LEAKS ON THE BURNER LINES COULD BE REPAIRED.									
		HIGH FURNACE PRESSURE TRIPPED THE BOILER OFF LINE. THIS CAUSED THE SCRUBBER TO BE OFF LINE FOR SEVEN HOURS.									
3/80	SYSTEM	100.0	99.6	100.0	60.3			744	450	448	99.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE BOILER AND SCRUBBER WERE TAKEN OFF-LINE TWICE DURING MARCH. THE FIRST OUTAGE WAS TO BALANCE THE BOILER ID FAN. LATER IN THE MONTH THE ID FANS AND THE ESPS HAD TO BE REPAIRED. THE BOILER OUTAGES KEPT THE SCRUBBER OFF-LINE 296 HOURS IN MARCH.									
4/80	SYSTEM	100.0			.0			720	0	0	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE FGD SYSTEM WAS AVAILABLE 100% DURING APRIL, HOWEVER, DID NOT OPERATE DUE TO THE OVERHAUL OF BOTH THE DUST COLLECTOR AND THE ID FAN.									
5/80	SYSTEM	.0	.0	.0	.0			744	462	0	77.8
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE FGD SYSTEM WAS DOWN THE ENTIRE MONTH FOR THE OVERHAUL OF THE FGD ID FANS. BECAUSE OF THIS, THE SYSTEM AVAILABILITY WAS ZERO FOR MAY.									
6/80	SYSTEM	75.2	81.4	81.4	72.2			720	639	520	78.9

NEVADA POWER: REID GARDNER 3 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE ID FAN OVERHAUL WAS COMPLETED EARLY IN JUNE.									
		THE BOILER WAS OUT OF SERVICE FOR 21 HOURS.									
7/80	SYSTEM	95.7	96.4	95.7	95.2			744	735	721	82.6
	** PROBLEMS/SOLUTIONS/COMMENTS										
		BOILER RELATED OUTAGES KEPT THE FGD SYSTEM OFF LINE FOR SEVERAL HOURS.									
		A HIGH VENTURI OUTLET TEMPERATURE FORCED THE FGD SYSTEM OFF LINE DURING PART OF JULY.									
		A HIGH VENTURI OUTLET TEMPERATURE FORCED THE FGD SYSTEM OFF LINE DURING									
8/80	SYSTEM	100.0	100.0	100.0	100.0			744	744	744	85.7
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE FGD SYSTEM WAS AVAILABLE DURING ALL OF AUGUST.									
9/80	SYSTEM	96.8	96.8	96.8	96.8			720	720	697	87.3
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE FGD SYSTEM WAS OUT OF SERVICE IN SEPTEMBER BECAUSE OF ROUTINE CLEANING AND MAINTENANCE.									
10/80	SYSTEM	85.0	84.0	84.4	80.7			744	715	600	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE FGD SYSTEM WAS TAKEN OFF-LINE DURING THE BEGINNING OF OCTOBER DUE TO A SCHEDULED UNIT OUTAGE.									
		DURING THE MONTH TWO OUTAGES AMOUNTING TO 111 HOURS OF OUTAGE TIME WERE CAUSED BY PROBLEMS WITH THE REHEATER FAN MOTOR.									
11/80	SYSTEM	94.8	100.0	94.8	94.8			720	682	682	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING NOVEMBER A SHEARED PIN ON THE AIR PREHEATER COUPLING FORCED THE SYSTEM OUT OF SERVICE FOR APPROXIMATELY SEVEN HOURS.									
		PROBLEMS WITH A TUBE LEAK FORCED THE SYSTEM DOWN SO THAT NECESSARY REPAIRS COULD BE PERFORMED.									
12/80	SYSTEM	100.0	95.7	99.5	71.4			744	531	531	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING DECEMBER THE SYSTEM WAS SHUTDOWN FOR A SCHEDULED OUTAGE WHICH LASTED APPROXIMATELY 210 HOURS.									

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	NORTHERN INDIANA PUB SERVICE	
PLANT NAME	DEAN H. MITCHELL	
UNIT NUMBER	11	
CITY	GARY	
STATE	INDIANA	
REGULATORY CLASSIFICATION	E	
PARTICULATE EMISSION LIMITATION - NG/J	43.	(.100 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	516.	(1.200 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	505	
GROSS UNIT GENERATING CAPACITY - MW	116	
NET UNIT GENERATING CAPACITY W/FGD - MW	94	
NET UNIT GENERATING CAPACITY WO/FGD - MW	108	
EQUIVALENT SCRUBBED CAPACITY - MW	115	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	BABCOCK & WILCOX	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	198.20	(420000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	142.2	(288 F)
STACK HEIGHT - M	51.	(168 FT)
STACK SHELL	FRP	
STACK TOP DIAMETER - M	*******	(***** FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	******	
AVERAGE HEAT CONTENT - J/G	25586.	(11000 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		******
AVERAGE ASH CONTENT - %	********	
RANGE ASH CONTENT - %	******	
AVERAGE MOISTURE CONTENT - %	11.00	
RANGE MOISTURE CONTENT - %	******	
AVERAGE SULFUR CONTENT - %	3.50	
RANGE SULFUR CONTENT - %	3.2-3.5	
AVERAGE CHLORIDE CONTENT - %	********	
RANGE CHLORIDE CONTENT - %	******	
*** PARTICLE CONTROL		
** ESP		
NUMBER	1	
TYPE	COLD SIDE	
SUPPLIER	AMERICAN STANDARD	
** PARTICLE SCRUBBER		
NUMBER	1	
GENERIC TYPE	VENTURI TOWER	
SPECIFIC TYPE	VARIABLE-THROAT/BOTTOM-ENTRY PLUMB BOB	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	AISI 1110	
GAS CONTACTING DEVICE TYPE	1 LEVEL OF SPRAYS	
NUMBER OF CONTACTING ZONES	1	
INLET GAS TEMPERATURE - C	142.2	(288 F)
*** FGD SYSTEM		
** GENERAL DATA		
SALEABLE PRODUCT/THROWAWAY PRODUCT	SALEABLE PRODUCT	
SO2 REMOVAL MODE	WET SCRUBBING	
PROCESS TYPE	WELLMAN LORD	
SYSTEM SUPPLIER	DAVY MCKEE	
A-E FIRM	DAVY MCKEE	
DEVELOPMENT LEVEL	DEMONSTRATION	
NEW/RETROFIT	RETROFIT	
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	98.50	
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	90.00	
CURRENT STATUS	1	

NORTHERN INDIANA PUB SERVICE: DEAN H. MITCHELL 11 (CONT.)

COMMERCIAL START-UP	6/77
INITIAL START-UP	7/76
CONTRACT AWARDED	6/72

** DESIGN AND OPERATING PARAMETERS

** ABSORBER

NUMBER	1
GENERIC TYPE	TRAY TOWER
SPECIFIC TYPE	VALVE TRAY
TRADE NAME/COMMON TYPE	BUBBLE CAP TRAY TOWER
SUPPLIER	DAVY MCKEE
SHELL GENERIC MATERIAL	CARBON STEEL
SHELL SPECIFIC MATERIAL	AISI 1110
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A
LINER GENERIC MATERIAL	INORGANIC
LINER SPECIFIC MATERIAL	ACID-RESISTANT BRICK & MORTAR
LINER MATERIAL TRADE NAME/COMMON TYPE	PREFIRED BRICK
GAS CONTACTING DEVICE TYPE	KOCH FLEXITRAY VALVE TRAYS WITH COLLECTOR TRAYS
NUMBER OF CONTACTING ZONES	3
GAS-SIDE PRESSURE DROP - KPA	3.0 (12.0 IN-H2O)
INLET GAS FLOW - CU. M/S	198.20 (420000 ACFM)
SO2 REMOVAL EFFICIENCY - %	91.0

** REHEATER

GENERIC TYPE	DIRECT COMBUSTION
TRADE NAME/COMMON TYPE	NATURAL GAS
TEMPERATURE INCREASE - C	10.0 (50 F)
INLET FLUE GAS TEMPERATURE - C	54.4 (130 F)

** FANS

NUMBER	1
FUNCTION	BOOSTER
APPLICATION	FORCED DRAFT
SERVICE	DRY
FLUE GAS FLOW RATE - CU.M/S	198.20 (420000 ACFM)
FLUE GAS TEMPERATURE - C	142.2 (288 F)
CONSTRUCTION MATERIAL GENERIC TYPE	INCONEL SHIELDS ON BLADE EDGES

** FANS

NUMBER	2
FUNCTION	BOOSTER
APPLICATION	BOILER I.D.
SERVICE	DRY

** DUCTWORK

LOCATION	SCRUBBER INLET
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
LINER GENERIC MATERIAL TYPE	NONE

** TANKS

SERVICE	NUMBER
ABSORBER FEED	****
ABSORBER SURGE	****
NACO3 MAKEUP	****

** PUMPS

SERVICE	NUMBER
DISSOLVING TANK TO ABSORBER FEED TAN	****
FLYASH PURGE TO POND TRANSFER	****
ABSORBER RECIRCULATION	3
EVAPORATOR-CRYSTALLIZER FEED	****
SLURRY FEED	****

** SOLIDS CONCENTRATING/DEWATERING

DEVICE	CENTRIFUGE
NUMBER	1

NORTHERN INDIANA PUB SERVICE: DEAN H. MITCHELL 11 (CONT.)

*** SALEABLE BYPRODUCTS

NATURE	ELEMENTAL SULFUR
QUALITY - %	99.9

** WATER BALANCE

WATER LOOP TYPE	CLOSED

** FGD SPARE CAPACITY INDICES

ABSORBER - %	.0

** FGD SPARE COMPONENT INDICES

ABSORBER	.0

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
11/76	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

FOLLOWING COMPLETION OF CONSTRUCTION IN MID-1976, START-UP OF THE VARIOUS SUBSYSTEMS AND COMPONENT PARTS WAS INITIATED. DURING THE JULY THROUGH NOVEMBER PERIOD, THREE SUSTAINED RUNS OF THE SO2 ABSORBER AND REGENERATION SYSTEM UNDER NORMAL OPERATING CONDITIONS WERE ACHIEVED. SO2 REMOVAL EFFICIENCY WAS EQUAL TO OR GREATER THAN THE 90% PERFORMANCE CRITERIA. THE UNIT 11 BOILER OPERATED 121 FULL DAYS AND 10 PARTIAL DAYS. THE WELLMAN LORD SO2 RECOVERY UNIT OPERATED 71 FULL DAYS AND 23 PARTIAL DAYS. DURING THIS PERIOD, NUMEROUS MODIFICATIONS AND CORRECTIONS TO THE SYSTEM WERE COMPLETED. THESE INCLUDED MODIFYING THE ABSORBER KOCH VALVE TRAYS TO IMPROVE TURNDOWN, RUBBER LINING THE BOTTOM ABSORBER COLLECTOR TRAY, RELOCATING AND IMPROVING TEMPERATURE CONTROL OF THE LOW PRESSURE STEAM SUPPLY, INSTALLING IMPROVED SO2 SAMPLE PROBES AND SEVERAL REPLACEMENTS AND MODIFICATIONS TO THE PURGE SALT RECOVERY AREA. FULLY INTEGRATED OPERATIONS INCLUDING SO2 REDUCTION AND SULFUR RECOVERY OCCURRED IN NOVEMBER, 1976. FROM JANUARY THROUGH MAY 1977, THE UNIT 11 BOILER WAS OUT OF SERVICE FOR ABOUT FIVE MONTHS FOLLOWING A BOILER-RELATED MISHAP WHICH OCCURRED ON JANUARY 15, 1977 DURING START-UP AFTER A SCHEDULED MAINTENANCE TURN AROUND.
ON JUNE 13, 1977 FGD OPERATIONS RESUMED FOLLOWING RETURN TO FULL SERVICE OF THE UNIT 11 BOILER. BY JUNE 15 FULLY INTEGRATED OPERATION OF THE ENTIRE FGD PLANT WAS ACHIEVED. THROUGH JUNE AND JULY, SEVERAL HUNDRED HOURS OF TOTAL SYSTEM OPERATION AT BOTH PARTIAL AND FULL LOAD WERE ACCRUED.

12/76	SYSTEM							744			
1/77	SYSTEM							744			
2/77	SYSTEM							672			
3/77	SYSTEM							744			
4/77	SYSTEM							720			
5/77	SYSTEM							744			
6/77	SYSTEM							720			
7/77	SYSTEM							744			
8/77	SYSTEM					89.80		744			

NORTHERN INDIANA PUB SERVICE: DEAN H. MITCHELL 11 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
				PERFORMANCE DATA							
	** PROBLEMS/SOLUTIONS/COMMENTS										
		PERFORMANCE TESTS COMMENCED ON AUGUST 29, 1977 AND WERE SUCCESSFULLY COMPLETED ON SEPTEMBER 14, 1977. THE TEST PERIOD INCLUDED 12 DAYS AT 92 MW FLUE GAS EQUIVALENT AND 3.5 DAYS AT 110 MW FLUE GAS EQUIVALENT. DURING THIS PERIOD, 91% OF THE SO2 WAS REMOVED WHILE BURNING COAL CONTAINING 3% SULFUR AND 204 TONS OF ELEMENTAL SULFUR WERE RECOVERED. ALL PERFORMANCE CRITERIA WERE MET INCLUDING SO2 REMOVAL, PARTICULATE EMISSION, RAW MATERIAL AND UTILITY CONSUMPTIONS AND RECOVERED SULFUR QUALITY. THE FGD UNIT SHUT DOWN SEPTEMBER 19 AND REMAINED IDLE THROUGH SEPTEMBER 30 DUE TO COAL FEED PROBLEMS RESULTING FROM WET COAL.								
9/77	SYSTEM							720			
10/77	SYSTEM					91.00		744			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		A DEMONSTRATION PERIOD OF ONE YEAR BEGAN SEPTEMBER 16. IN OCTOBER, THE FGD UNIT OPERATED 132 HOURS. OPERATIONS WERE INTERUPTED WHILE HEAT BALANCE TESTS WERE CONDUCTED ON THE BOILER BY NIPSCO AND TRW AND WERE INTERRUPTED FURTHER TO MAKE REPAIRS TO THE SO2 REDUCTION SECTION, THE EVAPORATOR, AND THE UNIT 11 BOILER.										
		NOTE: BEGINNING NOVEMBER 1977, PERIOD HOURS REPORTED BY THE UTILITY WERE GIVEN IN 30 DAY AVERAGES FOR EACH MONTH EXCEPT DECEMBER TO WHICH ADDITIONAL DAYS ARE ADDED TO BRING THE ANNUAL TO 365 DAYS. FOR THE PURPOSES OF THIS REPORT INCREMENTED PERIODS CORRESPOND EXACTLY TO THE APPROPRIATE CALENDAR MONTHS. FOR THIS REASON THE PRINTED UTILIZATION FIGURES WILL NOT BE IDENTICAL TO A FIGURE CALCULATED ON THE BASIS OF THE PRINTED FGD AND PERIOD HOURS.										
11/77	SYSTEM	74.0			72.0	59.0	90.00	720		428	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE FGD UNIT OPERATED FOR 18 CONSECUTIVE DAYS, AVERAGING 90% SO2 REMOVAL WITH 285 LONG TONS OF SULFUR RECOVERED. FGD OPERATION WAS INTERRUPTED BY BOILER TUBE LEAK AND RESUMPTION OF FGD OPERATION WAS FURTHER DELAYED BY NECESSARY MAINTENANCE IN THE EVAPORATOR SECTION.										
		THE FLUE GAS ISOLATION DAMPER NEEDED REPAIRS.									
		MAINTENANCE WAS PERFORMED ON THE FLUE GAS BOOSTER BLOWER.									
		THE SO2 REDUCTION SECTION REQUIRED MAINTENANCE DURING NOVEMBER.									
12/77	SYSTEM	49.0				.0		744		0	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE FLUE GAS BOOSTER BLOWER MALFUNCTIONED CAUSING MAINTENANCE ATTENTION.									
		MAINTENANCE WAS PERFORMED ON THE ABSORBER SOLUTION REGENERATION SECTION.									
		THE FGD SYSTEM WAS NOT OPERATED DURING THIS PERIOD DUE TO ABNORMAL BOILER OPERATING CONDITIONS RELATED TO HIGH SILICA LEVELS IN THE FEED WATER. THE HIGH SILICA LEVELS RESULTED FROM HIGH MAKE-UP WATER REQUIREMENTS DUE IN PART TO A HIGHER THAN NORMAL FGD PLANT USAGE, AS WELL AS A BOILER COAL FEED PROBLEM AND AN ESP MALFUNCTION.										
1/78	SYSTEM	80.0			.0	.0		744		0	

NORTHERN INDIANA PUB SERVICE: DEAN H. MITCHELL 11 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
		PERFORMANCE DATA									
2/78	SYSTEM	47.0			.0			672		0	

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM REMAINED DOWN THROUGHOUT JANUARY AS HIGH SILICA LEVELS IN THE UNIT 11 BOILER FEED WATER PERSISTED.

MAINTENANCE WAS PERFORMED ON THE ESP.

PROBLEMS CONTINUED WITH THE FLUE GAS BOOSTER BLOWER.

THE FGD SYSTEM SO2 COMPRESSOR MALFUNCTIONED AND NEEDED MAINTENANCE.

3/78	SYSTEM	90.0		77.0	30.0			744		215	

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS NOT OPERATED DUE TO ABNORMAL BOILER OPERATING CONDITIONS RELATED TO HIGH SILICA LEVELS IN THE BOILER FEED WATER, COUPLED WITH UNIT 11 COAL FEED PROBLEMS, STOP VALVE PROBLEMS, AN ESP MALFUNCTION AND A LEAKING BOILER TUBE.

MAINTENANCE WAS PERFORMED ON THE FLUE GAS BOOSTER BLOWER.

THE FLUE GAS ISOLATION DAMPER WAS REPAIRED DURING FEBRUARY.

THE EVAPORATOR CIRCIRCULATING PUMP NEEDED MAINTENANCE ATTENTION.

THE SO2 SUPERHEATER PIPING REPAIRS WERE PERFORMED DURING THE MONTH.

4/78	SYSTEM	.0		.0	.0			720		0	

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM OPERATED FOR TEN DAYS. OPERATION WAS INTERRUPTED BY A SHUTDOWN OF THE UNIT 11 BOILER FOR REPAIR OF COAL GRINDING MILLS AND ESPS. PROPER CONDITIONS COULD NOT BE RE-ESTABLISHED FOR RE-START OF THE FGD OPERATION BECAUSE OF COAL FEED AND GRINDING PROBLEMS CAUSED BY EXTREMELY POOR QUALITY COAL.

MAINTENANCE WAS PERFORMED ON THE BOOSTER BLOWER.

OPERATING PROBLEMS WERE AGAIN ENCOUNTERED WITH THE FLUE GAS ISOLATION DAMPER.

5/78	SYSTEM	51.0		50.0	37.0			744		263	

** PROBLEMS/SOLUTIONS/COMMENTS

THE FLUE GAS BOOSTER BLOWER WAS OUT OF SERVICE FOR THIS ENTIRE PERIOD FOR REBLADING. THE FGD SYSTEM WAS INOPERABLE.

A FAILURE OF THE FLUE GAS ISOLATION DAMPER OCCURRED.

A NEW SUPPLY OF HIGH SULFUR COAL WAS OBTAINED AND SUCCESSFULLY TESTED ON UNIT 11 BOILER. THIS COAL IS EXPECTED TO ALLEVIATE PAST DIFFICULTIES WITH THE COAL FEED AND GRINDING SYSTEM.

MAINTENANCE WAS PERFORMED ON THE BOILER ID FANS.

THE FGD ABSORBER REQUIRED MAINTENANCE DURING APRIL.

NORTHERN INDIANA PUB SERVICE: DEAN H. MITCHELL 11 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
6/78	SYSTEM	13.0			1.0	.0		720			3

** PROBLEMS/SOLUTIONS/COMMENTS

THE SO2 RECOVERY PORTION OF THE FGD SYSTEM OPERATED FOR 26 DAYS. THE FGD SYSTEM AS A WHOLE OPERATED FOR 11 DAYS.

FGD OPERATIONS WERE INTERRUPTED BY FAILURE OF THE FLUE GAS ISOLATION DAMPER.

FGD OPERATIONS WERE INTERRUPTED BY PROBLEMS WITH WET COAL WHICH REQUIRED THE BOILER TO OPERATE ON LOW SULFUR COAL FOR A SHORT PERIOD.

PLUGGING OF AN ENTRAINMENT SEPARATOR IN THE SO2 REDUCTION UNIT CAUSED PROBLEMS DURING MAY.

7/78	SYSTEM	6.0			4.0	2.0		744			17

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD PROCESS FACILITIES, CONSISTING OF THE ABSORBER, EVAPORATOR, SO2 REDUCTION AND PURGE TREATMENT UNITS, WERE AVAILABLE FOR OPERATION FOR ESSENTIALLY THE ENTIRE PERIOD.

OPERATION OF THE FGD SYSTEM WAS LIMITED BY FAILURE OF THE BOOSTER BLOWER DRIVE TURBINE.

OPERATION OF THE FGD SYSTEM WAS LIMITED DUE, IN PART, TO THE INABILITY OF THE ISOLATION DAMPER TO OPERATE.

8/78	SYSTEM	98.0			98.0	98.0		744			707

** PROBLEMS/SOLUTIONS/COMMENTS

OPERATION OF THE FGD SYSTEM WAS LIMITED BY IMBALANCE OF THE BOOSTER BLOWER DUE TO INABILITY OF THE ISOLATION DAMPER TO OPERATE. THIS CONDITION COULD NOT BE CORRECTED UNTIL POWER DEMANDS PERMITTED A SHUT DOWN OF THE UNIT 11 BOILER. FLUE GAS BOOSTER BLOWER PROBLEMS INCLUDED LOW OIL PRESSURE, LEAKING BEARING OIL SEALS AND DRIVE TURBINE GOVERNOR MALFUNCTION.

RECURRING FLUCTUATIONS IN THE PRESSURE OF THE MAIN STEAM SUPPLY TO THE FGD SYSTEM LIMITED FGD OPERATIONS.

THE FGD PROCESS FACILITIES WERE AVAILABLE FOR OPERATION FOR THE ENTIRE PERIOD.

9/78	SYSTEM	44.0			99.0	44.0		720			319

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT 11 BOILER OPERATED CONTINUOUSLY ON HIGH SULFUR COAL THROUGHOUT THE PERIOD. THE FGD SYSTEM ACHIEVED FULL OPERATION ON THE FIRST DAY OF THE PERIOD. AFTER PROBLEMS WITH THE BOOSTER BLOWER WERE CORRECTED, IT REMAINED IN FULL OPERATION FOR THE BALANCE OF THE PERIOD WITH THE EXCEPTION OF ONE TWO-HOUR INTERRUPTION DUE TO AN ELECTRICAL MOTOR MALFUNCTION.

MINOR BOOSTER BLOWER PROBLEMS OCCURRED OVER THE PERIOD.

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT 11 BOILER OPERATED ON HIGH SULFUR COAL UNTIL SEPTEMBER 12 WHEN IT WAS SHUT DOWN FOR AN ANNUAL OVERHAUL. THE BOILER REMAINED DOWN THROUGH THE END OF THE PERIOD. THE FGD SYSTEM CONTINUED IN FULL OPERATION UNTIL

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR

SEPTEMBER 12, WITH THE EXCEPTION OF ONE TWO-HOUR INTERRUPTION, AND WAS THEN SHUT DOWN CURRENTLY WITH THE BOILER.

A GOVERNOR MALFUNCTION OCCURRED ON THE SO2 COMPRESSOR DRIVE TURBINE CAUSING A TWO-HOUR OUTAGE ON THE FGD OPERATIONS.

10/78	SYSTEM	44.0	73.0	73.0	44.0			744	506	369	

** PROBLEMS/SOLUTIONS/COMMENTS

THIS PERIOD COVERS SEPTEMBER 29 THROUGH NOVEMBER 2. FOLLOWING THE ANNUAL TURNAROUND, THE UNIT 11 BOILER RESTARTED ON OCTOBER 6. A NEW BASELINE TEST WAS RUN ON THE BOILER OCTOBER 7 THROUGH 12. BALANCING OF THE FLUE GAS BOOSTER BLOWER WAS THEN COMPLETED AFTER WHICH THE FGD SYSTEM WAS STARTED ON OCTOBER 18.

11/78	SYSTEM	99.0	99.0	99.0	98.0			720	716	709	

** PROBLEMS/SOLUTIONS/COMMENTS

PROBLEMS WERE ENCOUNTERED WITH THE SODIUM SULFATE PURGE DRYER WHICH NECESSITATED DISPOSING OF PART OF THE SULFATE PURGE TO THE BOTTOM ASH POND FOR A PORTION OF THE PERIOD.

THE UNIT 11 BOILER OPERATED CONTINUOUSLY ON HIGH SULFUR COAL EXCEPT FOR ONE THREE-HOUR OUTAGE FOR REPAIR OF A STEAM CONTROL VALVE. VARIATIONS IN THE PRESSURE OF THE STEAM SUPPLY TO FGD OCCURRED DUE TO HIGH SILICA IN THE BOILER MAKE-UP WATER.

12/78	SYSTEM	64.0	72.0	72.0	64.0			744	642	462	

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER WAS SHUT DOWN FROM DECEMBER 14 TO 17 TO CLEAN THE AIR PREHEATERS.

THE BOILER OPERATED ON HIGH SULFUR COAL DURING DECEMBER.

AN INSTRUMENT MALFUNCTION DUE TO FREEZING RESULTED IN THE PLUGGING OF A HEAT EXCHANGER IN THE SO2 REGENERATION UNIT. THE FGD SYSTEM WAS DOWN FOR THREE DAYS WHILE THE HEAT EXCHANGER WAS CLEANED.

1/79	SYSTEM	90.0	28.0	90.0	28.0			744		198	

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER OPERATED ON HIGH SULFUR COAL FROM JANUARY 2 THROUGH 14 AND LOW SULFUR COAL FROM JANUARY 15 THROUGH 31.

INTIGRATED OPERATION OF THE FGD SYSTEM CONTINUED TO JANUARY 10 WHEN THE SO2 REDUCTION UNIT WAS SHUT DOWN FOR REPAIR OF A SULFUR CONDENSER INCLUDING CORRECTIVE MEASURES TO AVOID FUTURE PROBLEMS WITH THE CONDENSER. THE ABSORPTION AND REGENERATION UNITS CONTINUED IN OPERATION TO JANUARY 29 WITH RECYCLE OF SO2 TO THE ABSORBER INLET. THE FGD SYSTEM REMAINED DOWN THROUGH JANUARY 31.

2/79	SYSTEM	7.0	1.0	1.0	1.0			672	500	5	

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER OPERATED ON LOW SULFUR COAL FEBRUARY 1 THROUGH 12 AND HIGH SULFUR COAL FEBRUARY 13 THROUGH MARCH 2. THE FGD SYSTEM REMAINED DOWN THROUGH FEBRUARY 22 FOR COMPLETION OF SULFUR CONDENSER REPAIRS FOLLOWED BY REPAIR OF EXPANSION JOINT LEAKS.

NORTHERN INDIANA PUB SERVICE: DEAN H. MITCHELL 11 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
			A POWER INTERRUPTION ON FEBRUARY 24 RESULTED IN LOSS OF SEAL WATER TO THE EVAPORATOR PUMP AND PACKING FAILURE. THE FGD SYSTEM REMAINED DOWN THROUGH MARCH 2.								
3/79	SYSTEM	47.0	43.0	44.0	43.0			744	716	308	
	** PROBLEMS/SOLUTIONS/COMMENTS										
			THE BOILER OPERATED ON HIGH SULFUR COAL DURING THE MONTH.								
			THE FGD SYSTEM WAS SHUT DOWN DUE TO HIGH LEAKING IN THE EVAPORATOR CIRCULATING PUMP PACKING GLAND. THE PUMP SHAFT SLEEVE WAS REPLACED AND THE PUMP REALIGNED. THE SYSTEM WAS DOWN FOR ABOUT 16 DAYS.								
4/79	SYSTEM	73.0	73.0	73.0	73.0			720	722	527	
	** PROBLEMS/SOLUTIONS/COMMENTS										
			FGD OUTAGES IN THE EVAPORATOR SYSTEM RESULTED FROM HIGH VIBRATION IN THE CIRCULATING PUMP, PARTIAL PLUGGING OF THE HEATER TUBES AND A LEAK IN THE SO2 SUPERHEATER. FGD OUTAGES IN THE SO2 REDUCTION SYSTEM RESULTED FROM PLUGGING OF THE TAIL GAS LINE AND MALFUNCTION OF THE INCINERATOR COMBUSTION CONTROLS.								
5/79	SYSTEM	86.0	74.0	76.0	69.0			744	674	499	
	** PROBLEMS/SOLUTIONS/COMMENTS										
			FGD OUTAGES IN THE EVAPORATOR SYSTEM RESULTED FROM A CONTINUATION OF THE CIRCULATING PUMP VIBRATION AND THE SO2 SUPERHEATER GASKET LEAK.								
			BOILER OUTAGES WERE REQUIRED FOR REPAIR OF A BOILER STEAM TUBE LEAK AND FOR REPAIR OF A STEAM STOP VALVE.								
6/79	SYSTEM	91.0	75.0	80.0	63.0			720	607	455	
	** PROBLEMS/SOLUTIONS/COMMENTS										
			THE UNIT 11 BOILER OPERATED PART OF THE PERIOD ON HIGH SULFUR COAL AND PART ON A MIXTURE OF HIGH AND MEDIUM SULFUR COALS.								
			AN OUTAGE WAS REQUIRED FOR REPAIR OF A REHEAT STOP VALVE AND THE OPERATING RATE WAS LIMITED DUE TO AN ID FAN BEARING PROBLEM AND A FD FAN FAILURE. LOW MAIN STEAM PRESSURE AND LOW SO2 IN THE FLUE GAS CAUSED FGD OUTAGES. FGD OUTAGES ALSO RESULTED FROM A FLUE LEAK, A PLUGGED WATER VALVE AND REPAIR OF AN EXPANSION JOINT.								
7/79	SYSTEM	90.0	80.0	82.0	79.0			744	673	538	
	** PROBLEMS/SOLUTIONS/COMMENTS										
			UNIT 11 BOILER OPERATED ON HIGH SULFUR COAL. OUTAGES OCCURRED FOR REPACKING OF THE STEAM PRESSURE REGULATOR VALVE WHICH SUPPLIES FGD AND AN ELECTRICAL GROUND SPECIAL TESTING OF THE UNIT 11 FGD SYSTEM WAS CONDUCTED BY TRW FOR EPA FROM JULY 1 THROUGH 28 WHICH REQUIRED THAT THE BOILER RATE BE VARIED AND THAT THE SO2 REDUCTION UNIT BE DOWN FOR A PORTION OF THE PERIOD. IN ADDITION TO THE FGD OUTAGE REQUIRED BY THE TRW TESTING, FGD OUTAGES RESULTED FROM INSPECTION OF THE BOOSTER BLOWER SPEED REDUCER AND HIGH FLOW RESISTANCE IN THE SO2 REDUCTION UNIT.								
8/79	SYSTEM	96.0	80.0	80.0	60.0			720	536	429	

NORTHERN INDIANA PUB SERVICE: DEAN H. MITCHELL 11 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
		PERFORMANCE DATA									
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING AUGUST THE UNIT 11 BOILER OPERATED ON HIGH SULFUR COAL. BOILER OUTAGES OCCURRED DUE TO FAILURE OF AN ELECTRICAL BUSS BREAKER AND WATER HAMMER IN A TURBINE REHEAT LINE.									
		THE FGD SYSTEM OUTAGES DURING AUGUST RESULTED FROM LOW OIL PRESSURE IN THE BOOSTER BLOWER LUBE SYSTEM AND HIGH FLOW RESISTANCE IN THE SO2 REDUCTION UNIT.									
9/79	SYSTEM	91.0	75.0	75.0	73.0			720	697	523	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING THE MONTH OF SEPTEMBER THE UNIT 11 BOILER OPERATED ON HIGH SULFUR COAL. BOILER OUTAGES OCCURRED DUE TO AN ELECTRICAL SYSTEM MALFUNCTION AND A STEAM LEAK.									
		FGD OUTAGES DURING SEPTEMBER RESULTED FROM INSTRUMENT AND DRIVE TURBINE GOVERNOR PROBLEMS WITH THE BOOSTER BLOWER, A LEAK IN THE SO2 SUPERHEATER AND AN INTERRUPTION IN THE INSTRUMENT AIR SUPPLY TO THE SYSTEM.									
10/79	SYSTEM	81.0	72.0	72.0	71.0			744	594	428	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE BOILER OPERATED ON HIGH SULFUR COAL UNTIL OCTOBER 22 WHEN THE UNIT SHUTDOWN DUE TO A TURBINE BLADE FAILURE. IT WAS DECIDED TO START THE ANNUAL TURNAROUND AT THAT TIME.									
		FGD SYSTEM OUTAGES WERE REQUIRED FOR REPAIR OF THE BOOSTER BLOWER DRIVE GOVERNOR, AN ORFICE CONTACTOR CONTROL VALVE AND A GAS LEAK IN THE SO2 REDUCTION UNIT.									
11/79	SYSTEM	.0			.0			720	0	0	.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE BOILER AND FGD SYSTEM ANNUAL TURNAROUND WAS IN PROGRESS THROUGHOUT THE PERIOD. THE FGD SYSTEM WAS UNAVAILABLE THE ENTIRE PERIOD.									
12/79	SYSTEM	.0			.0			744	0	0	.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE TURNAROUND ON UNIT 11 WAS COMPLETED ON DECEMBER 14, HOWEVER, THE STEAM SUPPLY TO THE REGENERATION FACILITY WAS NOT AVAILABLE IN DECEMBER. THE FGD SYSTEM DID NOT OPERATE THE ENTIRE MONTH.									
1/80	SYSTEM	17.3			.0			744	0	0	.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE STEAM SUPPLY TO THE REGENERATION FACILITY WAS MADE AVAILABLE ON JANUARY 15. THE FGD SYSTEM WAS OPERATIONAL ON JANUARY 22 AFTER THE OVERHAUL OF THE BOOSTER BLOWER DRIVE WAS COMPLETED.									
		THE REGENERATION FACILITY WAS FORCED OUT SEVERAL TIMES DUE TO PROBLEMS WITH THE CONDENSATE RETURN.									
2/80	SYSTEM	46.3	27.0	26.5	23.3			696	600	162	

NORTHERN INDIANA PUB SERVICE: DEAN H. MITCHELL 11 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
		PERFORMANCE DATA									
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE BOILER WAS SHUT DOWN ON FEBRUARY 27 DUE TO A HYDROGEN LEAK.									
		THE FGD SYSTEM WAS FORCED OUT DUE TO CONTINUED PROBLEMS WITH THE CONDENSATE RETURN. GAS LEAKS IN THE FLUE AND VESSEL SHELL IN THE SO2 REDUCTION UNIT ALSO CAUSED THE SYSTEM TO GO DOWN.									
3/80	SYSTEM	75.4	20.4	24.9	14.5			744	529	108	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE BOILER WAS OPERATIONAL ON MARCH 1 AFTER THE HYDROGEN LEAKS WERE REPAIRED. THE BOILER WAS DOWN FROM MARCH 18 TO 23 SO THAT THE TURBINE STOP VALVES COULD BE PULLED AND THE HYDROGEN SEALS COULD BE INSPECTED.									
		THE FGD SYSTEM WAS FORCED OUT OF SERVICE WHEN A COMPRESSOR FAILED AND AGAIN LATER AFTER AN INSTRUMENT MALFUNCTION. THERE WAS A COMPLETE POWER IN THE FGD AREA WHICH FORCED THE SYSTEM DOWN FROM MARCH 26 THROUGH 27.									
4/80	SYSTEM	63.3	52.6	53.4	50.3			720	702	362	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		FGD SYSTEM OPERATIONS DURING APRIL WERE INTERRUPTED BY SULFUR ACCUMULATION AND BLOCKAGE IN THE CLAUS CONVERTER UNIT.									
5/80	SYSTEM	62.8	23.5	26.4	15.5			744	490	115	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE FGD SYSTEM REGENERATION FACILITY EXPERIENCED A DRIVE MOTOR FAILURE ON THE EVAPORATOR CIRCULATING PUMP DURING MAY.									
6/80	SYSTEM	53.3	.0	.0	.0			720	211	0	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE BOILER WAS OFF LINE MOST OF JUNE DUE TO LOW SYSTEM POWER DEMAND.									
		THE AVAILABILITY OF THE FGD SYSTEM WAS LIMITED BY PROBLEMS WITH THE BOOSTER BLOWER DRIVE AND LOOSENING OF A SUPPORT BEAM IN THE ABSORBER.									
7/80	SYSTEM	100.0	.0		.0			744	331	0	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE BOILER OPERATED ON LOW SULFUR COAL DURING JULY. THE BOILER WAS OFF LINE FOR APPROXIMATELY 17 DAYS DUE TO LOW SYSTEM POWER DEMAND.									
8/80	SYSTEM	83.9	65.6	65.6	31.0			744	352	231	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		FROM AUGUST 1 TO AUGUST 13 THE BOILER FIRED LOW SULFUR COAL OR WAS OPERATED AT LOW LOAD. FGD SYSTEM OPERATION WAS NOT NECESSARY DURING THIS TIME.									
		FROM AUGUST 14 TO AUGUST 31, HIGH SULFUR COAL WAS FIRED MAKING FGD SYSTEM OPERATION NECESSARY. PROBLEMS WITH THE BOOSTER BLOWER WERE ENCOUNTERED WHEN THE UTILITY ATTEMPTED TO BRING THE SYSTEM ON LINE. THE BLOWER EXPERIENCED LOW OIL PRESSURE CAUSING THE SYSTEM NOT TO BE OPERABLE UNTIL AUGUST 19.									

NORTHERN INDIANA PUB SERVICE: DEAN H. MITCHELL 11 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
9/80	SYSTEM	68.6	53.1	53.1	45.1			720	612	325	

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOOSTER BLOWER BEARING AND GOVERNOR REPAIRS ACCOUNTED FOR SOME OUTAGE TIME DURING SEPTEMBER.

THE SULFUR CONDENSERS IN THE SO2 REDUCTION UNIT WERE AN ADDITIONAL PROBLEM DURING SEPTEMBER.

10/80	SYSTEM	97.0	90.1	90.1	75.0			744	616	555	

** PROBLEMS/SOLUTIONS/COMMENTS

DURING OCTOBER A PROBLEM WAS ENCOUNTERED WITH A LEVEL INDICATOR ON THE FGD SYSTEM EVAPORATOR CAUSING 25 HOURS OF OUTAGE TIME.

11/80	SYSTEM	100.0	93.9	93.9	86.2			720	661		

** PROBLEMS/SOLUTIONS/COMMENTS

DURING NOVEMBER THE UTILITY REPORTED NO MAJOR PROBLEMS WERE ENCOUNTERED WITH THE FGD SYSTEM.

12/80	SYSTEM	92.5	62.6	62.6	50.1			744	596	373	

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS FORCED OUT OF SERVICE DUE TO A HIGH PRESSURE DROP IN THE SO2 REDUCTION CLAUS UNIT AND PROBLEMS WITH THE INCINERATOR INSTRUMENT.

DURING DECEMBER THE BOILER WAS OUT OF SERVICE FOR APPROXIMATELY 148 HOURS DUE TO CHANGE OVER TO LOW SULFUR COAL.

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	NORTHERN STATES POWER	
PLANT NAME	RIVERSIDE	
UNIT NUMBER	6,7	
CITY	MINNEAPOLIS	
STATE	MINNESOTA	
REGULATORY CLASSIFICATION	E	
PARTICULATE EMISSION LIMITATION - NG/J	172.	(.400 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	172.	(.400 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	350	
GROSS UNIT GENERATING CAPACITY - MW	110	
NET UNIT GENERATING CAPACITY W/FGD - MW	103	
NET UNIT GENERATING CAPACITY WO/FGD - MW	*****	
EQUIVALENT SCRUBBED CAPACITY - MW	110	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	BABCOCK & WILCOX	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	PEAK	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	320.89	(680000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	176.7	(350 F)
STACK HEIGHT - M	84.	(275 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	3.7	(12.0 FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	SUBBITUMINOUS	
AVERAGE HEAT CONTENT - J/G	21632.	(9300 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		9100-9500
AVERAGE ASH CONTENT - %	8.00	
RANGE ASH CONTENT - %	7.92-8.08	
AVERAGE MOISTURE CONTENT - %	22.00	
RANGE MOISTURE CONTENT - %	20-24	
AVERAGE SULFUR CONTENT - %	1.20	
RANGE SULFUR CONTENT - %	.9-1.5	
AVERAGE CHLORIDE CONTENT - %	********	
RANGE CHLORIDE CONTENT - %	******	
*** PARTICLE CONTROL		
** MECHANICAL COLLECTOR		
NUMBER	0	
TYPE	NONE	
** FABRIC FILTER		
NUMBER	1	
TYPE	REVERSE AIR	
SUPPLIER	JOY MFG	
INLET FLUE GAS CAPACITY - CU.M/S	320.9	(680000 ACFM)
PRESSURE DROP - KPA	1.5	(6.0 IN-H2O)
PARTICLE REMOVAL EFFICENCY - %	99.5	
** ESP		
NUMBER	0	
TYPE	NONE	
** PARTICLE SCRUBBER		
GENERIC TYPE	NONE	
SPECIFIC TYPE	N/A	
*** FGD SYSTEM		
** GENERAL DATA		
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT	
SO2 REMOVAL MODE	SPRAY DRYING	
PROCESS TYPE	LIME/SPRAY DRYING	
SYSTEM SUPPLIER	JOY MFG/NIRO ATOMIZER	
A-E FIRM	BLACK & VEATCH	

NORTHERN STATES POWER: RIVERSIDE 6,7 (CONT.)

DEVELOPMENT LEVEL	DEMONSTRATION	
NEW/RETROFIT	RETROFIT	
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.50	
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	90.00	
CURRENT STATUS	1	
COMMERCIAL START-UP	12/80	
INITIAL START-UP	11/80	
CONTRACT AWARDED	10/79	

** DESIGN AND OPERATING PARAMETERS

** ABSORBER

NUMBER	1	
GENERIC TYPE	SPRAY DRYER	
SPECIFIC TYPE	CROSSFLOW	
SUPPLIER	NIRO ATOMIZER	
DIMENSIONS - FT	40' X 105'	
SHELL GENERIC MATERIAL	STAINLESS STEEL	
SHELL SPECIFIC MATERIAL	AUSTENITIC	
LINER GENERIC MATERIAL	NONE	
LINER SPECIFIC MATERIAL	N/A	
LINER MATERIAL TRADE NAME/COMMON TYPE	N/A	
GAS CONTACTING DEVICE TYPE	ATOMIZER	
GAS-SIDE PRESSURE DROP - KPA	.5	(2.0 IN-H2O)
INLET GAS FLOW - CU. M/S	320.89	(680000 ACFM)
INLET GAS TEMPERATURE - C	176.7	(350 F)
SO2 REMOVAL EFFICIENCY - %	90.0	

** MIST ELIMINATOR

PRE-MIST ELIMINATOR/MIST ELIMINATOR	NONE	
NUMBER PER SYSTEM	0	

** REHEATER

NUMBER	0	
GENERIC TYPE	NONE	
SPECIFIC TYPE	N/A	
TRADE NAME/COMMON TYPE	N/A	

** FANS

NUMBER	2	
SUPPLIER	WESTINGHOUSE	
FUNCTION	BALANCED DRAFT	
APPLICATION	INDUCED DRAFT	
SERVICE	DRY	
FLUE GAS FLOW RATE - CU.M/S	160.45	(340000 ACFM)
CONSTRUCTION MATERIAL GENERIC TYPE	STEEL	

** REAGENT PREPARATION EQUIPMENT

DEVICE	BALL MILL	
MANUFACTURER	JOY/DENVER	
NUMBER	1	
FULL LOAD DRY FEED CAPACITY - M.TONS/HR	9.1	(10 TPH)

** REAGENT PREPARATION EQUIPMENT

FUNCTION	LIME SLAKING	
DEVICE	SLAKER	
MANUFACTURER	JOY/DENVER	
NUMBER	1	
FULL LOAD DRY FEED CAPACITY - M.TONS/HR	4.5	(5 TPH)
PRODUCT QUALITY - % SOLIDS	35.0	

** TANKS

SERVICE	NUMBER
MIXING	2

** PUMPS

SERVICE	NUMBER
SLURRY TRANSFER	5

NORTHERN STATES POWER: RIVERSIDE 6,7 (CONT.)

*** SLUDGE

** TREATMENT

METHOD	NONE

** DISPOSAL

NATURE	FINAL
TYPE	LANDFILL
LOCATION	OFF SITE
SITE TRANSPORTATION METHOD	TRUCKED

** PROCESS CONTROL AND INSTRUMENTATION

CHEMICAL PARAMETERS	OUTLET TEMP
MONITOR LOCATION	DRYER OUTLET
PROCESS CONTROL MANNER	AUTOMATIC
PROCESS CHEMISTRY MODE	FEEDBACK

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
11/80	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

OPERATIONS AT THE RIVERSIDE UNIT COMMENCED IN NOVEMBER 1980.

12/80	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

THE SYSTEM IS PRESENTLY IN THE SHAKEDOWN/DEBUGGING PHASE OF OPERATION.

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	NORTHERN STATES POWER	
PLANT NAME	SHERBURNE	
UNIT NUMBER	1	
CITY	BECKER	
STATE	MINNESOTA	
REGULATORY CLASSIFICATION	D	
PARTICULATE EMISSION LIMITATION - NG/J	37.	(.087 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	413.	(.960 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	2191	
GROSS UNIT GENERATING CAPACITY - MW	740	
NET UNIT GENERATING CAPACITY W/FGD - MW	700	
NET UNIT GENERATING CAPACITY WO/FGD - MW	720	
EQUIVALENT SCRUBBED CAPACITY - MW	740	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	COMBUSTION ENGINEERING	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	1349.16	(2859000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	154.4	(310 F)
STACK HEIGHT - M	198.	(650 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	9.9	(32.6 FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	SUBBITUMINOUS	
AVERAGE HEAT CONTENT - J/G	19771.	(8500 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		******
AVERAGE ASH CONTENT - %	9.00	
RANGE ASH CONTENT - %	******	
AVERAGE MOISTURE CONTENT - %	25.00	
RANGE MOISTURE CONTENT - %	******	
AVERAGE SULFUR CONTENT - %	.80	
RANGE SULFUR CONTENT - %	******	
AVERAGE CHLORIDE CONTENT - %	.03	
RANGE CHLORIDE CONTENT - %	******	
*** PARTICLE CONTROL		
** PARTICLE SCRUBBER		
NUMBER	12	
GENERIC TYPE	VENTURI TOWER	
SPECIFIC TYPE	VARIABLE-THROAT/VERTICALLY-ADJUSTABLE ROD DECKS	
SUPPLIER	COMBUSTION ENGINEERING	
DIMENSIONS - FT	3 X 25.5 THROAT (5 SECTIONS OF 3 X5)	
SHELL GENERIC MATERIAL	STAINLESS STEEL	
SHELL SPECIFIC MATERIAL	AUSTENITIC	
LINER GENERIC MATERIAL	NONE	
LINER SPECIFIC MATERIAL	N/A	
GAS CONTACTING DEVICE TYPE	316L SS RODS /CERAMIC NOZZLES	
NUMBER OF CONTACTING ZONES	2	
LIQUID RECIRCULATION RATE - LITER/S	223.0	(3540 GPM)
L/G RATIO - LITER/CU.M	2.3	(17.0 GAL/1000ACF)
PRESSURE DROP - KPA	3.2	(13.0 IN-H2O)
SUPERFICIAL GAS VELOCITY - M/S	24.4	(80.0 FT/S)
INLET GAS FLOW RATE - CU.M/S	122.6	(259900 ACFM)
INLET GAS TEMPERATURE - C	154.4	(310 F)
*** FGD SYSTEM		
** GENERAL DATA		
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT	
SO2 REMOVAL MODE	WET SCRUBBING	
PROCESS TYPE	LIMESTONE/ALKALINE FLYASH	
PROCESS ADDITIVES	NONE	
SYSTEM SUPPLIER	COMBUSTION ENGINEERING	
A-E FIRM	BLACK & VEATCH	

NORTHERN STATES POWER: SHERBURNE 1 (CONT.)

DEVELOPMENT LEVEL	FULL SCALE	
NEW/RETROFIT	NEW	
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.00	
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	50.00	
CURRENT STATUS	1	
COMMERCIAL START-UP	5/76	
INITIAL START-UP	3/76	
CONTRACT AWARDED	0/71	

** DESIGN AND OPERATING PARAMETERS

SPACE REQUIREMENTS - SQ M	26303.7	(283140 SQ FT)
OPER. & MAINT. REQUIREMENT - MANHR/DAY	150.0	

** ABSORBER

NUMBER	11	
GENERIC TYPE	PACKED TOWER	
SPECIFIC TYPE	STATIC BED PACKING	
TRADE NAME/COMMON TYPE	MARBLE BED SCRUBBER	
SUPPLIER	COMBUSTION ENGINEERING	
DIMENSIONS - FT	18 X 26.5 X 60	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	AISI 1110	
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A	
LINER GENERIC MATERIAL	ORGANIC	
LINER SPECIFIC MATERIAL	GLASS FLAKE-FILLED POLYESTER	
LINER MATERIAL TRADE NAME/COMMON TYPE	CEILCOTE FLAKEGLASS	
GAS CONTACTING DEVICE TYPE	13/16 IN. GLASS SPHERES	
NUMBER OF CONTACTING ZONES	1	
DISTANCE BETWEEN GAS CONTACTING ZONES - CM	10.2	(4.0IN)
LIQUID RECIRCULATION RATE - LITER/S	120.	(1900 GPM)
L/G RATIO - L/CU.M	1.3	(10.0 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	.5	(2.0 IN-H2O)
SUPERFICAL GAS VELOCITY - M/SEC	9.4	(31.0 FT/S)
INLET GAS FLOW - CU. M/S	94.38	(200000 ACFM)
INLET GAS TEMPERATURE - C	54.4	(130 F)
SO2 REMOVAL EFFICIENCY - %	50.0	
PARTICLE REMOVAL EFFICENCY - %	99.0	

** ABSORBER

NUMBER	1	
GENERIC TYPE	SPRAY TOWER	
SPECIFIC TYPE	STATIC BED PACKING	
SUPPLIER	COMBUSTION ENGINEERING	
DIMENSIONS - FT	26 X 18 X 60	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	AISI 1110	
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A	
LINER SPECIFIC MATERIAL	GLASS FLAKE-FILLED POLYESTER	
LINER MATERIAL TRADE NAME/COMMON TYPE	CEILCOTE FLAKEGLASS	
L/G RATIO - L/CU.M	1.3	(10.0 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	.5	(2.0 IN-H2O)
INLET GAS FLOW - CU. M/S	94.38	(200000 ACFM)
INLET GAS TEMPERATURE - C	54.4	(130 F)

** MIST ELIMINATOR

PRE-MIST ELIMINATOR/MIST ELIMINATOR	MIST ELIMINATOR	
NUMBER PER SYSTEM	12	
GENERIC TYPE	IMPINGEMENT	
SPECIFIC TYPE	BAFFLE	
TRADE NAME/COMMON TYPE	CHEVRON VANE	
CONFIGURATION	HORIZONTAL	
NUMBER OF STAGES	2	
NUMBER OF PASSES PER STAGE	3	
FREEBOARD DISTANCE - M	4.27	(14.0 FT)
DISTANCE BETWEEN STAGES - CM	25.40	(10.0 IN)
DISTANCE BETWEEN VANES - CM	10.2	(4.00 IN)
PRESSURE DROP - KPA	.1	(.5 IN-H2O)
SUPERFICAL GAS VELOCITY - M/S	9.4	(31.0 FT/S)
CONSTRUCTION MATERIAL GENERIC TYPE	FIBERGLASS REINFORCED PLASTIC	
WASH WATER SOURCE	THICKENER OVERFLOW AND COOLING TOWER BLOWDOWN	

NORTHERN STATES POWER: SHERBURNE 1 (CONT.)

** REHEATER		
NUMBER	11	
GENERIC TYPE	IN-LINE	
SPECIFIC TYPE	HOT WATER	
TRADE NAME/COMMON TYPE	FIN TUBE	
TEMPERATURE INCREASE - C	4.4	(40 F)
INLET FLUE GAS FLOW RATE - CU. M/S	94.38	(200000 ACFM)
INLET FLUE GAS TEMPERATURE - C	54.4	(130 F)
NUMBER OF TUBES PER BUNDLE	45	
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	
** FANS		
NUMBER	4	
SUPPLIER	GREEN FAN	
FUNCTION	BALANCED DRAFT	
APPLICATION	INDUCED DRAFT	
SERVICE	DRY	
FLUE GAS FLOW RATE - CU.M/S	94.38	(200000 ACFM)
FLUE GAS TEMPERATURE - C	82.2	(180 F)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	
** DUCTWORK		
LOCATION	SCRUBBER INLET	
SHELL GENERIC MATERIAL TYPE	CARBON STEEL	
LINER GENERIC MATERIAL TYPE	NONE	
** DUCTWORK		
LOCATION	REHEATER TO STACK	
SHELL GENERIC MATERIAL TYPE	CARBON STEEL	
LINER GENERIC MATERIAL TYPE	NONE	
** REAGENT PREPARATION EQUIPMENT		
FUNCTION	LIMESTONE GRINDING	
DEVICE	BALL MILL	
MANUFACTURER	ALLIS CHALMERS	
NUMBER	1	
FULL LOAD DRY FEED CAPACITY - M.TONS/HR	21.8	(24 TPH)
PRODUCT QUALITY - % SOLIDS	60.0	

** TANKS

SERVICE	NUMBER
REACTION	2
MAKE-UP WATER	2
SLURRY MAKE-UP	2
DILUTION	2

** PUMPS

SERVICE	NUMBER
POND RETURN	1
THICKENER UNDERFLOW	1
MAKE-UP WATER	1
REHEAT WATER	2
ABSORBER RECIRCULATION	2

** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	THICKENER
NUMBER	1
DIMENSIONS - FT	160 (DIA) X 10 (DEPTH)
SHELL SPECIFIC MATERIAL TYPE	CARBON STEEL
OUTLET STREAM CHARACTERISTICS	28% SOLIDS
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	THICKENER
NUMBER	1
DIMENSIONS - FT	160 (DIA) X 10 (DEPTH)
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
OUTLET STREAM CHARACTERISTICS	28% SOLIDS

NORTHERN STATES POWER: SHERBURNE 1 (CONT.)

*** SLUDGE

** TREATMENT

METHOD	FORCED OXIDATION

** DISPOSAL

NATURE	FINAL
TYPE	LINED POND
LOCATION	ON SITE
SITE TRANSPORTATION METHOD	PUMPED
SITE CAPACITY - CU.M	30575000 (25000.0 ACRE-FT)

** PROCESS CONTROL AND INSTRUMENTATION

CHEMICAL PARAMETERS	SLURRY PH & SOLIDS/TANK LEVELS/PRESSURE DROP/SO2
CONTROL LEVELS	PRESSURE DROP 12 IN H2O, 10% SOLIDS, PH=5-5.5
PROCESS CONTROL MANNER	AUTOMATIC
PROCESS CHEMISTRY MODE	FEEDBACK

** WATER BALANCE

WATER LOOP TYPE	CLOSED

** FGD SPARE CAPACITY INDICES

ABSORBER - %	9.0

** FGD SPARE COMPONENT INDICES

ABSORBER	1.0

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
3/76	SYSTEM							744			
4/76	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JANUARY A PRELIMINARY SYSTEM CHECKOUT WAS SUCCESFULLY COMPLETED BY PASSING AIR AND WATER THROUGH THE SYSTEM. THE SCRUBBING SYSTEM BEGAN FGD OPERATIONS ON MARCH 16. THE SHAKEDOWN PHASE OF OPERATIONS CONTINUED THROUGH APRIL.

5/76	101		62.0	55.0							
	102		83.0	73.0							
	103		81.0	72.0							
	104		59.0	52.0							
	105		72.0	64.0							
	106		90.0	80.6							
	107		57.0	50.3							
	108		69.0	61.0							
	109		60.0	53.0							
	110		75.0	66.0							
	111		72.0	64.0							
	112		67.0	59.0							
	SYSTEM	86.0	77.0	68.1				744	657	506	57.8

** PROBLEMS/SOLUTIONS/COMMENTS

FIRST COMMERCIAL OPERATION COMMENCED MAY 1, 1976. THIS IS AN INTERMEDIATE LOAD UNIT OPERATING NEAR FULL CAPACITY DURING THE DAY AND 35% CAPACITY AT NIGHT.

6/76	SYSTEM	84.0						720	688		69.9

NORTHERN STATES POWER: SHERBURNE 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
			MODIFICATIONS ARE CONTINUING ON THE SPRAY SYSTEM, SPRAY NOZZLES AND STRAINER SYSTEM.								
			SINCE APRIL THE UTILITY AND SYSTEM SUPPLIER HAVE BEEN MAKING CONTINUAL SYSTEM MODIFICATIONS, REQUIRING THE UNIT TO OPERATE AT NO GREATER THAN 80% CAPACITY.								
7/76	101		80.0		55.0						
	102		62.0		43.0						
	103		71.0		49.0						
	104		81.0		56.0						
	105		80.0		55.0						
	106		68.0		47.0						
	107		81.0		56.0						
	108		75.0		52.0						
	109		79.0		54.0						
	110		63.0		43.0						
	111		91.0		63.0						
	112		69.0		48.0						
	SYSTEM	84.0	81.8		56.5			744	512	419	49.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
			THE SLURRY NOZZLES ARE FREQUENTLY PLUGGED BY PARTICLES ABOVE QUARTER INCH SIZE. STRAINER MODIFICATIONS ARE PLANNED TO ALLEVIATE THIS PROBLEM.								
			HARD SCALE GYPSUM FORMATION ON THE VESSEL WALLS HAS LEVELED OFF. THE CLEANING PROCESS CALLS FOR THREE TO FOUR MODULES TO BE TAKEN OUT OF SERVICE EACH NIGHT. THUS, EACH MODULE IS CLEANED ONCE EVERY THREE DAYS.								
			A 70-MAN CREW IS REQUIRED TO MAINTAIN SCRUBBER OPERATIONS.								
			THE DEPOSITION OF SOFT SOLIDS IS STILL CONTINUING IN THE REHEATERS.								
			SOFT SOLIDS ACCUMULATION IN THE MIST ELIMINATORS IS STILL CAUSING PROBLEMS.								
8/76	101		46.0		44.0						
	102		93.0		88.0						
	103		51.0		48.0						
	104		84.0		80.0						
	105		83.0		79.0						
	106		76.0		72.0						
	107		71.0		67.0						
	108		84.0		80.0						
	109		81.0		77.0						
	110		76.0		72.0						
	111		87.0		82.0						
	112		91.0		86.0						
	SYSTEM	94.0	83.9		79.6			744	705	592	76.5
9/76	101		87.0		68.0						
	102		90.0		71.0						
	103		93.0		73.0						
	104		76.0		60.0						
	105		76.0		60.0						
	106		79.0		62.0						
	107		35.0		69.0						
	108		79.0		62.0						
	109		85.0		67.0						

NORTHERN STATES POWER: SHERBURNE 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	110		80.0		63.0						
	111		92.0		72.0						
	112		96.0		76.0						
	SYSTEM	95.0	92.6		73.0			720	566	524	65.6

** PROBLEMS/SOLUTIONS/COMMENTS

THE STRAINER SYSTEM IS BEING MODIFIED. THE DUPLEX UNITS ARE TO BE REPLACED BY IN-TANK SCREENS AND SOOT BLOWERS. BOTH ARE LOCATED AT THE SUCTION SIDE OF THE SPRAY WATER PUMP.

CARBON STEEL FIN TUBE REHEAT BUNDLES ARE AN AREA OF CONCERN. MULTIPLE FAILURES IN FOUR UNITS HAVE BEEN EXPERIENCED.

10/76	101		97.0		79.0						
	102		84.0		68.0						
	103		96.0		78.0						
	104		96.0		78.0						
	105		95.0		77.0						
	106		30.0		24.0						
	107		74.0		60.0						
	108		76.0		62.0						
	109		91.0		74.0						
	110		81.0		66.0						
	111		100.0		81.0						
	112		87.0		71.0						
	SYSTEM	92.9	91.6		74.4			744	606	554	

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY IS CONSIDERING MODIFYING THE DESIGN OF THE SHERBURNE 1 AND 2 FGD SYSTEMS FROM MARBLE BED TO SPRAY TOWER ABSORBERS. AT PRESENT ONE MODULE AT SHERBURNE 1 HAS BEEN CONVERTED TO A SPRAY TOWER ON AN EXPERIMENTAL BASIS.

11/76	101		83.0		83.0						
	102		80.0		80.0						
	103		87.0		87.0						
	104		79.0		79.0						
	105		92.0		92.0						
	106		80.0		80.0						
	107		93.0		93.0						
	108		89.0		89.0						
	109		69.0		69.0						
	110		78.0		78.0						
	111		73.0		73.0						
	112		93.0		93.0						
	SYSTEM	93.0	90.6		90.6			720	720	652	88.4
12/76	101		88.0		85.0						
	102		84.0		82.0						
	103		87.0		84.0						
	104		80.0		78.0						
	105		71.0		69.0						
	106		97.0		94.0						
	107		91.0		88.0						
	108		95.0		92.0						
	109		94.0		91.0						
	110		88.0		85.0						
	111		73.0		71.0						
	112		75.0		73.0						
	SYSTEM	94.7	93.0		90.2			744	722	671	87.4

NORTHERN STATES POWER: SHERBURNE 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UTILITY IS NOW CONDUCTING A FULL-LOAD EVALUATION STUDY, ANALYZING SYSTEM OPERATION ON 10 MODULES VS. THE DESIGNED 11 MODULES.									
		APPROXIMATELY ONE-THIRD OF THE STRAINER MODIFICATIONS ON MODULE 101 ARE COMPLETED.									
		THE UNIT IS CURRENTLY HAVING DIFFICULTY COMPLYING WITH THE 20% OPACITY REGULATION DUE TO THE EXTREMELY FINE FLY ASH BEING EMITTED (70% LESS THAN 1 MICRON).									
1/77	101		94.0	77.0							
	102		75.0	61.0							
	103		99.0	81.0							
	104		76.0	62.0							
	105		96.0	78.0							
	106		77.0	63.0							
	107		70.0	57.0							
	108		92.0	75.0							
	109		81.0	66.0							
	110		40.0	33.0							
	111		75.0	61.0							
	112		95.0	76.0							
	SYSTEM	90.0	88.2	71.8				744	607	535	70.1
2/77	101		89.0	81.0							
	102		99.0	90.0							
	103		64.0	58.0							
	104		96.0	87.0							
	105		64.0	58.0							
	106		99.0	90.0							
	107		81.0	73.0							
	108		62.0	56.0							
	109		98.0	89.0							
	110		93.0	84.0							
	111		98.0	89.0							
	112		61.0	55.0							
	SYSTEM	91.0	91.3	82.7				672	609	556	79.5
3/77	101		47.0	47.0							
	102		92.0	92.0							
	103		95.0	95.0							
	104		93.0	93.0							
	105		93.0	93.0							
	106		95.0	95.0							
	107		88.0	88.0							
	108		93.0	93.0							
	109		95.0	95.0							
	110		83.0	83.0							
	111		78.0	78.0							
	112		72.0	72.0							
	SYSTEM	95.0	93.1	93.0				744	743	692	92.8
	** PROBLEMS/SOLUTIONS/COMMENTS										
		ALL MODULES ARE NOW FITTED WITH IN-TANK STRAINERS. LOW JANUARY-MARCH OPERABILITIES RESULTED FROM COMPLETION OF STRAINER MODIFICATIONS.									
4/77	101		84.4	84.2							
	102		65.3	65.1							
	103		92.5	92.2							

NORTHERN STATES POWER: SHERBURNE 1 (CONT.)

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	104		95.4		95.1						
	105		96.2		96.0						
	106		62.2		62.1						
	107		72.8		72.6						
	108		91.4		91.1						
	109		58.5		58.3						
	110		92.9		92.6						
	111		90.4		90.1						
	112		87.9		87.6						
	SYSTEM	95.0	90.0		89.7			720	718	646	86.4
5/77	101		96.5		40.5						
	102		48.1		20.2						
	103		92.3		38.7						
	104		87.2		36.6						
	105		94.9		39.8						
	106		96.5		40.5						
	107		81.4		34.1						
	108		97.8		41.0						
	109		95.8		40.2						
	110		77.9		32.7						
	111		34.9		14.7						
	112		86.9		36.4						
	SYSTEM	92.0	90.0		37.8			744	312	281	35.6
6/77	101		76.0		26.0						
	102		77.0		27.0						
	103		75.0		26.0						
	104		75.0		26.0						
	105		30.0		10.0						
	106		87.0		30.0						
	107		58.0		20.0						
	108		44.0		15.0						
	109		61.0		21.0						
	110		80.0		28.0						
	111		.0		.0						
	112		83.0		29.0						
	SYSTEM	92.0	67.8		23.4			720	248	168	23.9

** PROBLEMS/SOLUTIONS/COMMENTS

A SCHEDULED TURBINE OVERHAUL LASTED FROM MAY 14 TO JUNE 18.

THE EVALUATION STUDY INITIATED DURING THE NOVEMBER-DECEMBER PERIOD WAS TEMPORARILY TERMINATED SO THAT STRAINER MODIFICATIONS COULD BE COMPLETED. THE STUDY SHOULD BEGIN AGAIN IN THE NEAR FUTURE.

7/77	101		93.0		92.0						
	102		66.0		65.0						
	103		92.0		91.0						
	104		90.0		89.0						
	105		92.0		91.0						
	106		94.0		93.0						
	107		91.0		90.0						
	108		17.0		17.0						
	109		94.0		93.0						
	110		83.0		82.0						
	111		78.0		77.0						
	112		83.0		82.0						
	SYSTEM	97.0	88.5		87.5			744	736	651	86.6

NORTHERN STATES POWER: SHERBURNE 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
			SOME STAINLWSS STEEL MODIFICATIONS TOOK PLACE.								
			WHILE THE UNIT WAS OUT IN JUNE THE FGD SYSTEM WAS CLEANED. THIS CLEANING WAS CREDITED FOR ONE OF THE HIGHEST AVAILABILITIES EVER DEMONSTRATED ON THIS UNIT.								
8/77	101		85.0		73.0						
	102		89.0		77.0						
	103		66.0		57.0						
	104		55.0		47.0						
	105		81.0		70.0						
	106		90.0		77.0						
	107		83.0		71.0						
	108		79.0		68.0						
	109		72.0		62.0						
	110		85.0		73.0						
	111		90.0		77.0						
	112		66.0		57.0						
	SYSTEM	95.0	85.6		73.6			744	640	548	64.9
	** PROBLEMS/SOLUTIONS/COMMENTS										
			ONLY REGULAR MAINTENANCE WAS REQUIRED ON THE FGD SYSTEM IN AUGUST.								
9/77	101		86.0		82.0						
	102		85.0		81.0						
	103		88.0		84.0						
	104		92.0		88.0						
	105		88.0		84.0						
	106		44.0		42.0						
	107		83.0		79.0						
	108		90.0		86.0						
	109		84.0		80.0						
	110		77.0		73.0						
	111		77.0		73.0						
	112		82.0		78.0						
	SYSTEM	95.0	88.7		84.6			720	686	609	78.2
	** PROBLEMS/SOLUTIONS/COMMENTS										
			TWENTY-FOUR PUMPS ARE BEING COMPLETELY OVERHAULED.								
			THE MODULE 106 SPRAY WATER PUMP WAS OVERHAULED IN SEPTEMBER.								
			SOME ANGLES WERE INSTALLED ON THE PRIMARY CONTACTOR RODS TO RESIST EROSION.								
10/77	101		70.0		57.0						
	102		81.0		66.0						
	103		95.0		78.0						
	104		97.0		79.0						
	105		63.0		52.0						
	106		35.0		29.0						
	107		87.0		71.0						
	108		99.0		81.0						
	109		96.0		79.0						
	110		39.0		32.0						
	111		58.0		47.0						
	112		96.0		79.0						
	SYSTEM	88.0	83.3		68.2			744	609	507	65.5

NORTHERN STATES POWER: SHERBURNE 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
			STRAINER/WASHER SCREEN EROSION HAS BEEN A PROBLEM. REPAIR AND REPLACEMENT HAS BEEN CONTINUALLY NECESSARY. 316L SS MATERIAL WILL BE USED IN THE FUTURE.								
11/77	101		77.0		76.0						
	102		91.0		89.0						
	103		42.0		41.0						
	104		86.0		84.0						
	105		79.0		77.0						
	106		82.0		80.0						
	107		87.0		85.0						
	108		91.0		89.0						
	109		89.0		87.0						
	110		89.0		87.0						
	111		92.0		90.0						
	112		52.0		51.0						
	SYSTEM	92.0	87.0		85.1			720	705	613	77.4
	** PROBLEMS/SOLUTIONS/COMMENTS										
			THE REPLACEMENT PROGRAM WILL BEGIN ON DECEMBER 21, 1977. IT TAKES FOUR TO SIX DAYS FOR WORK ON EACH MODULE TO REPLACE THE STRAINER SYSTEM.								
			LOW MODULE OPERABILITIES WERE PRIMARILY A RESULT OF SPRAY WATER PUMP OVERHAULS WHICH ARE CONTINUING AT A RATE OF ONE TO TWO A WEEK (THERE ARE 24 PUMPS ON THE SYSTEM).								
12/77	101		97.0		73.0						
	102		90.0		67.0						
	103		95.0		71.0						
	104		94.0		70.0						
	105		71.0		53.0						
	106		92.0		69.0						
	107		26.0		20.0						
	108		67.0		50.0						
	109		96.0		72.0						
	110		98.0		74.0						
	111		95.0		71.0						
	112		90.0		67.0						
	SYSTEM	93.0	91.9		68.8			744	557	512	59.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
			MODULE 107 REQUIRED EXTENSIVE MAINTENANCE ALONG WITH DOWNTIME FOR STRAINER REPLACEMENT.								
			PUMP OVERHAULS AND REPLACEMENT OF CARBON STEEL STRAINERS WITH 316L SS WERE PERFORMED ON MODULE 107 IN DECEMBER.								
1/78	101		83.0		72.0						
	102		63.0		55.0						
	103		88.0		77.0						
	104		73.0		64.0						
	105		84.0		73.0						
	106		84.0		73.0						
	107		92.0		80.0						
	108		64.0		56.0						
	109		91.0		79.0						
	110		80.0		70.0						
	111		88.0		77.0						

NORTHERN STATES POWER: SHERBURNE 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	112		82.0		71.0						
	SYSTEM	92.0	88.4		77.0			744	648	573	68.0
2/78	101		.0		.0						
	102		93.0		88.0						
	103		92.0		87.0						
	104		89.0		84.0						
	105		74.0		70.0						
	106		85.0		81.0						
	107		89.0		84.0						
	108		88.0		83.0						
	109		76.0		72.0						
	110		86.0		82.0						
	111		88.0		83.0						
	112		87.0		82.0						
	SYSTEM	92.0	86.1		81.5			672	636	548	73.6

** PROBLEMS/SOLUTIONS/COMMENTS

MODULES WHICH ARE SHOWING AVAILABILITY OF LESS THAN 80%, ARE THOSE IN WHICH THE STRAINER MODIFICATIONS WERE PERFOMED.

A BULK ENTRAINMENT SEPARATOR WAS INSTALLED ALONG WITH A KOCH WASH TRAY DURING THE PERIOD.

MODULE 101 WAS DOWN IN FEBRUARY FOR MODIFICATIONS TO THE SPRAY TOWER ABSORBER. MODIFICATIONS INCLUDED INSTALLATION OF A NEW PRE-MIST ELIMINATOR (KOCH WASH TRAY), NEW SPRAY NOZZLES AND REPLACEMENT OF TWO INCH DIAMETER STAINLESS STEEL RODS WITH 6.625-INCH DIAMETER CERAMIC-COATED CARBON STEEL RODS IN A MODULE PRIMARY CONTACTOR.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
3/78	101		71.0		65.0						
	102		83.0		75.0						
	103		64.0		58.0						
	104		89.0		81.0						
	105		90.0		82.0						
	106		83.0		75.0						
	107		62.0		56.0						
	108		89.0		81.0						
	109		97.0		88.0						
	110		71.0		65.0						
	111		79.0		72.0						
	112		90.0		82.0						
	SYSTEM	92.0	88.0		80.0			744	676	595	76.9
4/78	101		92.0		91.0						
	102		87.0		86.0						
	103		87.0		86.0						
	104		44.0		44.0						
	105		81.0		80.0						
	106		85.0		84.0						
	107		91.0		90.0						
	108		86.0		85.0						
	109		92.0		91.0						
	110		91.0		90.0						
	111		87.0		86.0						
	112		52.0		52.0						
	SYSTEM	95.0	88.6		87.7			720	713	632	87.2

** PROBLEMS/SOLUTIONS/COMMENTS

STRAINER MODIFICATIONS WERE PERFORMED ON MODULES 104 AND 112 WHICH ACCOUNTED FOR THE LOW MODULE OPERABILITIES.

NORTHERN STATES POWER: SHERBURNE 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
5/78	101		61.0		52.0						
	102		86.0		73.0						
	103		85.0		73.0						
	104		86.0		73.0						
	105		89.0		76.0						
	106		64.0		55.0						
	107		62.0		53.0						
	108		83.0		71.0						
	109		82.0		70.0						
	110		71.0		61.0						
	111		87.0		74.0						
	112		79.0		67.0						
	SYSTEM	95.0	85.0		72.6			744	635	540	69.0
6/78	101		50.0		50.0						
	102		84.0		84.0						
	103		85.0		84.0						
	104		85.0		84.0						
	105		62.0		62.0						
	106		78.0		78.0						
	107		55.0		55.0						
	108		83.0		83.0						
	109		88.0		87.0						
	110		82.0		82.0						
	111		72.0		72.0						
	112		95.0		94.0						
	SYSTEM	93.0	83.6		83.2			720	717	599	77.8
7/78	101		82.0		76.0						
	102		76.0		71.0						
	103		71.0		66.0						
	104		74.0		69.0						
	105		75.0		70.0						
	106		52.0		49.0						
	107		75.0		70.0						
	108		63.0		59.0						
	109		62.0		58.0						
	110		72.0		67.0						
	111		66.0		62.0						
	112		73.0		68.0						
	SYSTEM	95.0	76.5		71.4			744	694	531	71.7

** PROBLEMS/SOLUTIONS/COMMENTS

THE OCCURRANCE OF PLUGGING PROBLEMS IN THE MIST ELIMINATOR HAS BEEN MORE FREQUENT THAN NORMAL.

THE STRAINER MODIFICATIONS CONTINUED IN JUNE AND JULY.

THE UTILITY IS EVALUATING NEW RUBBER LINED PUMPS (8000 GPM) TO HELP CORRECT THE REHEATER AND MIST ELIMINATOR PLUGGING PROBLEMS.

THE OCCURANCE OF PLUGGING PROBLEMS IN THE REHEATER HAS BEEN MORE FREQUENT THAN NORMAL

THE UTILITY IS PREPARING FOR THE STATE COMPLIANCE DEADLINE ON NOVEMBER 1, 1978. CURRENTLY TESTING HAS BEEN PROCEEDING ON DIFFERENT MODULES IN AN EFFORT TO FINE TUNE THE SYSTEM.

THE FGD SYSTEM HAS BEEN EXPERIENCING PRIMARY CONTACTOR WALL AND MARBLE BED WEAR.

THE UTILITY IS EVALUATING NEW STAINLESS STEEL MIST ELIMINATOR WASH

NORTHERN STATES POWER: SHERBURNE 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
			LANCES (REPLACING THE ORIGINAL FIBERGLASS LANCES) TO HELP CORRECT THE REHEATER AND MIST ELIMINATOR PLUGGING PROBLEMS. THE FIBERGLASS WASH LANCES RUPTURE DURING PRESSURE SURGES.								
8/78	101		64.0	64.0							
	102		65.0	65.0							
	103		73.0	73.0							
	104		63.0	63.0							
	105		65.0	65.0							
	106		80.0	79.0							
	107		81.0	80.0							
	108		73.0	73.0							
	109		63.0	63.0							
	110		73.0	72.0							
	111		64.0	64.0							
	112		83.0	83.0							
	SYSTEM	91.0	77.0	76.7				744	742	571	75.7
9/78	101		89.0	44.0							
	102		62.0	31.0							
	103		77.0	38.0							
	104		77.0	38.0							
	105		58.0	29.0							
	106		82.0	41.0							
	107		68.0	34.0							
	108		68.0	34.0							
	109		80.0	40.0							
	110		80.0	40.0							
	111		55.0	27.0							
	112		75.0	37.0							
	SYSTEM	97.0	79.2	39.4				720	357	283	34.9
	** PROBLEMS/SOLUTIONS/COMMENTS										
			DIFFERENT MIST ELIMINATOR SPRAY PATTERNS ARE BEING TESTED AS POSSIBLE SOLUTION TO THE MIST ELIMINATOR PLUGGING PROBLEM REFERRED TO IN JULY.								
			THE BOILER WAS TAKEN OFF LINE ON SEPTEMBER 15, 1978 FOR A SCHEDULED ANNUAL BOILER AND TURBINE INSPECTION. THE BOILER CAME BACK ON LINE IN THE MIDDLE OF OCTOBER.								
			THE RUBBER LINED PUMPS THAT THE UTILITY WAS INVESTIGATING IN JULY, 1978 HAVE BEEN ORDERED. FOUR OF THE PUMPS HAVE BEEN RECEIVED AND ONE IS INSTALLED. THE OTHERS WILL BE INSTALLED AS THEY ARE RECEIVED.								
10/78	101		95.0	48.0							
	102		65.0	33.0							
	103		80.0	40.0							
	104		17.0	9.0							
	105		66.0	33.0							
	106		88.0	45.0							
	107		53.0	27.0							
	108		72.0	36.0							
	109		88.0	44.0							
	110		70.0	35.0							
	111		85.0	43.0							
	112		73.0	37.0							
	SYSTEM	92.0	77.5	39.1				744	375	291	35.6
	** PROBLEMS/SOLUTIONS/COMMENTS										
			MODULES 104 AND 107 WERE DOWN IN OCTOBER AND MODULE 110 WAS DOWN IN OCTOBER AND NOVEMBER FOR THE INSTALLATION OF THE NEW 8000 GPM SPRAY PUMPS MENTIONED EARLIER.								

NORTHERN STATES POWER: SHERBURNE 1 (CONT.)

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
			THE BOILER AND SCRUBBER SHOWED LOW OPERATING HOURS FOR OCTOBER BECAUSE THE BOILER/TURBINE OVERHAUL CONTINUED THROUGH THE FIRST HALF OF OCTOBER.								
11/78	101		42.0		42.0						
	102		51.0		51.0						
	103		88.0		87.0						
	104		81.0		80.0						
	105		71.0		70.0						
	106		78.0		77.0						
	107		77.0		76.0						
	108		63.0		63.0						
	109		85.0		84.0						
	110		61.0		61.0						
	111		84.0		83.0						
	112		70.0		70.0						
	SYSTEM	92.0	77.4		76.7			720	714	552	76.2
	** PROBLEMS/SOLUTIONS/COMMENTS										
			IN NOVEMBER MODULE 101 WAS DOWN (THE CONVERTED ROD SCRUBBER TEST MODULE) FOR PUMP WORK AND INTERNAL HEADER CONVERSION. THE MODULE IS BEING PREPAIRED FOR FURTHER TESTING.								
12/78	101		77.0		76.0						
	102		73.0		72.0						
	103		77.0		76.0						
	104		73.0		72.0						
	105		86.0		85.0						
	106		87.0		86.0						
	107		93.0		91.0						
	108		85.0		84.0						
	109		93.0		91.0						
	110		86.0		85.0						
	111		90.0		89.0						
	112		88.0		87.0						
	SYSTEM	94.0	91.6		90.4			744	733	672	73.4
1/79	101		72.0		66.0						
	102		39.0		36.0						
	103		76.0		70.0						
	104		95.0		88.0						
	105		73.0		68.0						
	106		95.0		88.0						
	107		81.0		75.0						
	108		89.0		82.0						
	109		96.0		89.0						
	110		92.0		85.0						
	111		83.0		77.0						
	112		93.0		86.0						
	SYSTEM	94.0	89.5		82.7			744	688	615	63.2
	** PROBLEMS/SOLUTIONS/COMMENTS										
			THERE WERE PROBLEMS WITH THE COAL FEEDER BELTS RESULTING IN MOVING WET COAL FROM OLDER COAL STOCKPILES TO THE BOILER DURING THE DECEMBER-JANUARY PERIOD.								
			THE TESTING ON MODULE 101 HAS BEEN COMPLETED BUT NO RESULTS ARE YET AVAILABLE.								
			THE PROBLEMS ENCOUNTERED WERE MAINLY WEATHER RELATED IN DECEMBER AND JANUARY.								
2/79	101		78.0		78.0						

NORTHERN STATES POWER: SHERBURNE 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTO
	102		73.0		73.0						
	103		70.0		70.0						
	104		76.0		76.0						
	105		50.0		50.0						
	106		91.0		88.0						
	107		92.0		92.0						
	108		92.0		92.0						
	109		75.0		75.0						
	110		77.0		77.0						
	111		66.0		66.0						
	112		93.0		93.0						
	SYSTEM	89.0	84.8		84.8			672	672	570	64.2
3/79	101		61.0		60.0						
	102		88.0		87.0						
	103		45.0		44.0						
	104		86.0		85.0						
	105		94.0		93.0						
	106		71.0		70.0						
	107		91.0		90.0						
	108		73.0		72.0						
	109		91.0		90.0						
	110		80.0		79.0						
	111		89.0		88.0						
	112		80.0		79.0						
	SYSTEM	92.0	86.3		85.2			744	734	634	56.2

** PROBLEMS/SOLUTIONS/COMMENTS

THE ONLY MAJOR PROBLEMS REPORTED BY THE UTILITY DURING FEBRUARY AND MARCH WERE BOILER RELATED-SPECIFICALLY PROBLEMS WITH WET COAL.

CURRENTLY THE UTILITY IS INCREASING THE RECYCLE PUMP CAPACITY BY INSTALLING 8000 GPM WORTHINGTON RECYCLE PUMPS. DURING THIS PERIOD THEY HAVE BEEN INSTALLED ON MODULES 101,103,104,105,107, AND 110.

4/79	SYSTEM	93.0						720	622		64.7

** PROBLEMS/SOLUTIONS/COMMENTS

AS OF NOVEMBER 1979 THE UTILITY DECIDED THAT IT WILL NO LONGER REPORT MODULAR INFORMATION.

5/79	SYSTEM	98.0						744	678		70.1

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO FGD SYSTEM PROBLEMS OCCURRED DURING APRIL OR MAY.

6/79	SYSTEM	93.0						720	701		70.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT SOME GENERAL PLUGGING WAS EXPERIENCED DURING JUNE BUT IT WAS NOT SERIOUS.

7/79	SYSTEM	93.0						744	695		72.0
8/79	SYSTEM	95.0						744	744		74.4
9/79	SYSTEM	92.0						720	166		17.1

NORTHERN STATES POWER: SHERBURNE 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
			ON SEPTEMBER 8 THE UNIT WENT DOWN FOR THE ANNUAL BOILER/TURBINE INSPECTION AND IS EXPECTED TO BE OFF LINE UNTIL THE LAST WEEK OF OCTOBER.								
10/79	SYSTEM	77.0						744	9		.0
11/79	SYSTEM	97.0						720	522		58.6
12/79	SYSTEM	95.0						744	744		82.3
	** PROBLEMS/SOLUTIONS/COMMENTS										
			THE UNIT WAS SUPPOSED TO BE BACK ON LINE IN OCTOBER AFTER THE ANNUAL BOILER/TURBINE INSPECTION, BUT CONTAMINANTS IN THE MAIN TURBINE OIL MADE IT NECESSARY TO CONTINUE THE OUTAGE UNTIL THE SECOND WEEK OF NOVEMBER.								
			PRESENTLY THE UTILITY IS SELECTIVELY REMOVING MARBLE BEDS FROM SERVICE TO TEST THE FEASIBILITY OF CONVERTING THE FGD MODULES TO SPRAY TOWERS.								
			ALL PIPING HAS BEEN CONVERTED FROM CARBON STEEL TO FIBERGLASS.								
1/80	SYSTEM	97.0						744	793		90.8
2/80	SYSTEM	97.0						696	687		66.2
3/80	SYSTEM	98.0						744	688		84.1
	** PROBLEMS/SOLUTIONS/COMMENTS										
			DURING THE FIRST QUARTER OF 1980 NO MAJOR PROBLEMS WERE ENCOUNTERED WITH THE FGD SYSTEM.								
			FROM MID-SEPTEMBER TO MID-OCTOBER THE UTILITY HAS SCHEDULED A BOILER OUTAGE AT WHICH TIME THE MARBLE BEDS WILL BE INSPECTED.								
			THE UTILITY HAS DECIDED TO CONVERT THE ENTIRE MARBLE BED SCRUBBING SYSTEM TO A SPRAY TOWER SYSTEM BY REMOVING THE MARBLE BEDS AND MODIFYING THE SPRAY ARRANGEMENT. TESTS CONDUCTED IN 1978 AND 1979 SHOW THAT MOST OF THE SO2 IS COLLECTED IN THE VENTURI SECTION OF THE SCRUBBING TRAINS AND THAT ALTHOUGH THE MARBLE BEDS IN THE ABSORBER SECTIONS IMPROVE INTIMATE SO2/ SLURRY MIXING, SO2 REMOVAL EFFICIENCY OF THE SCRUBBING TRAINS IS NOT MARKEDLY DIFFERENT WHEN MARBLE BEDS ARE REMOVED.								
4/80	SYSTEM	97.0						720	720		79.4
5/80	SYSTEM	96.0						744	720		78.1
6/80	SYSTEM	96.0						720	697		74.7
	** PROBLEMS/SOLUTIONS/COMMENTS										
			NO MAJOR OPERATIONAL PROBLEMS WERE REPORTED DURING THE SECOND QUARTER OF 1980.								
7/80	SYSTEM	100.0	100.0	100.0	100.0			744	744	744	82.1
	** PROBLEMS/SOLUTIONS/COMMENTS										
			NO OPERATIONAL PROBLEMS WERE ENCOUNTERED IN JULY.								
8/80	SYSTEM	100.0	100.0	100.0	99.2			744	738	738	69.1

EPA UTILITY FGD SURVEY: OCTOBER - DECEMBER 1980

NORTHERN STATES POWER: SHERBURNE 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
				PERFORMANCE DATA							
	** PROBLEMS/SOLUTIONS/COMMENTS										
				THERE WERE TWO SHORT TERM OUTAGES IN JULY DUE TO BOILER RELATED TRIPS.							
9/80	SYSTEM	100.0	100.0	100.0	99.6			720	717	717	76.8
	** PROBLEMS/SOLUTIONS/COMMENTS										
				A BOILER RELATED PROBLEM CAUSED THE ONLY OUTAGE TIME IN SEPTEMBER.							
10/80	SYSTEM	100.0		100.0	71.9			744	535	535	57.7
11/80	SYSTEM	100.0	.0		.0			720	0	0	.0
12/80	SYSTEM	100.0	100.0	100.0	81.0			744	603	603	51.1
	** PROBLEMS/SOLUTIONS/COMMENTS										
				DURING THE OCTOBER-DECEMBER PERIOD THE UNIT WAS SHUTDOWN FOR THE ANNUAL BOILER/TURBINE INSPECTION. THE OUTAGE EXTENDED LONGER THAN EXPECTED DUE TO SOME BOILER TUBE LEAKS.							
				DURING THE ANNUAL BOILER/TURBINE INSPECTION GENERAL MAINTENANCE WAS PERFORMED ON THE SCRUBBING SYSTEM. THE MAINTENANCE INCLUDED THE OVERHAUL OF THE SPRAY PUMPS AND THE REBUILDING OF THE PC RODS.							

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	NORTHERN STATES POWER	
PLANT NAME	SHERBURNE	
UNIT NUMBER	2	
CITY	BECKER	
STATE	MINNESOTA	
REGULATORY CLASSIFICATION	D	
PARTICULATE EMISSION LIMITATION - NG/J	37.	(.087 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	413.	(.960 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	2191	
GROSS UNIT GENERATING CAPACITY - MW	740	
NET UNIT GENERATING CAPACITY W/FGD - MW	700	
NET UNIT GENERATING CAPACITY WO/FGD - MW	720	
EQUIVALENT SCRUBBED CAPACITY - MW	740	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	COMBUSTION ENGINEERING	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	1349.16	(2859000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	154.4	(310 F)
STACK HEIGHT - M	198.	(650 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	9.9	(32.6 FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	SUBBITUMINOUS	
AVERAGE HEAT CONTENT - J/G	19771.	(8500 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		******
AVERAGE ASH CONTENT - %	9.00	
RANGE ASH CONTENT - %	******	
AVERAGE MOISTURE CONTENT - %	25.00	
RANGE MOISTURE CONTENT - %	******	
AVERAGE SULFUR CONTENT - %	.80	
RANGE SULFUR CONTENT - %	******	
AVERAGE CHLORIDE CONTENT - %	.03	
RANGE CHLORIDE CONTENT - %	******	
*** PARTICLE CONTROL		
** PARTICLE SCRUBBER		
NUMBER	12	
GENERIC TYPE	VENTURI TOWER	
SPECIFIC TYPE	VARIABLE-THROAT/VERTICALLY-ADJUSTABLE ROD DECKS	
SUPPLIER	COMBUSTION ENGINEERING	
DIMENSIONS - FT	3 X 25.5 THROAT (5 SECTIONS OF 3 X 5)	
SHELL GENERIC MATERIAL	STAINLESS STEEL	
SHELL SPECIFIC MATERIAL	AUSTENITIC	
LINER GENERIC MATERIAL	NONE	
LINER SPECIFIC MATERIAL	N/A	
GAS CONTACTING DEVICE TYPE	316L SS RODS/CERAMIC NOZZLES	
NUMBER OF CONTACTING ZONES	2	
LIQUID RECIRCULATION RATE - LITER/S	223.0	(3540 GPM)
L/G RATIO - LITER/CU.M	2.3	(17.0 GAL/1000ACF)
PRESSURE DROP - KPA	3.2	(13.0 IN-H2O)
SUPERFICIAL GAS VELOCITY - M/S	24.4	(80.0 FT/S)
INLET GAS FLOW RATE - CU.M/S	122.6	(259900 ACFM)
INLET GAS TEMPERATURE - C	154.4	(310 F)
*** FGD SYSTEM		
** GENERAL DATA		
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT	
SO2 REMOVAL MODE	WET SCRUBBING	
PROCESS TYPE	LIMESTONE/ALKALINE FLYASH	
PROCESS ADDITIVES	NONE	
SYSTEM SUPPLIER	COMBUSTION ENGINEERING	
A-E FIRM	BLACK & VEATCH	

NORTHERN STATES POWER: SHERBURNE 2 (CONT.)

DEVELOPMENT LEVEL	FULL SCALE	
NEW/RETROFIT	NEW	
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.00	
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	50.00	
CURRENT STATUS	1	
COMMERCIAL START-UP	4/77	
INITIAL START-UP	3/77	
CONTRACT AWARDED	0/71	
** DESIGN AND OPERATING PARAMETERS		
SPACE REQUIREMENTS - SQ M	26303.7	(283140 SQ FT)
OPER. & MAINT. REQUIREMENT - MANHR/DAY	150.0	
** ABSORBER		
NUMBER	12	
GENERIC TYPE	PACKED TOWER	
SPECIFIC TYPE	STATIC BED PACKING	
TRADE NAME/COMMON TYPE	MARBLE BED SCRUBBER	
SUPPLIER	COMBUSTION ENGINEERING	
DIMENSIONS - FT	18 X 26.5 X 60	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	AISI 1110	
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A	
LINER GENERIC MATERIAL	ORGANIC	
LINER SPECIFIC MATERIAL	GLASS FLAKE-FILLED POLYESTER	
LINER MATERIAL TRADE NAME/COMMON TYPE	CEILCOTE FLAKEGLASS	
GAS CONTACTING DEVICE TYPE	13/16 IN. GLASS SPHERES	
NUMBER OF CONTACTING ZONES	1	
DISTANCE BETWEEN GAS CONTACTING ZONES - CM	10.2	(4.0IN)
LIQUID RECIRCULATION RATE - LITER/S	120.	(1900 GPM)
L/G RATIO - L/CU.M	1.3	(10.0 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	.5	(2.0 IN-H2O)
SUPERFICAL GAS VELOCITY - M/SEC	9.4	(31.0 FT/S)
INLET GAS FLOW - CU. M/S	94.38	(200000 ACFM)
INLET GAS TEMPERATURE - C	54.4	(130 F)
SO2 REMOVAL EFFICIENCY - %	50.0	
PARTICLE REMOVAL EFFICENCY - %	99.0	
** MIST ELIMINATOR		
PRE-MIST ELIMINATOR/MIST ELIMINATOR	MIST ELIMINATOR	
NUMBER PER SYSTEM	12	
GENERIC TYPE	IMPINGEMENT	
SPECIFIC TYPE	BAFFLE	
TRADE NAME/COMMON TYPE	CHEVRON VANE	
CONFIGURATION	HORIZONTAL	
NUMBER OF STAGES	2	
NUMBER OF PASSES PER STAGE	3	
FREEBOARD DISTANCE - M	4.27	(14.0 FT)
DISTANCE BETWEEN VANES - CM	10.2	(4.00 IN)
PRESSURE DROP - KPA	.1	(.5 IN-H2O)
SUPERFICAL GAS VELOCITY - M/S	9.4	(31.0 FT/S)
CONSTRUCTION MATERIAL GENERIC TYPE	FIBERGLASS REINFORCED PLASTIC	
WASH WATER SOURCE	THICKENER OVERFLOW AND COOLING TOWER BLOWDOWN	
** REHEATER		
NUMBER	11	
GENERIC TYPE	IN-LINE	
SPECIFIC TYPE	HOT WATER	
TRADE NAME/COMMON TYPE	FIN TUBE	
TEMPERATURE INCREASE - C	4.4	(40 F)
INLET FLUE GAS FLOW RATE - CU. M/S	94.38	(200000 ACFM)
INLET FLUE GAS TEMPERATURE - C	54.4	(130 F)
NUMBER OF TUBES PER BUNDLE	45	
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	
** FANS		
NUMBER	4	
SUPPLIER	GREEN FAN	
FUNCTION	BALANCED DRAFT	
APPLICATION	INDUCED DRAFT	
SERVICE	DRY	

NORTHERN STATES POWER: SHERBURNE 2 (CONT.)

FLUE GAS FLOW RATE - CU.M/S	94.38	(200000 ACFM)
FLUE GAS TEMPERATURE - C	82.2	(180 F)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	

** DUCTWORK

LOCATION	SCRUBBER INLET
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
LINER GENERIC MATERIAL TYPE	NONE

** DUCTWORK

LOCATION	REHEATER TO STACK
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
LINER GENERIC MATERIAL TYPE	NONE

** REAGENT PREPARATION EQUIPMENT

FUNCTION	LIMESTONE GRINDING	
DEVICE	BALL MILL	
MANUFACTURER	ALLIS CHALMERS	
NUMBER	1	
FULL LOAD DRY FEED CAPACITY - M.TONS/HR	21.8	(24 TPH)
PRODUCT QUALITY - % SOLIDS	60.0	

** TANKS

SERVICE	NUMBER
REACTION	1
MAKE-UP WATER	1
SLURRY MAKE-UP	1
DILUTION	2

** PUMPS

SERVICE	NUMBER
POND RETURN	1
THICKENER UNDERFLOW	1
MAKE-UP WATER	1
REHEAT WATER	2
SCRUBBER RECIRCULATION	2
ABSORBER RECIRCULATION	12

** SOLIDS CONCENTRATING/DEWATERING

DEVICE	THICKENER	
NUMBER	1	
DIMENSIONS - FT	160 (DIA) X 10 (DEPTH)	
OUTLET STREAM CHARACTERISTICS	28% SOLIDS	

*** SLUDGE

** TREATMENT

METHOD	FORCED OXIDATION

** DISPOSAL

NATURE	FINAL	
TYPE	LINED POND	
LOCATION	ON SITE	
SITE TRANSPORTATION METHOD	PUMPED	
SITE CAPACITY - CU.M	30575000	(25000.0 ACRE-FT)

** PROCESS CONTROL AND INSTRUMENTATION

CHEMICAL PARAMETERS	SLURRY PH & SOLIDS/TANK LEVELS/PRESSURE DROP/SO2
CONTROL LEVELS	PRESSURE DROP 12 IN H2O, 10% SOLIDS, PH=5-5.5
PROCESS CONTROL MANNER	AUTOMATIC
PROCESS CHEMISTRY MODE	FEEDBACK

** WATER BALANCE

WATER LOOP TYPE	OPEN

NORTHERN STATES POWER: SHERBURNE 2 (CONT.)

** FGD SPARE CAPACITY INDICES
ABSORBER - % 9.0

** FGD SPARE COMPONENT INDICES
ABSORBER 1.0

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
4/77	201		.0	.0							
	202		95.0	91.9							
	203		93.3	90.3							
	204		87.4	84.6							
	205		82.6	80.0							
	206		83.8	81.1							
	207		93.7	90.7							
	208		73.9	71.5							
	209		90.5	87.6							
	210		86.8	84.0							
	211		84.7	81.9							
	212		85.5	82.8							
	SYSTEM	92.0	87.0	84.2				720	697	590	83.0
5/77	201		32.9	28.5							
	202		100.0	86.6							
	203		44.4	38.4							
	204		94.6	81.9							
	205		93.9	81.3							
	206		100.0	86.6							
	207		75.9	65.7							
	208		98.0	84.8							
	209		93.9	81.3							
	210		92.2	79.8							
	211		91.2	78.9							
	212		97.8	84.7							
	SYSTEM	91.0	92.3	79.9				744	644	594	76.5

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM BEGAN OPERATIONS IN APRIL 1977. ONLY MINOR PROBLEMS OCCURRED DURING APRIL AND MAY. THE SYSTEM IS CURRENTLY IN A SHAKEDOWN PHASE OF OPERATION.

6/77	201		92.0	92.0							
	202		76.0	76.0							
	203		78.0	78.0							
	204		79.0	79.0							
	205		89.0	89.0							
	206		74.0	74.0							
	207		67.0	67.0							
	208		88.0	88.0							
	209		88.0	88.0							
	210		78.0	78.0							
	211		45.0	45.0							
	212		85.0	85.0							
	SYSTEM	96.0	85.4	85.4				720	720	615	79.5

** PROBLEMS/SOLUTIONS/COMMENTS

CRACKING AND BUBBLING OF THE CEILCOTE LINING HAS BEEN OBSERVED ABOVE THE LIQUID LEVEL OF THE INTERNAL RECYCLE TANK.

7/77	201		96.0	78.0							
	202		87.0	70.0							
	203		86.0	70.0							

NORTHERN STATES POWER: SHERBURNE 2 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	204		97.0		79.0						
	205		96.0		78.0						
	206		88.0		71.0						
	207		88.0		71.0						
	208		95.0		77.0						
	209		57.0		46.0						
	210		93.0		75.0						
	211		94.0		76.0						
	212		87.0		70.0						
	SYSTEM	97.0	96.7		78.3			744	602	531	69.6
8/77	201		88.0		80.0						
	202		75.0		68.0						
	203		67.0		61.0						
	204		82.0		74.0						
	205		84.0		76.0						
	206		35.0		32.0						
	207		81.0		74.0						
	208		80.0		73.0						
	209		56.0		51.0						
	210		79.0		72.0						
	211		71.0		64.0						
	212		33.0		30.0						
	SYSTEM	93.0	75.6		68.6			744	675	510	66.6

** PROBLEMS/SOLUTIONS/COMMENTS

THE SPRAY PUMPS WERE OVERHAULED DURING AUGUST ON MODULES 206 AND 209.

THE SPRAY NOZZLES ON MODULES 206 AND 209 REQUIRED EXTENSIVE CLEANING.

9/77	201		89.0		89.0						
	202		61.0		61.0						
	203		82.0		82.0						
	204		90.0		90.0						
	205		81.0		81.0						
	206		86.0		86.0						
	207		52.0		52.0						
	208		88.0		88.0						
	209		56.0		56.0						
	210		87.0		87.0						
	211		73.0		73.0						
	212		86.0		86.0						
	SYSTEM	94.0	84.6		84.6			720	717	609	79.4

** PROBLEMS/SOLUTIONS/COMMENTS

THE STRAINERS IN THE MODULE 207 AND 209 REACTION TANKS HAVE STARTED ERODING. THE UTILITY ANTICIPATES REPLACING THEM VERY SOON.

10/77	201		98.0		90.0						
	202		89.0		82.0						
	203		87.0		80.0						
	204		86.0		79.0						
	205		62.0		57.0						
	206		99.0		91.0						
	207		98.0		90.0						
	208		93.0		86.0						
	209		96.0		88.0						
	210		96.0		88.0						
	211		70.0		64.0						
	212		81.0		75.0						
	SYSTEM	95.0	95.9		88.2			744	684	656	81.6

NORTHERN STATES POWER: SHERBURNE 2 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
			THE LOW OPERABILITIES ARE DUE TO SPRAY WATER PUMP OVERHAULS. 24 PUMPS ARE BEING OVERHAULED.								
			STRAINER/WASHER SCREEN EROSION HAS BEEN A PROBLEM. 316 SS MATERIAL WILL BE USED IN THE FUTURE. REPLACEMENT MATERIAL IS EXPECTED TO ARRIVE IN DECEMBER AND WORK IS EXPECTED TO LAST FOR THREE MONTHS.								
11/77	201		85.0	84.0							
	202		93.0	92.0							
	203		68.0	68.0							
	204		80.0	79.0							
	205		93.0	92.0							
	206		73.0	73.0							
	207		75.0	75.0							
	208		66.0	66.0							
	209		94.0	93.0							
	210		77.0	77.0							
	211		91.0	90.0							
	212		65.0	65.0							
	SYSTEM	91.0	87.3	86.7				720	715	624	81.7
12/77	201		53.0	52.0							
	202		93.0	92.0							
	203		94.0	93.0							
	204		87.0	86.0							
	205		89.0	88.0							
	206		95.0	94.0							
	207		93.0	92.0							
	208		83.0	82.0							
	209		62.0	61.0							
	210		82.0	81.0							
	211		90.0	89.0							
	212		92.0	91.0							
	SYSTEM	93.0	92.1	91.0				744	733	677	80.6
1/78	201		91.0	83.0							
	202		75.0	69.0							
	203		64.0	59.0							
	204		72.0	66.0							
	205		74.0	68.0							
	206		67.0	61.0							
	207		91.0	83.0							
	208		88.0	81.0							
	209		77.0	71.0							
	210		72.0	66.0							
	211		73.0	70.0							
	212		84.0	77.0							
	SYSTEM	92.0	84.4	77.6				744	682	577	70.3
	** PROBLEMS/SOLUTIONS/COMMENTS										
			THE REPLACEMENT OF STRAINER SCREENS BEGAN ON DECEMBER 21. FOUR TO SIX DAYS OF WORK ON EACH MODULE ARE REQUIRED TO MAKE STRAINER SCREEN REPLACEMENTS.								
2/78	201		83.0	77.0							
	202		85.0	78.0							
	203		55.0	51.0							
	204		91.0	84.0							
	205		89.0	82.0							

NORTHERN STATES POWER: SHERBURNE 2 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	206		76.0		70.0						
	207		71.0		66.0						
	208		89.0		82.0						
	209		85.0		78.0						
	210		81.0		75.0						
	211		97.0		90.0						
	212		60.0		55.0						
	SYSTEM	92.0	87.4		80.7			672	620	542	73.8

** PROBLEMS/SOLUTIONS/COMMENTS

STRAINER MODIFICATIONS WERE PERFORMED ON MODULES 203 AND 212.

3/78	201		82.0		82.0						
	202		92.0		92.0						
	203		90.0		90.0						
	204		83.0		83.0						
	205		78.0		78.0						
	206		85.0		85.0						
	207		91.0		91.0						
	208		62.0		62.0						
	209		83.0		83.0						
	210		78.0		78.0						
	211		88.0		88.0						
	212		89.0		89.0						
	SYSTEM	97.0	91.0		91.0			744	744	677	87.9

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT GENERATED MAXIMUM MEGAWATT-HOURS AND THE FGD SYSTEM TIED THE HIGHEST RECORDED AVAILABILITY OF 97%.

STRAINER MODIFICATIONS WERE PERFORMED ON MODULES 208 AND 210.

4/78	201		70.0		70.0						
	202		82.0		82.0						
	203		90.0		90.0						
	204		84.0		84.0						
	205		91.0		91.0						
	206		83.0		83.0						
	207		84.0		84.0						
	208		86.0		86.0						
	209		78.0		78.0						
	210		90.0		90.0						
	211		67.0		67.0						
	212		85.0		85.0						
	SYSTEM	92.0	90.0		90.0			720	719	648	81.9

** PROBLEMS/SOLUTIONS/COMMENTS

FROM FULL SCALE STARTUP ON APRIL 1, THE SYSTEM HAS BEEN OPERATING VERY WELL WITH NO MAJOR PROBLEMS ENCOUNTERED. THE UTILITY IS MAINTAINING A SCHEDULE OF NIGHTLY CLEANING ON THE SCRUBBERS. THE CURRENT SCHEME IS SUCH THAT EACH MODULE IS CLEANED AFTER SEVEN OR EIGHT DAYS OF OPERATION.

MODULE 201 WAS CONVERTED TO A SPRAY TOWER DURING APRIL.

5/78	201		97.0		16.0						
	202		94.0		15.0						
	203		80.0		13.0						
	204		90.0		15.0						
	205		90.0		15.0						
	206		89.0		14.0						

NORTHERN STATES POWER: SHERBURNE 2 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	207		90.0		15.0						
	208		92.0		15.0						
	209		28.0		5.0						
	210		91.0		15.0						
	211		78.0		13.0						
	212		14.0		2.0						
	SYSTEM	91.0	84.8		13.9			744	120	103	12.7

** PROBLEMS/SOLUTIONS/COMMENTS

THERE WERE LINER FAILURES (CEILCOTE) IN MOST OF THE MODULES DURING APRIL AND MAY. THE LINERS WERE REPAIRED BY THE CEILCOTE COMPANY AT THEIR OWN EXPENSE.

THE UNIT WENT DOWN ON MAY 6 FOR THE FIRST YEAR BOILER AND TURBINE INSPECTION AND WAS DOWN THE REMAINDER OF MAY.

6/78	201		77.0		61.0						
	202		46.0		37.0						
	203		41.0		33.0						
	204		67.0		53.0						
	205		62.0		49.0						
	206		62.0		49.0						
	207		72.0		57.0						
	208		78.0		62.0						
	209		60.0		48.0						
	210		62.0		49.0						
	211		76.0		60.0						
	212		75.0		60.0						
	SYSTEM	95.0	70.7		56.2			720	572	405	61.3
7/78	201		87.0		82.0						
	202		89.0		83.0						
	203		62.0		58.0						
	204		93.0		87.0						
	205		90.0		84.0						
	206		64.0		60.0						
	207		86.0		81.0						
	208		67.0		63.0						
	209		64.0		60.0						
	210		81.0		76.0						
	211		73.0		68.0						
	212		71.0		67.0						
	SYSTEM	95.0	84.3		79.0			744	697	588	71.5

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY IS EVALUATING NEW RUBBER LINED PUMPS (8000 GPM) AS POSSIBLE SOLUTIONS TO THE MIST ELIMINATOR AND REHEATER PLUGGING PROBLEMS.

THE UTILITY IS EVALUATING NEW STAINLESS STEEL MIST ELIMINATOR WASH LANCES (TO REPLACE ORIGINAL FIBERGLASS LANCES).

THE FGD SYSTEM HAS BEEN EXPERIENCING PRIMARY CONTACTOR WALL AND MARBLE BED WEAR.

THE UTILITY IS PREPARING FOR THE STATE COMPLIANCE DEADLINE ON NOVEMBER 1. CURRENTLY TESTING HAS BEEN PROCEEDING ON DIFFERENT MODULES IN AN EFFORT TO FINE TUNE THE SYSTEM.

PLUGGING PROBLEMS IN THE REHEATER HAVE BEEN MORE FREQUENT THAN NORMAL.

THE UTILITY IS IN THE PROCESS OF REPLACING THE ORIGINAL ZURN DUPLEX STRAINERS WITH 316 SS STRAINERS.

NORTHERN STATES POWER: SHERBURNE 2 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
			THE INLET SEAL STRIPS WERE REPAIRED.								
			PLUGGING PROBLEMS IN THE MIST ELIMINATOR HAVE BEEN MORE FREQUENT THAN NORMAL.								
8/78	201		88.0		82.0						
	202		100.0		93.0						
	203		48.0		45.0						
	204		79.0		74.0						
	205		81.0		76.0						
	206		72.0		67.0						
	207		64.0		60.0						
	208		87.0		81.0						
	209		54.0		50.0						
	210		76.0		71.0						
	211		80.0		75.0						
	212		71.0		66.0						
	SYSTEM	93.0	81.8		76.4			744	695	569	69.8
9/78	201		72.0		72.0						
	202		82.0		82.0						
	203		70.0		70.0						
	204		61.0		61.0						
	205		74.0		74.0						
	206		64.0		64.0						
	207		82.0		82.0						
	208		72.0		72.0						
	209		75.0		75.0						
	210		78.0		78.0						
	211		82.0		82.0						
	212		68.0		68.0						
	SYSTEM	96.0	80.0		80.0			720	720	576	74.4
	** PROBLEMS/SOLUTIONS/COMMENTS										
			THE RUBBER LINED PUMPS THAT THE UTILITY WAS INVESTIGATING HAVE BEEN ORDERED. FOUR OF THE PUMPS HAVE BEEN RECEIVED AND ONE IS INSTALLED. THE OTHERS WILL BE INSTALLED AS THEY ARE RECEIVED.								
			DIFFERENT MIST ELIMINATOR SPRAY PATTERNS ARE BEING TESTED TO MINIMIZE PLUGGING OCCURRENCES.								
			NO FGD RELATED OUTAGES WERE REPORTED BY THE UTILITY FOR THE AUGUST-SEPTEMBER REPORT PERIOD.								
10/78	201		90.0		83.0						
	202		79.0		73.0						
	203		59.0		55.0						
	204		73.0		68.0						
	205		69.0		64.0						
	206		64.0		59.0						
	207		78.0		72.0						
	208		76.0		70.0						
	209		72.0		67.0						
	210		69.0		64.0						
	211		72.0		67.0						
	212		82.0		76.0						
	SYSTEM	94.0	80.3		74.4			744	688	553	68.8
	** PROBLEMS/SOLUTIONS/COMMENTS										
			DURING OCTOBER MODULE 203 EXPERIENCED STRAINER PLUGGING.								
			DURING OCTOBER MODULE 203 EXPERIENCED REHEATER PROBLEMS WHICH TOGETHER								

NORTHERN STATES POWER: SHERBURNE 2 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
			PERFORMANCE DATA								
			WITH STRAINER PLUGGING CAUSED A FOUR TO FIVE DAY OUTAGE.								
11/78	201		84.0	55.0							
	202		45.0	30.0							
	203		82.0	54.0							
	204		80.0	52.0							
	205		75.0	49.0							
	206		58.0	38.0							
	207		77.0	51.0							
	208		75.0	49.0							
	209		83.0	54.0							
	210		83.0	54.0							
	211		72.0	47.0							
	212		47.0	31.0							
	SYSTEM	92.0	78.3	51.3				720	472	369	44.6
	** PROBLEMS/SOLUTIONS/COMMENTS										
			LOW NOVEMBER BOILER HOURS RESULTED FROM A NECESSARY TURBINE INSPECTION.								
			NORMAL OVERHAUL MAINTENANCE WAS PERFORMED ON THE SPRAY PUMPS OF MODULES 202 AND 212.								
12/78	201		85.0	84.0							
	202		92.0	91.0							
	203		89.0	88.0							
	204		84.0	83.0							
	205		84.0	83.0							
	206		84.0	83.0							
	207		96.0	95.0							
	208		88.0	87.0							
	209		78.0	77.0							
	210		92.0	91.0							
	211		81.0	80.0							
	212		94.0	93.0							
	SYSTEM	94.0	95.2	94.0				744	733	698	74.0
1/79	201		57.0	53.0							
	202		89.0	82.0							
	203		91.0	84.0							
	204		85.0	79.0							
	205		92.0	85.0							
	206		82.0	76.0							
	207		75.0	69.0							
	208		97.0	90.0							
	209		74.0	68.0							
	210		88.0	81.0							
	211		100.0	92.0							
	212		90.0	83.0							
	SYSTEM	94.0	92.7	85.6				744	688	638	66.9
	** PROBLEMS/SOLUTIONS/COMMENTS										
			THE PROBLEMS ENCOUNTERED IN DECEMBER AND JANUARY WERE MAINLY WEATHER RELATED.								
			THERE WERE PROBLEMS WITH THE COAL FEEDER BELTS RESULTING IN MOVING WET COAL FROM OLDER COAL STOCKPILES TO THE BOILER DURING THE DECEMBER-JANUARY PERIOD.								
2/79	201		86.0	86.0							
	202		84.0	84.0							
	203		73.0	73.0							

NORTHERN STATES POWER: SHERBURNE 2 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	204		89.0		89.0						
	205		59.0		59.0						
	206		76.0		76.0						
	207		72.0		72.0						
	208		68.0		68.0						
	209		80.0		80.0						
	210		75.0		75.0						
	211		92.0		92.0						
	212		65.0		65.0						
	SYSTEM	93.0	83.6		83.5			672	671	561	66.2
3/79	201		85.0		85.0						
	202		69.0		69.0						
	203		78.0		78.0						
	204		47.0		47.0						
	205		71.0		71.0						
	206		76.0		76.0						
	207		90.0		90.0						
	208		78.0		78.0						
	209		50.0		50.0						
	210		85.0		85.0						
	211		57.0		57.0						
	212		86.0		86.0						
	SYSTEM	91.0	79.3		79.3			744	744	590	53.7

** PROBLEMS/SOLUTIONS/COMMENTS

THE ONLY PROBLEMS ENCOUNTERED DURING FEBRUARY AND MARCH WERE BOILER-RELATED PROBLEMS RESULTING FROM WET COAL.

THE RECYCLE PUMPS ARE BEING REPLACED WITH LARGER 8000 GPM WORTHINGTON PUMPS. DURING THIS PERIOD THE PUMPS WERE INSTALLED ON MODULES 204 AND 206.

4/79	SYSTEM	95.0						720	717		71.8

** PROBLEMS/SOLUTIONS/COMMENTS

AS OF APRIL 1979 THE UTILITY HAS DECIDED THAT IT WILL ONLY REPORT THE AVAILABILITY OF THE TOTAL SYSTEM FOR THIS REPORT.

5/79	SYSTEM	99.0						744	263		28.1

** PROBLEMS/SOLUTIONS/COMMENTS

THE LOW BOILER HOURS IN MAY WERE DUE TO COMMENCEMENT OF THE ANNUAL BOILER AND TURBINE INSPECTION.

ALL PIPING HAS BEEN CHANGED TO FIBERGLASS.

6/79	SYSTEM	90.0						720	454		38.7

** PROBLEMS/SOLUTIONS/COMMENTS

THE ONLY PROBLEM REPORTED BY THE UTILITY WAS THE LOSS OF A BOILER SURGE PUMP AFTER THE UNIT RESTARTED.

7/79	SYSTEM	95.0						744	741		78.9
8/79	SYSTEM	96.0						744	740		72.3
9/79	SYSTEM	95.0						720	657		68.9

NORTHERN STATES POWER: SHERBURNE 2 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
		NO MAJOR OPERATIONAL PROBLEMS HAVE BEEN ENCOUNTERED WITH THIS UNIT SINCE IT CAME BACK ON LINE AFTER THE ANNUAL BOILER/TURBINE OVERHAUL IN MAY.									
10/79	SYSTEM	94.0						744	732		
11/79	SYSTEM	97.0						720	719		
12/79	SYSTEM	97.0						744	662		
	** PROBLEMS/SOLUTIONS/COMMENTS										
		NO MAJOR BOILER OR FGD OPERATIONAL PROBLEMS WERE ENCOUNTERED DURING THE FOURTH QUARTER OF 1979.									
1/80	SYSTEM	97.0						744	744		90.1
2/80	SYSTEM	96.0						696	696		91.8
3/80	SYSTEM	98.0						744	744		91.9
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING THE FIRST QUARTER OF 1980 THE FGD SYSTEM EXPERIENCED NO MAJOR PROBLEMS.									
		A FOUR WEEK BOILER OUTAGE IS SCHEDULED FOR MAY AT WHICH TIME THE MARBLE BEDS WILL BE REMOVED FROM THE FGD SYSTEM.									
		THE UTILITY HAS DECIDED TO CONVERT THE ENTIRE MARBLE BED SCRUBBING SYSTEM TO A SPRAY TOWER SYSTEM BY REMOVING THE MARBLE BEDS AND MODIFYING THE SPRAY ARRANGEMENT. TESTS CONDUCTED AT UNIT 1 IN 1978 AND 1979 SHOW THAT MOST OF THE SO2 IS COLLECTED IN THE VENTURI SECTION OF THE SCRUBBING TRAINS AND THAT ALTHOUGH THE MARBLE BEDS IN THE ABSORBER SECTIONS IMPROVE INTIMATE SO2/SLURRY MIXING, SO2 REMOVAL EFFICIENCY OF THE SCRUBBING TRAINS IS NOT MARKEDLY DIFFERENT WHEN MARBLE BEDS ARE REMOVED.									
4/80	SYSTEM	96.0						720	704		68.6
	** PROBLEMS/SOLUTIONS/COMMENTS										
		NO MAJOR OPERATIONAL PROBLEMS WERE ENCOUNTERED IN APRIL.									
5/80	SYSTEM	96.0						744	214		24.2
6/80	SYSTEM	100.0						720	51		2.8
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE FGD SYSTEM WAS OUT OF SERIVE MOST OF MAY AND JUNE BECAUSE OF THE ANNUAL BOILER AND TURBINE INSPECTION.									
7/80	SYSTEM	100.0	100.0	100.0	82.7			744	615	615	63.8
	** PROBLEMS/SOLUTIONS/COMMENTS										
		BOILER TUBE LEAKS CAUSED THE BOILER NOT TO OPERATE FOR 73 HOURS IN JULY.									
		BOTTOM ASH PLUGGING ALSO FORCED THE BOILER DOWN FOR 56 HOURS.									
8/80	SYSTEM	100.0	100.0	100.0	100.0			744	744	744	70.7
9/80	SYSTEM	100.0	100.0	100.0	100.0			720	720	720	100.0

NORTHERN STATES POWER: SHERBURNE 2 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE BOILER AND FGD SYSTEM RAN CONTINUOUSLY THROUGH AUGUST AND SEPTEMBER WITHOUT ANY PROBLEMS.									
10/80	SYSTEM	100.0	100.0	100.0	99.7			744	742	742	81.9
11/80	SYSTEM	100.0	100.0	100.0	100.0			720	720	720	82.2
12/80	SYSTEM	100.0	100.0	100.0	100.0			744	744	744	79.2
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING THE OCTOBER-DECEMBER PERIOD THE FGD SYSTEM WAS AVAILABLE 100% OF THE TIME.									

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	PACIFIC POWER & LIGHT	
PLANT NAME	JIM BRIDGER	
UNIT NUMBER	4	
CITY	ROCK SPRINGS	
STATE	WYOMING	
REGULATORY CLASSIFICATION	D	
PARTICULATE EMISSION LIMITATION - NG/J	43.	(.100 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	86.	(.200 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	2034	
GROSS UNIT GENERATING CAPACITY - MW	550	
NET UNIT GENERATING CAPACITY W/FGD - MW	508	
NET UNIT GENERATING CAPACITY WO/FGD - MW	509	
EQUIVALENT SCRUBBED CAPACITY - MW	550	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	COMBUSTION ENGINEERING	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	1283.57	(2720000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	*******	(**** F)
STACK HEIGHT - M	152.	(500 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	*******	(***** FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	SUBBITUMINOUS	
AVERAGE HEAT CONTENT - J/G	21632.	(9300 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		******
AVERAGE ASH CONTENT - %	9.00	
RANGE ASH CONTENT - %	******	
AVERAGE MOISTURE CONTENT - %	18.00	
RANGE MOISTURE CONTENT - %	******	
AVERAGE SULFUR CONTENT - %	.56	
RANGE SULFUR CONTENT - %	******	
AVERAGE CHLORIDE CONTENT - %	.01	
RANGE CHLORIDE CONTENT - %	******	
*** PARTICLE CONTROL		
** ESP		
TYPE	COLD SIDE	
SUPPLIER	CARBORUNDUM	
INLET FLUE GAS CAPACITY - CU.M/S	1099.9	(2330890 ACFM)
INLET FLUE GAS TEMPERATURE - C	121.1	(250 F)
PARTICLE REMOVAL EFFICENCY - %	99.0	
** PARTICLE SCRUBBER		
GENERIC TYPE	NONE	
SPECIFIC TYPE	N/A	
*** FGD SYSTEM		
** GENERAL DATA		
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT	
SO2 REMOVAL MODE	WET SCRUBBING	
PROCESS TYPE	SODIUM CARBONATE	
PROCESS ADDITIVES	NONE	
SYSTEM SUPPLIER	AIR CORRECTION DIVISION, UOP	
A-E FIRM	BECHTEL	
DEVELOPMENT LEVEL	FULL SCALE	
NEW/RETROFIT	NEW	
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.00	
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	91.00	
CURRENT STATUS	1	
COMMERCIAL START-UP	2/80	
INITIAL START-UP	9/79	
CONTRACT AWARDED	10/76	

PACIFIC POWER & LIGHT: JIM BRIDGER 4 (CONT.)

** DESIGN AND OPERATING PARAMETERS

** ABSORBER

NUMBER	3
GENERIC TYPE	TRAY TOWER
SPECIFIC TYPE	SIEVE TRAY
SHELL GENERIC MATERIAL	CARBON STEEL
SHELL SPECIFIC MATERIAL	AISI 1110
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A
LINER GENERIC MATERIAL	ORGANIC
LINER MATERIAL TRADE NAME/COMMON TYPE	RUBBER
NUMBER OF CONTACTING ZONES	1
L/G RATIO - L/CU.M	2.7 (20.0 GAL/1000 ACF)
SO2 REMOVAL EFFICIENCY - %	91.0

** MIST ELIMINATOR

PRE-MIST ELIMINATOR/MIST ELIMINATOR	MIST ELIMINATOR
VANE ANGLES - DEGREES	45

** PUMPS

SERVICE	NUMBER
-------	------
ABSORBER RECIRCULATION	****

** SOLIDS CONCENTRATING/DEWATERING

DEVICE	THICKENER
OUTLET STREAM CHARACTERISTICS	18% SOLIDS

*** SLUDGE

** DISPOSAL

NATURE	FINAL
TYPE	LINED POND
LOCATION	ON SITE
SITE TRANSPORTATION METHOD	PUMPED
SITE SERVICE LIFE - YRS	11

** WATER BALANCE

WATER LOOP TYPE	CLOSED

** FGD SPARE CAPACITY INDICES

ABSORBER - %	.0

** FGD SPARE COMPONENT INDICES

ABSORBER	.0

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
9/79	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT STARTED OPERATIONS AS SCHEDULED IN SEPTEMBER 1979. PRESENTLY THE FGD SYSTEM IS IN THE START UP PHASE WITH COMMERCIAL OPERATION SCHEDULED FOR DECEMBER.

THE UTILITY IS IN THE PROCESS OF CHECKING INTERLOCKS AND OTHER COMPONENTS BUILT INTO THE FGD SYSTEM TO PROTECT THE BOILER. FLUE GAS IS PASSING THROUGH MODULES ON AN INDIVIDUAL BASIS. THE FGD SYSTEM WILL NOT BE OPERATED IN AN INTEGRATED MODE UNTIL LATE OCTOBER.

10/79	SYSTEM							744			
11/79	SYSTEM							720			

PACIFIC POWER & LIGHT: JIM BRIDGER 4 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOI
12/79	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

SHAKEDOWN OPERATIONS CONTINUED THROUGHOUT THE FOURTH QUARTER OF 1979.

1/80	SYSTEM							744			
2/80	SYSTEM							696			
3/80	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT IS STILL IN THE SHAKEDOWN PHASE OF OPERATIONS. A NUMBER OF MECHANICAL PROBLEMS AND SOME CONTROL PROBLEMS HAVE BEEN ENCOUNTERED. NO PROCESS-RELATED PROBLEMS HAVE OCCURRED.

4/80	41	27.5	18.4	22.3	14.2						
	42	24.0	23.9	26.3	18.4						
	43	26.6	34.0	34.2	26.1						
	SYSTEM	26.0	25.4	27.6	19.6			720	553	141	

** PROBLEMS/SOLUTIONS/COMMENTS

ALL THREE MODULES WERE OUT OF SERVICE THE FIRST 21 DAYS OF APRIL WHILE THE UTILITY WAITED FOR DELIVERY OF NEW SPRAY NOZZLES. SOME PLUGGING HAD OCCURRED IN THE ORIGINAL NOZZLES. THE NEW NOZZLES WERE INSTALLED FOR TESTING PURPOSES.

5/80	41	95.2	46.0	92.6	42.9						
	42	72.4	75.1	71.7	70.1						
	43	100.0	81.6	100.0	76.1						
	SYSTEM	89.2	67.6	88.1	63.0			744	694	469	

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE 42 WAS FORCED OUT OF SERVICE FOR EIGHT DAYS IN MAY WHILE A VORTEX BREAKER WAS INSTALLED IN THE ABSORBER VESSEL. THE VESSEL WAS DRAINING BEFORE REACHING DESIGN FLUID LEVELS.

VORTEX BREAKERS WERE INSTALLED IN MODULES 41 AND 43 AS WELL BUT INSTALLATION IN THESE MODULES WAS NOT UNDERTAKEN DURING PERIODS WHEN MODULE SERVICE WAS REQUIRED.

6/80	41	81.2	77.7	66.5	30.9						
	42	89.2	100.0	85.1	43.2						
	43	86.0	75.0	73.6	29.8						
	SYSTEM	85.5	87.1	75.4	34.6			744	296	258	

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS DOWN FOR 5 DAYS TO REPAIR A RECIRCULATION PUMP BREAKER ON MODULE 41.

MODULES 41 AND 42 WERE UNAVAILABLE FOR A COMBINED TOTAL OF 6 DAYS DUE TO THE REPLACING OF THE PH CONTROL PIPING.

7/80	41	97.3	67.2	96.0	64.8						
	42	97.4	91.2	97.1	87.8						
	43	99.4	90.2	99.3	86.9						
	SYSTEM	98.0	82.9	97.6	79.8			744	717	594	

PACIFIC POWER & LIGHT: JIM BRIDGER 4 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
		NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED IN JULY.									
8/80	41	99.7	92.8	99.7	86.1						
	42	94.1	92.3	93.6	85.6						
	43	94.7	68.4	92.4	63.5						
	SYSTEM	96.2	84.5	95.2	78.4			744	690	583	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		NO FGD RELATED PROBLEMS WERE REPORTED FOR THE MONTH OF AUGUST.									
9/80	SYSTEM				.0			720	0	0	
10/80	SYSTEM				.0			744	0	0	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE BOILER AND FGD SYSTEM WERE OUT OF SERVICE DURING THE MONTHS OF SEPTEMBER AND OCTOBER FOR THE ANNUAL BOILER OUTAGE.									
11/80	SYSTEM							720			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		NO INFORMATION WAS AVAILABLE FOR NOVEMBER 1980.									
12/80	41	100.0	85.9	100.0	77.2						
	42	91.7	74.6	88.9	66.9						
	43	93.0	71.6	90.4	64.2						
	SYSTEM	94.9	77.4	93.1	69.4			744	668	517	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		SCALING PROBLEMS WERE ENCOUNTERED DURING DECEMBER. NO OTHER MAJOR FGD-RELATED PROBLEMS WERE REPORTED FOR THE MONTH.									

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	PENNSYLVANIA POWER	
PLANT NAME	BRUCE MANSFIELD	
UNIT NUMBER	1	
CITY	SHIPPINGPORT	
STATE	PENNSYLVANIA	
REGULATORY CLASSIFICATION	D	
PARTICULATE EMISSION LIMITATION - NG/J	15.	(.035 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	258.	(.600 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	2751	
GROSS UNIT GENERATING CAPACITY - MW	917	
NET UNIT GENERATING CAPACITY W/FGD - MW	825	
NET UNIT GENERATING CAPACITY WO/FGD - MW	880	
EQUIVALENT SCRUBBED CAPACITY - MW	917	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	FOSTER WHEELER	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	1580.86	(3350000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	140.6	(285 F)
STACK HEIGHT - M	290.	(950 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	5.8	(19.0 FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	BITUMINOUS	
AVERAGE HEAT CONTENT - J/G	26749.	(11500 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		11000-11950
AVERAGE ASH CONTENT - %	12.90	
RANGE ASH CONTENT - %	11.5-13.5	
AVERAGE MOISTURE CONTENT - %	7.00	
RANGE MOISTURE CONTENT - %	5.5-8.5	
AVERAGE SULFUR CONTENT - %	3.00	
RANGE SULFUR CONTENT - %	1.75-3.75	
AVERAGE CHLORIDE CONTENT - %	********	
RANGE CHLORIDE CONTENT - %	******	
*** PARTICLE CONTROL		
** PARTICLE SCRUBBER		
NUMBER	6	
GENERIC TYPE	VENTURI TOWER	
SPECIFIC TYPE	VARIABLE-THROAT/TOP-ENTRY PLUMB BOB	
SUPPLIER	CHEMICO	
DIMENSIONS - FT	35.5 DIA X 52 HIGH	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	AISI 1110	
LINER GENERIC MATERIAL	ORGANIC	
LINER SPECIFIC MATERIAL	GLASS FLAKE-FILLED POLYESTER	
GAS CONTACTING DEVICE TYPE	PLUMB BOB AND 2 SETS OF SPRAYS, 317 SS AND 316 S	
NUMBER OF CONTACTING ZONES	2	
LIQUID RECIRCULATION RATE - LITER/S	1386.0	(22000 GPM)
L/G RATIO - LITER/CU.M	5.3	(40.0 GAL/1000ACF)
PRESSURE DROP - KPA	.6	(2.3 IN-H2O)
SUPERFICIAL GAS VELOCITY - M/S	61.0	(200.0 FT/S)
INLET GAS FLOW RATE - CU.M/S	263.5	(558333 ACFM)
INLET GAS TEMPERATURE - C	140.6	(285 F)
SO2 REMOVAL EFFICENCY - %	70.0	
PARTICLE REMOVAL EFFICIENCY - %	99.8	
*** FGD SYSTEM		
** GENERAL DATA		
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT	
SO2 REMOVAL MODE	WET SCRUBBING	
PROCESS TYPE	LIME	
PROCESS ADDITIVES	MG PROMOTED	

PENNSYLVANIA POWER: BRUCE MANSFIELD 1 (CONT.)

SYSTEM SUPPLIER	CHEMICO DIVISION, ENVIROTECH	
A-E FIRM	GILBERT/COMMONWEALTH ASSOCIATES	
DEVELOPMENT LEVEL	FULL SCALE	
NEW/RETROFIT	NEW	
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.80	
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	92.10	
CURRENT STATUS	1	
TERMINATION	**/77	
COMMERCIAL START-UP	6/76	
INITIAL START-UP	12/75	
CONTRACT AWARDED	10/74	

** DESIGN AND OPERATING PARAMETERS

** ABSORBER

NUMBER	6	
GENERIC TYPE	VENTURI TOWER	
SPECIFIC TYPE	FIXED THROAT	
SUPPLIER	CHEMICO DIVISION, ENVIROTECH	
DIMENSIONS - FT	34 DIA X 51.5 HIGH	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	AISI 1110	
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A	
LINER GENERIC MATERIAL	ORGANIC	
LINER MATERIAL TRADE NAME/COMMON TYPE	POLYESTER FLAKEGLASS	
NUMBER OF CONTACTING ZONES	1	
LIQUID RECIRCULATION RATE - LITER/S	1222.	(19400 GPM)
L/G RATIO - L/CU.M	6.0	(45.0 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	2.0	(8.0 IN-H2O)
SUPERFICAL GAS VELOCITY - M/SEC	30.5	(100.0 FT/S)
INLET GAS FLOW - CU. M/S	201.31	(426600 ACFM)
INLET GAS TEMPERATURE - C	52.8	(127 F)
SO2 REMOVAL EFFICIENCY - %	92.1	

** MIST ELIMINATOR

PRE-MIST ELIMINATOR/MIST ELIMINATOR	MIST ELIMINATOR	
NUMBER PER SYSTEM	6	
GENERIC TYPE	IMPINGEMENT	
SPECIFIC TYPE	BAFFLE	
TRADE NAME/COMMON TYPE	CHEVRON VANE	
CONFIGURATION	HORIZONTAL	
NUMBER OF STAGES	1	
NUMBER OF PASSES PER STAGE	4	
DISTANCE BETWEEN VANES - CM	7.6	(3.00 IN)
VANE ANGLES - DEGREES	90	
PRESSURE DROP - KPA	.1	(.6 IN-H2O)
SUPERFICAL GAS VELOCITY - M/S	3.0	(10.0 FT/S)
CONSTRUCTION MATERIAL GENERIC TYPE	FIBERGLASS REINFORCED PLASTIC	
WASH WATER SOURCE	THICKENER OVERFLOW	
WASH RATE - L/S	3.8	(60 GAL/MIN)

** FANS

NUMBER	12	
NUMBER OF SPARES	6	
SUPPLIER	GREEN FAN	
FUNCTION	BALANCED DRAFT	
APPLICATION	BOILER I.D.	
SERVICE	WET	
FLUE GAS FLOW RATE - CU.M/S	263.32	(558000 ACFM)
FLUE GAS TEMPERATURE - C	47.8	(118 F)
CONSTRUCTION MATERIAL GENERIC TYPE	INCOLOY 825 ON HOUSINGS; INCONEL 625 SCROLLS AND	

** DUCTWORK

LOCATION	SCRUBBER INLET	
SHELL GENERIC MATERIAL TYPE	CARBON STEEL	
LINER GENERIC MATERIAL TYPE	POLYESTER FLAKEGLASS	

** DUCTWORK

LOCATION	SCRUBBER OUTLET	
SHELL GENERIC MATERIAL TYPE	CARBON STEEL	
LINER GENERIC MATERIAL TYPE	POLYESTER FLAKEGLASS	

PENNSYLVANIA POWER: BRUCE MANSFIELD 1 (CONT.)

** REAGENT PREPARATION EQUIPMENT

FUNCTION	LIME SLAKING
DEVICE	SLAKER
MANUFACTURER	DORR-OLIVER
NUMBER	2
FULL LOAD DRY FEED CAPACITY - M.TONS/HR	20.0 (22 TPH)

** TANKS

SERVICE	NUMBER
THICKENER UNDERFLOW	****
MIXING TANK (CALCILOX & THCKNR UNDRF	2
SLUDGE TRANSFER	****
MIXING TANK (SPENT SLURRY & FLYASH)	****
RECYCLE (SCRUBBER)	6
RECYCLE (ABSORBER)	6

** PUMPS

SERVICE	NUMBER
VENTURI RECIRCULATION	24
SLURRY FEED	4
LIME SLURRY RECIRCULATION	4
ABSORBER RECIRCULATION	24
THICKENER UNDERFLOW	4
THICKENER TRANSFER	4

** SOLIDS CONCENTRATING/DEWATERING

DEVICE	THICKENER
NUMBER	1
CONFIGURATION	CYLINDRICAL
DIMENSIONS - FT	200 DIA
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
OUTLET STREAM CHARACTERISTICS	30% SOLIDS

*** SLUDGE

** TREATMENT

METHOD	CALCILOX
PROPRIETARY PROCESS	DRAVO

** DISPOSAL

NATURE	FINAL
TYPE	LANDFILL
LOCATION	OFF SITE
SITE TRANSPORTATION METHOD	PUMPED
SITE CAPACITY - CU.M	59927000 (49000.0 ACRE-FT)

** PROCESS CONTROL AND INSTRUMENTATION

CHEMICAL PARAMETERS	PH SLURRY SOLIDS, LIQUID LEVEL, LIQUID FLOW
CONTROL LEVELS	PH 6.8-7.2
MONITOR LOCATION	PH-RECIRCULATING LINES AND THICKENER
PROCESS CONTROL MANNER	AUTOMATIC
PROCESS CHEMISTRY MODE	FEEDBACK

** WATER BALANCE

WATER LOOP TYPE	OPEN

** FGD SPARE CAPACITY INDICES

ABSORBER - %	.0

** FGD SPARE COMPONENT INDICES

ABSORBER	.0

PENNSYLVANIA POWER: BRUCE MANSFIELD 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
12/75	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

INITIAL OPERATION (SHAKEDOWN AND DEBUGGING) FOR PART OF THE SYSTEM COMMENCED IN DECEMBER 1975.

0/76 SYSTEM

** PROBLEMS/SOLUTIONS/COMMENTS

SINCE THE UNIT COMMENCED SCRUBBING OPERATIONS A NUMBER OF PROBLEM AREAS HAVE BEEN ENCOUNTERED. MAJOR AREAS OF CONCERN ARE SPECIFIED BELOW:

1. EXCESSIVE MAINTENANCE PROBLEMS WITH THE WET ID FAN HOUSINGS.
2. EXCESSIVE WATER ENTRAINMENT AND CARRY OVER OUT OF THE STACK CAUSING A STACK RAIN PROBLEM.
3. REHEAT BURNER PROBLEMS.
4. STACK FLUE LINER FAILURES.

1/76 SYSTEM 744

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT SHUT DOWN FOR ONE WEEK DUE TO PLUGGED MIST ELIMINATORS.

AN ID FAN HOUSING VIBRATION CAUSED PART OF THE ONE WEEK OUTAGE, ALONG WITH THE MIST ELIMINATOR PROBLEMS.

2/76 SYSTEM 696

3/76 SYSTEM 744

** PROBLEMS/SOLUTIONS/COMMENTS

FIRST ATTEMPTS AT STARTING UP THE REHEAT BURNERS WERE MADE THIS MONTH. SO MANY PROBLEMS WERE ENCOUNTERED THAT THE SYSTEM SUPPLIER IS GOING TO REDESIGN NEW REHEAT BURNERS.

4/76 SYSTEM 720 506

** PROBLEMS/SOLUTIONS/COMMENTS

THE INSTALLATION BEGAN PARTIAL COMMERICAL OPERATION ON APRIL 5.

TOTAL OPERATING HOURS ACCUMULATED TO DATE ARE AS FOLLOWS: 0, 210, 984, 2147, 2808, AND 2427 FOR MODULES A THROUGH F RESPECTIVELY. THE SCRUBBING SYSTEM IS CURRENTLY HANDLING FLUE GAS AT A TOTAL EQUIVALENT CAPACITY OF APPROXIMATELY 640 MW (GROSS).

5/76	A		35.1	28.1						
	B		100.0	81.3						
	C		99.5	79.6						
	D		82.7	66.1						
	E		100.0	83.6						
	F		82.9	66.3						
	SYSTEM	80.0	83.4	67.5				744	595	502

** PROBLEMS/SOLUTIONS/COMMENTS

THE LAST SCRUBBER TRAIN WAS PLACED IN SERVICE DURING THE MONTH. DURING OFF PEAK HOURS ON THE WEEKENDS WHEN THE UNIT IS OPERATING AT REDUCED LOADS, MAINTENANCE IS PERFORMED ON THE SHUT DOWN FGD MODULES SO THAT THEY

PENNSYLVANIA POWER: BRUCE MANSFIELD 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTO
			WILL BE IN OPERATING CONDITION FOR FULL LOAD OPERATION DURING THE HIGH DEMAND.								
6/76	A		99.2		99.2						
	B		94.4		94.4						
	C		97.4		97.4						
	D		93.6		93.6						
	E		97.9		97.9						
	F		79.6		79.6						
	SYSTEM	100.0	93.7		93.7			720	720	675	
	** PROBLEMS/SOLUTIONS/COMMENTS										
			THE UNIT WAS DECLARED COMMERCIALLY AVAILABLE FOR FULL LOAD OPERATION AT 825 MW (NET) ON JUNE 1, 1976. OVER THE PERIOD A REVISED SCRUBBER BAFFLE SYSTEM WAS INSTALLED IN AN EFFORT TO CORRECT SCRUBBER RECYCLE PUMP CAVITATION PROBLEMS.								
7/76	A		79.8		72.2						
	B		87.7		79.3						
	C		90.0		81.5						
	D		94.7		85.6						
	E		98.4		88.9						
	F		98.2		88.8						
	SYSTEM	90.0	91.5		82.7			744	673	615	
	** PROBLEMS/SOLUTIONS/COMMENTS										
			THE SYSTEM SUPPLIER IS STILL TRYING TO SOLVE THE REHEAT BURNER PROBLEMS.								
			TESTS CONDUCTED THIS MONTH SHOWED THAT THE FGD SYSTEM MIST ELIMINATORS ARE NOT PERFORMING TO DESIGN AND THAT THERE IS EXCESSIVE WATER ENTRAINED IN THE CLEANED FLUE GASSES CAUSING A STACK RAIN PROBLEM. CHEMICO IS WORKING ON THE DESIGN OF ADDITIONAL MIST ELIMINATORS THAT WILL REMOVE THIS EXCESS WATER.								
8/76	A		95.3		90.3						
	B		87.9		83.3						
	C		92.6		87.8						
	D		75.9		71.9						
	E		70.9		67.2						
	F		94.8		89.8						
	SYSTEM	95.0	86.2		81.7			744	705	608	
	** PROBLEMS/SOLUTIONS/COMMENTS										
			SECONDARY VERTICAL MIST ELIMINATORS WERE INSTALLED IN THE ABSORBER DISCHARGE DUCT IN AN ATTEMPT TO REDUCE THE EXCESSIVE ENTRAINED WATER. THEY DID NOT WORK BECAUSE THE FLUE GAS BLEW THEM APART IN A FEW MINUTES OF OPERATION.								
9/76	A		98.3		98.3						
	B		85.7		85.7						
	C		96.3		96.3						
	D		96.5		96.5						
	E		82.8		82.8						
	F		64.4		64.4						
	SYSTEM	100.0	87.3		87.3			720	720	629	
10/76	A		96.1		95.4						
	B		74.3		73.8						
	C		85.4		84.8						
	D		83.8		83.2						

PENNSYLVANIA POWER: BRUCE MANSFIELD 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	E		93.5		92.9						
	F		93.5		92.9						
	SYSTEM	99.0	87.8		87.2			744	739	649	
11/76	A		97.5		37.5						
	B		100.0		38.6						
	C		100.0		39.2						
	D		40.8		15.7						
	E		57.4		22.1						
	F		88.8		34.2						
	SYSTEM	38.0	80.8		31.2			720	277	225	

** PROBLEMS/SOLUTIONS/COMMENTS

A THREE WEEK OUTAGE OCCURRED DUE TO A FURNACE IMPLOSION.

DURING THE OUTAGE SCALE THROUGHOUT THE FGD SYSTEM WAS REMOVED.

DURING THE THREE WEEK OUTAGE THE UNIT 1 CHIMNEY FLUES WERE INSPECTED. THE A-SIDE FLUE POLYESTER LINING MATERIAL WAS FLAKING OFF AND ACID ATTACK WAS STARTING TO CORRODE THE CARBON STEEL FLUE. THE LINING SUPPLIER IS INVESTIGATING THE PROBLEM.

DURING THE OUTAGE THE PLUGGED MIST ELIMINATORS WERE CLEANED.

12/76	A		80.9		78.5						
	B		100.0		97.5						
	C		94.7		91.9						
	D		60.0		58.2						
	E		86.1		83.6						
	F		86.7		84.1						
	SYSTEM	100.0	84.7		82.3			744	722	612	
1/77	A	95.0	98.0		89.0						
	B	92.0	91.0		82.0						
	C	77.0	74.0		68.0						
	D	95.0	98.0		89.0						
	E	92.0	93.0		84.0						
	F	91.0	91.0		83.0						
	SYSTEM	90.3	90.8		82.5			744	675	614	

** PROBLEMS/SOLUTIONS/COMMENTS

SEVERE WINTER WEATHER MADE OPERATION OF THE OUTDOOR FGD SYSTEM VERY DIFFICULT AND AFFECTED THE RELIABILITY OF THE UNIT.

DURING THE FIRST PART OF THE MONTH THE THICKENER RAKE MECHANISM JAMMED AND COULD NOT BE REPAIRED. THE THICKENER WAS OPERATED FOR APPROXIMATELY THREE WEEKS WITH THE RAKE STOPPED UNTIL THE UNIT 2 THICKENER COULD BE PUT INTO EMERGENCY SERVICE.

2/77	A	77.0	81.0		65.0						
	B	69.0	70.0		56.0						
	C	77.0	81.0		65.0						
	D	86.0	96.0		77.0						
	E	92.0	100.0		81.0						
	F	81.0	84.0		67.0						
	SYSTEM	80.3	85.3		68.5			672	540	460	

** PROBLEMS/SOLUTIONS/COMMENTS

A SECOND SET OF VERTICAL SECONDARY MIST ELIMINATORS WAS INSTALLED IN THE ABSORBER DISCHARGE DUCT BUT THE FLUE GAS BLEW THEM OUT BEFORE THEIR EFFICIENCY FOR REMOVING ENTRAINED WATER IN THE FLUE GAS COULD BE TESTED.

PENNSYLVANIA POWER: BRUCE MANSFIELD 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
3/77	A	99.0	98.0		34.8						
	B	100.0	100.0		35.5						
	C	58.0	58.0		20.4						
	D	95.0	95.0		33.9						
	E	97.0	97.0		34.5						
	F	80.0	77.0		27.2						
	SYSTEM	88.2	87.5		31.1			744	264	231	

** PROBLEMS/SOLUTIONS/COMMENTS

AT MIDNIGHT ON MARCH 12, THE UNIT WAS SHUT DOWN FOR A 10-WEEK TURBINE OVERHAUL OUTAGE.

DURING THE MARCH OUTAGE REPAIRS WERE STARTED ON THE A-SIDE CHIMNEY FLUE WHICH WILL NOT BE COMPLETED UNTIL THE END OF AUGUST. AN INSPECTION OF THE B-SIDE CHIMNEY FLUE SHOWED THE SAME TYPE OF REPAIRS WOULD BE NEEDED, BUT WORK WILL NOT START ON THE B-SIDE UNTIL THE A-SIDE FLUE HAS BEEN REPAIRED. BECAUSE OF THESE REPAIRS THE UNIT WILL BE OPERATING AT APPROXIMATELY HALF LOAD FOR ROUGHLY ONE YEAR.

BECAUSE OF THE EXCESSIVE MAINTENANCE REQUIRED ON THE RUBBER LINED CARBON STEEL ID FAN HOUSINGS FROM PIECES OF SCRUBBER SCALE DAMAGING THE LINING AND CORROSION OF THE CARBON STEEL, INCONEL PLATE WILL BE INSTALLED ON THE SCROLL AREA OF EACH OF THE SIX FANS DURING THE OUTAGE.

A NEWLY DESIGNED SECONDARY VERTICAL MIST ELIMINATOR WILL BE INSTALLED IN THE ABSORBER DISCHARGE DUCT OF ONE OF THE SCRUBBER MODULES DURING THE OUTAGE.

DURING THE OUTAGE ALL SCRUBBING VESSELS, DUCTS, PIPING AND MIST ELIMINATOR WILL BE CLEANED AND ALL THE SCALE REMOVED.

DURING OPERATION OF THE FGD SYSTEM THE PH CONTROL COULD NOT BE AUTOMATED BECAUSE OF POOR DESIGN AND OPERATIONAL PROBLEMS WITH THE PROVIDED CONTROL SYSTEM. PH CONTROL WAS MANUALLY SAMPLED AND CONTROLLED OVER APPROXIMATELY ONE YEAR OF OPERATION. THE PH CONTROL AND MONITORING SYSTEM ARE BEING REVISED BY OPERATING PERSONNEL DURING THE OUTAGE IN AN EFFORT TO IMPROVE THE THE PH CONTROL SYSTEM.

THE LIME ADDITION PIPING IS BEING REVISED IN EACH OF THE SCRUBBER VESSELS DUE TO THE SEVERE SCALING OCCURRING WITH THE CURRENT LIME ADDITION SYSTEM.

THE SYSTEM SUPPLIER IS REDESIGNING THE EXISTING MIST ELIMINATOR SPRAY PIPING IN AN EFFORT TO CORRECT THE EXCESSIVE SCALING AND PLUGGING OF THE MIST ELIMINATORS.

CHANGES IN FLUSH WATER AND SEAL WATER PIPING ARE BEING MADE IN AN EFFORT TO CLOSE THE WATER LOOP.

NEWLY MODIFIED REHEAT BURNERS WILL BE INSTALLED DURING THE OUTAGE AND TESTED ON THE B-SIDE REHEATER WHEN THE UNIT STARTS UP IN MAY.

THE UNIT 1 THICKENER WAS CLEANED OUT AND THE JAMMED RAKE DRIVE MECHANISM WAS REPAIRED DURING THE OUTAGE.

4/77	SYSTEM				.0			720	0	0	.0
5/77	A	.0	.0		.0						
	B	.0	.0		.0						
	C	.0	.0		.0						
	D	100.0	84.0		13.7						
	E	100.0	84.8		13.8						

PENNSYLVANIA POWER: BRUCE MANSFIELD 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	F	47.2	41.2		6.7						
	SYSTEM	41.2	35.0		5.7			744	121	42	

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS STARTED UP ON MAY 23 USING D, E, AND F MODULES DUE TO REPAIRS BEING MADE TO THE A-SIDE CHIMNEY FLUE.

THERE WERE PROBLEMS SLAKING LIME AND GETTING MAGNESIUM LEVELS BUILT UP IN THE SCRUBBER RECYCLE LOOPS AFTER STARTUP.

6/77	A	.0	.0		.0						
	B	.0	.0		.0						
	C	.0	.0		.0						
	D	94.0	100.0		94.0						
	E	95.0	100.0		95.1						
	F	90.0	97.0		90.0						
	SYSTEM	46.5	49.5		46.5			720	669	335	

** PROBLEMS/SOLUTIONS/COMMENTS

HORIZONTAL MIST ELIMINATOR PRESSURE DROPS INCREASED TO THE POINT THAT NEW MIST ELIMINATORS HAD TO BE INSTALLED IN JUNE ON THE D, E AND F SCRUBBERS AND THE D AND E ABSORBERS.

7/77	A	.0	.0		.0						
	B	.0	.0		.0						
	C	.0	.0		.0						
	D	99.0	100.0		66.0						
	E	99.0	100.0		66.0						
	F	100.0	100.0		63.0						
	SYSTEM	49.7	50.0		32.5			744	473	242	

** PROBLEMS/SOLUTIONS/COMMENTS

UNIT 1 WAS DOWN FROM JULY 1 THROUGH JULY 12 TO MAKE SOME MODIFICATIONS TO THE GENERATOR COOLING SYSTEM. ON JULY 19 AND 20 THE PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL RESOURCES TESTED THE SO2 AND PARTICLE EMISSIONS FROM THE UNIT 1 FGD SYSTEM. SO2 EMISSIONS WERE 0.44 LB/MM BTU AND 1.26 LB/MM BTU FOR THE TWO TESTS RESPECTIVELY. FGD SO2 REMOVAL EFFICIENCY VARIED FROM 78% TO 89% FOR THE MONTH.

8/77	A	55.0	57.0		52.0						
	B	53.0	56.0		50.0						
	C	31.0	31.0		28.0						
	D	96.0	100.0		93.0						
	E	95.0	100.0		93.0						
	F	88.0	95.0		85.0						
	SYSTEM	69.7	73.2		66.8			744	692	497	

** PROBLEMS/SOLUTIONS/COMMENTS

UNIT 1 WAS DOWN FROM AUGUST 13 TO 15 BECAUSE OF BOILER TUBE LEAKS.

ON AUGUST 16 THE 1A CHIMNEY FLUE LINER REPAIRS WERE COMPLETED AND THE A, B AND C TRAINS WERE STARTED UP.

SEVERAL REPAIRS WERE MADE TO THE ID FAN HOUSING THIS MONTH.

THE AVERAGE SO2 REMOVAL EFFICIENCY FOR THE MONTH WAS 86.7% BASED ON THREE GRAB SAMPLES.

YORK RESEARCH BEGAN SETTING UP EQUIPMENT TO CONTINUOUSLY MONITOR THE SO2 REMOVAL EFFICIENCIES AS PART OF AN EPA RESEARCH PROJECT TO DETERMINE FEA-

PENNSYLVANIA POWER: BRUCE MANSFIELD 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTO

SIBLE NSPS FOR FGD.

EXTENSIVE MODIFICATIONS ARE BEING MADE IN THE PH CONTROL SYSTEMS IN AN EF FORT TO DEVISE A WORKABLE PH CONTROL SYSTEM.

9/77	A	84.0	97.0	75.0						
	B	82.0	95.0	73.0						
	C	81.0	98.0	76.0						
	D	53.0	60.0	46.0						
	E	50.0	56.0	44.0						
	F	43.0	44.0	34.0						
	SYSTEM	65.5	75.0	58.0				720	558	418

** PROBLEMS/SOLUTIONS/COMMENTS

FROM SEPTEMBER 17 TO 22 THE UNIT WAS DOWN TO INSTALL RIGGING IN THE 1B CHIMNEY FLUE TO BEGIN FLUE LINER REPAIRS. D, E AND F TRAINS WERE OFF THE REMAINDER OF THE MONTH.

THE AVERAGE SO2 REMOVAL EFFICIENCIES FOR THE MONTH WERE 93.2% BASED ON FOUR GRAB SAMPLE TESTS.

A BOILER TUBE LEAK CAUSED THE UNIT TO BE DOWN SEPTEMBER 10 TO 12.

10/77	A	93.0	96.0	93.0						
	B	98.0	100.0	98.0						
	C	87.0	90.0	87.0						
	D	.0	.0	.0						
	E	.0	.0	.0						
	F	.0	.0	.0						
	SYSTEM	46.3	47.7	46.3	77.50			744	720	344

** PROBLEMS/SOLUTIONS/COMMENTS

THE C-MODULE MIST ELIMINATOR SPRAY NOZZLES AND MIST ELIMINATOR ITSELF WERE CLEANED.

ABS STACK REPAIRS ON UNIT 2 NECESSITATED TAKING UNIT 1 DOWN FOR TWO DAYS. (A PROTECTIVE CAP HAD TO BE PUT OVER THE 2B FLUE BY HELICOPTER. PREVAILING WINDS NECESSITATED TAKING UNIT 1 OFF IN ORDER TO DO THIS.)

11/77	A	95.0	95.0	95.0						
	B	99.0	99.0	99.0						
	C	91.0	91.0	91.0						
	D	.0	.0	.0						
	E	.0	.0	.0						
	F	.0	.0	.0						
	SYSTEM	47.5	47.5	47.5	85.00			720	720	342

** PROBLEMS/SOLUTIONS/COMMENTS

REMOVAL OF THE OLD COATING AND PRIMING OF THE FLUE LINING IN FLUE 1B IS PROCEEDING SLOWER THAN ANTICIPATED. IT IS EXPECTED THAT TOTAL WORK ON THE FLUE WILL NOT BE COMPLETED UNTIL FEBRUARY OR MARCH 1978.

12/77	A	100.0	100.0	91.0						
	B	93.0	94.0	79.0						
	C	99.0	100.0	91.0						
	D	.0	.0	.0						
	E	.0	.0	.0						
	F	.0	.0	.0						
	SYSTEM	48.7	49.0	43.5				744	626	324

PENNSYLVANIA POWER: BRUCE MANSFIELD 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
		SANDBLASTING OF UNIT 1B FLUE IS NEARING COMPLETION. THE FLUE WILL BE RELINED WITH CXL-2000.									
0/78	SYSTEM										
	** PROBLEMS/SOLUTIONS/COMMENTS										
		NOTE: AN ATTEMPT IS ALWAYS MADE TO BEGIN OPERATION OF THE BOILER AND FGD SYSTEM SIMULTANEOUSLY AT BRUCE MANSFIELD. OCCASIONALLY PROBLEMS DELAY BOILER STARTUP MAKING IT POSSIBLE FOR MONTHLY FGD MODULE HOURS TO EXCEED ACTUAL BOILER HOURS.									
1/78	A	100.0	100.0		58.0						
	B	.0	.0		.0						
	C	100.0	100.0		58.0						
	D	.0	.0		.0						
	E	.0	.0		.0						
	F	.0	.0		.0						
	SYSTEM	33.3	33.3		19.3			744	331	144	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UNIT TRIPPED SEVERAL TIMES DUE TO DIFFICULTIES IN BURNING WET STOCKPILE COAL.									
		THERE WERE PROBLEMS WITH THE 1B FAN WHICH NECESSITATED EXTENSIVE REPAIRS. LINING ABRASION AND DISBONDMENT IN THE FAN CAUSED CORROSION OF UNDERLYING-SUPPORT METAL.									
2/78	A	79.0	100.0		79.0						
	B	61.0	80.0		61.0						
	C	82.0	100.0		82.0						
	D	.0	.0		.0						
	E	.0	.0		.0						
	F	.0	.0		.0						
	SYSTEM	37.0	46.7		37.0			672	514	249	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		EXTENSIVE REPAIRS TO THE 1B ID FAN AND THE EMERGENCY NEED FOR LOAD FROM THE PLANT DURING THE COAL STRIKE TEMPORARILY OVERLOADED THE 1A AND 1C TRAINS. THE 1C MIST ELIMINATORS WILL BE REPLACED AS A RESULT OF THIS.									
		THE 1B FLUE RELINING CONTINUED.									
3/78	A	43.0	47.0		43.0						
	B	91.0	98.0		91.0						
	C	90.0	97.0		90.0						
	D	65.0	70.0		65.0						
	E	50.0	54.0		50.0						
	F	60.0	65.0		60.0						
	SYSTEM	66.5	71.8		66.5			744	689	495	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		REPLACEMENT OF THE LINING IN THE 1B CHIMNEY WITH CXL 2000 WAS COMPLETED.									
		REPAIRS WERE MADE ON THE A, B AND C FAN HOUSINGS.									
4/78	A	74.0	74.0		74.0						

EPA UTILITY FGD SURVEY: OCTOBER - DECEMBER 1980

PENNSYLVANIA POWER: BRUCE MANSFIELD 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTO
	B	88.0	88.0		88.0						
	C	49.0	49.0		49.0						
	D	87.0	87.0		87.0						
	E	97.0	97.0		97.0						
	F	94.0	94.0		94.0						
	SYSTEM	81.5	81.5		81.5			720	720	587	

** PROBLEMS/SOLUTIONS/COMMENTS

FAN HOUSINGS LEAK REPAIRS WERE MADE DURING APRIL.

MISCELLANEOUS LEAK REPAIRS WERE MADE TO DUCTS.

5/78	A	98.0	97.0		59.0						
	B	.0	.0		.0						
	C	98.0	97.0		59.0						
	D	91.0	85.0		52.0						
	E	92.0	84.0		52.0						
	F	92.0	86.0		53.0						
	SYSTEM	78.5	74.8		45.8			744	457	341	

** PROBLEMS/SOLUTIONS/COMMENTS

THE ANNUAL BOILER INSPECTION OUTAGE BEGAN ON MAY 20.

EXTENSIVE REPAIRS WERE MADE ON THE 1B FAN.

6/78	A	.0									
	B	.0									
	C	100.0									
	D	100.0									
	E	100.0									
	F	100.0									
	SYSTEM	66.7			.0			720	0	0	.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER INSPECTION AND GENERATOR STATOR COOLER REPAIRS CONTINUED THROUGH JUNE.

7/78	SYSTEM							744			
8/78	SYSTEM							744			
9/78	SYSTEM							720			
10/78	SYSTEM	96.3						744	671		
11/78	SYSTEM							720			
12/78	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

NO INFORMATION WAS AVAILABLE FOR THIS REPORT PERIOD.

1/79	SYSTEM							744			
2/79	SYSTEM							672			
3/79	SYSTEM							744			
4/79	SYSTEM							720			
5/79	SYSTEM							744			

PENNSYLVANIA POWER: BRUCE MANSFIELD 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
		PERFORMANCE DATA									
	** PROBLEMS/SOLUTIONS/COMMENTS										
		UNIT 1 IS CURRENTLY DOWN FOR A BOILER OVERHAUL.									
		SIX OF THE TWELVE FAN HOUSINGS HAVE BEEN CHANGED FROM CARBON STEEL TO INCOLLOY 825.									
6/79	SYSTEM							720			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UTILITY REPORTS THAT THE AVAILABILITY FROM JANUARY 1, 1979 THROUGH MAY 31, 1979 WAS 92.0%.									
		THE UTILITY REPORTED THAT FAN MOTOR FAILURES WERE A MAJOR PROBLEM AREA DURING THE FIRST HALF OF 1979.									
7/79	SYSTEM							744			
8/79	SYSTEM							744			
9/79	SYSTEM							720			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		FAN HOUSING WORK (CHANGING FROM LINED CARBON STEEL TO INCOLLOY 825) IS CONTINUING.									
		NEW PH MONITOR MODIFICATIONS HAVE YIELDED PROMISING RESULTS WITH RESPECT TO MONITOR AVAILABILITY.									
		THE FGD SYSTEM ATTRIBUTED 17.4% OF THE TOTAL UNIT UNAVAILABILITY FOR 1979 TO DATE. THE BREAKDOWN IS AS FOLLOWS: 7.6% SCRUBBER ID FAN WORK/PROBLEMS 8.3% GENERAL SCRUBBER PROBLEMS AND MAINTENANCE 1.0% REAGENT HANDLING PROBLEMS (LIME SLAKER AND PIPING) 0.5% MIST ELIMINATOR PLUGGING									
10/79	SYSTEM	96.1						744			
11/79	SYSTEM	90.8						720			
12/79	SYSTEM	99.8						744			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING THE PERIOD AN ADDITIONAL FAN HOUSING WAS REPLACED WITH THE NEW INCOLLOY 825. BY THE END OF 1980 ALL THE FAN HOUSINGS WILL BE REPLACED WITH THE NEW MATERIAL.									
		WHERE THE NEW PH MONITORS HAVE BEEN INSTALLED, THE PROBE MAINTENANCE HAS BEEN CUT 80%, AND THE MIST ELIMINATORS HAVE BEEN LESS OF A PROBLEM TO MAINTAIN.									
		THE SLUDGE PUMPS HAVE BEEN A PROBLEM. THE PUMPS REQUIRE AN OVERHAUL EVERY 1000 HOURS AND HAVE FREQUENT VALVE FAILURES. NEW VALVE MANIFOLDS MAY BE INSTALLED TO IMPROVE PUMP SERVICE BY ALLOWING ACCESS TO INDIVIDUAL BALL VALVES.									
1/80	SYSTEM	98.6	100.0		73.1			744	544	544	
2/80	SYSTEM	98.4	100.0		74.9			696	521	521	

PENNSYLVANIA POWER: BRUCE MANSFIELD 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP FACT
	** PROBLEMS/SOLUTIONS/COMMENTS										
				NO MAJOR FGD-RELATED PROBLEMS OCCURRED DURING JANUARY AND FEBRUARY.							
3/80	SYSTEM	98.8	100.0		72.6			744	540	540	
	** PROBLEMS/SOLUTIONS/COMMENTS										
				THE BOILER WAS OUT OF SERVICE ONE WEEK IN MARCH DUE TO A PLUGGED AIR PREHEATER. NO MAJOR FGD-RELATED PROBLEMS WERE REPORTED FOR MARCH.							
4/80	SYSTEM	91.1	100.0		81.4			720	586	586	
5/80	SYSTEM							744			
6/80	SYSTEM							720			
	** PROBLEMS/SOLUTIONS/COMMENTS										
				INFORMATION FOR THE MONTHS OF MAY AND JUNE IS NOT YET AVAILABLE.							
7/80	SYSTEM	98.4	100.0		85.9			744	639	639	
8/80	SYSTEM	98.9	100.0		55.4			744	412	412	
9/80	SYSTEM	95.3	100.0		74.0			720	533	533	
10/80	SYSTEM	98.3	100.0		28.1			744	209	209	
	** PROBLEMS/SOLUTIONS/COMMENTS										
				ON OCTOBER 10 THE UNIT WAS TAKEN OUT OF SERVICE FOR A TURBINE OVERHAUL. DURING THIS OUTAGE THE UTILITY COMMENCED THE INSTALLATION OF A MANIFOLD SYSTEM IN THE STACK. THE OUTAGE IS SCHEDULED TO LAST APPROXIMATELY 12 WEEKS.							
11/80	SYSTEM	.0			.0			720	0	0	
12/80	SYSTEM	.0			.0			744	0	0	
	** PROBLEMS/SOLUTIONS/COMMENTS										
				DURING THE YEAR MINOR EROSION PROBLEMS WITH THE ID FAN ROTORS WERE ENCOUNTERED. FOUR OF THE SIX ID FAN ROTORS HAVE BEEN REPAIRED.							
				BRUCE MANSFIELD 1 REMAINED OFF LINE DURING NOVEMBER AND DECEMBER AS A RESULT OF THE TURBINE OVERHAUL.							

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	PENNSYLVANIA POWER	
PLANT NAME	BRUCE MANSFIELD	
UNIT NUMBER	2	
CITY	SHIPPINGPORT	
STATE	PENNSYLVANIA	
REGULATORY CLASSIFICATION	D	
PARTICULATE EMISSION LIMITATION - NG/J	15.	(.035 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	258.	(.600 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	2751	
GROSS UNIT GENERATING CAPACITY - MW	917	
NET UNIT GENERATING CAPACITY W/FGD - MW	825	
NET UNIT GENERATING CAPACITY WO/FGD - MW	880	
EQUIVALENT SCRUBBED CAPACITY - MW	917	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	FOSTER WHEELER	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	1580.86	(3350000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	140.6	(285 F)
STACK HEIGHT - M	290.	(950 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	5.8	(19.0 FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	BITUMINOUS	
AVERAGE HEAT CONTENT - J/G	26749.	(11500 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		11000-11950
AVERAGE ASH CONTENT - %	12.90	
RANGE ASH CONTENT - %	11.5-13.5	
AVERAGE MOISTURE CONTENT - %	7.00	
RANGE MOISTURE CONTENT - %	5.5-8.5	
AVERAGE SULFUR CONTENT - %	3.00	
RANGE SULFUR CONTENT - %	1.75-3.75	
AVERAGE CHLORIDE CONTENT - %	********	
RANGE CHLORIDE CONTENT - %	******	
*** PARTICLE CONTROL		
** PARTICLE SCRUBBER		
NUMBER	6	
GENERIC TYPE	VENTURI TOWER	
SPECIFIC TYPE	VARIABLE-THROAT/TOP-ENTRY PLUMB BOB	
SUPPLIER	CHEMICO	
DIMENSIONS - FT	35.5 DIA X 52 HIGH	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	AISI 1110	
LINER GENERIC MATERIAL	ORGANIC	
LINER SPECIFIC MATERIAL	GLASS FLAKE-FILLED POLYESTER	
GAS CONTACTING DEVICE TYPE	PLUM BOB AND 2 SETS OF SPRAYS, 317 SS AND 316 SS	
NUMBER OF CONTACTING ZONES	2	
LIQUID RECIRCULATION RATE - LITER/S	1386.0	(22000 GPM)
L/G RATIO - LITER/CU.M	5.3	(40.0 GAL/1000ACF)
PRESSURE DROP - KPA	5.7	(23.0 IN-H2O)
SUPERFICIAL GAS VELOCITY - M/S	61.0	(200.0 FT/S)
INLET GAS FLOW RATE - CU.M/S	263.5	(558333 ACFM)
INLET GAS TEMPERATURE - C	140.6	(285 F)
SO2 REMOVAL EFFICENCY - %	70.0	
PARTICLE REMOVAL EFFICIENCY - %	99.8	
*** FGD SYSTEM		
** GENERAL DATA		
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT	
SO2 REMOVAL MODE	WET SCRUBBING	
PROCESS TYPE	LIME	
PROCESS ADDITIVES	MG PROMOTED	

PENNSYLVANIA POWER: BRUCE MANSFIELD 2 (CONT.)

SYSTEM SUPPLIER	CHEMICO DIVISION, ENVIROTECH		
A-E FIRM	GILBERT/COMMONWEALTH ASSOCIATES		
DEVELOPMENT LEVEL	FULL SCALE		
NEW/RETROFIT	NEW		
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.80		
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	92.10		
CURRENT STATUS	1		
TERMINATION	10/77		
COMMERCIAL START-UP	10/77		
INITIAL START-UP	7/77		
CONTRACT AWARDED	10/74		

** DESIGN AND OPERATING PARAMETERS

** ABSORBER

NUMBER	6		
GENERIC TYPE	VENTURI TOWER		
SPECIFIC TYPE	FIXED THROAT		
SUPPLIER	CHEMICO DIVISION, ENVIROTECH		
DIMENSIONS - FT	34 DIA X 51.5 HIGH		
SHELL GENERIC MATERIAL	CARBON STEEL		
SHELL SPECIFIC MATERIAL	AISI 1110		
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A		
LINER GENERIC MATERIAL	ORGANIC		
LINER MATERIAL TRADE NAME/COMMON TYPE	POLYESTER FLAKEGLASS		
NUMBER OF CONTACTING ZONES	1		
LIQUID RECIRCULATION RATE - LITER/S	1222.	(19400 GPM)	
L/G RATIO - L/CU.M	6.0	(45.0 GAL/1000 ACF)	
GAS-SIDE PRESSURE DROP - KPA	2.0	(8.0 IN-H2O)	
SUPERFICAL GAS VELOCITY - M/SEC	30.5	(100.0 FT/S)	
INLET GAS FLOW - CU. M/S	201.31	(426600 ACFM)	
INLET GAS TEMPERATURE - C	52.8	(127 F)	
SO2 REMOVAL EFFICIENCY - %	92.1		

** MIST ELIMINATOR

PRE-MIST ELIMINATOR/MIST ELIMINATOR	MIST ELIMINATOR		
NUMBER PER SYSTEM	6		
GENERIC TYPE	IMPINGEMENT		
SPECIFIC TYPE	BAFFLE		
TRADE NAME/COMMON TYPE	CHEVRON VANE		
CONFIGURATION	HORIZONTAL		
NUMBER OF STAGES	1		
NUMBER OF PASSES PER STAGE	4		
DISTANCE BETWEEN VANES - CM	7.6	(3.00 IN)	
VANE ANGLES - DEGREES	90		
PRESSURE DROP - KPA	.1	(.6 IN-H2O)	
SUPERFICAL GAS VELOCITY - M/S	3.0	(10.0 FT/S)	
CONSTRUCTION MATERIAL GENERIC TYPE	FIBERGLASS REINFORCED PLASTIC		
WASH WATER SOURCE	THICKENER OVERFLOW		
WASH RATE - L/S	3.8	(60 GAL/MIN)	

** FANS

NUMBER	12		
NUMBER OF SPARES	6		
SUPPLIER	GREEN FAN		
FUNCTION	BALANCED DRAFT		
APPLICATION	BOILER I.D.		
SERVICE	WET		
FLUE GAS FLOW RATE - CU.M/S	263.32	(558000 ACFM)	
FLUE GAS TEMPERATURE - C	47.8	(118 F)	
CONSTRUCTION MATERIAL GENERIC TYPE	HOUSINGS;INCOLOY 825 - BLADES;INCONEL 625		

** DUCTWORK

LOCATION	SCRUBBER INLET
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
LINER GENERIC MATERIAL TYPE	POLYESTER FLAKEGLASS

** DUCTWORK

LOCATION	SCRUBBER OUTLET
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
LINER GENERIC MATERIAL TYPE	POLYESTER FLAKEGLASS

PENNSYLVANIA POWER: BRUCE MANSFIELD 2 (CONT.)

** REAGENT PREPARATION EQUIPMENT

FUNCTION	LIME SLAKING
DEVICE	SLAKER
MANUFACTURER	DORR-OLIVER
NUMBER	2
FULL LOAD DRY FEED CAPACITY - M.TONS/HR	20.0 (22 TPH)

** TANKS

SERVICE	NUMBER
THICKENER UNDERFLOW	****
MIXING TANK [CALCILOX & THCKNR UNDRF	2
SLUDGE TRANSFER	****
MIXING TANK [SPENT SLURRY & FLYASH]	****
RECYCLE (SCRUBBER)	6
RECYCLE (ABSORBER)	6

** PUMPS

SERVICE	NUMBER
VENTURI RECIRCULATION	12
SLURRY FEED	4
LIME SLURRY RECIRCULATION	4
ABSORBER RECIRCULATION	24
THICKENER UNDERFLOW	4
THICKENER TRANSFER	4

** SOLIDS CONCENTRATING/DEWATERING

DEVICE	THICKENER
NUMBER	1
CONFIGURATION	CYLINDRICAL
DIMENSIONS - FT	200 DIA
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
OUTLET STREAM CHARACTERISTICS	30% SOLIDS

*** SLUDGE

** TREATMENT

METHOD	CALCILOX
PROPRIETARY PROCESS	DRAVO

** DISPOSAL

NATURE	FINAL
TYPE	LANDFILL
LOCATION	OFF SITE
SITE TRANSPORTATION METHOD	PUMPED
SITE CAPACITY - CU.M	59927000 (49000.0 ACRE-FT)

** PROCESS CONTROL AND INSTRUMENTATION

CHEMICAL PARAMETERS	PH SLURRY SOLIDS, LIQUID LEVEL, LIQUID FLOW
CONTROL LEVELS	PH 6.8-7.2
MONITOR LOCATION	PH-RECIRCULATING LINES AND THICKENER
PROCESS CONTROL MANNER	AUTOMATIC
PROCESS CHEMISTRY MODE	FEEDBACK

** WATER BALANCE

WATER LOOP TYPE	OPEN

** FGD SPARE CAPACITY INDICES

ABSORBER - %	.0

** FGD SPARE COMPONENT INDICES

ABSORBER	.0

PENNSYLVANIA POWER: BRUCE MANSFIELD 2 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTO
10/77	2A	94.0	100.0		83.0						
	2B	97.0	100.0		88.0						
	2C	98.0	100.0		87.0						
	2D	63.0	61.0		48.0						
	2E	66.0	59.0		47.0						
	2F	61.0	51.0		41.0						
	SYSTEM	79.8	78.5		65.7			744	595	489	

** PROBLEMS/SOLUTIONS/COMMENTS

UNIT 2 WAS DECLARED AVAILABLE FOR COMMERCIAL OPERATION AT 825 MW ON OCTOBER 1, 1977.

THE SPRAYS IN THE 2F FAN WERE CLEANED.

REPAIRS WERE MADE TO THE 2B FLUE STACK LINING BECAUSE OF PREMATURE FAILURE OF SEVERAL TEST PATCHES.

THE UNIT TRIPPED DUE TO FAULTY GENERATOR CONTROL TRANSFORMERS.

11/77	2A	100.0	100.0		83.0						
	2B	96.0	100.0		81.0						
	2C	88.0	92.0		74.0						
	2D	47.0	57.0		46.0						
	2E	55.0	52.0		42.0						
	2F	47.0	42.0		34.0						
	SYSTEM	72.2	73.8		60.0			720	581	432	

** PROBLEMS/SOLUTIONS/COMMENTS

PROBLEMS ASSOCIATED WITH THE STATION POWER TRANSFORMERS CAUSED LIMITATION IN LOAD ON UNIT 2. THREE OF THE SIX STATION POWER TRANSFORMERS FOR UNIT 2 WERE DESTROYED.

12/77	2A	74.0	77.0		63.0						
	2B	99.0	100.0		86.0						
	2C	98.0	100.0		83.0						
	2D	100.0	100.0		86.0						
	2E	89.0	85.0		69.0						
	2F	99.0	93.0		76.0						
	SYSTEM	93.2	92.5		77.2			744	607	574	

** PROBLEMS/SOLUTIONS/COMMENTS

COLD WEATHER CAUSED SOME FREEZING PROBLEMS WITH PROCESS PIPING.

1/78	2A	95.0	58.0		31.0						
	2B	100.0	100.0		76.0						
	2C	96.0	56.0		29.0						
	2D	94.0	100.0		70.0						
	2E	99.0	100.0		64.0						
	2F	99.0	96.0		50.0						
	SYSTEM	97.2	85.0		53.3			744	391	397	

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT TRIPPED SEVERAL TIMES DUE TO DIFFICULTIES IN BURNING WET STOCK-PILE COAL. WHEN THE UNIT WAS ON LINE DURING THIS MONTH, THE WET COAL ALSO PREVENTED FULL LOAD OPERATION OF COAL MILLS.

BOILER CONTROL VALVE ("W" VALVE) PROBLEMS COMPOUNDED START-UP DIFFICULTIES.

PENNSYLVANIA POWER: BRUCE MANSFIELD 2 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
2/78	2A	84.0	46.0		48.0						
	2B	87.0	68.0		68.0						
	2C	89.0	88.0		88.0						
	2D	97.0	71.0		71.0						
	2E	99.0	99.0		99.0						
	2F	78.0	78.0		78.0						
	SYSTEM	89.0	75.0		75.3			672	672	506	

** PROBLEMS/SOLUTIONS/COMMENTS

MANY PROBLEMS OCCURRED WITH ID FAN COOLERS DUE TO INCLEMENT WEATHER.

3/78	2A	100.0	100.0		67.0						
	2B	93.0	91.0		60.0						
	2C	13.0	10.0		13.0						
	2D	95.0	100.0		68.0						
	2E	95.0	96.0		64.0						
	2F	97.0	99.0		65.0						
	SYSTEM	82.2	82.7		56.2			744	494	418	

** PROBLEMS/SOLUTIONS/COMMENTS

EXTENSIVE ID FAN HOUSING REPAIRS WERE PERFORMED ON THE 2C FAN.

A BOILER TUBE LEAK CAUSED SEVERAL DAYS OUTAGE.

4/78	2A	100.0	82.0		81.0						
	2B	100.0	82.0		81.0						
	2C	59.0	59.0		59.0						
	2D	15.0	15.0		15.0						
	2E	14.0	14.0		14.0						
	2F	13.0	13.0		13.0						
	SYSTEM	50.2	44.2		43.8			720	713	315	

** PROBLEMS/SOLUTIONS/COMMENTS

FLUE LINING REPAIRS ON THE 2B CHIMNEY BEGAN ON APRIL 5.

EXTENSIVE REPAIRS WERE MADE ON THE 2C ID FAN, CAUSING IT TO BE DOWN FROM MARCH 6 THROUGH APRIL 13.

5/78	2A	100.0	100.0		37.0						
	2B	100.0	100.0		37.0						
	2C	100.0	100.0		37.0						
	2D	.0	.0		.0						
	2E	.0	.0		.0						
	2F	.0	.0		.0						
	SYSTEM	50.0	50.0		18.5			744	270	138	

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS OFF-LINE FOR THREE WEEKS FOR REPAIRS TO THE 2C ID FAN, INCLUDING COVERING THE HOUSING WITH INCOLOY 825.

2B STACK LINING REPAIRS CONTINUED.

6/78	2A	70.0	100.0		70.0						
	2B	69.0	100.0		69.0						
	2C	66.0	100.0		66.0						
	2D	.0	.0		.0						
	2E	.0	.0		.0						
	2F	.0	.0		.0						
	SYSTEM	34.2	50.0		34.2			720	417	246	

PENNSYLVANIA POWER: BRUCE MANSFIELD 2 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTO
	** PROBLEMS/SOLUTIONS/COMMENTS										
		2B STACK LINING REPAIRS CONTINUED.									
		-NOTE: AN ATTEMPT IS ALWAYS MADE TO BEGIN OPERATION OF THE BOILER AND FGD SYSTEM SIMULTANEOUSLY AT BRUCE MANSFIELD. OCCASIONALLY PROBLEMS DELAY BOILER START-UP, MAKING IT POSSIBLE FOR MONTHLY FGD MODULE HOURS TO EXCEED ACTUAL BOILER HOURS.									
7/78	SYSTEM							744			
8/78	SYSTEM							744			
9/78	SYSTEM							720			
10/78	SYSTEM	99.3						744	144		
11/78	SYSTEM							720			
12/78	SYSTEM							744			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		NO INFORMATION WAS AVAILABLE FOR THIS PERIOD.									
1/79	SYSTEM							744			
2/79	SYSTEM							672			
3/79	SYSTEM							744			
4/79	SYSTEM							720			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		NO INFORMATION WAS REPORTED FOR THIS PERIOD BY THE UTILITY.									
5/79	SYSTEM							744			
6/79	SYSTEM							720			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UTILITY REPORTED THAT THE AVAILABILITY FOR JANUARY 1, 1979 THROUGH MAY 31, 1979 WAS 88.8%.									
		THE UTILITY REPORTED THAT SOME FAN PROBLEMS WERE RECENTLY ENCOUNTERED.									
7/79	SYSTEM							744			
8/79	SYSTEM							744			
9/79	SYSTEM							720			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		CHIMNEY LINING WORK (APPLICATION OF CXL 2000) WAS COMPLETED IN EARLY 1979.									
		FAN HOUSING WORK (CHANGING FROM LINED CARBON STEEL TO INCOLLOY 825) IS CONTINUING.									
		NEW PH MONITOR MODIFICATIONS HAVE YIELDED PROMISING RESULTS WITH RESPECT TO MONITOR AVAILABILITY.									

PENNSYLVANIA POWER: BRUCE MANSFIELD 2 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
				PERFORMANCE DATA							
			THE FGD SYSTEM ATTRIBUTED 10.8% OF THE TOTAL UNIT UNAVAILABILITY FOR 1979 TO DATE. THE BREAKDOWN IS AS FOLLOWS: 5.0% CHIMNEY (FINISHED CXL 2000 APPLICATION) 1.3% GENERAL SCRUBBER PROBLEMS AND MAINTENANCE 1.5% ID FAN WORK/PROBLEMS 2.0% MIST ELIMINATOR PLUGGING 1.0% EMISSION VIOLATION (CUT BACK OF BOILER LOAD BECAUSE OF LOW SO2 REMOVAL EFFICIENCY).							
10/79	SYSTEM	97.5						744			
11/79	SYSTEM	100.0						720			
12/79	SYSTEM	96.5						744			
	** PROBLEMS/SOLUTIONS/COMMENTS										
			DURING THE PERIOD AN ADDITIONAL FAN HOUSING WAS REPLACED WITH THE NEW INCOLLOY 825. BY THE END OF 1980 ALL THE FAN HOUSINGS WILL BE REPLACED WITH THE NEW MATERIAL. WHERE THE NEW PH MONITORS HAVE BEEN INSTALLED, PROBE MAINTENANCE HAS BEEN CUT 80%, AND MIST ELIMINATOR MAINTENANCE HAS BEEN LESS OF A PROBLEM. THE SLUDGE PUMPS HAVE BEEN A PROBLEM. THE PUMPS REQUIRE AN OVERHAUL EVERY 1000 HOURS AND HAVE FREQUENT VALVE FAILURES. NEW VALVE MANIFOLDS MAY BE INSTALLED TO IMPROVE PUMP SERVICE BY ALLOWING ACCESS TO INDIVIDUAL BALL VALVES.							
1/80	SYSTEM	97.1	100.0		75.7			744	563	563	
2/80	SYSTEM	94.7	100.0		89.3			696	622	622	
	** PROBLEMS/SOLUTIONS/COMMENTS										
			THE FGD SYSTEM EXPERIENCED NO MAJOR PROBLEMS DURING JANUARY AND FEBRUARY.								
3/80	SYSTEM	98.4	100.0		47.4			744	353	353	
	** PROBLEMS/SOLUTIONS/COMMENTS										
			THE BOILER WAS OUT OF SERVICE 16 DAYS IN MARCH FOR A SCHEDULED BOILER INSPECTION. NO MAJOR FGD-RELATED PROBLEMS WERE REPORTED.								
4/80	SYSTEM	89.5	100.0		87.0			720	626	626	
5/80	SYSTEM							744			
6/80	SYSTEM							720			
	** PROBLEMS/SOLUTIONS/COMMENTS										
			INFORMATION FOR THE MONTHS OF MAY AND JUNE IS NOT YET AVAILABLE.								
7/80	SYSTEM	95.4	100.0		76.8			744	571	571	
8/80	SYSTEM	93.9	100.0		74.1			744	551	551	
9/80	SYSTEM	97.9	100.0		75.1			720	541	541	
10/80	SYSTEM	97.2	100.0		90.3			744	672	672	
11/80	SYSTEM	97.2	100.0		82.5			720	594	594	

EPA UTILITY FGD SURVEY: OCTOBER - DECEMBER 1980

PENNSYLVANIA POWER: BRUCE MANSFIELD 2 (CONT.)

PERIOD	MODULE	PERFORMANCE DATA AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTO
12/80	SYSTEM	97.9	100.0		68.1			744	507	507	

** PROBLEMS/SOLUTIONS/COMMENTS

DURING A TURBINE OVERHAUL OF UNIT 1, A MANIFOLD SYSTEM WAS BEING INSTALLED IN THE STACK. UNIT 2 IS SCHEDULED TO BE SHUTDOWN IN LATE 1981 OR EARLY 1982 SO THAT THE MANIFOLD SYSTEM CAN BE COMPLETED. DURING THIS OUTAGE THE ID FAN ROTORS, WHICH HAVE ERODED, ARE SCHEDULED TO BE REPLACED.

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	PENNSYLVANIA POWER	
PLANT NAME	BRUCE MANSFIELD	
UNIT NUMBER	3	
CITY	SHIPPINGPORT	
STATE	PENNSYLVANIA	
REGULATORY CLASSIFICATION	D	
PARTICULATE EMISSION LIMITATION - NG/J	32.	(.075 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	258.	(.600 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	2751	
GROSS UNIT GENERATING CAPACITY - MW	917	
NET UNIT GENERATING CAPACITY W/FGD - MW	825	
NET UNIT GENERATING CAPACITY WO/FGD - MW	*****	
EQUIVALENT SCRUBBED CAPACITY - MW	917	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	FOSTER WHEELER	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	1561.05	(3308000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	140.6	(285 F)
STACK HEIGHT - M	183.	(600 FT)
STACK SHELL	******	
STACK TOP DIAMETER - M	*******	(***** FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	******	
AVERAGE HEAT CONTENT - J/G	26749.	(11500 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		11,500-11,950
AVERAGE ASH CONTENT - %	12.50	
RANGE ASH CONTENT - %	11.5-13.5	
AVERAGE MOISTURE CONTENT - %	7.00	
RANGE MOISTURE CONTENT - %	5.5-8.5	
AVERAGE SULFUR CONTENT - %	3.00	
RANGE SULFUR CONTENT - %	1.75-3.75	
AVERAGE CHLORIDE CONTENT - %	********	
RANGE CHLORIDE CONTENT - %	******	
*** PARTICLE CONTROL		
** ESP		
NUMBER	3	
TYPE	COLD SIDE	
** PARTICLE SCRUBBER		
SPECIFIC TYPE	NONE	
*** FGD SYSTEM		
** GENERAL DATA		
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT	
SO2 REMOVAL MODE	WET SCRUBBING	
PROCESS TYPE	LIME	
PROCESS ADDITIVES	MG PROMOTED	
SYSTEM SUPPLIER	PULLMAN KELLOGG	
A-E FIRM	GILBERT/COMMONWEALTH ASSOCIATES	
DEVELOPMENT LEVEL	FULL SCALE	
NEW/RETROFIT	NEW	
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	95.00	
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	92.20	
CURRENT STATUS	1	
COMMERCIAL START-UP	6/80	
INITIAL START-UP	6/80	
** DESIGN AND OPERATING PARAMETERS		

PENNSYLVANIA POWER: BRUCE MANSFIELD 3 (CONT.)

** ABSORBER	
NUMBER	4
GENERIC TYPE	SPRAY TOWER
SPECIFIC TYPE	OPEN CROSSCURRENT SPRAY
TRADE NAME/COMMON TYPE	WEIR HORIZONTAL SPRAY CHAMBER
SUPPLIER	PULLMAN KELLOGG
SHELL SPECIFIC MATERIAL	AISI 1110
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A
LINER GENERIC MATERIAL	ORGANIC
LINER MATERIAL TRADE NAME/COMMON TYPE	RUBBER
NUMBER OF CONTACTING ZONES	6
GAS-SIDE PRESSURE DROP - KPA	.7 (2.8 IN-H2O)
SUPERFICAL GAS VELOCITY - M/SEC	6.7 (22.0 FT/S)
** MIST ELIMINATOR	
PRE-MIST ELIMINATOR/MIST ELIMINATOR	MIST ELIMINATOR
GENERIC TYPE	IMPINGEMENT
SPECIFIC TYPE	BAFFLE
TRADE NAME/COMMON TYPE	CHEVRON VANE
** REHEATER	
GENERIC TYPE	NONE
SPECIFIC TYPE	N/A
TRADE NAME/COMMON TYPE	N/A
** FANS	
NUMBER	4
APPLICATION	CENTRIFUGAL RADIAL TIP
SERVICE	DRY

** TANKS	
SERVICE	NUMBER
REACTION	****
LIME SLURRY	****

** PUMPS	
SERVICE	NUMBER
SLURRY RECIRCULATION	****

** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	THICKENER
NUMBER	1
*** SLUDGE	
** TREATMENT	
METHOD	FLYASH STABILIZATION
** FGD SPARE CAPACITY INDICES	
ABSORBER - %	2.5
** FGD SPARE COMPONENT INDICES	
ABSORBER	1.0

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
6/80	SYSTEM							720			

PENNSYLVANIA POWER: BRUCE MANSFIELD 3 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
				INITIAL OPERATION OF THE FGD SYSTEM COMMENCED ON JUNE 9, 1980. THE UTILITY REPORTED THAT IT IS PRESENTLY IN THE PROCESS OF DEBUGGING THE SYSTEM.							
7/80	SYSTEM							744			
8/80	SYSTEM							744			
9/80	SYSTEM	100.0	100.0		100.0			720	720	720	
	** PROBLEMS/SOLUTIONS/COMMENTS										
				COMMERCIAL OPERATION OF UNIT 3 COMMENCED ON SEPTEMBER 29, 1980.							
10/80	SYSTEM	89.1	100.0		74.1			744	551	551	
11/80	SYSTEM	90.3	100.0		63.2			720	455	455	
12/80	SYSTEM	91.1	100.0		68.0			744	506	506	
	** PROBLEMS/SOLUTIONS/COMMENTS										
				SINCE STARTUP THE UTILITY HAS EXPERIENCED PROBLEMS WITH THE CEILCOTE LINER WEARING ON THE ABSORBER WALLS.							
				PROBLEMS WITH MIST CARRYOVER HAVE RESULTED IN THE INSTALLATION OF BAFFLES AT THE MIST ELIMINATOR TROUGHS.							
				SINCE STARTUP PROBLEMS HAVE OCCURRED AS A RESULT OF H2S GAS GENERATION IN DEAD SPOTS OF THE REACTION TANKS. THE TANK AGITATORS ARE BEING RELOCATED.							

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	PUBLIC SERVICE OF NEW MEXICO	
PLANT NAME	SAN JUAN	
UNIT NUMBER	1	
CITY	WATERFLOW	
STATE	NEW MEXICO	
REGULATORY CLASSIFICATION	C	
PARTICULATE EMISSION LIMITATION - NG/J	9.	(.020 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	279.	(.650 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	1560	
GROSS UNIT GENERATING CAPACITY - MW	361	
NET UNIT GENERATING CAPACITY W/FGD - MW	314	
NET UNIT GENERATING CAPACITY WO/FGD - MW	330	
EQUIVALENT SCRUBBED CAPACITY - MW	361	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	FOSTER WHEELER	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	750.32	(1590000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	122.8	(253 F)
STACK HEIGHT - M	122.	(400 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	6.1	(20.0 FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	SUBBITUMINOUS	
AVERAGE HEAT CONTENT - J/G	20934.	(9000 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		8000-11628
AVERAGE ASH CONTENT - %	22.00	
RANGE ASH CONTENT - %	12.59-22.45	
AVERAGE MOISTURE CONTENT - %	14.82	
RANGE MOISTURE CONTENT - %	10.5	
AVERAGE SULFUR CONTENT - %	.80	
RANGE SULFUR CONTENT - %	.6-1.3	
AVERAGE CHLORIDE CONTENT - %	.03	
RANGE CHLORIDE CONTENT - %	0-0.09	
*** PARTICLE CONTROL		
** ESP		
NUMBER	1	
TYPE	HOT SIDE	
SUPPLIER	WESTERN PREC. DIVISION, JOY	
INLET FLUE GAS CAPACITY - CU.M/S	943.8	(2000000 ACFM)
INLET FLUE GAS TEMPERATURE - C	371.1	(700 F)
PRESSURE DROP - KPA	.6	(3. IN-H2O)
PARTICLE REMOVAL EFFICENCY - %	99.8	
** PARTICLE SCRUBBER		
NUMBER	4	
GENERIC TYPE	VENTURI TOWER	
SPECIFIC TYPE	VARIABLE-THROAT/BOTTOM-ENTRY PLUMB BOB	
SUPPLIER	DAVY MCKEE	
DIMENSIONS - FT	12'6" DIA X 28' 0" HIGH	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	AISI 1110	
GAS CONTACTING DEVICE TYPE	ACID BRICK	
NUMBER OF CONTACTING ZONES	1	
LIQUID RECIRCULATION RATE - LITER/S	224.9	(3570 GPM)
L/G RATIO - LITER/CU.M	.9	(7.1 GAL/1000ACF)
PRESSURE DROP - KPA	3.1	(12.5 IN-H2O)
SUPERFICIAL GAS VELOCITY - M/S	48.8	(160.0 FT/S)
INLET GAS FLOW RATE - CU.M/S	237.4	(503000 ACFM)
INLET GAS TEMPERATURE - C	134.4	(274 F)
PARTICLE REMOVAL EFFICIENCY - %	75.0	

PUBLIC SERVICE OF NEW MEXICO: SAN JUAN 1 (CONT.)

*** FGD SYSTEM

** GENERAL DATA

SALEABLE PRODUCT/THROWAWAY PRODUCT	SALEABLE PRODUCT	
SO2 REMOVAL MODE	WET SCRUBBING	
PROCESS TYPE	WELLMAN LORD	
PROCESS ADDITIVES	NONE	
SYSTEM SUPPLIER	DAVY MCKEE	
A-E FIRM	STEARNS-ROGER	
DEVELOPMENT LEVEL	FULL SCALE	
NEW/RETROFIT	RETROFIT	
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.80	
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	90.00	
CURRENT STATUS	1	
COMMERCIAL START-UP	4/78	
INITIAL START-UP	4/78	
CONTRACT AWARDED	2/74	

** DESIGN AND OPERATING PARAMETERS

** ABSORBER

NUMBER	4	
NUMBER OF SPARES	1	
GENERIC TYPE	TRAY TOWER	
SPECIFIC TYPE	VALVE TRAY	
TRADE NAME/COMMON TYPE	BUBBLE CAP TRAY TOWER	
SUPPLIER	DAVY MCKEE	
DIMENSIONS - FT	24' X 29' X 79' HIGH	
SHELL GENERIC MATERIAL	INORGANIC	
SHELL SPECIFIC MATERIAL	REINFORCED CONCRETE	
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A	
LINER GENERIC MATERIAL	INORGANIC	
LINER SPECIFIC MATERIAL	ACID-RESISTANT BRICK & MORTAR	
LINER MATERIAL TRADE NAME/COMMON TYPE	PREFIRED BRICK	
GAS CONTACTING DEVICE TYPE	5-LEVELS OF VALVE TRAYS (KOCH FLEXITRAYS)	
NUMBER OF CONTACTING ZONES	5	
DISTANCE BETWEEN GAS CONTACTING ZONES - CM	5.1	(2.0IN)
LIQUID RECIRCULATION RATE - LITER/S	47.	(750 GPM)
L/G RATIO - L/CU.M	.2	(1.7 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	4.0	(16.0 IN-H2O)
SUPERFICAL GAS VELOCITY - M/SEC	3.3	(10.8 FT/S)
INLET GAS FLOW - CU. M/S	205.28	(435000 ACFM)
INLET GAS TEMPERATURE - C	48.9	(120 F)
SO2 REMOVAL EFFICIENCY - %	90.0	

** MIST ELIMINATOR

PRE-MIST ELIMINATOR/MIST ELIMINATOR	MIST ELIMINATOR	
NUMBER PER SYSTEM	8	
GENERIC TYPE	IMPINGEMENT	
SPECIFIC TYPE	BAFFLE	
TRADE NAME/COMMON TYPE	CHEVRON VANE	
CONFIGURATION	HORIZONTAL	
NUMBER OF PASSES PER STAGE	1	
PRESSURE DROP - KPA	.0	(.0 IN-H2O)
SUPERFICAL GAS VELOCITY - M/S	3.2	(10.5 FT/S)
CONSTRUCTION MATERIAL GENERIC TYPE	NORYL PLASTIC	
WASH WATER SOURCE	TREATED WATER	
WASH RATE - L/S	3.8	(60 GAL/MIN)

** REHEATER

NUMBER	1	
GENERIC TYPE	INDIRECT HOT AIR	
SPECIFIC TYPE	EXTERNAL HEAT EXCHANGER	
TRADE NAME/COMMON TYPE	STEAM TUBE BUNDLES	
TEMPERATURE INCREASE - C	10.0	(50 F)
INLET FLUE GAS FLOW RATE - CU. M/S	647.45	(1372000 ACFM)
INLET FLUE GAS TEMPERATURE - C	51.7	(125 F)
CONSTRUCTION MATERIAL GENERIC TYPE	304 SS	

PUBLIC SERVICE OF NEW MEXICO: SAN JUAN 1 (CONT.)

** FANS		
NUMBER	4	
SUPPLIER	BUFFALO FORGE	
FUNCTION	BOOSTER	
APPLICATION	FORCED DRAFT	
SERVICE	DRY	
FLUE GAS FLOW RATE - CU.M/S	276.06	(585000 ACFM)
FLUE GAS TEMPERATURE - C	122.8	(253 F)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	
** DUCTWORK		
LOCATION	ESP TO FANS	
DIMENSIONS	16 X 24	
SHELL GENERIC MATERIAL TYPE	CARBON STEEL	
** TANKS		
SERVICE	NUMBER	
ABSORBER PRODUCT PUMP	1	
** PUMPS		
SERVICE	NUMBER	
ABSORBER PRODUCT TRANSFER	2	
SCRUBBER RECIRCULATION	4	
ABSORBER RECIRCULATION	20	
ABSORBER SPRAY RECIRCULATION	8	
*** SALEABLE BYPRODUCTS		
NATURE	ELEMENTAL SULFUR	
FULL LOAD QUANTITY - M T/H	1.45	(1.60 TPH)
QUALITY - %	99.0	
DISPOSITION	MARKETED	
*** SLUDGE		
** TREATMENT		
METHOD	NONE	
** DISPOSAL		
** DISPOSAL		
TYPE	NONE	
** PROCESS CONTROL AND INSTRUMENTATION		
CHEMICAL PARAMETERS	PH & DENSITY	
CONTROL LEVELS	PH 5.5-6.5; SP. GR. 1.2-1.3	
MONITOR LOCATION	ABSORBER FEED AND PRODUCT SOLUTION	
PROCESS CONTROL MANNER	MANUAL	
** WATER BALANCE		
WATER LOOP TYPE	CLOSED	
POND SEEPAGE/RUNOFF WATER LOSS - LITERS/S	45	
MAKEUP WATER ADDITION - LITERS/S	23.0	(365 GPM)
** FGD SPARE CAPACITY INDICES		
ABSORBER - %	33.3	
** FGD SPARE COMPONENT INDICES		
ABSORBER	2.0	

PUBLIC SERVICE OF NEW MEXICO: SAN JUAN 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
0/78	SYSTEM										

** PROBLEMS/SOLUTIONS/COMMENTS

NOTE: ALTHOUGH THIS FGD SYSTEM IS DESIGNED TO BRING THE BOILER INTO COMPLIANCE WITH A 0.34 LB/MM BTU SO2 EMISSION STANDARD, THE STATE HAS INITIALLY ONLY REQUIRED A 1.2 LB/MM BTU SO2 CONTROL LEVEL. SAN JUAN 1 WILL BE REQUIRED TO MEET THE MORE STRINGENT SO2 EMISSION LIMITATION VALUE BY SEPTEMBER 1, 1980. THE UNIT ONLY REQUIRES TWO OF THE FOUR SCRUBBING TRAINS TO MEET THE 1.2 LB/MM BTU LIMITATION VALUE; HOWEVER, THREE ARE REQUIRED FOR THE MORE STRINGENT LIMITATION VALUE (THE SYSTEM IS DESIGNED TO INCLUDE ONE SPARE SCRUBBING TRAIN WHEN MEETING THE 0.34 LB/MM BTU SO2 EMISSION STANDARD). BECAUSE OF THIS CHANGE IN EMISSION LIMITATION VALUES THE FGD SYSTEM WILL EFFECTIVELY HAVE AN ABSORBER SPARE COMPONENT INDEX OF 2.0 (100% SPARE CAPACITY FOR THIS SYSTEM) THROUGH AUGUST, 1980 AND 1.0 (33.3% SPARE CAPACITY FOR THIS SYSTEM) THEREAFTER. CONSEQUENTLY THE "SYSTEM" DEPENDABILITY FACTORS WILL BE CALCULATED AS:

MODULAR AVERAGE X 2.00
THROUGH AUGUST, 1980 AND:
MODULAR AVERAGE X 1.33
THEREAFTER.

4/78	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

SO2 ABSORPTION BEGAN ON APRIL 8, 1978 USING TWO OF THE FOUR CELLS. ONE THIRD OF THE FLUE GAS IS BEING BYPASSED. THE FGD SYSTEM IS IN A SHAKEDOWN/DEBUGGING PHASE. FULL COMMERCIAL FGD SYSTEM OPERATION IS EXPECTED IN JUNE.

5/78	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

OVER THE APRIL-MAY PERIOD 22 DAYS OF DATA WERE ACCUMULATED FOR THE FGD SYSTEM. DURING THIS PERIOD THE BOILER WAS OUT OF SERVICE SEVEN HOURS AND THE FGD SYSTEM 28 HOURS FOR UNSCHEDULED CORRECTIONS. THE SYSTEM HAS STILL NOT STABILIZED. NO MAJOR FGD SYSTEM PROBLEMS WERE REPORTED.

6/78	SYSTEM							720			
7/78	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

A HIGH PRESSURE DROP ACROSS THE VENTURIS PREVENTED FULL FLUE GAS FLOW THROUGH THE FGD SYSTEM IN JUNE AND JULY.

8/78	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

THE HIGH VENTURI PRESSURE DROP REPORTED FOR JULY WAS LOWERED BY ADJUSTING INTERNAL PLUMB BOBS IN THE VENTURI THROATS.

REPAIRS WERE MADE TO THE MIST ELIMINATORS WHILE THE MODULES WERE DOWN FOR VENTURI PLUMB BOB ADJUSTMENTS.

9/78	SYSTEM							720			

PUBLIC SERVICE OF NEW MEXICO: SAN JUAN 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTC
	** PROBLEMS/SOLUTIONS/COMMENTS										
		A FIRE IN THE START-UP TRANSFORMER DUCT BANK CAUSED A TWO WEEK BOILER OUTAGE.									
10/78	SYSTEM								744		
	** PROBLEMS/SOLUTIONS/COMMENTS										
		HEAT TRACING FAILURES ALLOWED LINE FREEZING TO OCCUR.									
		SOME SULFUR PRODUCT HAS BEEN PRODUCED BUT THE CHEMICAL PLANT OPERATIONS HAVE NOT YET BEEN OPTOMIZED.									
		SHAKEDOWN/DEBUGGING OPERATIONS ARE CONTINUING.									
11/78	SYSTEM								720		
12/78	SYSTEM								744		
	** PROBLEMS/SOLUTIONS/COMMENTS										
		ALTHOUGH THE FGD SYSTEM HAS BEEN OPERATING, WEATHER-RELATED PROBLEMS HAVE LIMITED OPERATIONS TO TWO MODULES.									
1/79	SYSTEM								744		
2/79	SYSTEM								672		
	** PROBLEMS/SOLUTIONS/COMMENTS										
		FREEZE UPS RESULTED IN REHEATER LEAKS LIMITING ABSORBER OPERATIONS.									
3/79	SYSTEM								744		
4/79	SYSTEM								720		
5/79	SYSTEM								744		
	** PROBLEMS/SOLUTIONS/COMMENTS										
		HOURS ARE NOT YET AVAILABLE BECAUSE THE UTILITY IS CONCENTRATING EFFORTS ON OPERATION OF THIS NEW UNIT. THE UTILITY REPORTED THAT THE SCRUBBING MODULES THEMSELVES ARE OPERATING ACCEPTABLY. ALSO THE CHEMICAL PLANT IS AVAILABLE AND THERE IS NO SYSTEM PLUGGING WHATSOEVER.									
		THE MAJOR PROBLEM ENCOUNTERED WAS FAN VIBRATION. THE UTILITY HAS BEEN WORKING WITH THE SUPPLIER IN AN EFFORT TO DISCOVER WHY FAN BALANCE HAS BEEN DIFFICULT TO MAINTAIN.									
7/79	SYSTEM								744		
8/79	SYSTEM								744		
9/79	SYSTEM								720		
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING THE THIRD QUARTER THE UNIT OPERATED WITH TWO ABSORBERS. ALL FOUR ABSORBERS HAVE BEEN LARGELY AVAILABLE. ONE ABSORBER WAS DOWN DUE TO BOOSTER BLOWER VIBRATION PROBLEMS.									
10/79	SYSTEM								744		

PUBLIC SERVICE OF NEW MEXICO: SAN JUAN 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
11/79	SYSTEM							720			
12/79	A	94.0	79.0		23.8						
	B	100.0	67.4		20.3						
	C	.0	.0		.0						
	D	30.0	5.8		1.8						
	SYSTEM	100.0	76.1		23.0			744	224	171	

** PROBLEMS/SOLUTIONS/COMMENTS

NOTE: SEE COMMENTS FOR 00/78 EXPLAINING SYSTEM DEPENDABILITY CALCULATIONS.

A REHEATER PROBLEM HAS LIMITED SCRUBBING OPERATIONS TO TWO TO THE FOUR ABSORBER MODULES. IF THE BOILER WERE TO OPERATE AT A HIGHER LOAD THE REHEATERS WOULD BE UNABLE TO BOOST THE TEMPERATURE OF THE FLUE GAS ABOVE DEW POINT. THE FGD SYSTEM HAS BEEN LIMITING UNIT MWH PRODUCTION.

1/80	A	81.0	51.0		41.8						
	B	96.0	42.3		34.7						
	C	.0	.0		.0						
	D	83.0	79.3		65.1						
	SYSTEM	100.0	86.3		70.8			744	610	527	
2/80	A	.0	.0		.0						
	B	99.0	94.3		85.9						
	C	3.0	2.5		2.3						
	D	99.0	97.6		88.9						
	SYSTEM	100.0	97.2		88.6			696	634	616	
3/80	A	.0	.0		.0						
	B	100.0	50.4		17.6						
	C	58.1	82.8		29.2						
	D	97.5	85.5		30.1						
	SYSTEM	100.0	100.0	100.0	38.5			744	262	286	31.0

** PROBLEMS/SOLUTIONS/COMMENTS

SCRUBBER OPERATIONS AT UNIT ONE ARE STILL LIMITED TO TWO MODULES BECAUSE OF THE CURRENT LACK OF REHEATER CAPACITY.

4/80	A	.0	.0		.0						
	B	98.2	71.5		48.2						
	C	50.0	7.2		4.9						
	D	91.7	71.5		48.2						
	SYSTEM	100.0	75.1	100.0	50.7			720	485	365	55.8

** PROBLEMS/SOLUTIONS/COMMENTS

ONLY TWO MODULES ARE NEEDED AT THE PRESENT TIME TO MEET CURRENT SO2 EMISSION REGULATIONS (SEE COMMENTS FOR 00/78).

A TUBE WALL LEAK FORCED THE BOILER OUT OF SERVICE DURING APRIL.

HIGH VIBRATIONS IN THE BOOSTER BLOWER IN MODULE D FOLLOWED AFTER THE UNIT OUTAGE.

HIGH VIBRATIONS IN THE BOOSTER BLOWER CAUSED MODULE A TO BE UNAVAILABLE THE ENTIRE MONTH.

REPAIR AND MAINTENANCE OF THE BOOSTER BLOWER AND ISOLATION DAMPERS IN MODULE C WERE PERFORMED DURING APRIL.

5/80	A	73.1	62.1		55.9						

PUBLIC SERVICE OF NEW MEXICO: SAN JUAN 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTO
	B	99.7	37.2		33.5						
	C	75.5	71.8		64.7						
	D	80.2	19.9		17.9						
	SYSTEM	100.0	95.5	100.0	86.0			744	670	640	87.4

** PROBLEMS/SOLUTIONS/COMMENTS

BOOSTER BLOWER VIBRATIONS ARE CONTINUING IN ALL THE MODULES.

THERE WAS A UNIT OUTAGE SO THAT REPAIR WORK COULD BE UNDERTAKEN ON THE ESP.

6/80	A	2.8	2.5		2.1						
	B	96.9	92.0		75.6						
	C	82.5	79.2		65.0						
	D	.1	.2		.1						
	SYSTEM	91.2	87.0	79.8	71.4			720	591	514	65.4

** PROBLEMS/SOLUTIONS/COMMENTS

A BOILER TUBE LEAK FORCED THE UNIT OUT OF SERVICE IN JUNE.

REPAIR WORK WAS DONE ON THE ISOLATION DAMPERS DURING JUNE.

7/80	A	.0	.0		.0						
	B	30.4	16.0		16.0						
	C	89.2	87.9		87.9						
	D	82.8	79.6		79.6						
	SYSTEM	100.0	91.7		91.7			744	744	683	91.7

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE A WAS UNAVAILABLE IN JULY BECAUSE OF REPAIRS MADE TO THE ISOLATION DAMPER AND THE LOWER CHIMNEY SEAL.

MODULE B WAS FORCED OUT BECAUSE OF HIGH VIBRATIONS IN THE BOOSTER BLOWER. VIBRATIONAL PROBLEMS ALSO KEPT MODULE D OFF LINE UNTIL JULY 4, WHEN THE BOOSTER BLOWER WAS BALANCED.

8/80	A	.0	.0		.0						
	B	21.5	21.5		21.5						
	C	91.1	77.8		77.8						
	D	94.4	90.1		90.1						
	SYSTEM	100.0	94.7	93.2	94.7			744	744	704	82.0

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE A DID NOT OPERATE IN AUGUST BECAUSE OF REPAIRS MADE TO THE LOWER CHIMNEY SEAL.

MODULE B WAS OUT OF SERVICE FOR OVER 3 WEEKS TO CLEAN, PAINT, AND BALANCE THE BOOSTER BLOWER ROTOR.

CRACKED WELDS ON THE WATER INLET NOZZLES WERE REPAIRED ON MODULE C.

9/80	A	.0	.0		.0						
	B	37.2	57.4		31.4						
	C	39.4	56.1		30.7						
	D	45.1	71.8		39.3						
	SYSTEM	60.9	92.7	94.8	50.7			720	394	365	43.5

PUBLIC SERVICE OF NEW MEXICO: SAN JUAN 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
		HIGH VIBRATIONS IN THE BOOSTER BLOWER CAUSED MODULE C TO SHUT DOWN FOR PART OF SEPTEMBER.									
		THE FGD SYSTEM WAS DOWN FOR SEVERAL DAYS BECAUSE OF BOILER RELATED PROBLEMS.									
		THE BOILER AND FGD SYSTEM WENT DOWN ON SEPTEMBER 18, 1980 FOR SCHEDULED MAINTENANCE AND WERE UNAVAILABLE THE REST OF THE MONTH.									
10/80	A	27.0	38.4		26.5						
	B	48.9	68.2		47.0						
	C	48.5	69.6		48.0						
	D	37.6	17.1		11.8						
	SYSTEM	50.8	73.3	73.7	50.0			744	513	376	58.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE BOILER WAS OUT OF SERVICE FROM OCTOBER 1 TO OCTOBER 3 FOR A SCHEDULED OVERHAUL.									
		A REHEAT TUBE LEAK CAUSED THE UNIT TO SHUTDOWN FROM OCTOBER 5 TO OCTOBER 11. SCRUBBER MODULES B AND C WERE RETURNED TO OPERATION ON OCTOBER 14. MAINTENANCE ON MODULE D WAS NOT COMPLETED UNTIL OCTOBER 19 AND MODULE A ON OCTOBER 23.									
11/80	A	88.6	53.7		48.8						
	B	91.1	84.4		76.5						
	C	94.9	59.4		53.9						
	D	93.6	86.4		19.3						
	SYSTEM	96.1	86.4	95.8	78.3			720	653	564	69.6
	** PROBLEMS/SOLUTIONS/COMMENTS										
		ALL FOUR ABSORBER MODULES WERE AVAILABLE FOR MOST OF NOVEMBER EXCEPT FOR MINOR OUTAGES CAUSED BY COMPUTER PROBLEMS.									
		A TOTAL POWER FAILURE OCCURRED ON NOVEMBER 14 CAUSING THE UNIT TO BE OFF LINE FOR FOUR DAYS.									
12/80	A	96.4	83.0		81.3						
	B	85.6	80.2		78.6						
	C	96.5	75.3		73.8						
	D	.0	.0		.0						
	SYSTEM	100.0	90.1	99.4	88.3			744	729	657	73.3
	** PROBLEMS/SOLUTIONS/COMMENTS										
		UNIT 1 WAS DOWN FROM DECEMBER 20 TO 22 IN ORDER TO TIE IN THE UNIT 4 MAIN TRANSFORMER.									
		THE "D" MODULE WAS DOWN THE ENTIRE MONTH SO THAT THE BOOSTER BLOWER ROTOR COULD BE CLEANED AND BALANCED. THE ABSORBER RECIRCULATING PUMP DISCHARGE VALVE WAS ALSO REPAIRED DURING THE MONTH.									

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	PUBLIC SERVICE OF NEW MEXICO	
PLANT NAME	SAN JUAN	
UNIT NUMBER	2	
CITY	WATERFLOW	
STATE	NEW MEXICO	
REGULATORY CLASSIFICATION	C	
PARTICULATE EMISSION LIMITATION - NG/J	21.	(.050 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	228.	(.530 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	1560	
GROSS UNIT GENERATING CAPACITY - MW	350	
NET UNIT GENERATING CAPACITY W/FGD - MW	306	
NET UNIT GENERATING CAPACITY WO/FGD - MW	322	
EQUIVALENT SCRUBBED CAPACITY - MW	350	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	FOSTER WHEELER	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	725.78	(1538000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	122.8	(253 F)
STACK HEIGHT - M	122.	(400 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	6.1	(20.0 FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	SUBBITUMINOUS	
AVERAGE HEAT CONTENT - J/G	20934.	(9000 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		8000-11628
AVERAGE ASH CONTENT - %	22.00	
RANGE ASH CONTENT - %	12.59-22.45	
AVERAGE MOISTURE CONTENT - %	10.50	
RANGE MOISTURE CONTENT - %	8.1-15.01	
AVERAGE SULFUR CONTENT - %	.80	
RANGE SULFUR CONTENT - %	.6-1.3	
AVERAGE CHLORIDE CONTENT - %	.03	
RANGE CHLORIDE CONTENT - %	0-0.09	
*** PARTICLE CONTROL		
** ESP		
NUMBER	1	
TYPE	HOT SIDE	
SUPPLIER	WESTERN PREC. DIVISION, JOY	
INLET FLUE GAS CAPACITY - CU.M/S	943.8	(2000000 ACFM)
INLET FLUE GAS TEMPERATURE - C	371.1	(700 F)
PRESSURE DROP - KPA	.6	(3. IN-H2O)
PARTICLE REMOVAL EFFICENCY - %	99.5	
** PARTICLE SCRUBBER		
NUMBER	4	
GENERIC TYPE	VENTURI TOWER	
SPECIFIC TYPE	VARIABLE-THROAT/BOTTOM-ENTRY PLUMB BOB	
SUPPLIER	DAVY MCKEE	
DIMENSIONS - FT	12'6" DIA X 28' 0" HIGH	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	AISI 1110	
GAS CONTACTING DEVICE TYPE	ACID BRICK	
NUMBER OF CONTACTING ZONES	1	
LIQUID RECIRCULATION RATE - LITER/S	224.9	(3570 GPM)
L/G RATIO - LITER/CU.M	.9	(7.1 GAL/1000ACF)
PRESSURE DROP - KPA	3.1	(12.5 IN-H2O)
SUPERFICIAL GAS VELOCITY - M/S	48.8	(160.0 FT/S)
INLET GAS FLOW RATE - CU.M/S	229.8	(487000 ACFM)
INLET GAS TEMPERATURE - C	134.4	(274 F)
PARTICLE REMOVAL EFFICIENCY - %	75.0	

PUBLIC SERVICE OF NEW MEXICO: SAN JUAN 2 (CONT.)

*** FGD SYSTEM

** GENERAL DATA

SALEABLE PRODUCT/THROWAWAY PRODUCT	SALEABLE PRODUCT	
SO2 REMOVAL MODE	WET SCRUBBING	
PROCESS TYPE	WELLMAN LORD	
PROCESS ADDITIVES	NONE	
SYSTEM SUPPLIER	DAVY MCKEE	
A-E FIRM	STEARNS-ROGER	
DEVELOPMENT LEVEL	FULL SCALE	
NEW/RETROFIT	RETROFIT	
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	90.00	
CURRENT STATUS	1	
COMMERCIAL START-UP	8/78	
INITIAL START-UP	8/78	
CONTRACT AWARDED	2/74	

** DESIGN AND OPERATING PARAMETERS

** ABSORBER

NUMBER	4	
NUMBER OF SPARES	1	
GENERIC TYPE	TRAY TOWER	
SPECIFIC TYPE	VALVE TRAY	
TRADE NAME/COMMON TYPE	BUBBLE CAP TRAY TOWER	
SUPPLIER	DAVY MCKEE	
DIMENSIONS - FT	24' X 29' X 79' HIGH	
SHELL GENERIC MATERIAL	INORGANIC	
SHELL SPECIFIC MATERIAL	REINFORCED CONCRETE	
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A	
LINER GENERIC MATERIAL	INORGANIC	
LINER SPECIFIC MATERIAL	ACID-RESISTANT BRICK & MORTAR	
LINER MATERIAL TRADE NAME/COMMON TYPE	PREFIRED BRICK	
GAS CONTACTING DEVICE TYPE	5-LEVELS OF VALVE TRAYS (KOCH FLEXITRAYS)	
NUMBER OF CONTACTING ZONES	5	
DISTANCE BETWEEN GAS CONTACTING ZONES - CM	5.1	(2.0IN)
LIQUID RECIRCULATION RATE - LITER/S	47.	(750 GPM)
L/G RATIO - L/CU.M	.2	(1.7 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	4.0	(16.0 IN-H2O)
SUPERFICAL GAS VELOCITY - M/SEC	3.3	(10.8 FT/S)
INLET GAS FLOW - CU. M/S	198.67	(421000 ACFM)
INLET GAS TEMPERATURE - C	48.9	(120 F)
SO2 REMOVAL EFFICIENCY - %	90.0	

** MIST ELIMINATOR

PRE-MIST ELIMINATOR/MIST ELIMINATOR	MIST ELIMINATOR	
NUMBER PER SYSTEM	8	
GENERIC TYPE	IMPINGEMENT	
SPECIFIC TYPE	BAFFLE	
TRADE NAME/COMMON TYPE	CHEVRON VANE	
CONFIGURATION	HORIZONTAL	
NUMBER OF PASSES PER STAGE	1	
PRESSURE DROP - KPA	.0	(.0 IN-H2O)
SUPERFICAL GAS VELOCITY - M/S	3.2	(10.5 FT/S)
CONSTRUCTION MATERIAL GENERIC TYPE	NORYL PLASTIC	
WASH WATER SOURCE	TREATED WATER	
WASH RATE - L/S	3.8	(60 GAL/MIN)

** REHEATER

NUMBER	1	
GENERIC TYPE	INDIRECT HOT AIR	
SPECIFIC TYPE	EXTERNAL HEAT EXCHANGER	
TRADE NAME/COMMON TYPE	STEAM TUBE BUNDLES	
TEMPERATURE INCREASE - C	10.0	(50 F)
INLET FLUE GAS FLOW RATE - CU. M/S	62.67	(132800 ACFM)
INLET FLUE GAS TEMPERATURE - C	48.9	(120 F)
CONSTRUCTION MATERIAL GENERIC TYPE	304 SS	

PUBLIC SERVICE OF NEW MEXICO: SAN JUAN 2 (CONT.)

** FANS		
NUMBER	4	
SUPPLIER	BUFFALO FORGE	
FUNCTION	BOOSTER	
APPLICATION	FORCED DRAFT	
SERVICE	DRY	
FLUE GAS FLOW RATE - CU.M/S	276.06	(585000 ACFM)
FLUE GAS TEMPERATURE - C	122.8	(253 F)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	
** DUCTWORK		
LOCATION	ESP TO FANS	
DIMENSIONS	16 X 24	
SHELL GENERIC MATERIAL TYPE	CARBON STEEL	
** TANKS		
SERVICE	NUMBER	
ABSORBER PRODUCT PUMP	1	
** PUMPS		
SERVICE	NUMBER	
ABSORBER PRODUCT TRANSFER	2	
SCRUBBER RECIRCULATION	4	
ABSORBER RECIRCULATION	20	
ABSORBER SPRAY RECIRCULATION	8	
*** SALEABLE BYPRODUCTS		
NATURE	ELEMENTAL SULFUR	
FULL LOAD QUANTITY - M T/H	1.36	(1.50 TPH)
QUALITY - %	99.5	
DISPOSITION	MARKETED	
*** SLUDGE		
** DISPOSAL		
** PROCESS CONTROL AND INSTRUMENTATION		
CHEMICAL PARAMETERS	PH & DENSITY	
CONTROL LEVELS	PH 5.5-6.5; SP. GR. 1.2-1.3	
MONITOR LOCATION	ABSORBER FEED AND PRODUCT SOLUTION	
PROCESS CONTROL MANNER	MANUAL	
** WATER BALANCE		
WATER LOOP TYPE	CLOSED	
POND SEEPAGE/RUNOFF WATER LOSS - LITERS/S	45	
MAKEUP WATER ADDITION - LITERS/S	22.4	(355 GPM)
** FGD SPARE CAPACITY INDICES		
ABSORBER - %	33.0	
** FGD SPARE COMPONENT INDICES		
ABSORBER	1.0	

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
0/78	SYSTEM										

PUBLIC SERVICE OF NEW MEXICO: SAN JUAN 2 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
		PERFORMANCE DATA									

** PROBLEMS/SOLUTIONS/COMMENTS

NOTE: ALTHOUGH THIS FGD SYSTEM IS DESIGNED TO BRING THE BOILER INTO COMPLIANCE WITH A 0.34 LB/MM BTU SO2 EMISSION STANDARD, THE STATE HAS INITIALLY ONLY REQUIRED A 1.2 LB/MM BTU SO2 CONTROL LEVEL. SAN JUAN 2 WILL BE REQUIRED TO MEET THE MORE STRINGENT SO2 EMISSION LIMITATION VALUE BY APRIL 18, 1980. THE UNIT ONLY REQUIRES TWO OF THE FOUR SCRUBBING TRAINS TO MEET THE 1.2 LB/MM BTU LIMITATION VALUE; HOWEVER, THREE ARE REQUIRED FOR THE MORE STRINGENT LIMITATION VALUE (THE SYSTEM IS DESIGNED TO INCLUDE ONE SPARE SCRUBBING TRAIN WHEN MEETING THE 0.34 LB/MM BTU SO2 EMISSION STANDARD). BECAUSE OF THIS CHANGE IN EMISSION LIMITATION VALUES THE FGD SYSTEM WILL EFFECTIVELY HAVE AN ABSORBER SPARE COMPONENT INDEX OF 2.0 (100% SPARE CAPACITY FOR THIS SYSTEM) THROUGH APRIL 17, 1980 AND 1.0 (33.3% SPARE CAPACITY FOR THIS SYSTEM) THEREAFTER. CONSEQUENTLY THE "SYSTEM" DEPENDABILITY FACTORS WILL BE CALCULATED AS:

MODULAR AVERAGE X 2.0
THROUGH APRIL 17, 1980 AND:
MODULAR AVERAGE X 1.33
THEREAFTER.

8/78 SYSTEM 744

** PROBLEMS/SOLUTIONS/COMMENTS

INITIAL FGD OPERATIONS BEGAN IN LATE AUGUST. SHAKEDOWN/DEBUGGING OPERATIONS CONTINUED THROUGH AUGUST.

PROBLEMS WERE ENCOUNTERED WITH THE BOOSTER FAN CONTROL DAMPER.

9/78 SYSTEM 720

** PROBLEMS/SOLUTIONS/COMMENTS

ALL THREE MODULES OPERATED SIMULTANEOUSLY FOR THE FIRST TIME IN SEPTEMBER.

A TWO WEEK BOILER OUTAGE WAS CAUSED BY A FIRE IN THE START-UP TRANSFORMER DUCT BANK. PROBLEMS WERE ALSO ENCOUNTERED WITH BOILER DAMPERS.

NO FGD SYSTEM PROBLEMS WERE REPORTED FOR SEPTEMBER.

10/78 SYSTEM 744

** PROBLEMS/SOLUTIONS/COMMENTS

HEAT TRACING FAILURES ALLOWED LINE FREEZING TO OCCUR.

A TEMPORARY HIGH FLYASH LOADING WAS THE RESULT OF AN ESP MALFUNCTION.

THE FGD SYSTEM IS STILL EXPERIENCING ROUTINE START UP PHASE PROBLEMS.

11/78 SYSTEM 720

12/78 SYSTEM 744

** PROBLEMS/SOLUTIONS/COMMENTS

ALTHOUGH FGD THE SYSTEM HAS BEEN OPERATING, WEATHER-RELATED PROBLEMS HAVE LIMITED OPERATIONS TO TWO MODULES. REHEATER LEAKS OCCURRED DURING THE PERIOD.

1/79 SYSTEM 744

PUBLIC SERVICE OF NEW MEXICO: SAN JUAN 2 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PERFORMANCE DATA PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
2/79	SYSTEM							672			
3/79	SYSTEM							744			
4/79	SYSTEM							720			
5/79	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

HOURS ARE NOT YET AVAILABLE BECAUSE THE UTILITY IS CONCENTRATING EFFORTS ON OPERATION OF THIS NEW UNIT. THE UTILITY REPORTED THAT THE SCRUBBING MODULES THEMSELVES ARE OPERATING ACCEPTABLY. ALSO THE CHEMICAL PLANT IS AVAILABLE AND THERE IS NO SYSTEM PLUGGING WHATSOEVER.

THE MAJOR PROBLEM ENCOUNTERED WAS FAN VIBRATION. THE UTILITY HAS BEEN WORKING WITH THE SUPPLIER IN AN EFFORT TO DISCOVER WHY FAN BALANCE HAS BEEN DIFFICULT TO MAINTAIN.

7/79	SYSTEM							744			
8/79	SYSTEM							744			
9/79	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE THIRD QUARTER TWO OF THE FOUR ABSORBERS WERE DOWN DUE TO BOOSTER BLOWER VIBRATION PROBLEMS.

10/79	SYSTEM							744			
11/79	SYSTEM							720			
12/79	E	100.0	80.1	66.9							
	F	100.0	73.3	61.3							
	G	.0	.0	.0							
	H	.0	.0	.0							
	SYSTEM	100.0	76.7	64.1				744	622	477	

** PROBLEMS/SOLUTIONS/COMMENTS

NOTE: SEE COMMENTS FOR 00/78 EXPLAINING SYSTEM DEPENDABILITY CALCULATIONS.

DURING DECEMBER TWO MODULES WERE DOWN COMPLETELY AS A RESULT OF REHEATER PROBLEMS.

1/80	E	92.0	63.0	62.4							
	F	100.0	.0	.0							
	G	.0	.0	.0							
	H	.0	.0	.0							
	SYSTEM	96.0	31.5	31.2				744	737	232	

** PROBLEMS/SOLUTIONS/COMMENTS

THE F-MODULE WAS AVAILABLE, HOWEVER, FGD SERVICE WAS NOT REQUIRED BECAUSE A BOILER-RELATED POWER FAILURE FORCED THE BOILER TO OPERATE AT LOW LOAD.

2/80	E	97.0	65.7	64.5							
	F	22.0	12.3	12.1							
	G	.0	.0	.0							
	H	.0	.0	.0							
	SYSTEM	59.5	39.0	38.3				696	683	267	

PUBLIC SERVICE OF NEW MEXICO: SAN JUAN 2 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
3/80	E	87.0	.0		.0						
	F	85.0	93.6		59.4						
	G	.0	.0		.0						
	H	.0	.0		.0						
	SYSTEM	86.0	46.8		29.7			744	472	221	33.0

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE FIRST QUARTER ONLY ONE ABSORBER COULD BE OPERATED DUE TO AN ELECTRICAL PROBLEM. CURRENTLY, OPERATIONS ARE LIMITED TO TWO ABSORBERS UNTIL NEW REHEATERS ARE INSTALLED. REHEATER INSTALLATION IS EXPECTED TO BE COMPLETED IN APRIL.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
4/80	E	99.3	91.3		68.5						
	F	99.9	71.1		53.3						
	G	.0	.0		.0						
	H	44.2	58.5		43.9						
	SYSTEM	100.0	90.8	98.8	68.1			720	540	490	66.3

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE G IS DOWN FOR MAJOR REPAIRS WHICH WERE A RESULT OF AN INTERNAL FIRE EARLIER IN THE YEAR.

A REGULATION CHANGE EFFECTIVE APRIL 18, NOW REQUIRES THAT THREE MODULES OPERATE TO MEET SO2 REGULATIONS (SEE COMMENTS FOR 00/78).

MODULE H WAS UNAVAILABLE IN THE BEGINNING OF THE MONTH.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
5/80	E	99.1	97.3		86.7						
	F	98.9	95.2		84.8						
	G	.0	.0		.0						
	H	98.9	91.9		81.9						
	SYSTEM	99.0	94.8	100.0	84.5			744	663	628	79.1

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER WAS DOWN FOR SEVERAL HOURS FOR MINOR MAINTENANCE AND BOILER TUBE REPAIRS.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
6/80	E	89.2	72.4		56.0						
	F	89.6	74.1		57.4						
	G	.0	.0		.0						
	H	88.8	83.8		64.9						
	SYSTEM	89.2	76.7	98.3	59.4			720	557	428	69.6

** PROBLEMS/SOLUTIONS/COMMENTS

AN ELECTRICAL CABLE FAILURE PREVENTED MODULES E AND F FROM OPERATING SIMULTANEOUSLY. AUXILIARY POWER COULD ONLY BE PROVIDED TO ONE MODULE.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
7/80	E	97.6	55.4		49.1						
	F	96.9	85.0		75.3						
	G	.0	.0		.0						
	H	98.9	91.0		80.6						
	SYSTEM	97.8	77.1		68.3			744	659	508	79.8

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER WAS DOWN FOR SEVERAL DAYS IN JULY TO REPAIR STEAM TUBE LEAKS.

THE POWER CABLE WHICH FAILED IN JUNE WAS REPAIRED THIS MONTH. THIS CABLE PERMITS SIMULTANEOUS OPERATION OF THE E AND F MODULES WITH THE H MODULE.

PUBLIC SERVICE OF NEW MEXICO: SAN JUAN 2 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
8/80	E	98.4	90.2		85.8						
	F	97.8	72.7		69.1						
	G	.0	.0		.0						
	H	98.3	92.6		88.0						
	SYSTEM	98.2	85.2	100.0	81.0			744	707	602	88.7

** PROBLEMS/SOLUTIONS/COMMENTS

TUBE LEAK REPAIRS IN THE BOILER CAUSED THE FGD SYSTEM NO TO OPERATE FOR TWO DAYS.

9/80	E	99.0	56.1		51.9						
	F	99.3	56.1		51.9						
	G	.0	.0		.0						
	H	97.6	56.2		52.1						
	SYSTEM	98.6	56.1	62.5	51.9			720	667	374	85.5

** PROBLEMS/SOLUTIONS/COMMENTS

ESP PROBLEMS CAUSED ERRATIC OPERATION OF THE FGD SYSTEM FOR SEVERAL DAYS IN SEPTEMBER.

THE FGD SYSTEM WAS NOT OPERATED DURING A SCHEDULED OUTAGE OF THE CHEMICAL PLANT. THE SYSTEM WAS AVAILABLE DURING THIS TIME.

MODULE G WAS UNAVAILABLE IN SEPTEMBER BECAUSE OF ONGOING REPAIR OF FIRE DAMAGE.

10/80	E	14.7	36.2		14.7						
	F	15.7	39.0		15.7						
	G	.0	.0		.0						
	H	1.1	.0		.0						
	SYSTEM	10.5	25.0	27.0	10.1			744	301	75	40.0

** PROBLEMS/SOLUTIONS/COMMENTS

UNIT 2 WAS OFF LINE FROM OCTOBER 4 TO OCTOBER 23 FOR A SCHEDULED FALL OUTAGE.

THE "F" MODULE WAS UNAVAILABLE ESSENTIALLY THE ENTIRE MONTH AS A RESULT OF MAINTENANCE BEING PERFORMED.

THE "G" MODULE REMAINED UNAVAILABLE DURING THE MONTH AS A RESULT OF THE FIRE DAMAGE INCURRED ON MARCH 24.

10/80	E	14.7	36.2		14.7						
	F	15.7	38.9		15.7						
	G	.0	.0		.0						
	H	1.1	.0		.0						
	SYSTEM	10.5	25.0	27.0	10.1			744	301	75	40.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER WAS TAKEN OFF LINE ON OCTOBER 4 FOR A SCHEDULED OVERHAUL. THE BOILER WAS RETURNED TO OPERATION ON OCTOBER 23.

OPERABILITY AND AVAILABILITY OF THE FGD SYSTEM WERE LOW BECAUSE MODULE G WAS STILL OFF LINE TO REPAIR FIRE DAMAGE INCURRED ON MARCH 24. MODULE H WAS OFF LINE ESSENTIALLY THE ENTIRE PERIOD FOR MAINTENANCE.

11/80	E	97.6	85.8		55.3						
	F	90.0	73.3		47.2						

PUBLIC SERVICE OF NEW MEXICO: SAN JUAN 2 (CONT.).

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	G	.0	.0		.0						
	H	57.2	20.7		13.3						
	SYSTEM	81.8	59.5	60.4	38.3			720	464	276	57.0

** PROBLEMS/SOLUTIONS/COMMENTS

UNIT 2 WAS DOWN FROM NOVEMBER 13 TO 18 TO REPAIR A WATERWALL TUBE LEAK AND FROM NOVEMBER 19 TO 23 AS A RESULT OF THE FAILURE OF A START-UP TRANSFORMER.

THE "H" MODULE WAS OUT OF SERVICE FROM NOVEMBER 1 TO 12 TO BALANCE THE ROTOR IN THE BOOSTER BLOWER AND TO REPAIR THE ABSORBER RECIRCULATING PUMP.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
12/80	E	95.3	42.4		34.3						
	F	95.6	59.9		48.4						
	G	.0	.0		.0						
	H	69.4	51.7		41.8						
	SYSTEM	85.8	51.6	100.0	41.7			744	601	310	73.9

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS DOWN FROM DECEMBER 6 TO 7 TO REPAIR A TUBE LEAK, BUT THEN REMAINED DOWN UNTIL DECEMBER 11 FOR A TRANSFORMER TIE-IN.

THE "H" MODULE WAS DOWN FROM DECEMBER 11 TO 19 TO REPAIR A LEAK THAT HAD DEVELOPED AT THE SUCTION SIDE OF THE ABSORBER RECIRCULATING PUMP.

THE UNIT 2 FGD SYSTEM EXPERIENCED A LOSS OF POWER ON DECEMBER 24 AND DID NOT RETURN TO SERVICE UNTIL DECEMBER 26 AS A RESULT OF COMPUTER PROBLEMS THAT DEVELOPED.

THE "G" MODULE REMAINED OUT OF SERVICE THROUGH THE END OF THE FOURTH QUARTER AS A RESULT OF THE FIRE DAMAGE INCURRED IN MARCH.

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	PUBLIC SERVICE OF NEW MEXICO
PLANT NAME	SAN JUAN
UNIT NUMBER	3
CITY	WATERFLOW
STATE	NEW MEXICO
REGULATORY CLASSIFICATION	C
PARTICULATE EMISSION LIMITATION - NG/J	9. (.020 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	146. (.340 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	****** (****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	1560
GROSS UNIT GENERATING CAPACITY - MW	534
NET UNIT GENERATING CAPACITY W/FGD - MW	468
NET UNIT GENERATING CAPACITY WO/FGD - MW	487
EQUIVALENT SCRUBBED CAPACITY - MW	534
** UNIT DATA - BOILER AND STACK	
BOILER SUPPLIER	BABCOCK & WILCOX
BOILER TYPE	PULVERIZED COAL
BOILER SERVICE LOAD	BASE
DESIGN BOILER FLUE GAS FLOW - CU.M/S	963.05 (2040800 ACFM)
BOILER FLUE GAS TEMPERATURE - C	120.6 (249 F)
STACK HEIGHT - M	122. (400 FT)
STACK SHELL	CONCRETE
STACK TOP DIAMETER - M	8.5 (28.0 FT)
** FUEL DATA	
FUEL TYPE	COAL
FUEL GRADE	SUBBITUMINOUS
AVERAGE HEAT CONTENT - J/G	20934. (9000 BTU/LB)
RANGE HEAT CONTENT - BTU/LB	8000-11628
AVERAGE ASH CONTENT - %	22.00
RANGE ASH CONTENT - %	12.59-22.45
AVERAGE MOISTURE CONTENT - %	10.50
RANGE MOISTURE CONTENT - %	8.10-15.01
AVERAGE SULFUR CONTENT - %	.80
RANGE SULFUR CONTENT - %	.59-1.3
AVERAGE CHLORIDE CONTENT - %	.03
RANGE CHLORIDE CONTENT - %	0.0-0.09
*** PARTICLE CONTROL	
** PARTICLE SCRUBBER	
NUMBER	4
GENERIC TYPE	VENTURI TOWER
SPECIFIC TYPE	VARIABLE-THROAT/BOTTOM-ENTRY PLUMB BOB
SUPPLIER	DAVY MCKEE
DIMENSIONS - FT	14'6" DIA X 32'8" HIGH
SHELL GENERIC MATERIAL	CARBON STEEL
SHELL SPECIFIC MATERIAL	AISI 1110
GAS CONTACTING DEVICE TYPE	ACID BRICK
NUMBER OF CONTACTING ZONES	1
LIQUID RECIRCULATION RATE - LITER/S	315.0 (5000 GPM)
L/G RATIO - LITER/CU.M	1.2 (9.2 GAL/1000ACF)
PRESSURE DROP - KPA	3.1 (12.5 IN-H2O)
SUPERFICIAL GAS VELOCITY - M/S	3.3 (10.8 FT/S)
INLET GAS FLOW RATE - CU.M/S	316.6 (671000 ACFM)
INLET GAS TEMPERATURE - C	133.3 (272 F)
PARTICLE REMOVAL EFFICIENCY - %	75.0
*** FGD SYSTEM	
** GENERAL DATA	
SALEABLE PRODUCT/THROWAWAY PRODUCT	SALEABLE PRODUCT
SO2 REMOVAL MODE	WET SCRUBBING
PROCESS TYPE	WELLMAN LORD
PROCESS ADDITIVES	NONE
SYSTEM SUPPLIER	DAVY MCKEE
A-E FIRM	DAVY MCKEE
DEVELOPMENT LEVEL	FULL SCALE

PUBLIC SERVICE OF NEW MEXICO: SAN JUAN 3 (CONT.)

NEW/RETROFIT	NEW	
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.50	
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	90.00	
CURRENT STATUS	1	
INITIAL START-UP	12/79	
CONTRACT AWARDED	8/78	

** DESIGN AND OPERATING PARAMETERS

** ABSORBER

NUMBER	1	
GENERIC TYPE	TRAY TOWER	
SPECIFIC TYPE	VALVE TRAY	
TRADE NAME/COMMON TYPE	BUBBLE CAP TRAY TOWER	
SUPPLIER	DAVY MCKEE	
DIMENSIONS - FT	30' X 33'6" X 78' HIGH	
SHELL GENERIC MATERIAL	INORGANIC	
SHELL SPECIFIC MATERIAL	REINFORCED CONCRETE	
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A	
LINER GENERIC MATERIAL	STAINLESS STEEL	
LINER MATERIAL TRADE NAME/COMMON TYPE	TYPE 316L	
GAS CONTACTING DEVICE TYPE	5 LEVELS OF VALVE TRAYS	
NUMBER OF CONTACTING ZONES	5	
LIQUID RECIRCULATION RATE - LITER/S	35.	(550 GPM)
L/G RATIO - L/CU.M	.1	(1.0 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	4.2	(17.0 IN-H2O)
SUPERFICAL GAS VELOCITY - M/SEC	3.3	(10.8 FT/S)
INLET GAS FLOW - CU. M/S	240.67	(510000 ACFM)
INLET GAS TEMPERATURE - C	48.9	(120 F)
SO2 REMOVAL EFFICIENCY - %	90.0	

** MIST ELIMINATOR

PRE-MIST ELIMINATOR/MIST ELIMINATOR	MIST ELIMINATOR	
NUMBER PER SYSTEM	2	
CONFIGURATION	HORIZONTAL	
WASH WATER SOURCE	TREATED WATER	
WASH RATE - L/S	10.4	(165 GAL/MIN)

** REHEATER

GENERIC TYPE	INDIRECT HOT AIR	
SPECIFIC TYPE	EXTERNAL HEAT EXCHANGER	
TRADE NAME/COMMON TYPE	STEAM TUBE BUNDLES	
INLET FLUE GAS FLOW RATE - CU. M/S	866.41	(1836000 ACFM)
INLET FLUE GAS TEMPERATURE - C	52.8	(127 F)

** FANS

NUMBER	4	
NUMBER OF SPARES	1	
SUPPLIER	BUFFALO FORGE	
FUNCTION	BOOSTER	
APPLICATION	FORCED DRAFT	
SERVICE	DRY	
FLUE GAS FLOW RATE - CU.M/S	328.25	(695600 ACFM)
FLUE GAS TEMPERATURE - C	120.6	(249 F)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	

** TANKS

SERVICE	NUMBER
ABSORBER PRODUCT PUMP	1

** PUMPS

SERVICE	NUMBER
SCRUBBER RECIRCULATION	1

*** SALEABLE BYPRODUCTS

NATURE	SULFURIC ACID	
FULL LOAD QUANTITY - M T/H	19.05	(21.00 TPH)

PUBLIC SERVICE OF NEW MEXICO: SAN JUAN 3 (CONT.)

DISPOSITION	MARKETED
** PROCESS CONTROL AND INSTRUMENTATION	
CHEMICAL PARAMETERS	PH & DENSITY
CONTROL LEVELS	PH 5.5-6.5; SP.GR. 1.2-1.3
MONITOR LOCATION	ABSORBER FEED AND PRODUCT SOLUTION
PROCESS CONTROL MANNER	MANUAL
** WATER BALANCE	
WATER LOOP TYPE	CLOSED
** FGD SPARE CAPACITY INDICES	
ABSORBER - %	.0
** FGD SPARE COMPONENT INDICES	
ABSORBER	.0

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
12/79	M	100.0	11.2		5.9						
	SYSTEM	100.0	11.2		5.9			744	392	44	

** PROBLEMS/SOLUTIONS/COMMENTS

THE SAN JUAN 3 BOILER AND FGD SYSTEM BEGAN OPERATIONS IN DECEMBER 1979. CURRENTLY ONLY ONE MODULE IS OPERATING. THE OTHER THREE MODULES WILL BECOME OPERATIONAL ONE BY ONE UNTIL ALL ARE ON LINE. THE SYSTEM IS NOT EXPECTED TO BE FULLY OPERATIONAL (ALL FOUR MODULES) UNTIL 1982.

DURING DECEMBER THE BOILER EXPERIENCED ERRATIC OPERATIONS. NO FGD SYSTEM PROBLEMS WERE REPORTED.

1/80	M	86.0	54.4		41.5						
	SYSTEM	86.0	54.4		41.5			744	568	309	

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM FIGURES REFLECT THE OPERATION OF A SINGLE MODULE. ONLY ONE MODULE WILL BE NEEDED UNTIL MAY 1982 TO MEET CURRENT SO2 EMISSION REGULATIONS.

2/80	M	98.0	13.6		1.0						
	SYSTEM	98.0	13.6		1.0			696	44	7	
3/80	M	85.5	78.3	79.6	56.7						
	SYSTEM	85.5	78.3	79.6	56.7			744	539	422	53.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE ONE MODULE CURRENTLY OPERATIONAL AT SAN JUAN 3 OPERATED WITHOUT ANY MAJOR PROBLEMS DURING THE FIRST QUARTER OF 1980. THE BOILER WAS OFF LINE FOR APPROXIMATELY 24 DAYS IN FEBRUARY DUE TO AN ELECTRICAL PROBLEM.

4/80	M	92.1	82.7	90.1	71.8						
	SYSTEM	92.1	82.7	90.1	71.8			720	625	517	77.0

** PROBLEMS/SOLUTIONS/COMMENTS

MINOR REPAIR WORK WAS DONE TO THE BOILER THIS MONTH. FGD SYSTEM AVAILABILITY WAS OVER 90%.

5/80	M	100.0	78.1	100.0	32.7						
	SYSTEM	100.0	78.1	100.0	32.7			744	311	243	35.0

PUBLIC SERVICE OF NEW MEXICO: SAN JUAN 3 (CONT.)

PERIOD	MODULE	PERFORMANCE DATA: AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE BOILER WAS OUT OF SERVICE FOR A SCHEDULED MAINTENANCE OUTAGE.									
6/80	M	49.0	43.3	39.2	27.6						
	SYSTEM	49.0	43.3	39.2	27.6			720	460	127	55.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		MINOR REPAIR AND MAINTENANCE OF THE BOILER CAUSED SYSTEM OUTAGE TIME.									
		THE FGD SYSTEM DID NOT OPERATE AFTER JUNE 19 DUE TO FAILURE OF THE MIST ELIMINATOR MESH PADS AND BOTTOM BALLAST TRAY.									
7/80	M	75.5	89.8	89.8	74.5						
	SYSTEM	75.5	89.8	89.8	74.5			744	617	554	66.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE FGD SYSTEM WAS RETURNED TO SERVICE ON JULY 5 AFTER BOILER AND FGD SYSTEM REPAIRS WERE MADE.									
8/80	M	83.2	81.6	82.7	80.2						
	SYSTEM	83.2	81.6	82.7	80.2			744	732	597	81.9
	** PROBLEMS/SOLUTIONS/COMMENTS										
		BEARINGS ON THE CIRCULATING PUMP WERE REPLACED DURING AUGUST.									
		A PUMP DISCHARGE VALVE WAS REPLACED DUE TO LEAKAGE.									
9/80	M	96.7	59.4	59.1	45.7						
	SYSTEM	96.7	59.4	59.1	45.7			720	549	329	61.6
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE FGD SYSTEM WAS DOWN FOR SEVERAL DAYS IN SEPTEMBER BECAUSE OF BOILER TUBE LEAKS.									
		THE FGD SYSTEM WAS NOT OPERATED DURING A SCHEDULED OUTAGE OF THE CHEMICAL PLANT. THE SYSTEM WAS AVAILABLE DURING THIS TIME.									
10/80	M	91.0	65.1	67.2	63.7						
	SYSTEM	91.0	65.1	67.2	63.7			744	728	474	84.2
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING OCTOBER THE BOILER WAS OUT OF SERVICE FOR APPROXIMATELY 24 HOURS DUE TO A POWER TRIP CAUSED BY THE FORCED DRAFT FAN.									
		MODULE M WAS RETURNED TO SERVICE ON OCTOBER 8, 1980 FOLLOWING COMPLETION OF THE CHEMICAL PLANT OUTAGE. HOWEVER, MODULE M WAS SHUT DOWN ON OCTOBER 29, 1980 TO REPLACE THE BADLY DAMAGED BOTTOM COLLECTOR TRAY.									
11/80	M	59.0	73.0	86.0	38.0						
	SYSTEM	59.0	73.0	86.0	38.0			720	372	273	38.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING NOVEMBER THE BOILER WAS OUT OF SERVICE APPROXIMATELY 312 HOURS DUE TO A SCHEDULED MAINTENANCE OVERHAUL. DURING THIS TIME REPAIRS WERE MADE TO THE BOTTOM BALLAST TRAY AND SUPPORT BEAMS IN THE M MODULE.									

PUBLIC SERVICE OF NEW MEXICO: SAN JUAN 3 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP FACT
		MODULE M WAS NOT OPERATED FOR APPROXIMATELY 96 HOURS DUE TO A POWER FAILURE THAT CAUSED AN UPSET IN THE CHEMICAL PLANT AND CONSEQUENT LACK OF ABSORBER FEED SOLUTION.									
12/80	M	90.0	86.0	87.0	65.0						
	SYSTEM	90.0	86.0	87.0	65.0			744	564	484	68.(

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER WAS OUT OF SERVICE APPROXIMATELY 168 HOURS DUE TO TUBE LEAKS IN THE SUPERHEATER SECTION.

DURING DECEMBER MODULE M WAS OUT OF SERVICE APPROXIMATELY 50 HOURS DUE TO AN INSPECTION FOLLOWING MAJOR REPAIRS COMPLETED IN NOVEMBER.

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	SALT RIVER PROJECT	
PLANT NAME	CORONADO	
UNIT NUMBER	1	
CITY	ST. JOHNS	
STATE	ARIZONA	
REGULATORY CLASSIFICATION	D	
PARTICULATE EMISSION LIMITATION - NG/J	43.	(.100 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	344.	(.800 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	700	
GROSS UNIT GENERATING CAPACITY - MW	350	
NET UNIT GENERATING CAPACITY W/FGD - MW	350	
NET UNIT GENERATING CAPACITY WO/FGD - MW	365	
EQUIVALENT SCRUBBED CAPACITY - MW	280	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	RILEY STOKER	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	1226.94	(2600000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	404.4	(760 F)
STACK HEIGHT - M	152.	(500 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	5.8	(19.0 FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	SUBBITUMINOUS	
AVERAGE HEAT CONTENT - J/G	19306.	(8300 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		8,000-11,000
AVERAGE ASH CONTENT - %	25.00	
RANGE ASH CONTENT - %	19-35	
AVERAGE MOISTURE CONTENT - %	16.00	
RANGE MOISTURE CONTENT - %	12-20	
AVERAGE SULFUR CONTENT - %	1.00	
RANGE SULFUR CONTENT - %	0.4-1.0	
AVERAGE CHLORIDE CONTENT - %	********	
RANGE CHLORIDE CONTENT - %	******	
*** PARTICLE CONTROL		
** ESP		
NUMBER	2	
TYPE	HOT SIDE	
SUPPLIER	WESTERN PREC. DIVISION, JOY	
INLET FLUE GAS CAPACITY - CU.M/S	1321.3	(2800000 ACFM)
INLET FLUE GAS TEMPERATURE - C	404.4	(760 F)
PRESSURE DROP - KPA	.8	(3. IN-H2O)
PARTICLE REMOVAL EFFICENCY - %	99.8	
** PARTICLE SCRUBBER		
GENERIC TYPE	NONE	
SPECIFIC TYPE	N/A	
*** FGD SYSTEM		
** GENERAL DATA		
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT	
SO2 REMOVAL MODE	WET SCRUBBING	
PROCESS TYPE	LIMESTONE	
PROCESS ADDITIVES	NONE	
SYSTEM SUPPLIER	PULLMAN KELLOGG	
A-E FIRM	BECHTEL	
DEVELOPMENT LEVEL	FULL SCALE	
NEW/RETROFIT	NEW	
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.87	
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	66.00	
CURRENT STATUS	1	
COMMERCIAL START-UP	12/79	

SALT RIVER PROJECT: CORONADO 1 (CONT.)

INITIAL START-UP	11/79	
CONTRACT AWARDED	6/76	

** DESIGN AND OPERATING PARAMETERS

**** ABSORBER**		
NUMBER	2	
NUMBER OF SPARES	0	
GENERIC TYPE	SPRAY TOWER	
SPECIFIC TYPE	OPEN CROSSCURRENT SPRAY	
TRADE NAME/COMMON TYPE	WEIR HORIZONTAL SPRAY CHAMBER	
SUPPLIER	PULLMAN KELLOGG	
DIMENSIONS - FT	120 L X 28 W X 17 H	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	AISI 1110	
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A	
LINER GENERIC MATERIAL	ORGANIC	
LINER SPECIFIC MATERIAL	GLASS FLAKE-FILLED POLYESTER	
LINER MATERIAL TRADE NAME/COMMON TYPE	FLAKEGLASS	
GAS CONTACTING DEVICE TYPE	NONE	
NUMBER OF CONTACTING ZONES	4	
LIQUID RECIRCULATION RATE - LITER/S	630.	(10000 GPM)
GAS-SIDE PRESSURE DROP - KPA	.4	(1.5 IN-H2O)
SUPERFICAL GAS VELOCITY - M/SEC	6.6	(21.6 FT/S)
INLET GAS TEMPERATURE - C	121.1	(250 F)
SO2 REMOVAL EFFICIENCY - %	82.0	
**** MIST ELIMINATOR**		
PRE-MIST ELIMINATOR/MIST ELIMINATOR	MIST ELIMINATOR	
NUMBER PER SYSTEM	2	
GENERIC TYPE	IMPINGEMENT	
SPECIFIC TYPE	BAFFLE	
TRADE NAME/COMMON TYPE	CHEVRON VANE	
CONFIGURATION	VERTICAL	
NUMBER OF STAGES	1	
NUMBER OF PASSES PER STAGE	3	
FREEBOARD DISTANCE - M	8.84	(29.0 FT)
DISTANCE BETWEEN STAGES - CM	1.78	(.7 IN)
DISTANCE BETWEEN VANES - CM	3.0	(1.20 IN)
PRESSURE DROP - KPA	.1	(.5 IN-H2O)
SUPERFICAL GAS VELOCITY - M/S	4.6	(15.0 FT/S)
CONSTRUCTION MATERIAL GENERIC TYPE	HEIL NORYL E-265	
WASH WATER SOURCE	COOLING TOWER BLOWDOWN	
WASH RATE - L/S	39.4	(625 GAL/MIN)
**** REHEATER**		
GENERIC TYPE	BYPASS	
SPECIFIC TYPE	COLD SIDE	
TRADE NAME/COMMON TYPE	N/A	
PERCENT GAS BYPASSED - AVG	20.0	
TEMPERATURE INCREASE - C	10.0	(50 F)
**** FANS**		
NUMBER	2	
NUMBER OF SPARES	0	
SUPPLIER	GREEN FAN	
FUNCTION	BOOSTER	
APPLICATION	FORCED DRAFT	
SERVICE	DRY	
FLUE GAS FLOW RATE - CU.M/S	304.32	(644880 ACFM)
FLUE GAS TEMPERATURE - C	127.2	(261 F)
**** DUCTWORK**		
LOCATION	SCRUBBER INLET	
DIMENSIONS	15'7" W X 13' H	
SHELL GENERIC MATERIAL TYPE	CARBON STEEL	
LINER GENERIC MATERIAL TYPE	NONE	
**** DUCTWORK**		
LOCATION	SCRUBBER OUTLET	
DIMENSIONS	33 X 18	

SALT RIVER PROJECT: CORONADO 1 (CONT.)

SHELL GENERIC MATERIAL TYPE	CARBON STEEL
LINER GENERIC MATERIAL TYPE	GLASS FLAKE POLYESTER-RESIN

** REAGENT PREPARATION EQUIPMENT

FUNCTION	LIMESTONE GRINDING
DEVICE	BALL MILL
MANUFACTURER	MINE & SMELTER CORP.
NUMBER	2
FULL LOAD DRY FEED CAPACITY - M.TONS/HR	11.8 (13 TPH)
PRODUCT QUALITY - % SOLIDS	20.0

** TANKS

SERVICE	NUMBER
REACTION MIX	2
PROCESS WATER	2
MIST ELIMINATOR	2
SEAL WATER	1
LIMESTONE SLURRY STORAGE	1
SLUDGE STORAGE	1

** PUMPS

SERVICE	NUMBER
SLURRY RECIRCULATION	11
SLUDGE DISPOSAL	4
SLURRY PURGE	4
ALKALI MAKEUP	1
PROCESS WATER	2
SEAL WATER	1
HIGH PRESSURE SEAL WATER	2
MIST ELIMINATOR WASH	2

** SOLIDS CONCENTRATING/DEWATERING

DEVICE	THICKENER
NUMBER	1
NUMBER OF SPARES	0
DIMENSIONS - FT	105 (DIA) X 12 (DEPTH)
SHELL GENERIC MATERIAL TYPE	STEEL
FEED STREAM CHARACTERISTICS	10% SOLIDS
OUTLET STREAM CHARACTERISTICS	30% SOLIDS

*** SLUDGE

** DISPOSAL

NATURE	FINAL
TYPE	LINED POND
LOCATION	ON SITE
SITE TRANSPORTATION METHOD	PIPE (8 IN. ABOVE GROUND, EPOXY LINED CEMENT ASB
SITE CAPACITY - CU.M	4525100 (3700.0 ACRE-FT)
SITE SERVICE LIFE - YRS	35

** PROCESS CONTROL AND INSTRUMENTATION

CHEMICAL PARAMETERS	SO2 INLET CONCENTRATION GAS FLOW, PH
CONTROL LEVELS	0-1000 PPM SO2, 0-500,000 SCFM, 4-8 PH
MONITOR LOCATION	INLET DUCT, FIRST AND FOURTH STAGES (PH)
PROCESS CONTROL MANNER	AUTOMATIC AND MANUAL
PROCESS CHEMISTRY MODE	FEED FORWARD

** WATER BALANCE

WATER LOOP TYPE	OPEN
EVAPORATION WATER LOSS - LITER/S	13.2 (210 GPM)
POND SEEPAGE/RUNOFF WATER LOSS - LITERS/S	0
MAKEUP WATER ADDITION - LITERS/S	17.0 (270 GPM)

** FGD SPARE CAPACITY INDICES

ABSORBER - %	.0

SALT RIVER PROJECT: CORONADO 1 (CONT.)

** FGD SPARE COMPONENT INDICES
ABSORBER .0

PERIOD	MODULE	PERFORMANCE DATA: AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP FACT
11/79	SYSTEM							720			
12/79	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

THE CORONADO UNIT 1 COMMENCED OPERATIONS IN NOVEMBER 1979. THE FGD SYSTEM HAS PASSED EPA PERFORMANCE TESTS.

1/80	SYSTEM							744			
2/80	SYSTEM							696			
3/80	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE PERIOD STACK EMISSION TESTS WERE COMPLETED. NO OPERATIONAL INFORMATION WAS AVAILABLE.

4/80	SYSTEM							720			
5/80	SYSTEM							744			
6/80	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

ALTHOUGH FGD SYSTEM PERFORMANCE DATA ARE BEING LOGGED, THE UTILITY REPORTE THAT THE INFORMATION IS UNAVAILABLE FOR RELEASE AT THIS TIME.

7/80	SYSTEM							744			
8/80	SYSTEM							744			
9/80	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY WILL NOT AUTHORIZE THE RELEASE OF FGD PERFORMANCE DATA AT THIS TIME, BUT NOTED THAT THE SYSTEM IS TO SHUT DOWN ON NOVEMBER 1, 1980 FOR A MAJOR OVERHAUL.

10/80	SYSTEM							744			
11/80	SYSTEM							720			
12/80	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

ON NOVEMBER 8, 1980 THE UNIT WAS TAKEN OFF LINE FOR A MAJOR OVERALL THAT IS EXPECTED TO LAST FOR APPROXIMATELY 45 DAYS.

THE PERFORMANCE DATA ARE NOT YET AVAILABLE FOR RELEASE.

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	SALT RIVER PROJECT	
PLANT NAME	CORONADO	
UNIT NUMBER	2	
CITY	ST. JOHNS	
STATE	ARIZONA	
REGULATORY CLASSIFICATION	D	
PARTICULATE EMISSION LIMITATION - NG/J	43.	(.100 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	344.	(.800 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	700	
GROSS UNIT GENERATING CAPACITY - MW	350	
NET UNIT GENERATING CAPACITY W/FGD - MW	350	
NET UNIT GENERATING CAPACITY WO/FGD - MW	365	
EQUIVALENT SCRUBBED CAPACITY - MW	280	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	RILEY STOKER	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	1226.94	(2600000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	404.4	(760 F)
STACK HEIGHT - M	152.	(500 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	5.8	(19.0 FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	SUBBITUMINOUS	
AVERAGE HEAT CONTENT - J/G	19306.	(8300 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		8,000-11,000
AVERAGE ASH CONTENT - %	25.00	
RANGE ASH CONTENT - %	19-35	
AVERAGE MOISTURE CONTENT - %	16.00	
RANGE MOISTURE CONTENT - %	12-20	
AVERAGE SULFUR CONTENT - %	1.00	
RANGE SULFUR CONTENT - %	0.4-1.0	
AVERAGE CHLORIDE CONTENT - %	********	
RANGE CHLORIDE CONTENT - %	******	
*** PARTICLE CONTROL		
** ESP		
NUMBER	2	
TYPE	HOT SIDE	
SUPPLIER	WESTERN PREC. DIVISION, JOY	
INLET FLUE GAS CAPACITY - CU.M/S	1321.3	(2800000 ACFM)
INLET FLUE GAS TEMPERATURE - C	404.4	(760 F)
PRESSURE DROP - KPA	.8	(3. IN-H2O)
PARTICLE REMOVAL EFFICENCY - %	99.8	
** PARTICLE SCRUBBER		
GENERIC TYPE	NONE	
SPECIFIC TYPE	N/A	
*** FGD SYSTEM		
** GENERAL DATA		
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT	
SO2 REMOVAL MODE	WET SCRUBBING	
PROCESS TYPE	LIMESTONE	
PROCESS ADDITIVES	NONE	
SYSTEM SUPPLIER	PULLMAN KELLOGG	
A-E FIRM	BECHTEL	
DEVELOPMENT LEVEL	FULL SCALE	
NEW/RETROFIT	NEW	
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.87	
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	66.00	
CURRENT STATUS	1	
COMMERCIAL START-UP	10/81	

SALT RIVER PROJECT: CORONADO 2 (CONT.)

INITIAL START-UP	7/80	
CONTRACT AWARDED	6/76	

** DESIGN AND OPERATING PARAMETERS

** ABSORBER		
NUMBER	2	
NUMBER OF SPARES	0	
GENERIC TYPE	SPRAY TOWER	
SPECIFIC TYPE	OPEN CROSSCURRENT SPRAY	
TRADE NAME/COMMON TYPE	WEIR HORIZONTAL SPRAY CHAMBER	
SUPPLIER	PULLMAN KELLOGG	
DIMENSIONS - FT	120 L X 28 W X 17 H	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	AISI 1110	
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A	
LINER GENERIC MATERIAL	ORGANIC	
LINER SPECIFIC MATERIAL	GLASS FLAKE-FILLED POLYESTER	
LINER MATERIAL TRADE NAME/COMMON TYPE	FLAKEGLASS	
NUMBER OF CONTACTING ZONES	4	
LIQUID RECIRCULATION RATE - LITER/S	630.	(10000 GPM)
GAS-SIDE PRESSURE DROP - KPA	.4	(1.5 IN-H2O)
INLET GAS FLOW - CU. M/S	25.48	(54000 ACFM)
INLET GAS TEMPERATURE - C	46.1	(115 F)
SO2 REMOVAL EFFICIENCY - %	82.0	
** MIST ELIMINATOR		
PRE-MIST ELIMINATOR/MIST ELIMINATOR	MIST ELIMINATOR	
NUMBER PER SYSTEM	2	
GENERIC TYPE	IMPINGEMENT	
SPECIFIC TYPE	BAFFLE	
TRADE NAME/COMMON TYPE	CHEVRON VANE	
CONFIGURATION	VERTICAL	
NUMBER OF STAGES	1	
NUMBER OF PASSES PER STAGE	3	
FREEBOARD DISTANCE - M	8.84	(29.0 FT)
DISTANCE BETWEEN STAGES - CM	1.78	(.7 IN)
DISTANCE BETWEEN VANES - CM	3.0	(1.20 IN)
SUPERFICAL GAS VELOCITY - M/S	4.6	(15.0 FT/S)
CONSTRUCTION MATERIAL GENERIC TYPE	HEIL NORYL E-265	
WASH WATER SOURCE	COOLING TOWER BLOWDOWN	
WASH RATE - L/S	39.4	(625 GAL/MIN)
** REHEATER		
GENERIC TYPE	BYPASS	
SPECIFIC TYPE	COLD SIDE	
TRADE NAME/COMMON TYPE	N/A	
PERCENT GAS BYPASSED - AVG	20.0	
TEMPERATURE INCREASE - C	10.0	(50 F)
** FANS		
NUMBER	2	
NUMBER OF SPARES	0	
SUPPLIER	GREEN FAN	
FUNCTION	BOOSTER	
APPLICATION	FORCED DRAFT	
SERVICE	DRY	
FLUE GAS FLOW RATE - CU.M/S	304.32	(644880 ACFM)
FLUE GAS TEMPERATURE - C	127.2	(261 F)
** DUCTWORK		
LOCATION	SCRUBBER INLET	
DIMENSIONS	15'7" W X 13' H	
SHELL GENERIC MATERIAL TYPE	CARBON STEEL	
LINER GENERIC MATERIAL TYPE	NONE	
** DUCTWORK		
LOCATION	SCRUBBER OUTLET	
DIMENSIONS	33 X 18	
SHELL GENERIC MATERIAL TYPE	CARBON STEEL	
LINER GENERIC MATERIAL TYPE	GLASS FLAKE POLYESTER-RESIN	

SALT RIVER PROJECT: CORONADO 2 (CONT.)

** REAGENT PREPARATION EQUIPMENT

FUNCTION	LIMESTONE GRINDING
DEVICE	BALL MILL
MANUFACTURER	MINE & SMELTER CORP.
NUMBER	2
FULL LOAD DRY FEED CAPACITY - M.TONS/HR	11.8 (13 TPH)
PRODUCT QUALITY - % SOLIDS	20.0

** TANKS

SERVICE	NUMBER
REACTION MIX	****
PROCESS WATER	2
MIST ELIMINATOR	2
SEAL WATER	1
LIMESTONE SLURRY STORAGE	1
SLUDGE STORAGE	1

** PUMPS

SERVICE	NUMBER
SLURRY RECIRCULATION	10
SLUDGE DISPOSAL	4
SLURRY PURGE	4
ALKALI MAKEUP	1
PROCESS WATER	2
SEAL WATER	1
HIGH PRESSURE SEAL WATER	2
MIST ELIMINATOR WASH	2

** SOLIDS CONCENTRATING/DEWATERING

DEVICE	THICKENER
NUMBER	1
NUMBER OF SPARES	0
DIMENSIONS - FT	105 (DIA) X 12 (DEPTH)
FEED STREAM CHARACTERISTICS	10% SOLIDS
OUTLET STREAM CHARACTERISTICS	30% SOLIDS

*** SLUDGE

** DISPOSAL

NATURE	FINAL
TYPE	LINED POND
LOCATION	ON SITE
SITE TRANSPORTATION METHOD	PIPE
SITE CAPACITY - CU.M	4525100 (3700.0 ACRE-FT)
SITE SERVICE LIFE - YRS	35

** PROCESS CONTROL AND INSTRUMENTATION

CHEMICAL PARAMETERS	SO2 INLET CONCENTRATION GAS FLOW, PH
CONTROL LEVELS	0-1000 PPM SO2, 0-500,000 SCFM, 4-8 PH
MONITOR LOCATION	INLET DUCT, FIRST AND FOURTH STAGES (PH)
PROCESS CONTROL MANNER	AUTOMATIC AND MANUAL
PROCESS CHEMISTRY MODE	FEED FORWARD

** WATER BALANCE

WATER LOOP TYPE	OPEN
EVAPORATION WATER LOSS - LITER/S	13.2 (210 GPM)
POND SEEPAGE/RUNOFF WATER LOSS - LITERS/S	0
MAKEUP WATER ADDITION - LITERS/S	17.0 (270 GPM)

** FGD SPARE CAPACITY INDICES

ABSORBER - %	.0

** FGD SPARE COMPONENT INDICES

ABSORBER	.0

EPA UTILITY FGD SURVEY: OCTOBER - DECEMBER 1980

SALT RIVER PROJECT: CORONADO 2 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAI FACT
		PERFORMANCE DATA									
7/80	SYSTEM							744			
8/80	SYSTEM							744			
9/80	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

INITIAL OPERATION OF THE FGD SYSTEM AT THE CORONADO 2 STATION COMMENCED IN JULY, 1980.

DURING THE THIRD QUARTER 1980 A BEARING INSPECTION WAS CONDUCTED. THE UN IS PRESENTLY IN THE PROCESS OF BEGINNING COMMERCIAL OPERATION.

10/80	SYSTEM							744			
11/80	SYSTEM							720			
12/80	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

THE PERFORMANCE DATA ARE NOT YET AVAILABLE FOR RELEASE.

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	SOUTH CAROLINA PUBLIC SERVICE	
PLANT NAME	WINYAH	
UNIT NUMBER	2	
CITY	GEORGETOWN	
STATE	SOUTH CAROLINA	
REGULATORY CLASSIFICATION	B	
PARTICULATE EMISSION LIMITATION - NG/J	43.	(.100 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	516.	(1.200 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	519	
GROSS UNIT GENERATING CAPACITY - MW	280	
NET UNIT GENERATING CAPACITY W/FGD - MW	258	
NET UNIT GENERATING CAPACITY WO/FGD - MW	261	
EQUIVALENT SCRUBBED CAPACITY - MW	140	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	BABCOCK & WILCOX	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	384.14	(814030 ACFM)
BOILER FLUE GAS TEMPERATURE - C	132.2	(270 F)
STACK HEIGHT - M	122.	(400 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	4.9	(16.0 FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	BITUMINOUS	
AVERAGE HEAT CONTENT - J/G	26749.	(11500 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		******
AVERAGE ASH CONTENT - %	13.50	
RANGE ASH CONTENT - %	******	
AVERAGE MOISTURE CONTENT - %	********	
RANGE MOISTURE CONTENT - %	6.5-7.0	
AVERAGE SULFUR CONTENT - %	1.70	
RANGE SULFUR CONTENT - %	1.0-1.2	
AVERAGE CHLORIDE CONTENT - %	********	
RANGE CHLORIDE CONTENT - %	******	
*** PARTICLE CONTROL		
** ESP		
NUMBER	1	
TYPE	COLD SIDE	
SUPPLIER	RESEARCH-COTTRELL	
INLET FLUE GAS CAPACITY - CU.M/S	384.1	(814030 ACFM)
INLET FLUE GAS TEMPERATURE - C	132.2	(270 F)
** PARTICLE SCRUBBER		
NUMBER	1	
GENERIC TYPE	VENTURI TOWER	
SPECIFIC TYPE	VARIABLE-THROAT/SIDE-MOVABLE BLOCKS	
SUPPLIER	BABCOCK & WILCOX	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	AISI 1110	
LINER GENERIC MATERIAL	ORGANIC	
LINER SPECIFIC MATERIAL	RUBBER	
GAS CONTACTING DEVICE TYPE	SPRAY NOZZLES (316 SS)	
L/G RATIO - LITER/CU.M	1.9	(14.4 GAL/1000ACF)
PRESSURE DROP - KPA	.7	(3.0 IN-H2O)
SUPERFICIAL GAS VELOCITY - M/S	27.4	(90.0 FT/S)
INLET GAS FLOW RATE - CU.M/S	192.1	(407015 ACFM)
INLET GAS TEMPERATURE - C	132.2	(270 F)
*** FGD SYSTEM		
** GENERAL DATA		
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT	
SO2 REMOVAL MODE	WET SCRUBBING	

SOUTH CAROLINA PUBLIC SERVICE: WINYAH 2 (CONT.)

PROCESS TYPE	LIMESTONE	
PROCESS ADDITIVES	NONE	
SYSTEM SUPPLIER	BABCOCK & WILCOX	
A-E FIRM	BURNS & ROE	
DEVELOPMENT LEVEL	FULL SCALE	
NEW/RETROFIT	NEW	
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.40	
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	45.00	
CURRENT STATUS	1	
INITIAL START-UP	7/77	

** DESIGN AND OPERATING PARAMETERS

** ABSORBER

NUMBER	2	
GENERIC TYPE	TRAY TOWER	
SPECIFIC TYPE	SIEVE TRAY	
SUPPLIER	BABCOCK & WILCOX	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	AISI 1110	
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A	
LINER GENERIC MATERIAL	ORGANIC	
LINER MATERIAL TRADE NAME/COMMON TYPE	RUBBER	
GAS CONTACTING DEVICE TYPE	SIEVE TRAY	
L/G RATIO - L/CU.M	6.3	(47.5 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	1.1	(4.5 IN-H2O)
SUPERFICAL GAS VELOCITY - M/SEC	3.2	(10.5 FT/S)
INLET GAS FLOW - CU. M/S	159.50	(338000 ACFM)
INLET GAS TEMPERATURE - C	52.2	(126 F)
SO2 REMOVAL EFFICIENCY - %	90.0	

** MIST ELIMINATOR

PRE-MIST ELIMINATOR/MIST ELIMINATOR	MIST ELIMINATOR	
NUMBER PER SYSTEM	1	
GENERIC TYPE	IMPINGEMENT	
SPECIFIC TYPE	BAFFLE	
TRADE NAME/COMMON TYPE	CHEVRON VANE	
CONFIGURATION	HORIZONTAL	
NUMBER OF STAGES	1	
NUMBER OF PASSES PER STAGE	3	
PRESSURE DROP - KPA	.2	(1.0 IN-H2O)
CONSTRUCTION MATERIAL GENERIC TYPE	DURAKANE	
WASH WATER SOURCE	SYSTEM RECYCLE WATER AND FRESH WATER	

** REHEATER

GENERIC TYPE	BYPASS	
SPECIFIC TYPE	COLD SIDE	
TRADE NAME/COMMON TYPE	N/A	
PERCENT GAS BYPASSED - AVG	50.0	

** FANS

NUMBER	1	
SUPPLIER	STURTEVANT DIV., WESTINGHOUSE	
FUNCTION	BOOSTER	
APPLICATION	FORCED DRAFT	
FLUE GAS FLOW RATE - CU.M/S	192.06	(407000 ACFM)
FLUE GAS TEMPERATURE - C	132.2	(270 F)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	

** DUCTWORK

LOCATION	SCRUBBER INLET	
SHELL GENERIC MATERIAL TYPE	COR-TEN STEEL	
LINER GENERIC MATERIAL TYPE	NONE	

** DUCTWORK

LOCATION	OUTLET DAMPER	
SHELL GENERIC MATERIAL TYPE	COR-TEN STEEL	
LINER GENERIC MATERIAL TYPE	CEILCOTE FLAKEGLASS	

SOUTH CAROLINA PUBLIC SERVICE: WINYAH 2 (CONT.)

** DUCTWORK

LOCATION	DAMPER TO STACK
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
LINER GENERIC MATERIAL TYPE	PLASITE (40-60 MILS) AND KAOCRETE

** REAGENT PREPARATION EQUIPMENT

FUNCTION	LIMESTONE GRINDING
DEVICE	BALL MILL
NUMBER	1

** PUMPS

SERVICE	NUMBER
VENTURI RECIRCULATION	1
ABSORBER RECIRCULATION	1

** SOLIDS CONCENTRATING/DEWATERING

DEVICE	THICKENER
NUMBER	1
DIMENSIONS - FT	50 DIA
OUTLET STREAM CHARACTERISTICS	35% SOLIDS

*** SLUDGE

** DISPOSAL

NATURE	FINAL
TYPE	POND
LOCATION	ON SITE
SITE TRANSPORTATION METHOD	PUMPED

** WATER BALANCE

WATER LOOP TYPE	OPEN
MAKEUP WATER ADDITION - LITERS/S	6.3 (100 GPM)

** FGD SPARE CAPACITY INDICES

ABSORBER - %	.0

** FGD SPARE COMPONENT INDICES

ABSORBER	.0

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
7/77	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

INITIAL OPERATION OF THE WINYAH 2 FGD SYSTEM TOOK PLACE IN JULY.

8/77	SYSTEM	90.0						744			
9/77	SYSTEM	90.0						720			

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS REPORTEDLY AVAILABLE 90% OF THE AUGUST-SEPTEMBER PERIOD. SOME MINOR PROBLEMS HAVE BEEN EXPERIENCED WITH THE SO2 AND NO2 MONITORS.

10/77	SYSTEM	100.0						744			
11/77	SYSTEM	100.0						720			

SOUTH CAROLINA PUBLIC SERVICE: WINYAH 2 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTO
		PERFORMANCE DATA									
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING THE OCTOBER-NOVEMBER PERIOD THE FGD SYSTEM WAS AVAILABLE 100% OF THE TIME. FREQUENT PLUGGING OF SAMPLE LINES HAS BEEN CAUSING RECURRING INSTRUMENTATION PROBLEMS.									
12/77	SYSTEM							744			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		AN ACCEPTANCE TEST WAS RUN IN DECEMBER; HOWEVER, THE RESULTS WERE REJECTED DUE TO IMPROPER SAMPLE COLLECTION AND STORAGE TECHNIQUES.									
1/78	SYSTEM							744			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		IN EARLY JANUARY THE SYSTEM WENT DOWN TO FOR TWO DAYS TO CHECK THE INSTRUMENTATION.									
		THE SO2 MONITORS HAVE AGAIN MALFUNCTIONED.									
		ALL THE SAMPLE LINES HAVE BEEN REPLACED AND NEW HEAT TRACINGS HAVE BEEN INSTALLED AROUND THEM.									
2/78	SYSTEM							672			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE FGD SYSTEM WAS BYPASSED FOR SERVERAL DAYS IN FEBRUARY TO ALLOW SYSTEM CLEANING IN PREPARATION FOR TESTING BY BABCOCK AND WILCOX.									
3/78	SYSTEM							744			
4/78	SYSTEM							720			
5/78	SYSTEM							744			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		SOME MINOR SCALING WAS ENCOUNTERED DURING THE APRIL-MAY PERIOD BUT IT DID NOT CAUSE AN OUTAGE.									
6/78	SYSTEM		100.0		94.3			720	679	679	
7/78	SYSTEM		100.0		97.0			744	722	722	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		ONE SCHEDULED BOILER OUTAGE OCCURRED IN JUNE FOR THE INSTALLATION OF A TEST PANEL. IN JULY, TWO BOILER OUTAGES OCCURRED. NO FORCED FGD OUTAGES WERE REPORTED.									
8/78	SYSTEM							744			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UTILITY REPORTED NO FORCED FGD OUTAGES DURING AUGUST.									
9/78	SYSTEM							720			

SOUTH CAROLINA PUBLIC SERVICE: WINYAH 2 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
		PERFORMANCE DATA									
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE SO2 ANALYZERS PERFORMED WELL DURING A TWO WEEK CERTIFICATION TEST THAT TOOK PLACE IN SEPTEMBER.									
10/78	SYSTEM				.0			744	0	0	.0
11/78	SYSTEM							720			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UNIT WAS DOWN FROM OCTOBER 1 TO NOVEMBER 15 FOR A TURBINE INSPECTION. DURING THIS TIME THE FGD SYSTEM WAS CLEANED AND INSPECTED.									
12/78	SYSTEM	84.8	82.6	82.6	82.1			744	740	611	89.3
	** PROBLEMS/SOLUTIONS/COMMENTS										
		SO2 MONITOR PROBLEMS CONTINUED THROUGH DECEMBER.									
		AN OUTAGE WAS NECESSARY FOR AN ABSORBER PUMP BELT RENEWAL.									
		FEED SLURRY FLOWMETER PROBLEMS WERE ENCOUNTERED DURING DECEMBER.									
		THE LIMESTONE MILL OIL PUMP PROBLEMS TRIPPED THE MILL OFF LINE A NUMBER OF TIMES IN DECEMBER.									
		A MINOR OUTAGE WAS CAUSED BY PLUGGING OF THE SLURRY DELIVERY LINE.									
		QUENCHER PROBLEMS OCCURRED DURING DECEMBER.									
1/79	SYSTEM	99.7	99.7	99.7	99.7			744	744	742	89.3
2/79	SYSTEM	96.6	96.3	96.4	92.7			672	647	623	75.4
3/79	SYSTEM	96.5	96.4	96.4	92.7			744	716	690	75.3
	** PROBLEMS/SOLUTIONS/COMMENTS										
		AN OUTAGE WAS REQUIRED TO RENEW QUENCHER PUMP BELTS AND FOR REPAIRS TO A QUENCHER SUCTION VALVE.									
		OUTAGES WERE REQUIRED TO REPAIR A HOLE IN THE FEED SLURRY LINE, TO INSPECT THE MODULE FOR PLUGGING, AND BECAUSE OF A BOOSTER FAN TRIP.									
		THE OPERATING VALUES SHOWN ARE THE FIGURES FOR FEBRUARY AND MARCH COMBINED.									
4/79	SYSTEM	99.4	99.4	99.4	99.4			720	720	716	67.6
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UTILITY REPORTED THAT THE SO2 MONITOR HAS PASSED THE STATE CERTIFICATION TEST BUT REQUIRES CONTINUING MAINTENANCE TO KEEP IT OPERATING.									
		A MALFUNCTION OF THE RECIRCULATION TANK LEVEL INDICATOR RESULTED IN A LOW LIQUID LEVEL WHICH FORCED THE SCRUBBER OUT OF SERVICE.									
5/79	SYSTEM	98.4	98.7	100.0	95.6			744	721	711	75.1

SOUTH CAROLINA PUBLIC SERVICE: WINYAH 2 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
		PERFORMANCE DATA									
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UTILITY REPORTED THAT THE SO2 MONITOR SAMPLE PUMP REQUIRES MAINTENANCE ALMOST EVERY 24 HOURS.									
		A BOILER OUTAGE ALLOWED TIME FOR CLEANING ABSORBER TRAYS, UNPLUGGING FOUR NOZZLES, CLEANING THE SUMP BOTTOM, AND REPAIRING A SPRAY WASH VALVE.									
6/79	SYSTEM	92.4	92.3	92.1	91.6	80.00		720	716	660	79.8
	** PROBLEMS/SOLUTIONS/COMMENTS										
		FOUR OUTAGES IN JUNE WERE DUE TO PLUGGED ABSORBER NOZZLES. THE PRIMARY CAUSE APPEARED TO BE THAT A SCREEN IN THE ABSORBER SIDE OF THE SUMP BOTTOM WAS LEFT OUT DURING THE PREVIOUS OUTAGE.									
		A HEAVY SCALE BUILD-UP IN THE SUMP BELOW THE VENTURI WAS NOTED.									
		THE UTILITY REPORTED THAT MGO TESTING HAS BEGUN.									
7/79	SYSTEM	98.4	98.4	98.4	97.8	84.00		744	740	727	81.5
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE ABSORBER WAS FORCED OFF-LINE ONCE DURING JULY DUE TO QUENCHER PUMP PACKING PROBLEMS.									
		SOME PLUGGING WAS ENCOUNTERED WITH ONE OF THE ABSORBER NOZZLES.									
		SOME OUTAGE TIME WAS NEEDED TO INSTALL A QUENCHER WALL WASH NOZZLE.									
		TESTS WITH THE ADDITION OF MGO DURING THE MONTH SHOWED IMPROVED SO2 REMOVAL EFFICIENCIES OF APPROXIMATELY 10%, ALTHOUGH LOW SO2 INLET READINGS PREVENTED CONCLUSIVE TEST RESULTS.									
8/79	SYSTEM	99.4	99.0	99.4	98.1	80.00		744	737	730	88.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		A FOUR HOUR OUTAGE RESULTED FROM BOOSTER FAN CONTROL PROBLEMS.									
		A NEW PORT FOR THE SCRUBBER OUTLET GAS SAMPLE PROBE HAD TO BE INSTALLED. THIS REQUIRED ONE HOUR OF SCHEDULED DOWN TIME.									
9/79	SYSTEM							720			
10/79	SYSTEM							744			
11/79	SYSTEM							720			
12/79	SYSTEM							744			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		NO INFORMATION WAS AVAILABLE FOR THIS REPORT PERIOD.									
1/80	SYSTEM							744			
2/80	SYSTEM							696			
3/80	SYSTEM							744			

SOUTH CAROLINA PUBLIC SERVICE: WINYAH 2 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING THE FIRST QUARTER OF 1980 NO MAJOR FGD RELATED PROBLEMS WERE REPORTED.									
4/80	SYSTEM	100.0	100.0	100.0	85.3			720	614	614	60.2
5/80	SYSTEM	95.8	94.9	94.9	77.7			744	609	578	61.9
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE FGD SYSTEM WAS OFF LINE THROUGH PART OF MAY TO WASH DOWN THE ABSORBER MODULES.									
6/80	SYSTEM	100.0	100.0	100.0	99.6			720	718	718	76.6
	** PROBLEMS/SOLUTIONS/COMMENTS										
		NUMEROUS LEAKS IN THE FGD SYSTEM WERE REPAIRED THROUGHOUT THE PERIOD WHILE THE BOILER AND SCRUBBER WERE IN SERVICE. NO MAJOR OPERATIONAL PROBLEMS WERE REPORTED FOR APRIL, MAY, OR JUNE.									
7/80	SYSTEM	100.0	100.0	100.0	100.0			744	744	744	75.3
	** PROBLEMS/SOLUTIONS/COMMENTS										
		NO OPERATIONAL PROBLEMS WERE REPORTED DURING JULY.									
8/80	SYSTEM	99.7	99.7	99.7	88.3			744	659	657	74.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE GRIT SEPARATOR PLUGGED CAUSING A TWO HOUR OUTAGE. THE FGD SYSTEM WAS AVAILABLE THROUGH ALL OF AUGUST EXCEPT FOR THIS SHORT OUTAGE.									
9/80	SYSTEM	96.5	100.0	100.0	87.2			720	629	629	73.4
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE BOILER AND FGD SYSTEM WENT DOWN FOR A SCHEDULED MAINTENANCE OVERHAUL ON SEPTEMBER 30, 1980. WORK SCHEDULED TO BE DONE INCLUDED INSTALLING A SECOND TRAY IN THE ABSORBER MODULE, RENEWING DEMISTER WASH SYSTEM WITH ALLOY 20 PIPING, AND CLEANING SCALE DEPOSITS FROM QUENCHER THROAT.									

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	SOUTH CAROLINA PUBLIC SERVICE	
PLANT NAME	WINYAH	
UNIT NUMBER	3	
CITY	GEORGETOWN	
STATE	SOUTH CAROLINA	
REGULATORY CLASSIFICATION	B	
PARTICULATE EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	*****	
GROSS UNIT GENERATING CAPACITY - MW	280	
NET UNIT GENERATING CAPACITY W/FGD - MW	252	
NET UNIT GENERATING CAPACITY WO/FGD - MW	258	
EQUIVALENT SCRUBBED CAPACITY - MW	280	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	RILEY STOKER	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	********	(******* ACFM)
BOILER FLUE GAS TEMPERATURE - C	*******	(**** F)
STACK HEIGHT - M	******	(**** FT)
STACK SHELL	******	
STACK TOP DIAMETER - M	*******	(***** FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	******	
AVERAGE HEAT CONTENT - J/G	26749.	(11500 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		******
AVERAGE ASH CONTENT - %	********	
RANGE ASH CONTENT - %	******	
AVERAGE MOISTURE CONTENT - %	********	
RANGE MOISTURE CONTENT - %	******	
AVERAGE SULFUR CONTENT - %	1.70	
RANGE SULFUR CONTENT - %	******	
AVERAGE CHLORIDE CONTENT - %	********	
RANGE CHLORIDE CONTENT - %	******	
*** PARTICLE CONTROL		
** ESP		
NUMBER	1	
SUPPLIER	RESEARCH-COTTRELL	
** PARTICLE SCRUBBER		
GENERIC TYPE	NONE	
SPECIFIC TYPE	N/A	
*** FGD SYSTEM		
** GENERAL DATA		
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT	
SO2 REMOVAL MODE	WET SCRUBBING	
PROCESS TYPE	LIMESTONE	
SYSTEM SUPPLIER	BABCOCK & WILCOX	
A-E FIRM	BURNS & ROE	
DEVELOPMENT LEVEL	FULL SCALE	
NEW/RETROFIT	NEW	
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	90.00	
CURRENT STATUS	1	
COMMERCIAL START-UP	6/80	
INITIAL START-UP	5/80	
** DESIGN AND OPERATING PARAMETERS		
** ABSORBER		
NUMBER	2	
GENERIC TYPE	SPRAY TOWER	

SOUTH CAROLINA PUBLIC SERVICE: WINYAH 3 (CONT.)

SPECIFIC TYPE	OPEN COUNTERCURRENT SPRAY
SUPPLIER	BABCOCK & WILCOX
SO2 REMOVAL EFFICIENCY - %	90.0

** MIST ELIMINATOR

PRE-MIST ELIMINATOR/MIST ELIMINATOR	MIST ELIMINATOR
GENERIC TYPE	IMPINGEMENT
SPECIFIC TYPE	BAFFLE
TRADE NAME/COMMON TYPE	CHEVRON VANE

** REHEATER

GENERIC TYPE	INDIRECT HOT AIR
SPECIFIC TYPE	EXTERNAL HEAT EXCHANGER
TRADE NAME/COMMON TYPE	STEAM TUBE BUNDLES

** WATER BALANCE

WATER LOOP TYPE	CLOSED

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
6/80	SYSTEM	60.0	60.0	60.0	46.6			720	559	336	59.5

** PROBLEMS/SOLUTIONS/COMMENTS

INITIAL FGD OPERATIONS BEGAN JUNE 3, 1980.

THE INLET DAMPER LOCKED UP FORCING THE FGD SYSTEM OUT OF SERVICE FOR PART OF JUNE.

THERE HAVE BEEN CONTINUING PROBLEMS WITH THE THICKENER SUMP RESULTING FROM IT'S LOCATION. THESE PROBLEMS FORCED THE FGD SYSTEM OUT OF SERVICE FOR APPROXIMATELY 7 DAYS.

7/80	A	12.8	12.8	12.8	12.8						
	B	12.8	12.8	12.8	12.8						
	SYSTEM	12.8	12.8	12.8	12.8			744	744	95	79.8

** PROBLEMS/SOLUTIONS/COMMENTS

THE THICKNER RAKE DRIVE MECHANISM WAS REPAIRED DURING JULY.

THE LARGE BELT DRIVEN PUMP HAS BEGUN TO SHOW SIGNS OF RAPID WEAR.

THE FGD SYSTEM WAS OUT OF SERVICE BECAUSE OF COMPUTER LOGIC PROBLEMS CAUSED BY A BAD CABLE.

THE THICKNER SUMP PUMP AND MIXER MOTORS WERE FLOODED OUT CAUSING THE FGD SYSTEM TO GO DOWN.

8/80	A	18.0	20.4	20.4	18.0						
	B	18.0	20.4	20.4	18.0						
	SYSTEM	18.0	20.4	20.4	18.0			744	658	134	79.4

** PROBLEMS/SOLUTIONS/COMMENTS

THE THICKNER SUMP PUMP AND MIXER MOTORS CONTINUED TO HAVE PROBLEMS BECAUSE OF THE FLOODING LAST MONTH.

THE SCRUBBER OUTLET DAMPER WOULD NOT CLOSE PROPERLY WHICH REQUIRED WORK DURING AUGUST.

THE ABSORBER TRAY STRAP WAS BROKEN IN SEVERAL AREAS AND REQUIRED REPAIR WORK DURING THE MONTH.

9/80	A	.0	.0	.0	.0						

SOUTH CAROLINA PUBLIC SERVICE: WINYAH 3 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACT(
	B	.0	.0	.0	.0						
	SYSTEM	.0	.0	.0	.0			720	647	0	84.(

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS OUT OF SERVICE THROUGH ALL OF SEPTEMBER BECAUSE OF REPAIRS BEING MADE ON THE THICKNER.

10/80	SYSTEM	13.9	94.0	93.4	13.9			744	111	103	10.(

** PROBLEMS/SOLUTIONS/COMMENTS

DURING OCTOBER THE INSTALLATION OF THE ADDITIONAL ABSORBER TRAY AND THE NEW MIST ELIMINATOR WASH SYSTEM WERE COMPLETED.

DURING THE SCHEDULED OVERHAUL THE MODULE WAS INSPECTED AND THE RUBBER LINING WAS TESTED.

THE MODULE WAS REMOVED FROM SERVICE TO REPACK THE QUENCHER PUMP AND TO INSPECT THE BELTS.

11/80	SYSTEM	100.0	100.0	100.0	100.0			720	720	720	86.5
12/80	SYSTEM	98.9	98.9	98.9	98.9			744	744	736	95.7

** PROBLEMS/SOLUTIONS/COMMENTS

DURING DECEMBER THE SYSTEM WAS REMOVED FROM SERVICE DUE TO A LIMESTONE FEEDER FAILURE.

OUTAGE TIME DURING THE MONTH WAS ALSO CAUSED BY THE NECESSARY REPAIR OF THE SEAL WATER LINE TO THE HOLDING TANK PUMPS.

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	SOUTH MISSISSIPPI ELEC PWR	
PLANT NAME	R.D. MORROW, SR.	
UNIT NUMBER	1	
CITY	HATTISBURG	
STATE	MISSISSIPPI	
REGULATORY CLASSIFICATION	B	
PARTICULATE EMISSION LIMITATION - NG/J	43.	(.100 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	516.	(1.200 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	400	
GROSS UNIT GENERATING CAPACITY - MW	200	
NET UNIT GENERATING CAPACITY W/FGD - MW	180	
NET UNIT GENERATING CAPACITY WO/FGD - MW	191	
EQUIVALENT SCRUBBED CAPACITY - MW	124	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	RILEY STOKER	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	303.29	(642700 ACFM)
BOILER FLUE GAS TEMPERATURE - C	132.2	(270 F)
STACK HEIGHT - M	124.	(408 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	3.3	(10.7 FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	BITUMINOUS	
AVERAGE HEAT CONTENT - J/G	27912.	(12000 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		11000-11500
AVERAGE ASH CONTENT - %	15.00	
RANGE ASH CONTENT - %	14-17	
AVERAGE MOISTURE CONTENT - %	6.50	
RANGE MOISTURE CONTENT - %	6 - 7	
AVERAGE SULFUR CONTENT - %	1.30	
RANGE SULFUR CONTENT - %	1 - 1.75	
AVERAGE CHLORIDE CONTENT - %	.01	
RANGE CHLORIDE CONTENT - %	******	
*** PARTICLE CONTROL		
** ESP		
NUMBER	1	
TYPE	HOT SIDE	
SUPPLIER	BUELL DIVISION, ENVIROTECH	
INLET FLUE GAS CAPACITY - CU.M/S	579.5	(1228000 ACFM)
INLET FLUE GAS TEMPERATURE - C	426.7	(800 F)
PRESSURE DROP - KPA	.1	(0. IN-H2O)
PARTICLE REMOVAL EFFICENCY - %	99.6	
** PARTICLE SCRUBBER		
GENERIC TYPE	NONE	
SPECIFIC TYPE	N/A	
*** FGD SYSTEM		
** GENERAL DATA		
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT	
SO2 REMOVAL MODE	WET SCRUBBING	
PROCESS TYPE	LIMESTONE	
PROCESS ADDITIVES	NONE	
SYSTEM SUPPLIER	ENVIRONEERING, RILEY STOKER	
A-E FIRM	BURNS & MCDONNELL	
DEVELOPMENT LEVEL	FULL SCALE	
NEW/RETROFIT	NEW	
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.60	
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	52.70	
CURRENT STATUS	1	
COMMERCIAL START-UP	8/78	

SOUTH MISSISSIPPI ELEC PWR: R.D. MORROW, SR. 1 (CONT.)

INITIAL START-UP	8/78	
CONTRACT AWARDED	5/75	

** DESIGN AND OPERATING PARAMETERS

** ABSORBER

NUMBER	1	
GENERIC TYPE	PACKED TOWER	
SPECIFIC TYPE	ROD DECK	
TRADE NAME/COMMON TYPE	VENTRI-SORBER	
SUPPLIER	ENVIRONEERING, RILEY STOKER	
DIMENSIONS - FT	90 X 40 X 10	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	AISI 1110	
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A	
LINER GENERIC MATERIAL	ORGANIC	
LINER SPECIFIC MATERIAL	SYNTHETIC RUBBER	
LINER MATERIAL TRADE NAME/COMMON TYPE	CHLOROBUTYL	
GAS CONTACTING DEVICE TYPE	7 LAYERS OF SS RODS	
NUMBER OF CONTACTING ZONES	7	
LIQUID RECIRCULATION RATE - LITER/S	1260.	(20000 GPM)
L/G RATIO - L/CU.M	6.6	(49.0 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	2.0	(8.0 IN-H2O)
INLET GAS FLOW - CU. M/S	192.03	(406940 ACFM)
INLET GAS TEMPERATURE - C	132.2	(270 F)
SO2 REMOVAL EFFICIENCY - %	85.0	
PARTICLE REMOVAL EFFICENCY - %	.0	

** MIST ELIMINATOR

PRE-MIST ELIMINATOR/MIST ELIMINATOR	MIST ELIMINATOR	
NUMBER PER SYSTEM	1	
GENERIC TYPE	IMPINGEMENT	
SPECIFIC TYPE	BAFFLE	
TRADE NAME/COMMON TYPE	CHEVRON VANE	
CONFIGURATION	VERTICAL	
NUMBER OF STAGES	3	
NUMBER OF PASSES PER STAGE	1	
CONSTRUCTION MATERIAL GENERIC TYPE	FIBERGLASS REINFORCED PLASTIC	
WASH WATER SOURCE	SUPERNATANT/FRESH MAKEUP	

** REHEATER

GENERIC TYPE	BYPASS	
SPECIFIC TYPE	FLUE GAS	
TRADE NAME/COMMON TYPE	COLD SIDE	
PERCENT GAS BYPASSED - AVG	38.0	
INLET FLUE GAS FLOW RATE - CU. M/S	115.24	(244200 ACFM)
INLET FLUE GAS TEMPERATURE - C	148.9	(300 F)
CONSTRUCTION MATERIAL GENERIC TYPE	MILD STEEL/HASTELLOY G CLADDING	

** FANS

NUMBER	2	
NUMBER OF SPARES	0	
SUPPLIER	GREEN FAN	
FUNCTION	BALANCED DRAFT	
APPLICATION	BOILER I.D.	
SERVICE	DRY	
FLUE GAS FLOW RATE - CU.M/S	201.03	(426000 ACFM)
FLUE GAS TEMPERATURE - C	148.9	(300 F)
CONSTRUCTION MATERIAL GENERIC TYPE	MILD STEEL	

** DUCTWORK

LOCATION	SCRUBBER INLET	
SHELL GENERIC MATERIAL TYPE	CARBON STEEL	
LINER GENERIC MATERIAL TYPE	HASTELLOY G	

** DUCTWORK

LOCATION	SCRUBBER OUTLET TO STACK	
SHELL GENERIC MATERIAL TYPE	CARBON STEEL	
LINER GENERIC MATERIAL TYPE	HASTELLOY G CLADDING	

SOUTH MISSISSIPPI ELEC PWR: R.D. MORROW, SR. 1 (CONT.)

** REAGENT PREPARATION EQUIPMENT

FUNCTION	LIMESTONE GRINDING
DEVICE	BALL MILL
MANUFACTURER	KENNEDY VAN SAUN
NUMBER	1
FULL LOAD DRY FEED CAPACITY - M.TONS/HR	.9 (1 TPH)
PRODUCT QUALITY - % SOLIDS	5.0

** TANKS

SERVICE	NUMBER
LIMESTONE SLURRY	1
RECYCLE	1

** PUMPS

SERVICE	NUMBER
ABSORBER RECIRCULATION	3

** SOLIDS CONCENTRATING/DEWATERING

DEVICE	VACUUM FILTER
NUMBER	1
NUMBER OF SPARES	0
FEED STREAM CHARACTERISTICS	25% SOLIDS
OUTLET STREAM CHARACTERISTICS	60% SOLIDS

** SOLIDS CONCENTRATING/DEWATERING

DEVICE	THICKENER
NUMBER	1
NUMBER OF SPARES	0
DIMENSIONS - FT	40 (DIA) X 11 (DEPTH)
SHELL GENERIC MATERIAL TYPE	MILD STEEL
FEED STREAM CHARACTERISTICS	10% SOLIDS
OUTLET STREAM CHARACTERISTICS	25% SOLIDS

*** SLUDGE

** TREATMENT

METHOD	FLYASH STABILIZATION
INLET QUALITY - %	80.0

** DISPOSAL

NATURE	FINAL
TYPE	LANDFILL
LOCATION	OFF SITE
SITE TRANSPORTATION METHOD	TRUCK/CONVEYOR
SITE DIMENSIONS	600 X 850
SITE CAPACITY - CU.M	403590 (330.0 ACRE-FT)

** PROCESS CONTROL AND INSTRUMENTATION

CHEMICAL PARAMETERS	PH, SO2
CONTROL LEVELS	5.7-5.9
MONITOR LOCATION	RECYCLE TANK/INLET DUCT
PROCESS CONTROL MANNER	AUTOMATIC
PROCESS CHEMISTRY MODE	FEEDBACK/FEED FORWARD

** WATER BALANCE

WATER LOOP TYPE	CLOSED

** FGD SPARE CAPACITY INDICES

ABSORBER - %	.0

** FGD SPARE COMPONENT INDICES

ABSORBER	.0

SOUTH MISSISSIPPI ELEC PWR: R.D. MORROW, SR. 1 (CONT.)

PERIOD	MODULE	PERFORMANCE DATA: AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP FACT
8/78	SYSTEM							744			
9/78	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

A FORCED BOILER OUTAGE OCCURRED DURING THE PERIOD AS A RESULT OF BOILER TUBE LEAKS. THE UNIT IS EXPECTED TO START UP AGAIN IN EARLY NOVEMBER.

10/78	SYSTEM				.0			744	0	0	.(
11/78	SYSTEM				.0			720	0	0	.(

** PROBLEMS/SOLUTIONS/COMMENTS

OPERATION OF THE UNIT WAS INTERMITTENT DUE TO CONTINUING BOILER TUBE PROBLEMS. THE BOILER WAS SHUT DOWN NOVEMBER 1 AS A RESULT OF BOILER TUBE PROBLEMS. RESUMPTION OF OPERATION IS SCHEDULED FOR MARCH 1979.

THE FGD SYSTEM WAS BYPASSED ENTIRELY IN OCTOBER DUE TO SERIOUS CONTROL VALVE PLUGGING.

12/78	SYSTEM				.0			744	0	0	.0
1/79	SYSTEM				.0			744	0	0	.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT HAS NOT YET BEEN RESTARTED SINCE THE NOVEMBER SHUTDOWN.

2/79	SYSTEM				.0			672	0	0	.0
3/79	SYSTEM				.0			744	0	0	.0
4/79	SYSTEM							720	631		

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER RETURNED TO SERVICE ON APRIL 1 AFTER COMPLETION OF REPAIRS TO THE BOILER TUBES.

NO FGD SYSTEM RELATED PROBLEMS WERE REPORTED BY THE UTILITY FOR APRIL.

5/79	SYSTEM							744			
6/79	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE SYSTEM OPERATED MOST OF MAY AND JUNE WITH NO MAJOR PROBLEMS.

7/79	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE FIRST WEEK OF JULY THE UNIT WAS REMOVED FROM SERVICE DUE TO SEVERE PROBLEMS WITH THE FGD SYSTEM. THE UTILITY NOTED THAT ABOUT HALF OF THE MODULE HEADERS WERE PLUGGED, HOLES WERE NOTED IN THE MODULE SHELL, THE UPPER ROD BANK CORRODED AWAY FROM THE SHELL, AND EXTENSIVE PLUGGING OF THE MIST ELIMINATOR OCCURRED. LINER FAILURE AT THE OUTLET DUCTWORK WAS ALSO EXPERIENCED. THE UTILITY PLANS TO REPLACE THE DUCTWORK WITH HASTALLOY. THE FGD SYSTEM IS EXPECTED TO BE OFF LINE FOR SEVERAL MONTHS

SOUTH MISSISSIPPI ELEC PWR: R.D. MORROW, SR. 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
				PERFORMANCE DATA							
			FOR REPAIRS TO BE COMPLETED.								
8/79	SYSTEM	.0			.0			744	0	0	.0
9/79	SYSTEM	.0			.0			720	0	0	.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
			THE UNIT REMAINED OFF LINE DURING THE MONTHS OF AUGUST AND SEPTEMBER AS MAINTENANCE AND REPAIR WORK CONTINUED.								
10/79	SYSTEM	.0	.0	.0	.0	.00	91.00	744	282	0	23.0
11/79	SYSTEM	.0	.0	.0	.0			720		0	
12/79	SYSTEM	.0	.0	.0	.0			744		0	
	** PROBLEMS/SOLUTIONS/COMMENTS										
			THE SCRUBBER HAS REMAINED OFF LINE THROUGH THE REPORT PERIOD DUE TO THE LINING FAILURE. RELINING SHOULD BE COMPLETED AND THE UNIT ON LINE IN MARCH.								
1/80	SYSTEM	.0		.0	.0			740	0	0	.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
			THE UNIT REMAINED OFF LINE DURING JANUARY AS RELINING OF THE SCRUBBERS WAS COMING TO COMPLETION.								
			THE PRESATURATOR AREAS, BYPASS DUCTS, AND THE SECTIONS OF DUCT FROM ABSORBER EXITS AT POINTS WHERE BYPASSED GAS MIXES WITH WET GAS ALL THE WAY TO THE STACK ARE BEING LINED WITH HASTELLOY G (A 1/8 INCH LINING IS BEING WELDED TO THE EXISTING CARBON STEEL). THE MAIN BODY OF THE ABSORBER MODULES IMMEDIATELY ABOVE THE PRESATURATOR SECTIONS ALL THE WAY TO THE ABSORBER EXIT IS BEING LINED WITH CHLOROBUTYL RUBBER (ON THE EXISTING CARBON STEEL).								
2/80	SYSTEM	.0		.0	.0			696	0	0	.0
3/80	SYSTEM	41.5	95.1	100.0	39.5			744	309	294	
	** PROBLEMS/SOLUTIONS/COMMENTS										
			DURING MARCH THE UNIT 1 FGD SYSTEM RETURNED TO SERVICE OPERATING 294 HOURS.								
4/80	SYSTEM	100.0	99.0	100.0	99.0	80.00		720	720	713	
	** PROBLEMS/SOLUTIONS/COMMENTS										
			THERE WERE NO OPERATIONAL PROBLEMS RELATED TO THE FGD SYSTEM DURING APRIL. FOUR INSPECTIONS WERE PERFORMED WHICH REQUIRED THE FGD SYSTEM TO BE OUT OF SERVICE FOR SEVEN HOURS.								
5/80	SYSTEM	99.7	99.8	100.0	88.7	80.00		744	660	658	
	** PROBLEMS/SOLUTIONS/COMMENTS										
			THE BOILER WAS SCHEDULED TO BE OUT OF SERVICE FOR 84 HOURS TO CLEAN THE AIR PREHEATERS. THE BOILER OPERATED THE REMAINING HOURS IN MAY.								
			THE FGD SYSTEM WAS SCHEDULED TO BE OUT OF SERVICE FOR 1.5 HOURS FOR ROUTINE MODULE INSPECTION. THE FGD SYSTEM WAS AVAILABLE 99.7% DURING MAY.								
6/80	SYSTEM	99.2	97.0	99.0	93.0	90.00		720	690	668	68.9

SOUTH MISSISSIPPI ELEC PWR: R.D. MORROW, SR. 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTO
		PERFORMANCE DATA									
7/80	SYSTEM	94.1	99.3	99.3	94.1	90.00		744	705	700	67.3
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING JUNE OPERATIONS CAME TO A HAULT FOR APPROXIMATELY SIX HOURS TO CLEA THE MIST ELIMINATORS. OTHER OUTAGE TIME DURING THE MONTH WAS CAUSED BY BOILER-RELATED PROBLEMS.									
7/80	SYSTEM	94.1	99.3	99.3	94.1	90.00		744	705	700	67.3
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING JULY THE SCRUBBER WAS INSPECTED FOR SCALE ACCUMULATION AND A TRIP TEST WAS CONDUCTED ON THE SCRUBBER CONTROLS TO CHECK ON EARLIER MODIFICATIONS.									
		THE MAJORITY OF OUTAGE TIME WAS CAUSED BY A MALFUNCTION OF THE BALL MILL. THIS RESULTED IN A LOSS OF LIMESTONE SUPPLY IN THE STORAGE TANK.									
		A LEAK IN THE FEED WATER LINE CAUSED ADDITIONAL OUTAGE TIME DURING THE MONTH.									
8/80	SYSTEM	100.0	100.0	100.0	100.0	80.00		744	744	744	77.7
	** PROBLEMS/SOLUTIONS/COMMENTS										
		NO PROBLEMS WERE ENCOUNTERED DURING THE MONTH OF AUGUST.									
9/80	SYSTEM	99.2	99.6	99.6	99.2			720	717	714	70.3
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING SEPTEMBER THE SCRUBBER WAS INSPECTED CAUSING TWO HOURS OF OUTAGE TIME.									
		A BRIEF FGD OUTAGE OF 12 MINUTES WAS CAUSED BY AN ELECTRICAL SHORT.									
		THE UNIT AND FGD SYSTEM WERE OUT OF SERVICE FOR APPROXIMATELY 3 1/2 HOURS DUE TO ESP PROBLEMS.									
10/80	SYSTEM	62.6	94.4	94.4	25.1			744	198	187	18.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING OCTOBER THE FGD SYSTEM WAS OFF LINE FOR 278 HOURS SO THAT GENERAL SYSTEM REPAIRS COULD BE MADE.									
		BOILER TUBE LEAKS CAUSED A BOILER OUTAGE OF 38 HOURS DURING THE MONTH.									
		ESP PROBLEMS ENCOUNTERED IN OCTOBER CAUSED APPROXIMATELY 241 HOURS OF OUTAGE TIME.									
11/80	SYSTEM	24.9	41.9	41.9	10.8			720	185	78	20.6
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING NOVEMBER THE FGD SYSTEM WAS SHUTDOWN FOR APPROXIMATELY 516 HOURS TO MAKE REPAIRS TO THE HASTELLOY G MATERIAL IN THE SCRUBBER.									
		A BOILER TUBE LEAK CAUSED ADDITIONAL OUTAGE TIME DURING THE MONTH.									
12/80	SYSTEM	99.9	99.4	99.4	64.0			744	479	476	49.8

SOUTH MISSISSIPPI ELEC PWR: R.D. MORROW, SR. 1 (CONT.)

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR

** PROBLEMS/SOLUTIONS/COMMENTS

DURING DECEMBER A FIRE IN THE BOILER CAUSED TWO BALL MILLS TO EXPLODE RESULTING IN APPROXIMATELY 267 HOURS OF OUTAGE TIME.

A DUCT VOLTAGE TEST WAS CONDUCTED DURING DECEMBER.

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	SOUTH MISSISSIPPI ELEC PWR	
PLANT NAME	R.D. MORROW, SR.	
UNIT NUMBER	2	
CITY	HATTISBURG	
STATE	MISSISSIPPI	
REGULATORY CLASSIFICATION	B	
PARTICULATE EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	40	
GROSS UNIT GENERATING CAPACITY - MW	200	
NET UNIT GENERATING CAPACITY W/FGD - MW	180	
NET UNIT GENERATING CAPACITY WO/FGD - MW	191	
EQUIVALENT SCRUBBED CAPACITY - MW	124	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	RILEY STOKER	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	303.29	(642700 ACFM)
BOILER FLUE GAS TEMPERATURE - C	132.2	(270 F)
STACK HEIGHT - M	124.	(408 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	3.3	(10.7 FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	BITUMINOUS	
AVERAGE HEAT CONTENT - J/G	27912.	(12000 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		11000-11500
AVERAGE ASH CONTENT - %	15.00	
RANGE ASH CONTENT - %	14-17	
AVERAGE MOISTURE CONTENT - %	6.50	
RANGE MOISTURE CONTENT - %	6 - 7	
AVERAGE SULFUR CONTENT - %	1.30	
RANGE SULFUR CONTENT - %	1 - 1.75	
AVERAGE CHLORIDE CONTENT - %	.01	
RANGE CHLORIDE CONTENT - %	******	
*** PARTICLE CONTROL		
** ESP		
NUMBER	1	
TYPE	HOT SIDE	
SUPPLIER	BUELL DIVISION, ENVIROTECH	
INLET FLUE GAS CAPACITY - CU.M/S	579.5	(1228000 ACFM)
INLET FLUE GAS TEMPERATURE - C	426.7	(800 F)
PRESSURE DROP - KPA	.1	(0. IN-H2O)
PARTICLE REMOVAL EFFICENCY - %	99.6	
** PARTICLE SCRUBBER		
GENERIC TYPE	NONE	
SPECIFIC TYPE	N/A	
*** FGD SYSTEM		
** GENERAL DATA		
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT	
SO2 REMOVAL MODE	WET SCRUBBING	
PROCESS TYPE	LIMESTONE	
PROCESS ADDITIVES	NONE	
SYSTEM SUPPLIER	ENVIRONEERING, RILEY STOKER	
A-E FIRM	BURNS & MCDONNELL	
DEVELOPMENT LEVEL	FULL SCALE	
NEW/RETROFIT	NEW	
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.60	
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	52.70	
CURRENT STATUS	1	
COMMERCIAL START-UP	6/79	

SOUTH MISSISSIPPI ELEC PWR: R.D. MORROW, SR. 2 (CONT.)

INITIAL START-UP	6/79
CONTRACT AWARDED	5/75

** DESIGN AND OPERATING PARAMETERS

** ABSORBER

NUMBER	1	
GENERIC TYPE	PACKED TOWER	
SPECIFIC TYPE	ROD DECK	
TRADE NAME/COMMON TYPE	VENTRI-SORBER	
SUPPLIER	ENVIRONEERING, RILEY STOKER	
DIMENSIONS - FT	10 X 40 X 10	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	AISI 1110	
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A	
LINER GENERIC MATERIAL	ORGANIC	
LINER SPECIFIC MATERIAL	SYNTHETIC RUBBER	
LINER MATERIAL TRADE NAME/COMMON TYPE	CHLOROBUTYL	
GAS CONTACTING DEVICE TYPE	7 LAYERS OF SS RODS	
NUMBER OF CONTACTING ZONES	7	
LIQUID RECIRCULATION RATE - LITER/S	1260.	(20000 GPM)
L/G RATIO - L/CU.M	6.6	(49.0 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	2.0	(8.0 IN-H2O)
INLET GAS FLOW - CU. M/S	192.03	(406940 ACFM)
INLET GAS TEMPERATURE - C	132.2	(270 F)
SO2 REMOVAL EFFICIENCY - %	85.0	
PARTICLE REMOVAL EFFICENCY - %	.0	

** MIST ELIMINATOR

PRE-MIST ELIMINATOR/MIST ELIMINATOR	MIST ELIMINATOR	
GENERIC TYPE	IMPINGEMENT	
SPECIFIC TYPE	BAFFLE	
TRADE NAME/COMMON TYPE	CHEVRON VANE	
CONFIGURATION	VERTICAL	
NUMBER OF STAGES	3	
NUMBER OF PASSES PER STAGE	1	
CONSTRUCTION MATERIAL GENERIC TYPE	FIBERGLASS REINFORCED PLASTIC	
WASH WATER SOURCE	SUPERNATANT/FRESH MAKEUP	

** REHEATER

GENERIC TYPE	BYPASS	
SPECIFIC TYPE	FLUE GAS	
TRADE NAME/COMMON TYPE	COLD SIDE	
PERCENT GAS BYPASSED - AVG	38.0	
INLET FLUE GAS FLOW RATE - CU. M/S	115.24	(244200 ACFM)
INLET FLUE GAS TEMPERATURE - C	148.9	(300 F)
CONSTRUCTION MATERIAL GENERIC TYPE	MILD STEEL/HASTELLOY G CLADDING	

** FANS

NUMBER	2	
NUMBER OF SPARES	0	
SUPPLIER	GREEN FAN	
FUNCTION	BALANCED DRAFT	
APPLICATION	BOILER I.D.	
SERVICE	DRY	
FLUE GAS FLOW RATE - CU.M/S	201.03	(426000 ACFM)
FLUE GAS TEMPERATURE - C	148.9	(300 F)
CONSTRUCTION MATERIAL GENERIC TYPE	MILD STEEL	

** DUCTWORK

LOCATION	SCRUBBER INLET
SHELL GENERIC MATERIAL TYPE	MILD STEEL
LINER GENERIC MATERIAL TYPE	HASTELLOY G

** REAGENT PREPARATION EQUIPMENT

FUNCTION	LIMESTONE GRINDING	
DEVICE	BALL MILL	
MANUFACTURER	KENNEDY VAN SAUN	
NUMBER	1	
FULL LOAD DRY FEED CAPACITY - M.TONS/HR	.9	(1 TPH)
PRODUCT QUALITY - % SOLIDS	5.0	

SOUTH MISSISSIPPI ELEC PWR: R.D. MORROW, SR. 2 (CONT.)

** TANKS

SERVICE	NUMBER
LIMESTONE SLURRY	1
RECYCLE	1

** PUMPS

SERVICE	NUMBER
ABSORBER RECIRCULATION	3

** SOLIDS CONCENTRATING/DEWATERING

DEVICE	VACUUM FILTER
NUMBER	1
NUMBER OF SPARES	0
FEED STREAM CHARACTERISTICS	25% SOLIDS
OUTLET STREAM CHARACTERISTICS	60% SOLIDS

** SOLIDS CONCENTRATING/DEWATERING

DEVICE	THICKENER
NUMBER	1
NUMBER OF SPARES	0
DIMENSIONS - FT	40 DIA
SHELL GENERIC MATERIAL TYPE	MILD STEEL
FEED STREAM CHARACTERISTICS	10% SOLIDS
OUTLET STREAM CHARACTERISTICS	25% SOLIDS

*** SLUDGE

** TREATMENT

METHOD	FLYASH STABILIZATION
INLET QUALITY - %	80.0

** DISPOSAL

NATURE	FINAL
TYPE	LANDFILL
LOCATION	ON SITE
SITE TRANSPORTATION METHOD	TRUCK/CONVEYOR
SITE DIMENSIONS	600 X 850
SITE CAPACITY - CU.M	403590 (330.0 ACRE-FT)

** PROCESS CONTROL AND INSTRUMENTATION

CHEMICAL PARAMETERS	PH, SO2
CONTROL LEVELS	5.7-5.9
MONITOR LOCATION	RECYCLE TANK/INLET DUCT
PROCESS CONTROL MANNER	AUTOMATIC
PROCESS CHEMISTRY MODE	FEEDBACK/FEED FORWARD

** WATER BALANCE

WATER LOOP TYPE	CLOSED

** FGD SPARE CAPACITY INDICES

ABSORBER - %	.0

** FGD SPARE COMPONENT INDICES

ABSORBER	.0

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
6/79	SYSTEM							720			

SOUTH MISSISSIPPI ELEC PWR: R.D MORROW, SR. 2 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
	R.D. MORROW 2 BEGAN SCRUBBER OPERATIONS IN THE LATTER PART OF JUNE. OPERATIONAL DATA ARE NOT YET AVAILABLE.										
7/79	SYSTEM							744			
8/79	SYSTEM							744			
	** PROBLEMS/SOLUTIONS/COMMENTS										
	NO INFORMATION WAS AVAILABLE FOR THE JULY-AUGUST 1979 PERIOD.										
9/79	SYSTEM	4.7	100.0	4.7	4.7			720	34	34	2.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
	DURING SEPTEMBER THE UNIT WAS TAKEN OFF LINE DUE TO FAILURE OF LINERS AND PLUGGING IN THE MIST ELIMINATOR SECTIONS.										
10/79	SYSTEM	.0		.0	.0	.00	86.00	744	477	0	52.5
11/79	SYSTEM	.0		.0	.0			720		0	
12/79	SYSTEM	.0		.0	.0			744		0	
	** PROBLEMS/SOLUTIONS/COMMENTS										
	THE SCRUBBER HAS REMAINED OFF LINE THROUGH THE REPORT PERIOD DUE TO THE LINING FAILURES. RELINING SHOULD BE COMPLETED AND THE UNIT ON SHOULD BE BACK ON LINE IN MAY.										
1/80	SYSTEM	.0		.0	.0			744	743	0	75.4
	** PROBLEMS/SOLUTIONS/COMMENTS										
	THE UNIT REMAINED OFF LINE DURING JANUARY WHILE SCRUBBER LINER REPAIRS CONTINUED. THE PRESATURATOR AREAS, BYPASS DUCTS, AND THE SECTIONS OF DUCT FROM ABSORBER EXITS AT POINTS WHERE BYPASSED GAS MIXES WITH WET GAS ALL THE WAY TO THE STACK ARE BEING LINED WITH HASTELLOY G (A 1/8 INCH LINING IS BEING WELDED TO THE EXISTING CARBON STEEL). THE MAIN BODY OF THE ABSORBER MODULES IMMEDIATELY ABOVE THE PRESATURATOR SECTIONS ALL THE WAY TO THE ABSORBER EXIT IS BEING LINED WITH CHLOROBUTYL RUBBER (ON THE EXISTING CARBON STEEL).										
2/80	SYSTEM	.0	.0	.0	.0			696	698	0	75.0
3/80	SYSTEM	.0	.0	.0	.0	.00		744	486	0	
4/80	SYSTEM	.0			.0	.00		720	0	0	.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
	THE FGD SYSTEM REMAINED OFF LINE THROUGH APRIL AS SCRUBBER LINER REPAIRS CONTINUED. THE UNIT IS EXPECTED BACK ON LINE AT THE END OF MAY.										
5/80	SYSTEM	2.4	14.2	14.2	2.4	85.00		744	127	18	

SOUTH MISSISSIPPI ELEC PWR: R.D. MORROW, SR. 2 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
		PERFORMANCE DATA									
6/80	SYSTEM	99.3	90.0	99.1	78.0	90.00		720	625	561	68.9
7/80	SYSTEM	79.8	80.7	80.7	79.8	85.00		744	736	594	73.8
8/80	SYSTEM	98.8	99.5	99.5	98.8	80.00		744	739	735	74.3
8/80	SYSTEM	98.8	99.5	99.5	98.8	80.00		744	739	735	74.3
9/80	SYSTEM	99.8	99.5	99.5	88.3			720	639	636	62.4

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT REMAINED OFF LINE DURING MOST OF MAY TO COMPLETE SCRUBBER AND STACK LINING MODIFICATIONS.

THE BOILER OPERATED 127 HOURS IN MAY; HOWEVER, THE FGD SYSTEM OPERATED ONLY 13 HOURS BECAUSE OF COMPUTER CONTROL PROBLEMS.

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM COMPUTER LOST POWER DURING JUNE CAUSING THE UNIT TO BE SHUT DOWN FOR 25 MINUTES.

DURING JUNE OPERATIONS CAME TO A HAULT FOR APPROXIMATELY FIVE HOURS TO CLEAN THE MIST ELIMINATORS. OTHER OUTAGE TIME DURING THE MONTH WAS CAUSED BY BOILER RELATED PROBLEMS.

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JULY BALL MILL REPAIRS ACCOUNTED FOR THE MAJOR PORTION OF THE FGD-RELATED OUTAGE TIME.

THE SCRUBBER WAS INSPECTED FOR SCALE ACCUMULATION AND A TRIP TEST WAS CONDUCTED ON THE SCRUBBER CONTROLS TO CHECK ON EARLIER MODIFICATIONS.

THE SCRUBBING SYSTEM WENT OFF LINE DUE TO AN ALARM TRIGGERED BY HIGH TEMPERATURE, WHICH WAS DETERMINED TO BE A FALSE ALARM.

A POSSIBLE TUBE LEAK SHUT THE BOILER DOWN ON JULY 27. THE UNIT WENT BACK ON LINE WITHOUT FINDING THE LEAK. THE BOILER WAS THEN TAKEN OFF LINE ON JULY 28 TO FIND THE LEAK AND MAKE THE NECESSARY REPAIRS.

PROBLEMS WITH THE BURNER MANAGEMENT CONTROL SYSTEM ALSO CAUSED A BOILER-RELATED OUTAGE.

** PROBLEMS/SOLUTIONS/COMMENTS

DURING AUGUST THE FGD SYSTEM WAS SHUT DOWN FOR FOUR HOURS FOR REPAIR OF A TUBE LEAK.

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER WAS OUT OF SERVICE APPROXIMATELY FIVE HOURS DURING AUGUST DUE TO A BOILER TUBE LEAK.

AFTER THE REPAIRS TO THE BOILER TUBE AN ADDITIONAL FOUR HOURS OF OUTAGE TIME WAS NECESSARY TO START UP THE FGD SYSTEM.

** PROBLEMS/SOLUTIONS/COMMENTS

DURING SEPTEMBER THE BOILER WAS TAKEN OUT OF SERVICE FOR APPROXIMATELY 83 HOURS DUE TO A TUBE LEAK.

SOUTH MISSISSIPPI ELEC PWR: R.D. MORROW, SR. 2 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
		A BOILER INSPECTION AND AN ELECTRICAL SHORT IN THE CONTROLS CAUSED THE FGD SYSTEM TO SHUT DOWN WITH THE BOILER FOR APPROXIMATELY 1 1/2 HOURS.									
10/80	SYSTEM	79.8	98.9	98.9	79.5			744	598	591	68.6
	** PROBLEMS/SOLUTIONS/COMMENTS										
		PITTING OF THE HASTELLOY G MATERIAL IN THE SCRUBBER WAS DETECTED DURING A SCRUBBER INSPECTION.									
		DURING OCTOBER FURNACE DRAFT PROBLEMS ACCOUNTED FOR APPROXIMATELY FOUR HOURS OF DOWN TIME.									
11/80	SYSTEM	80.2	95.3	95.3	74.8			720	565	538	67.7
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING NOVEMBER THE FGD SYSTEM WAS OFF LINE APPROXIMATELY 131 HOURS TO REPAIR DUCTWORK.									
		AN ADDITIONAL 8 HOURS OF OUTAGE TIME WAS REQUIRED FOR NOZZLE CLEANING.									
12/80	SYSTEM	49.7	92.7	92.7	49.7			744	399		39.6
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING DECEMBER REPAIRS TO THE SCRUBBER DUCT CAUSED APPROXIMATELY 348 HOURS OF DOWN TIME.									
		THE RECYCLE NOZZLES PLUGGED CAUSING THE SYSTEM TO SHUTDOWN FOR APPROXIMATELY 24 HOURS.									
		A ONE HOUR OUTAGE WAS CAUSED BY A MODULE HIGH TEMPERATURE ALARM.									

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	SOUTHERN ILLINOIS POWER COOP	
PLANT NAME	MARION	
UNIT NUMBER	4	
CITY	MARION	
STATE	ILLINOIS	
REGULATORY CLASSIFICATION	B	
PARTICULATE EMISSION LIMITATION - NG/J	13.	(.030 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	516.	(1.200 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	272	
GROSS UNIT GENERATING CAPACITY - MW	173	
NET UNIT GENERATING CAPACITY W/FGD - MW	161	
NET UNIT GENERATING CAPACITY WO/FGD - MW	165	
EQUIVALENT SCRUBBED CAPACITY - MW	173	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	BABCOCK & WILCOX	
BOILER TYPE	CYCLONE	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	285.50	(605000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	143.3	(290 F)
STACK HEIGHT - M	122.	(400 FT)
STACK SHELL	******	
STACK TOP DIAMETER - M	6.4	(21.0 FT)
** FUEL DATA		
FUEL TYPE	COAL/REFUSE	
FUEL GRADE	BITUMINOUS	
AVERAGE HEAT CONTENT - J/G	23841.	(10250 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		8500-11400
AVERAGE ASH CONTENT - %	16.69	
RANGE ASH CONTENT - %	7.5-23.0	
AVERAGE MOISTURE CONTENT - %	12.20	
RANGE MOISTURE CONTENT - %	1.5-20.0	
AVERAGE SULFUR CONTENT - %	3.75	
RANGE SULFUR CONTENT - %	1.4-4.4	
AVERAGE CHLORIDE CONTENT - %	.10	
RANGE CHLORIDE CONTENT - %	0-0.12	
*** PARTICLE CONTROL		
** ESP		
NUMBER	1	
SUPPLIER	BABCOCK & WILCOX	
INLET FLUE GAS CAPACITY - CU.M/S	326.3	(691500 ACFM)
INLET FLUE GAS TEMPERATURE - C	143.3	(290 F)
PRESSURE DROP - KPA	.1	(1. IN-H2O)
PARTICLE REMOVAL EFFICENCY - %	99.6	
** PARTICLE SCRUBBER		
GENERIC TYPE	NONE	
SPECIFIC TYPE	N/A	
*** FGD SYSTEM		
** GENERAL DATA		
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT	
SO2 REMOVAL MODE	WET SCRUBBING	
PROCESS TYPE	LIMESTONE	
PROCESS ADDITIVES	NONE	
SYSTEM SUPPLIER	BABCOCK & WILCOX	
A-E FIRM	BURNS & MCDONNELL	
DEVELOPMENT LEVEL	FULL SCALE	
NEW/RETROFIT	NEW	
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	.00	
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	89.40	
CURRENT STATUS	1	
COMMERCIAL START-UP	6/79	
INITIAL START-UP	5/79	

SOUTHERN ILLINOIS POWER COOP: MARION 4 (CONT.)

CONTRACT AWARDED	1/76
** DESIGN AND OPERATING PARAMETERS	
** ABSORBER	
NUMBER	2
GENERIC TYPE	SPRAY TOWER
SPECIFIC TYPE	OPEN COUNTERCURRENT SPRAY
SUPPLIER	BABCOCK & WILCOX
L/G RATIO - L/CU.M	9.9 (74.0 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	1.5 (6.0 IN-H2O)
INLET GAS FLOW - CU. M/S	139.68 (296000 ACFM)
INLET GAS TEMPERATURE - C	53.9 (129 F)
SO2 REMOVAL EFFICIENCY - %	89.4
** MIST ELIMINATOR	
PRE-MIST ELIMINATOR/MIST ELIMINATOR	MIST ELIMINATOR
GENERIC TYPE	IMPINGEMENT
SPECIFIC TYPE	BAFFLE
TRADE NAME/COMMON TYPE	CHEVRON VANE
** REHEATER	
GENERIC TYPE	NONE
SPECIFIC TYPE	N/A
TRADE NAME/COMMON TYPE	N/A
** FANS	
NUMBER	2
SUPPLIER	BUFFALO FORGE
FUNCTION	BOOSTER
APPLICATION	FORCED DRAFT
SERVICE	DRY
FLUE GAS FLOW RATE - CU.M/S	165.24 (350150 ACFM)
FLUE GAS TEMPERATURE - C	157.2 (315 F)

** TANKS

SERVICE	NUMBER
MIST ELIMINATOR WASH TANK	1
ABSORBER/QUENCHER RECYCLE	2
RECLAIMED WATER TANK	1
MILL PRODUCT TANK	1
LIMESTONE SLURRY STORAGE	1

** PUMPS

SERVICE	NUMBER
ABSORBER RECIRCULATION	5
QUENCHER RECIRCULATION	2
MIST ELIMINATOR WASH	2
WASTE SLURRY	2
RECLAIMED WATER	2
MILL PRODUCT	2
LIMESTONE SLURRY TRANSFER	2
SLUDGE TRANSFER	3

** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	THICKENER
NUMBER	1
DIMENSIONS - FT	125 (DIA) X 9 (DEPTH)
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	CENTRIFUGE
NUMBER	2
NUMBER OF SPARES	0
CAPACITY	125 GPM
*** SLUDGE	

SOUTHERN ILLINOIS POWER COOP: MARION 4 (CONT.)

** TREATMENT	
METHOD	FLYASH STABILIZATION
** DISPOSAL	
NATURE	FINAL
TYPE	LANDFILL
LOCATION	ON SITE
** PROCESS CONTROL AND INSTRUMENTATION	
CHEMICAL PARAMETERS	PH
CONTROL LEVELS	5-6
** WATER BALANCE	
WATER LOOP TYPE	CLOSED
** FGD SPARE CAPACITY INDICES	
SCRUBBER - %	2.0
ABSORBER - %	38.0
** FGD SPARE COMPONENT INDICES	
SCRUBBER	.3
ABSORBER	.6

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
5/79	SYSTEM							744			
6/79	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE UNIT BEGAN OPERATION IN MAY. HOWEVER, THE UNIT IS NOW DOWN AND HAS SUFFERED TWO PREVIOUS OUTAGES. THE PREVIOUS OUTAGES WERE DUE TO CENTRIFUGE AND THICKENER PROBLEMS. THE PRESENT OUTAGE IS DUE TO BEARING FAILURES ON THE PUG MILL AND IMPROPER FIT OF THE SLUDGE CONVEYING BELT.

7/79	SYSTEM							744			
8/79	SYSTEM							744			
9/79	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE THIRD QUARTER A ROUTINE INSPECTION OF THE SCRUBBER INTERNALS SHOWED NO SCALE FORMATION.

THE UTILITY REPORTED THAT THE FGD SYSTEM HAS ACHIEVED A 0.7 LB/MMBTU OF SO2 EMISSION LEVEL. THE UNIT IS SUBJECT TO THE 1.2 LB/MMBTU SO2 EMISSION STANDARD.

THE CONTINUOUS MONITORS HAVE NOT BEEN OPERATING ACCEPTABLY.

A TURBINE OVERHAUL/INSPECTION IS SCHEDULED FOR OCTOBER 1, 1979.

10/79	SYSTEM					.0		744	0	0	.0
11/79	SYSTEM	100.0			26.7			720	192	192	
12/79	SYSTEM	100.0			71.0			744	528	528	

SOUTHERN ILLINOIS POWER COOP: MARION 4 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UNIT WAS DOWN FROM OCTOBER 1 THROUGH NOVEMBER 17 FOR A BOILER/TURBINE INSPECTION. NO MAJOR FGD RELATED PROBLEMS WERE ENCOUNTERED DURING THE FOURTH QUARTER OF 1979 OTHER THAN SOME FREEZE-UPS CAUSED BY THE WINTER WEATHER.									
1/80	SYSTEM		100.0		10.0			744	72	72	
2/80	SYSTEM		100.0		31.0			696	216	216	
3/80	SYSTEM		100.0		48.4			744	360	360	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING JANUARY THE LOW BOILER AND SCRUBBER HOURS WERE A RESULT OF AN 18 DAY BOILER OUTAGE NEEDED FOR CORRECTION OF TUBE PROBLEMS. BOILER OUTAGES DUE TO TUBE PROBLEMS WERE ALSO EXPERIENCED IN FEBRUARY AND MARCH. THE ONLY REPORTED FGD-RELATED PROBLEM DURING THE FIRST QUARTER OF 1980 WAS MAINTAINING THE BELT ALIGNMENT IN THE SLUDGE DISPOSAL SYSTEM.									
4/80	SYSTEM	66.7	66.7	66.7	66.7			720	720	480	81.3
	** PROBLEMS/SOLUTIONS/COMMENTS										
		SHAFT BREAKAGE WITHIN THE RECLAIM WATER PUMP CAUSED FGD SYSTEM OUTAGE TIME DURING APRIL.									
5/80	SYSTEM	77.4	58.8	58.8	32.3			744	408	240	49.6
	** PROBLEMS/SOLUTIONS/COMMENTS										
		A BOILER OUTAGE CAUSED THE FGD SYSTEM NOT TO OPERATE FOR TWO WEEKS. SHAFT BREAKAGE WITHIN THE WATER RECLAIM PUMP CONTINUED THROUGH MAY.									
6/80	SYSTEM	50.0	50.0	50.0	50.0			720	720	360	82.3
	** PROBLEMS/SOLUTIONS/COMMENTS										
		SHAFT BREAKAGE WITHIN THE WATER RECLAIM PUMP CONTINUED TO CAUSE FGD OUTAGE TIME. A SOLUTION HAS BEEN PROPOSED TO SIPCO BY THEIR ENGINEERING CONSULTANT FOR CONSIDERATION.									
7/80	SYSTEM	96.7	100.0	100.0	95.9			744	714	714	82.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		AFTER REVIEW OF THE PROPOSED SOLUTION OF THE SHAFT BREAKAGE PROBLEM WITHIN THE RECLAIM WATER PUMP, SIPCO AUTHORIZED THEIR CONSULTANT TO PROCEED WITH THE WORK TO CORRECT THE PROBLEM.									
8/80	SYSTEM	100.0	100.0	100.0	90.5			744	673	673	89.6
	** PROBLEMS/SOLUTIONS/COMMENTS										
		PROBLEMS WITH THE SHAFT BREAKAGE IN THE RECLAIM WATER PUMPS CONTINUED THROUGH AUGUST. A REPLACEMENT PUMP HAS BEEN PURCHASED TO SOLVE THE PROBLEM.									
9/80	A	100.0	100.0	100.0	100.0						

SOUTHERN ILLINOIS POWER COOP: MARION 4 (CONT.)

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	B	100.0	100.0	100.0	100.0						
	SYSTEM	100.0	100.0	100.0	100.0			720	720	720	100.0

** PROBLEMS/SOLUTIONS/COMMENTS

SUMMARY OF GENERAL PROBLEMS TO DATE

THE MAJOR CAUSES OF SCRUBBER OUTAGES HAVE CENTERED AROUND COLD WEATHER-RELATED CONVEYOR BELT AND PIPING PROBLEMS, PUG MILL BEARING FAILURES, AND RECLAIM WATER PUMP SHAFT FAILURES. OTHER PROBLEMS HAVE BEEN RELATED TO PROCESS CHEMISTRY CONTROL. THE UTILITY REPORTED THAT NUMEROUS SMALL PROBLEMS ALSO HAVE OCCURRED BUT HAVE GENERALLY BEEN CORRECTED SOON AFTER THEIR DISCOVERY. DETAILS OF THE PRIMARY SCRUBBER PROBLEMS ARE OUTLINED BELOW:

COLD WEATHER PROBLEMS

THE MOST SEVERE FREEZING PROBLEM CONCERNS THE SLUDGE CONVEYOR SYSTEM. WHEN THE AMBIENT TEMPERATURE DROPS BELOW 30 F THE CONVEYOR SYSTEM BECOMES INOPERABLE. THE UTILITY HAS ATTEMPTED TO REMOVE THE FROZEN SLUDGE USING VARIOUS COMMERCIAL AND COMPANY-BUILT SCRAPERS WITH LITTLE SUCCESS. THE UTILITY ALSO INSTALLED HEATERS AT THE VARIOUS TRANSFER POINTS TO THAW THE SLUDGE. THIS PROVED UNSUCCESSFUL AS WELL. THE PROBLEM HAS NOT YET BEEN SOLVED.

AN ADDITIONAL PROBLEM WITH THE CONVEYOR SYSTEM HAS BEEN THE FAILURE OF THE BELT TO TRACK CORRECTLY. ON SEVERAL OCCASIONS THE BELT HAS TOUCHED THE STRUCTURAL STEEL SUPPORTS RESULTING IN BELT DAMAGE. HOWEVER, BY REDUCING THE CONVEYOR SPEED THE UTILITY HAS INCREASED THE ESTIMATED BELT LIFE FROM FIVE TO 10 YEARS.

THE OTHER COLD WEATHER PROBLEM IS RELATED TO THE SCRUBBER VESSEL PIPING SYSTEM. ON SEVERAL OCCASIONS WATER LINE FREEZE UPS HAVE RESULTED IN SCRUBBER OUTAGES. WHEN THE PROBLEM WAS DISCOVERED, THE UTILITY INSTALLED EXTENSIVE HEAT TRACING ON EXPOSED WATER LINES. ALTHOUGH THERE HAS BEEN NO COLD WEATHER SINCE THE HEAT TRACING INSTALLATION, THE UTILITY BELIEVES THAT THE PROBLEM IS SOLVED.

PUG MILL PROBLEM

SEVERAL BEARING FAILURES HAVE OCCURRED ON THE PUG MILL. THE UTILITY HAS INCREASED THE MAINTENANCE ON THE MILL SYSTEM TO LESSEN THE LIKELIHOOD OF ANOTHER FAILURE. THE UTILITY REPORTED THAT IF THIS PROCEDURE MODIFICATION DOES NOT INCREASE THE PUG MILL RELIABILITY TO AN ACCEPTABLE LEVEL OTHER ACTION WILL BE TAKEN.

RECLAIM WATER PUMP SHAFT FAILURE

THE RECLAIM WATER PUMPS PRODUCE A VERY FLAT OUTPUT PRESSURE CURVE BUT THEY FEED A SYSTEM COMPOSED OF MANY AUTOMATICALLY CONTROLLED DIAPHRAGM VALVES. THE OPENING AND CLOSING OF THESE VALVES EXPOSES THE PUMPS TO A WIDE VARIABILITY IN WATER REQUIREMENTS. MOTOR SHAFT FATIGUE RESULTS WHEN THE PUMPS ATTEMPT TO RESPOND TO THE VARIABLE DEMAND. THE SYSTEM SUPPLIER IS CURRENTLY SUPPLYING THE UTILITY WITH INFORMATION ON THE OPERATION OF THE DIAPHRAGM VALVES. THE UTILITY'S CONSULTANT ENGINEERING FIRM WILL REVIEW THE MATERIAL AND SUGGEST POSSIBLE CONTROL VALVE CHANGES. THE UTILITY REPORTED THAT IF THIS IS NOT POSSIBLE OR DOES NOT WORK, A DESIGN CHANGE TO A DIFFERENT PUMP TYPE WILL BE CONSIDERED. WHILE THE PROBLEM CONTINUES, THE UTILITY IS KEEPING A COMPLETE SHAFT AND IMPELLER ON SITE.

PROCESS CHEMISTRY

THE UTILITY HAS LOST CONTROL OF THE PROCESS CHEMISTRY SEVERAL TIMES. THE SLURRY SOLIDS LEVEL HAS CONSEQUENTLY INCREASED TO THE POINT THAT

SOUTHERN ILLINOIS POWER COOP: MARION 4 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
					PERFORMANCE DATA						

THE THICKENER RAKE HAS BECOME INOPERABLE. TO SOLVE THE PROBLEM THE UTILITY HAS BEEN IMPROVING THE CHEMISTRY MONITORING SYSTEM. IN THE INTERIM, WHERE EXISTING MONITORS ARE OUT OF SERVICE, LAB PERSONNEL PERFORM MANUAL TESTS TO MAINTAIN PROCESS CHEMISTRY CONTROL.

THE BOILER AND THE FGD SYSTEM OPERATED THE ENTIRE MONTH OF SEPTEMBER WITH NO PROBLEMS.

10/80	SYSTEM	100.0	100.0	100.0	57.7			744	429	429	42.3

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER WAS TAKEN OFF LINE ON OCTOBER 18 FOR A SCHEDULED ANNUAL OVERHAUL, DURING WHICH TIME THE FGD SYSTEM REMAINED AVAILABLE.

11/80	A	90.2	.0	.0	.0						
	B	90.2	.0	.0	.0						
	SYSTEM	90.2	.0	.0	.0			720	71	0	11.2

** PROBLEMS/SOLUTIONS/COMMENTS

DUE TO PROBLEMS ENCOUNTERED WITH THE BOILER, THE SCHEDULED MAINTENANCE OUTAGE WAS CONTINUED THROUGH NOVEMBER 26.

WHEN THE UTILITY ATTEMPTED TO START THE FGD SYSTEM, A LEAK WAS DETECTED IN THE HIGH PRESSURE LUBRICATION LINE ON THE BALL MILL CAUSING THE SYSTEM TO REMAIN OUT OF SERVICE THROUGH NOVEMBER.

12/80	A	79.7	78.1	78.1	72.2						
	B	79.4	77.8	77.8	71.9						
	SYSTEM	79.6	77.9	77.9	72.0			744	688	536	88.3

** PROBLEMS/SOLUTIONS/COMMENTS

THE BALL MILL LUBRICATION PROBLEM CONTINUED INTO DECEMBER CAUSING APPROXIMATELY 150 HOURS OF OUTAGE TIME.

ON DECEMBER 30 THE B MODULE WAS TAKEN OFF LINE FOR APPROXIMATELY THREE HOURS TO REPAIR A WALL LEAK IN THE QUENCHER SECTION. MODULE A WAS TAKEN OFF LINE LATER THAT DAY DUE TO THE SAME PROBLEM.

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	SOUTHERN INDIANA GAS & ELEC	
PLANT NAME	A.B. BROWN	
UNIT NUMBER	1	
CITY	WEST FRANKLIN	
STATE	INDIANA	
REGULATORY CLASSIFICATION	B	
PARTICULATE EMISSION LIMITATION - NG/J	43.	(.100 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	516.	(1.200 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	250	
GROSS UNIT GENERATING CAPACITY - MW	265	
NET UNIT GENERATING CAPACITY W/FGD - MW	250	
NET UNIT GENERATING CAPACITY WO/FGD - MW	252	
EQUIVALENT SCRUBBED CAPACITY - MW	265	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	BABCOCK & WILCOX	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	429.43	(910000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	154.4	(310 F)
STACK HEIGHT - M	152.	(498 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	4.4	(14.5 FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	BITUMINOUS	
AVERAGE HEAT CONTENT - J/G	25819.	(11100 BTU/LB)
RANGE HEAT CONTENT - BTU/LB	10100-11600	
AVERAGE ASH CONTENT - %	9.40	
RANGE ASH CONTENT - %	8.45-11.4	
AVERAGE MOISTURE CONTENT - %	13.30	
RANGE MOISTURE CONTENT - %	10.10-21.10	
AVERAGE SULFUR CONTENT - %	3.35	
RANGE SULFUR CONTENT - %	2.8-3.9	
AVERAGE CHLORIDE CONTENT - %	.05	
RANGE CHLORIDE CONTENT - %	.01-.08	
*** PARTICLE CONTROL		
** MECHANICAL COLLECTOR		
TYPE	NONE	
** FABRIC FILTER		
TYPE	NONE	
** ESP		
NUMBER	1	
TYPE	COLD SIDE	
SUPPLIER	BUELL DIVISION, ENVIROTECH	
INLET FLUE GAS CAPACITY - CU.M/S	372.8	(790036 ACFM)
INLET FLUE GAS TEMPERATURE - C	145.0	(293 F)
PRESSURE DROP - KPA	.8	(3. IN-H2O)
PARTICLE REMOVAL EFFICENCY - %	99.5	
** PARTICLE SCRUBBER		
GENERIC TYPE	NONE	
SPECIFIC TYPE	N/A	
*** FGD SYSTEM		
** GENERAL DATA		
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT	
SO2 REMOVAL MODE	WET SCRUBBING	
PROCESS TYPE	DUAL ALKALI	
PROCESS ADDITIVES	NONE	
SYSTEM SUPPLIER	FMC	
A-E FIRM	MID-VALLEY	

SOUTHERN INDIANA GAS & ELEC: A.B. BROWN 1 (CONT.)

DEVELOPMENT LEVEL	FULL SCALE		
NEW/RETROFIT	NEW		
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.50		
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	85.00		
CURRENT STATUS	1		
COMMERCIAL START-UP	4/79		
INITIAL START-UP	3/79		
CONTRACT AWARDED	12/76		
** DESIGN AND OPERATING PARAMETERS			
** ABSORBER			
NUMBER	2		
NUMBER OF SPARES	0		
GENERIC TYPE	VENTURI TOWER		
SPECIFIC TYPE	VARIABLE-THROAT/BOTTOM ENTRY PLUMB BOB		
TRADE NAME/COMMON TYPE	DUAL-THROAT VARIABLE SCRUBBER		
SUPPLIER	FMC		
DIMENSIONS - FT	62 HIGH X 32 DIA.		
SHELL GENERIC MATERIAL	CARBON STEEL		
SHELL SPECIFIC MATERIAL	AISI 1110		
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A		
LINER GENERIC MATERIAL	ORGANIC		
LINER SPECIFIC MATERIAL	GLASS FLAKE-FILLED POLYESTER		
LINER MATERIAL TRADE NAME/COMMON TYPE	FLAKEGLASS		
GAS CONTACTING DEVICE TYPE	DISC CONTACTORS		
NUMBER OF CONTACTING ZONES	3		
LIQUID RECIRCULATION RATE - LITER/S	315.	(5000 GPM)	
L/G RATIO - L/CU.M	1.3	(10.0 GAL/1000 ACF)	
GAS-SIDE PRESSURE DROP - KPA	1.0	(4.0 IN-H2O)	
INLET GAS FLOW - CU. M/S	237.84	(504000 ACFM)	
INLET GAS TEMPERATURE - C	145.0	(293 F)	
SO2 REMOVAL EFFICIENCY - %	85.0		
** MIST ELIMINATOR			
PRE-MIST ELIMINATOR/MIST ELIMINATOR	MIST ELIMINATOR		
NUMBER PER SYSTEM	2		
GENERIC TYPE	IMPINGEMENT		
SPECIFIC TYPE	BAFFLE		
TRADE NAME/COMMON TYPE	CHEVRON VANE		
CONFIGURATION	HORIZONTAL		
NUMBER OF STAGES	1		
NUMBER OF PASSES PER STAGE	1		
DISTANCE BETWEEN STAGES - CM	1.78	(.7 IN)	
PRESSURE DROP - KPA	.5	(2.0 IN-H2O)	
CONSTRUCTION MATERIAL GENERIC TYPE	NORYL PLASTIC		
WASH WATER SOURCE	FRESH WATER		
** REHEATER			
GENERIC TYPE	NONE		
SPECIFIC TYPE	N/A		
TRADE NAME/COMMON TYPE	N/A		
** FANS			
NUMBER	2		
NUMBER OF SPARES	0		
SUPPLIER	WESTINGHOUSE		
FUNCTION	BOOSTER		
APPLICATION	FORCED DRAFT		
SERVICE	DRY		
FLUE GAS FLOW RATE - CU.M/S	237.84	(504000 ACFM)	
FLUE GAS TEMPERATURE - C	145.0	(293 F)	
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL		
** DUCTWORK			
LOCATION	SCRUBBER INLET		
DIMENSIONS	10'6" X 14'		
SHELL GENERIC MATERIAL TYPE	CARBON STEEL		
LINER GENERIC MATERIAL TYPE	NONE		

SOUTHERN INDIANA GAS & ELEC: A.B. BROWN 1 (CONT.)

** DUCTWORK	
LOCATION	SCRUBBER OUTLET
DIMENSIONS	12 X 8
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
LINER GENERIC MATERIAL TYPE	FLAKEGLASS
** REAGENT PREPARATION EQUIPMENT	
FUNCTION	LIME SLAKING
DEVICE	SLAKER
MANUFACTURER	WALLACE & TIERNAN
NUMBER	3
FULL LOAD DRY FEED CAPACITY - M.TONS/HR	3.6 (4 TPH)
PRODUCT QUALITY - % SOLIDS	20.0
** TANKS	
SERVICE	NUMBER
REACTION	1
SURGE TANK	1
SCRUBBER LIQUOR HOLDING	2
** PUMPS	
SERVICE	NUMBER
ABSORBER RECIRCULATION	4
THICKENER UNDERFLOW	6
REGENERATION RETURN	2
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	VACUUM FILTER
NUMBER	3
NUMBER OF SPARES	1
CAPACITY	340 TON/DAY
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
OUTLET STREAM CHARACTERISTICS	60% SOLIDS
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	THICKENER
NUMBER	1
NUMBER OF SPARES	0
DIMENSIONS - FT	100 (DIA) X 16 (DEPTH)
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
*** SLUDGE	
** TREATMENT	
METHOD	NONE
** DISPOSAL	
NATURE	FINAL
TYPE	LANDFILL
LOCATION	ON SITE
SITE TRANSPORTATION METHOD	TRUCK
SITE DIMENSIONS	1400' X 1400' X 35'
SITE CAPACITY - CU.M	1834500 (1500.0 ACRE-FT)
SITE SERVICE LIFE - YRS	20
** PROCESS CONTROL AND INSTRUMENTATION	
CHEMICAL PARAMETERS	SCRUBBER MODULE PH, LIME REACTOR PH
CONTROL LEVELS	SCRUBBER MODULE 6.3-6.8, LIME REACTOR 8.0-10.0
MONITOR LOCATION	ABSORBER RECIR. LINE-LIME REACTOR OVERFLOW
PROCESS CONTROL MANNER	AUTOMATIC
PROCESS CHEMISTRY MODE	FEEDBACK
** WATER BALANCE	
WATER LOOP TYPE	CLOSED

SOUTHERN INDIANA GAS & ELEC: A.B. BROWN 1 (CONT.)

** CHEMICALS AND CONSUMPTION

NAME	LIME
CONSUMPTION	6.3 TPH

** FGD SPARE CAPACITY INDICES

ABSORBER - %	20.0

** FGD SPARE COMPONENT INDICES

ABSORBER	.3

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
3/79	SYSTEM							744			
4/79	SYSTEM							720			29.6

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM BEGAN OPERATIONS ON MARCH 18, 1979. NO OPERATIONAL DATA ARE YET AVAILABLE.

5/79	SYSTEM							744			54.7
6/79	SYSTEM							720			65.4

** PROBLEMS/SOLUTIONS/COMMENTS

OPERATING HOURS ARE NOT YET AVAILABLE. HOWEVER, THE UNIT HAS BEEN RUNNING INTERMITTENTLY AS A RESULT OF PUMP LINER AND FRP PIPING DESIGN PROBLEMS.

7/79	SYSTEM					62.8	54.8	744	650	408	48.1
8/79	SYSTEM					94.3	94.2	744	743	701	51.7

** PROBLEMS/SOLUTIONS/COMMENTS

IN AUGUST THE FGD SYSTEM WAS FORCED OFF LINE FOR 43 HOURS DUE TO PROBLEMS WITH THE RECYCLE PUMP IMPELLERS.

9/79	SYSTEM					74.6	74.2	720	716	534	62.5

** PROBLEMS/SOLUTIONS/COMMENTS

IN SEPTEMBER 52 HOURS OF SCHEDULED OUTAGE WERE USED TO INSTALL A WATER FILTER. THE SCRUBBER WAS ALSO TAKEN OFF LINE FOR 72 HOURS FOR PRECIPITATOR TESTING. THE ONLY FORCED OUTAGE DURING THE MONTH BEGAN ON SEPTEMBER 28 AND LASTED THROUGH THE END OF THE MONTH AS A RESULT OF POOR FILTER CAKE QUALITY. THIS HAS RESULTED FROM PROBLEMS WITH THE VACUUM FILTERS AS WELL AS CHEMICAL PROBLEMS.

10/79	A	88.6	96.8	100.0	84.5						
	B	87.3	98.5	98.5	86.0						
	SYSTEM	88.0	97.7	99.3	85.3			744	649	634	49.6
11/79	A	91.0	97.1	98.2	89.4						
	B	91.0	94.4	95.5	86.9						
	SYSTEM	91.0	95.8	96.9	88.2			720	663	635	62.1
12/79	A	80.9	80.9	80.9	80.8						
	B	81.2	81.3	81.2	81.2						
	SYSTEM	81.1	81.1	81.1	81.0			744	743	603	53.5

EPA UTILITY FGD SURVEY: OCTOBER - DECEMBER 1980

SOUTHERN INDIANA GAS & ELEC: A.B. BROWN 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING THE FOURTH QUARTER PROBLEMS WERE ENCOUNTERED WITH THE LIME SLAKER FEED.									
		THE THICKENER RAKE FROZE CAUSING 9 DAYS OUTAGE TIME.									
		THE ISOLATION DAMPER HAS CAUSED SOME PROBLEMS THIS QUARTER. THE UTILITY HAS NOT YET SOLVED THIS PROBLEM.									
1/80	A	99.0	96.5	99.1	96.4						
	B	99.0	99.0	99.1	99.0						
	SYSTEM	99.0	98.0	99.1	97.7			744	744	727	65.8
	** PROBLEMS/SOLUTIONS/COMMENTS										
		SEVEN HOURS OF FGD SYSTEM FORCED OUTAGE TIME DURING JANUARY WERE CAUSED BY A THICKENER RAKE STALL.									
2/80	A	99.1	70.3	98.8	69.4						
	B	98.4	70.0	97.8	68.7						
	SYSTEM	98.8	70.2	98.3	69.1			696	687	481	75.5
	** PROBLEMS/SOLUTIONS/COMMENTS										
		SOME OUTAGE TIME IN FEBRUARY RESULTED FROM A WET SLUDGE PRODUCT. A CHEMICAL IMBALANCE CAUSED THE SLUDGE PROBLEM.									
3/80	A	98.7	64.8	95.2	26.5						
	B	99.2	51.6	96.3	21.1						
	SYSTEM	99.0	58.2	95.8	23.8			744	304	177	23.8
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING MARCH, BOILER DOWN TIME WAS DUE TO A SCHEDULED UNIT OUTAGE, DURING WHICH TIME MAINTENANCE WAS PERFORMED ON THE SCRUBBER.									
4/80	A	100.0	96.8	100.0	92.9						
	B	100.0	99.7	100.0	95.7						
	SYSTEM	100.0	98.3	100.0	94.3			720	691	679	58.6
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING APRIL, THERE WERE NO OPERATIONAL PROBLEMS WITH THE FGD SYSTEM. THE SYSTEM WAS AVAILABLE 100% OF THE TIME.									
5/80	A	100.0	100.0	100.0	82.8						
	B	100.0	100.0	100.0	82.8						
	SYSTEM	100.0	100.0	100.0	82.8			744	604	616	53.7
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING MAY NO FORCED OUTAGES WERE EXPERIENCED WITH THE FGD SYSTEM. THE BOILER WAS OFF LINE FOR 140 HOURS DURING THE MONTH FOR GENERAL MAINTENANCE, DURING WHICH TIME SOME GENERAL FGD SYSTEM MAINTENANCE WAS ALSO PERFORMED.									
6/80	A	100.0	100.0	100.0	98.2						
	B	100.0	100.0	100.0	98.2						
	SYSTEM	100.0	100.0	100.0	98.2			720	706	707	55.4

SOUTHERN INDIANA GAS & ELEC: A.B. BROWN 1 (CONT.)

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
		NO FGD RELATED PROBLEMS WERE REPORTED FOR THE MONTH OF JUNE. THE FGD SYSTEM OPERATED 100% OF THE TIME THE BOILER WAS ON LINE.									
7/80	A	98.1	97.9	97.9	92.5						
	B	86.8	87.7	87.7	82.9						
	SYSTEM	92.4	92.8	92.8	87.7			744	703	653	62.6
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE B MODULE RECIRCULATION PUMPS WERE THE MAJOR CAUSE OF DOWNTIME. TWO PIECES OF THE CHEVRON MIST ELIMINATOR FELL CAUSING THE SUCTION LINES TO PLUG.									
		ADDITIONAL PROBLEMS WITH THE PUMP WERE CAUSED BY THE THRUST BEARING. THIS WAS CORRECTED BY THE MANUFACTURER.									
		THE UNAVAILABILITY OF THE VACUUM FILTERS AND ASSOCIATED EQUIPMENT REQUIRED THE SCRUBBER TO SHUTDOWN TO AVOID A STOPPAGE OF THE THICKENER RAKE. THIS SITUATION ACCOUNTED FOR APPROXIMATELY 15 HOURS OF SYSTEM OUTAGE TIME DURING JULY.									
8/80	A	94.5	94.5	94.5	94.5						
	B	94.8	94.8	94.8	94.8						
	SYSTEM	94.6	94.6	94.6	94.6			744	744	704	61.4
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE MAJOR CAUSE OF UNAVAILABLITY FOR AUGUST WAS PROBLEMS WITH SOLIDS DISPOSAL, INCLUDING PROBLEMS WITH PRIMARY LIQUID-SOLID SEPARATION UP TO AND INCLUDING FINAL LANDFILLING.									
9/80	A	100.0	99.6	99.6	99.6						
	B	100.0	99.6	99.6	99.6						
	SYSTEM	100.0	99.6	99.6	99.6			720	720	717	59.8
	** PROBLEMS/SOLUTIONS/COMMENTS										
		SLUDGE DISPOSAL REMAINS THE MOST PREVALENT PROBLEM DUE TO MECHANICAL BREAKDOWN OF THE DISPOSAL TRUCKS AND UNDERFLOW PUMPS, IN ADDITION TO THE HIGH MAINTENANCE REQUIREMENTS OF THE ROTARY VACUUM FILTERS.									
		THE MONTH OF SEPTEMBER ALSO SAW AN EXTREMELY HIGH RATE OF FAILURE OF RECIRCULATION PUMPS, WITH DAMAGE TO THE RUBBER LINED CASINGS AND IMPELLERS. THE CAUSE OF THIS PROBLEM IS UNKNOWN TO THE UTILITY AT THIS POINT.									
10/80	A	98.4	98.2	98.2	98.2						
	B	100.0	93.8	93.8	93.8						
	SYSTEM	99.2	96.0	96.0	96.0			744	744	714	59.8
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE SYSTEM UNAVAILABILITY DURING THE MONTH WAS CAUSED BY TWO SEPARATE INSTANCES OF REGULATOR VALVE FAILURE.									
		NO MAJOR FGD RELATED PROBLEMS WERE REPORTED FOR OCTOBER; HOWEVER, SEVERAL PROCESS LINES HAD LOW FLOWS AT TIMES DUE TO BLOCKAGES CAUSED BY PIECES OF BROKEN MIST ELIMINATOR.									
11/80	A	97.5	83.8	85.2	54.6						
	B	97.5	83.8	85.2	54.6						
	SYSTEM	97.5	83.8	85.2	54.6			720	469	393	38.2

SOUTHERN INDIANA GAS & ELEC: A.B. BROWN 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
		PERFORMANCE DATA									

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER WAS DOWN FROM NOVEMBER 7 TO NOVEMBER 17.

THE FGD SYSTEM WAS SHUTDOWN ON NOVEMBER 6 DUE TO DEPLETION OF THE SODA ASH INVENTORY WHICH RESULTED IN A LOW CHEMICAL CONCENTRATION.

THE TRANSITION DUCTWORK FROM ONE MODULE TO THE STACK WAS REPLACED WITH 317L SS WHILE THE OTHER SIDE RECEIVED A FLOUROELASTOMER COATING.

THE CHEVRONS WERE CAKED WITH AN EXTREMELY HARD AND HEAVY MATERIAL CONSISTING PRIMARILY OF SODIUM CARBONATES AND SULFATES.

THE MIST ELIMINATORS WERE RE-TIED DURING NOVEMBER TO PREVENT FURTHER SECTIONS FROM FALLING.

12/80	A	100.0	97.4	97.4	94.3						
	B	98.2	95.0	95.0	92.1						
	SYSTEM	99.2	96.2	96.2	93.2			744	721	694	52.4

** PROBLEMS/SOLUTIONS/COMMENTS

A MAJOR EQUIPMENT PROBLEM WITH THE LIME SLAKERS WAS ENCOUNTERED DURING DECEMBER. THE PH AND LEVEL CONTROLS CAUSED ERRATIC OPERATION SEVERAL TIMES DURING THE MONTH, ADDING TO THE CONTINUAL WATER BALANCE PROBLEMS.

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	SPRINGFIELD CITY UTILITIES	
PLANT NAME	SOUTHWEST	
UNIT NUMBER	1	
CITY	SPRINGFIELD	
STATE	MISSOURI	
REGULATORY CLASSIFICATION	B	
PARTICULATE EMISSION LIMITATION - NG/J	43.	(.100 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	516.	(1.200 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	173	
GROSS UNIT GENERATING CAPACITY - MW	194	
NET UNIT GENERATING CAPACITY W/FGD - MW	173	
NET UNIT GENERATING CAPACITY WO/FGD - MW	182	
EQUIVALENT SCRUBBED CAPACITY - MW	194	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	RILEY STOKER	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	375.16	(795000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	148.9	(300 F)
STACK HEIGHT - M	117.	(384 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	3.4	(11.0 FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	BITUMINOUS	
AVERAGE HEAT CONTENT - J/G	26749.	(11500 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		10500-12500
AVERAGE ASH CONTENT - %	13.00	
RANGE ASH CONTENT - %	10-22	
AVERAGE MOISTURE CONTENT - %	9.00	
RANGE MOISTURE CONTENT - %	6-12	
AVERAGE SULFUR CONTENT - %	3.50	
RANGE SULFUR CONTENT - %	2.5 - 4.5	
AVERAGE CHLORIDE CONTENT - %	.30	
RANGE CHLORIDE CONTENT - %	******	
*** PARTICLE CONTROL		
** ESP		
NUMBER	1	
TYPE	COLD SIDE	
SUPPLIER	AIR CORRECTION DIVISION, UOP	
INLET FLUE GAS TEMPERATURE - C	148.9	(300 F)
PARTICLE REMOVAL EFFICENCY - %	99.7	
** PARTICLE SCRUBBER		
GENERIC TYPE	NONE	
SPECIFIC TYPE	N/A	
*** FGD SYSTEM		
** GENERAL DATA		
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT	
SO2 REMOVAL MODE	WET SCRUBBING	
PROCESS TYPE	LIMESTONE	
SYSTEM SUPPLIER	AIR CORRECTION DIVISION, UOP	
A-E FIRM	BURNS & MCDONNELL	
DEVELOPMENT LEVEL	FULL SCALE	
NEW/RETROFIT	NEW	
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.70	
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	80.00	
CURRENT STATUS	1	
COMMERCIAL START-UP	9/77	
INITIAL START-UP	4/77	
CONTRACT AWARDED	8/73	

SPRINGFIELD CITY UTILITIES: SOUTHWEST 1 (CONT.)

** DESIGN AND OPERATING PARAMETERS

** ABSORBER		
NUMBER	2	
GENERIC TYPE	PACKED TOWER	
SPECIFIC TYPE	MOBILE BED PACKING	
TRADE NAME/COMMON TYPE	TURBULENT CONTACT ABSORBER	
SUPPLIER	AIR CORRECTION DIVISION, UOP	
DIMENSIONS - FT	16 X 30 X 54.5 HIGH	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	ASTM A-36	
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A	
LINER GENERIC MATERIAL	ORGANIC	
LINER SPECIFIC MATERIAL	SYNTHETIC RUBBER	
LINER MATERIAL TRADE NAME/COMMON TYPE	NEOPRENE	
GAS CONTACTING DEVICE TYPE	1 7/8" NITRILE FOAM SPHERES	
NUMBER OF CONTACTING ZONES	3	
LIQUID RECIRCULATION RATE - LITER/S	819.	(13000 GPM)
L/G RATIO - L/CU.M	5.5	(41.0 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	1.5	(6.0 IN-H2O)
INLET GAS FLOW - CU. M/S	156.91	(332500 ACFM)
INLET GAS TEMPERATURE - C	65.6	(150 F)
SO2 REMOVAL EFFICIENCY - %	87.0	
** MIST ELIMINATOR		
PRE-MIST ELIMINATOR/MIST ELIMINATOR	MIST ELIMINATOR	
NUMBER PER SYSTEM	2	
GENERIC TYPE	IMPINGEMENT	
SPECIFIC TYPE	BAFFLE	
TRADE NAME/COMMON TYPE	CHEVRON VANE	
NUMBER OF STAGES	2	
NUMBER OF PASSES PER STAGE	3	
DISTANCE BETWEEN STAGES - CM	1.52	(.6 IN)
DISTANCE BETWEEN VANES - CM	2.5	(1.00 IN)
CONSTRUCTION MATERIAL GENERIC TYPE	FIBERGLASS REINFORCED PLASTIC	
** REHEATER		
GENERIC TYPE	NONE	
SPECIFIC TYPE	N/A	
TRADE NAME/COMMON TYPE	N/A	
** FANS		
NUMBER	2	
SUPPLIER	GREEN FAN	
APPLICATION	BOILER I.D.	
SERVICE	DRY	
FLUE GAS FLOW RATE - CU.M/S	192.06	(407000 ACFM)
FLUE GAS TEMPERATURE - C	168.3	(335 F)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	
** DUCTWORK		
LOCATION	SCRUBBER INLET	
SHELL GENERIC MATERIAL TYPE	CARBON STEEL	
LINER GENERIC MATERIAL TYPE	NONE	
** DUCTWORK		
LOCATION	SCRUBBER OUTLET TO STACK	
SHELL GENERIC MATERIAL TYPE	CARBON STEEL	
LINER GENERIC MATERIAL TYPE	PLASITE 4005	
** REAGENT PREPARATION EQUIPMENT		
FUNCTION	LIMESTONE GRINDING	
DEVICE	BALL MILL	
MANUFACTURER	KENNEDY VAN SAUN	
NUMBER	2	
FULL LOAD DRY FEED CAPACITY - M.TONS/HR	7.3	(8 TPH)
PRODUCT QUALITY - % SOLIDS	40.0	

SPRINGFIELD CITY UTILITIES: SOUTHWEST 1 (CONT.)

** TANKS

SERVICE	NUMBER
LIMESTONE SLURRY	1
SLURRY HOLD TANK	2
DEMISTER WASH TANK	1
PRESATURATOR SUPPLY TANK	1

** PUMPS

SERVICE	NUMBER
ABSORBER RECIRCULATION	4
MIST ELIMINATOR WASH	2
THICKENER FEED	2
SLURRY FEED	4
SLURRY TRANSFER	2
PRESATURATOR WATER-TRAP OUT TRAY WAS	2

** SOLIDS CONCENTRATING/DEWATERING

DEVICE	VACUUM FILTER
NUMBER	1
NUMBER OF SPARES	0
FEED STREAM CHARACTERISTICS	30% SOLIDS
OUTLET STREAM CHARACTERISTICS	60% SOLIDS

** SOLIDS CONCENTRATING/DEWATERING

DEVICE	THICKENER
NUMBER	1
NUMBER OF SPARES	0
DIMENSIONS - FT	112 DIA
SHELL GENERIC MATERIAL TYPE	CARBON STEEL

*** SLUDGE

** TREATMENT

** DISPOSAL

NATURE	FINAL
TYPE	LANDFILL
LOCATION	ON SITE
SITE TRANSPORTATION METHOD	TRUCK

** PROCESS CONTROL AND INSTRUMENTATION

CHEMICAL PARAMETERS	PH, SLURRY DENSITY
CONTROL LEVELS	PH 5.4-5.5
MONITOR LOCATION	RECYCLE SLURRY LINE
PROCESS CONTROL MANNER	MANUAL

** WATER BALANCE

WATER LOOP TYPE	CLOSED

** FGD SPARE CAPACITY INDICES

ABSORBER - %	20.0

** FGD SPARE COMPONENT INDICES

ABSORBER	.3

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
0/77	SYSTEM										

SPRINGFIELD CITY UTILITIES: SOUTHWEST 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
				PERFORMANCE DATA							

** PROBLEMS/SOLUTIONS/COMMENTS

INSTALLATION OF THE LIMESTONE FGD SYSTEM WAS COMPLETED DURING THE FIRST QUARTER OF 1977 (BEHIND SCHEDULE, PRIMARILY BECAUSE OF DELAYS IN ELECTRICAL WORK). FOLLOWING AIR/WATER TESTS AND CHECKOUT OF LIMESTONE PREPARATION FACILITIES, THE FGD PLANT WAS STARTED UP IN EARLY APRIL 1977 FOR MECHANICAL SHAKEDOWN/DEBUGGING OPERATIONS WHICH CONTINUED THROUGHOUT THE SUMMER. COMPLIANCE TESTING AND CERTIFICATION OF COMMERCIAL AVAILABILITY WERE SUCCESSFULLY COMPLETED IN SEPTEMBER, JUST BEFORE A SCHEDULED 3-MONTH FALL SHUTDOWN. OPERATION OF THE SYSTEM HAS BEEN HAMPERED BY A NUMBER OF PROBLEMS: MIST ELIMINATOR PLUGGING (PIPING TO M.E. SPRAY SYSTEM HAS BEEN MODIFIED), CORROSION IN THE PRESATURATOR (WAS RELINED WITH PRECRETE), CORROSION OF THE INLET/OUTLET GAS DAMPERS (REPLACED WITH 316 SS DAMPERS), AND FAILURE OF PRECRETE LINING IN THE SCRUBBER AND CEILCOTE IN THE STACK (BOTH FAILURES IDENTIFIED AS APPLICATION PROBLEMS). THE UTILITY ALSO FOUND IT NECESSARY TO CHANGE THE SYSTEM PH CONTROL FROM 5.9 TO 5.6 TO INCREASE LIMESTONE UTILIZATION AND DECREASE PLUGGING WITHIN THE SYSTEM.

4/77	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

FGD OPERATIONS BEGAN IN EARLY APRIL. THE SYSTEM IS CURRENTLY EXPERIENCING MIST ELIMINATOR PLUGGING AND INSTRUMENTATION PROBLEMS.

5/77	SYSTEM							744			
6/77	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

THE SCRUBBER EXPERIENCED CORROSION IN THE PRESATURATOR AREAS THAT WILL WILL REQUIRE RELINING.

7/77	SYSTEM							744			
8/77	SYSTEM							744			
9/77	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS OPERATED ROUGHLY 60% OF THE AUGUST-SEPTEMBER PERIOD. A NEW SOURCE PERFORMANCE TEST WAS RUN DURING THE SECOND WEEK OF SEPTEMBER. LATER, THE UNIT WAS SHUT DOWN FOR THE FIRST TURBINE INSPECTION.

10/77	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

A SCHEDULED OCTOBER-NOVEMBER OUTAGE WAS INITIATED. THE UNIT IS SCHEDULED TO START UP AGAIN IN JANUARY.

DURING OCTOBER THE OUTLET DAMPERS WERE MODIFIED. THE 316 SS DAMPERS WERE. REPLACED WITH 316L SS DAMPERS.

THE PRESATURATOR WAS RELINED WITH HIGH MOLYBDENUM STEEL AS A RESULT OF THE PRECRETE FAILURE NOTED EARLIER (JUNE).

OUTLET DUCTWORK WAS RELINED WITH CEILCOTE DURING THE OUTAGE.

HOLLOW PACKING BALLS WERE REPLACED WITH HEAVIER WALLED PLASTIC BALLS.

SPRINGFIELD CITY UTILITIES: SOUTHWEST 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
				PERFORMANCE DATA							

THE BALLS WERE RUPTURING AND FILLING WITH SLURRY MAKING THEM INEFFECTIVE.

LEAKING AROUND OUTLET DAMPERS WAS MINIMIZED BY SEAL-AIR FANS.

11/77 SYSTEM 720

12/77 SYSTEM 744

** PROBLEMS/SOLUTIONS/COMMENTS

THE PLANT SHUTDOWN CONTINUED UNTIL JANUARY 28 WHEN THE BOILER RESTARTED. THE FGD SYSTEM WAS EXPECTED TO BE PUT BACK ON LINE IN FEBRUARY 1978. DURING THE OUTAGE ALL REMAINING MODIFICATIONS TO THE FGD SYSTEM WERE COMPLETED.

1/78 SYSTEM 744

2/78 SYSTEM 672

** PROBLEMS/SOLUTIONS/COMMENTS

THE ABSORBERS DID NOT OPERATE DUE TO AN EXPANSION JOINT FAILURE BETWEEN THE ID FAN AND THE ABSORBERS.

THE ABSORBERS ARE CURRENTLY BEING BY-PASSED. THE FGD SYSTEM IS EXPECTED TO BE BACK ON LINE BY THE END OF APRIL.

3/78 SYSTEM 744

4/78 SYSTEM 720

** PROBLEMS/SOLUTIONS/COMMENTS

ONLY ONE ABSORBER MODULE IS CURRENTLY OPERATING. THE EXPANSION JOINT FAILURE MENTIONED PREVIOUSLY WAS DIRECTLY RELATED TO THE DAMPER FAILURE WHICH DIRECTED THE BOILER FLUE GAS TO THE SEALED OFF FGD SYSTEM.

THE DAMPER LOUVERS HAVE BEEN STICKING. THERE ARE NO MANUAL CONTROLS FOR THE DOUBLE LOUVER DAMPERS SO THAT WHEN INSTRUMENTATION FAILURES OCCUR THE UNIT MUST BE SHUT DOWN. OF THE 12 DAMPERS (6 PAIRS) ON THIS SYSTEM 6 HAVE BEEN REBUILT.

AN FRP LINER FAILURE OCCURRED DURING THIS PERIOD.

A PUMP FAILURE OCCURRED DURING THE PERIOD. THE PROBLEM DOES NOT APPEAR TO BE SEVERE.

5/78 SYSTEM 744

6/78 SYSTEM 720

** PROBLEMS/SOLUTIONS/COMMENTS

THE S-1 MODULE RAN STEADILY FOR OVER 11 DAYS. THE S-2 MODULE WAS STILL DOWN WITH EXPANSION JOINT PROBLEMS.

DURING THE MONTH THE MIST ELIMINATOR WASH SYSTEM WAS ALTERED FROM A SEPARATE CLOSED LOOP FOR EACH MODULE TO A COMMON SYSTEM FOR BOTH MODULES. THE NEW SYSTEM TAKES SUPERNATANT FROM THE TOP OF THE THICKENER FOR MIST ELIMINATOR SPRAY.

INSTRUMENTATION PROBLEMS WERE ENCOUNTERED DURING THE MONTH. PH PROBES WERE LOST, THE MAG-FLOW METER FOR LIMESTONE SLURRY FAILED, AND THE AUTO-

SPRINGFIELD CITY UTILITIES: SOUTHWEST 1 (CONT.)

PERIOD	MODULE	PERFORMANCE DATA: AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
		MATIC GAS ANALYZERS DID NOT OPERATE PROPERLY. SOME PIPES EXPERIENCED PLUGGING DUE TO NEOPRENE PEELING FROM VALVES. IT IS EXPECTED THAT VALVE REPAIR OR REPLACEMENT SHOULD STOP THE PLUGGING. THE SLUDGE SYSTEM EXPERIENCED SOME FILTER BELT PROBLEMS DURING THE MONTH. REPAIRS WERE MADE BUT INSUFFICIENT SLUDGE HAS BEEN GENERATED TO DETERMINE IF THE PROBLEMS HAVE BEEN SOLVED.									
7/78	S-1	16.7	16.7	16.7	16.7						
	S-2	.0	.0	.0	.0						
	SYSTEM	8.3	8.3	8.3	8.3			744	744	62	70.1
	** PROBLEMS/SOLUTIONS/COMMENTS										
		PROBLEMS WERE ENCOUNTERED WITH THE S-1 MODULE TRANSFER PUMPS. NINE DAYS WERE REQUIRED TO TRACE THE ELECTRICAL-RELATED PROBLEM. A 17-DAY OUTAGE WAS CAUSED BY PROBLEMS WITH THE BALL MILL AIR SUPPLY WHICH RESULTED IN THE UNAVAILABILITY OF SLURRY. THE S-2 MODULE WAS STILL DOWN IN JULY WHILE THE UTILITY WAITED FOR THE REPLACEMENT EXPANSION JOINT. WORK WAS DONE DURING THE MONTH TO IMPROVE THE INSTRUMENTATION. IT WAS DISCOVERED THAT MANY OF THE PROBLEMS WERE DUE TO SCALE ACCUMULATION ON THE PROBES.									
8/78	S-1	59.0	59.0	59.0	59.0						
	S-2	.0	.0	.0	.0						
	SYSTEM	29.5	29.5	29.5	29.5			744	744	220	56.6
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE S-2 MODULE REMAINED DOWN THROUGHOUT AUGUST BECAUSE THE REPLACEMENT EXPANSION JOINT HAD NOT YET ARRIVED. EXPANSION JOINT REPAIRS ON THE S-1 MODULE SCRUBBER FORCED THE MODULE OUT OF SERVICE FOR 84 HOURS. PROBLEMS WITH THE THICKENER AND PLUGGED LINES FORCED THE S-1 MODULE OUT OF SERVICE FOR 211 HOURS.									
9/78	S-1	22.1	28.6	28.6	22.1						
	S-2	.0	.0	.0	.0						
	SYSTEM	11.1	14.3	14.3	11.1			720	557	80	49.1
	** PROBLEMS/SOLUTIONS/COMMENTS										
		CONTINUATION OF THE EXPANSION JOINT PROBLEM RESULTED IN THE S-2 MODULE REMAINING DOWN THROUGHOUT THE MONTH. S-2 MODULE DOWN TIME WAS DUE TO PLUGGING OF THE THICKENER SLURRY MAKEUP LINES AND FAILURE OF THE BALLS WITHIN THE MODULE. THE HEAVIER-WALLED PING PONG BALLS THAT WERE INSTALLED DURING THE DECEMBER 1977-JANUARY 1978 PERIOD WERE REPLACED WITH 1.25 INCH DIAMETER SOLID RUBBER BALLS DURING SEPTEMBER 1978.									
10/78	SYSTEM	.0	.0	.0	.0			744	26	0	

SPRINGFIELD CITY UTILITIES: SOUTHWEST 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
		PERFORMANCE DATA									
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE BOILER WAS DOWN FOR A SCHEDULED OUTAGE DURING THE MONTH									
		CONSIDERABLE CLEANING OF THE S-1 MODULE WAS DONE AS THE LOWER TWO LEVELS OF THE MODULE HAD BEGUN TO PLUG WHEN THE BALLS FAILED (SEE SEPTEMBER 1978).									
		A THOROUGH CLEANING OF THE ENTIRE FGD SYSTEM OCCURRED DURING THIS PERIOD.									
		A BEARING WAS REPLACED ON THE SLURRY DRAW OFF PUMP. WORK WAS ALSO REQUIRED ON A WASTE DRAW OFF PUMP.									
		THE OUTLET DUCT WAS CLEANED AND A PLASITE LINER WAS INSTALLED. REPAIR WAS MADE TO THE BYPASS DUCT TOGGLE (A PAIR OF EXPANSION JOINTS WITH TWO TO THREE FT. OF DUCT BETWEEN THEM) DUE TO METAL DETERIORATION.									
		THE RUBBER COATING ON HOLD TANK AGITATORS AND SLURRY STORAGE TANK AGITATORS WERE REPAIRED.									
		MAINTENANCE WAS PERFORMED ON FANS, DAMPERS AND VALVES.									
		MAINTENANCE AND MODIFICATIONS TO THE INSTRUMENTATION HAVE YIELDED SOME IMPROVEMENT IN OPERATIONS. SOME INSTRUMENTATION PROBLEMS RESULTED FROM SCALE ACCUMULATION ON PROBES. MODIFICATIONS TO THE PRESATURATOR TEMPERATURE PROBES WHICH WERE COMPLETELY COATED WITH MATERIAL ARE EXPECTED TO PERMANENTLY RECTIFY THE PROBLEM IN THIS AREA.									
		THE FILTER BELTS HAVE STILL BEEN TEARING AS MENTIONED EARLIER (JUNE, 1978). THERE HAVE BEEN PROBLEMS BOTH UPSTREAM AND DOWNSTREAM OF THE FILTER BELTS IN THE SLUDGE DISPOSAL SYSTEM.									
		THE UTILITY REPORTED THAT THERE HAS BEEN NO SIGN OF SCALE ACCUMULATION ON THE MIST ELIMINATORS SINCE THE WASH SYSTEM WAS MODIFIED AS REPORTED IN JUNE, 1978.									
11/78	S-1	68.1	64.7	64.7	64.3						
	S-2	34.9	22.4	22.4	22.3						
	SYSTEM	51.5	43.6	43.6	43.3			720	716	312	52.1
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE BOILER OUTAGE LASTED INTO THE FIRST PART OF NOVEMBER DURING WHICH TIME SCRUBBER REPAIR WORK CONTINUED.									
		AN FGD OUTAGE WAS CAUSED BY A FAN BEARING FAILURE ON THE S-2 MODULE DURING NOVEMBER.									
		ALL DAMPERS WERE SERVICED, REPAIRED AND EXERCISED.									
12/78	S-1	45.2	32.9	32.9	29.7						
	S-2	81.7	76.2	76.2	68.7						
	SYSTEM	63.4	54.6	54.6	49.2			744	671	366	58.9
	** PROBLEMS/SOLUTIONS/COMMENTS										
		PRESATURATOR NOZZLE PLUGGING OCCURRED IN THE S-1 MODULE DURING DECEMBER. AFTER THE SPRAY NOZZLES WERE REPLACED FROZEN LINES PREVENTED MODULE STARTUP.									
		SEVERAL LINES BROKE OR DEVELOPED LEAKS AS A RESULT OF FREEZE UPS.									
		ALL THE MAJOR OUTAGES CAN BE ATTRIBUTED TO THE COLD WEATHER. THE SYSTEM									

SPRINGFIELD CITY UTILITIES: SOUTHWEST 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
				PERFORMANCE DATA							
				WAS NOT DESIGNED WITH DUE REGARD TO WEATHER CONDITIONS.							
				ONE OR TWO MINOR SCRUBBER SHUTDOWNS RESULTED FROM FROZEN INSTRUMENTATION.							
1/79	S-1	.0	.0	.0	.0						
	S-2	42.6	47.3	47.3	29.0						
	SYSTEM	21.3	24.9	24.9	14.5			744	457	108	43.9
	** PROBLEMS/SOLUTIONS/COMMENTS										
				THE S-2 MODULE WAS UNAVAILABLE FOR 117 HOURS BECAUSE OF VALVE FREEZE-UPS.							
				FROZEN VALVES AND EQUIPMENT CONTRIBUTED TO THE OUTAGES OF THE S-1 MODULE.							
				DURING THE FIRST 15 DAYS OF JANUARY THE SECOND BALL MILL WAS UNUSEABLE BECAUSE OF A COMPRESSED AIR SYSTEM FAILURE. THIS RESULTED IN AN INSUFFICIENT LIMESTONE SLURRY SUPPLY TO THE S-1 MODULE.							
2/79	S-1	28.7	.0	.0	.0						
	S-2	24.2	32.0	32.0	24.2						
	SYSTEM	26.5	16.0	16.0	12.1			672	508	81	48.2
	** PROBLEMS/SOLUTIONS/COMMENTS										
				THE S-1 MODULE EXPERIENCED PLUGGING PROBLEMS IN THE FIRST AND SECOND STAGES DURING FEBRUARY AND DID NOT OPERATE. DUE TO FLUE GAS LEAKING INTO THE MODULE, ACCESS COULD NOT BE OBTAINED TO CLEAN THE MODULE.							
				EXPANSION JOINT PROBLEMS AND BROKEN LINES THROUGHOUT THE SYSTEM WERE REPORTED.							
				SCRUBBING OPERATIONS WERE HAMPERED DURING THE LATTER PART OF FEBRUARY BECAUSE OF INSUFFICIENT LIMESTONE SLURRY.							
				THE S-2 MODULE PROBLEMS INCLUDED FROZEN VALVES AND LINES.							
3/79	S-1	62.0	39.5	39.5	38.8						
	S-2	55.1	14.0	14.0	13.7						
	SYSTEM	58.6	26.8	26.8	26.3			744	730	195	46.2
	** PROBLEMS/SOLUTIONS/COMMENTS										
				THE MAJORITY OF MODULE S-1 DOWNTIME WAS DUE TO A BROKEN SUPERNATE LINE AND MAKEUP CROSS TIE.							
				THE UTILITY REPORTED THAT THE MODULE WAS UNABLE TO RUN FOR A TIME DUE TO A DESIGN PROBLEM WITH THE WESTINGHOUSE 500 HP MOTORS.							
4/79	S-1	42.6	30.9	30.9	18.5						
	S-2	51.6	45.0	45.0	27.0						
	SYSTEM	47.1	38.0	38.0	22.8			720	432	164	28.4
	** PROBLEMS/SOLUTIONS/COMMENTS										
				MODULE S-1 EXPERIENCED AN EXPANSION JOINT FAILURE ON THE ID FAN DISCHARGE.							
				LOW DENSITY AT THE SLURRY HOLD TANK WAS A MAJOR PROBLEM.							
				SOME PLUGGING OF THE FIRST STAGE OF THE S-2 MODULE WAS REPORTED BY THE UTILITY.							
5/79	S-1	84.1	77.5	77.5	67.0						

SPRINGFIELD CITY UTILITIES: SOUTHWEST 1 (CONT.)

PERIOD	MODULE	PERFORMANCE DATA AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	S-2	.0	.0	.0	.0						
	SYSTEM	42.1	38.8	38.8	33.5			744	644	249	37.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE S-2 MODULE WAS NOT OPERATED DURING MAY DUE TO A BROKEN RECYCLE TANK AGITATOR SHAFT. A NEW ONE HAS BEEN ORDERED. RUBBER LINING OF THE SHAFT AND REPAIR OF DAMAGED LINING ON THE IMPELLER WILL BE DONE ON SITE.

6/79	S-1	55.0	53.0	53.0	52.9						
	S-2	.0	.0	.0	.0						
	SYSTEM	27.5	26.5	26.5	26.5			720	719	191	53.8

** PROBLEMS/SOLUTIONS/COMMENTS

THE BROKEN AGITATOR SHAFT ON THE S-2 MODULE WAS REPLACED AND LINED DURING JUNE.

THE S-1 MODULE WAS OUT OF SERVICE ON THREE OCCASIONS DUE TO PLUGGING OF THE FIRST AND SECOND STAGES. THE UTILITY REPORTED THAT WITH THE EXCEPTION OF THE PLUGGING PROBLEM ONLY A FEW MINOR SHORT DURATION TRIPS WERE NOTED.

7/79	S-1	59.2	34.1	34.1	34.1						
	S-2	55.3	47.4	47.4	47.3						
	SYSTEM	57.3	40.8	40.8	40.7			744	743	303	52.7

** PROBLEMS/SOLUTIONS/COMMENTS

THE S-1 MODULE WAS NOT OPERATED DURING THE FIRST PART OF THE PERIOD DUE TO PLUGGING IN THE FIRST AND SECOND STAGES. TWO OTHER OUTAGES OCCURRED. ONE RESULTED FROM A BROKEN SLURRY LINE AND THE OTHER FROM PROCESS CONTROL TROUBLE ATTRIBUTED TO A MINI COMPUTER MALFUNCTION.

THE S-2 MODULE WAS NOT OPERATED FOR TWO PERIODS. ONCE WHEN THE TANK WAS BEING REFILLED AFTER AN AGITATOR WAS INSTALLED AND ONCE TO CLEAN THE FIRST AND SECOND STAGES.

8/79	S-1	74.6	53.8	53.8	50.7						
	S-2	94.8	70.9	70.9	66.8						
	SYSTEM	84.7	62.4	62.4	58.8			744	701	437	58.6

** PROBLEMS/SOLUTIONS/COMMENTS

THE S-1 MODULE WAS DOWN FOR TWO PERIODS DUE TO PLUGGING IN THE ABSORBER SECTION. THE MODULE ALSO TRIPPED OFF AS A RESULT OF SUPERNATE PUMP FAILURES.

9/79	S-1	48.6	58.3	58.3	45.8						
	S-2	68.8	60.2	78.8	47.4						
	SYSTEM	71.3	59.3	65.7	46.6			720	566	336	45.6

** PROBLEMS/SOLUTIONS/COMMENTS

THE S-1 MODULE WAS OFF LINE DUE TO PLUGGING IN THE ABSORBER SECTION FOR TWO PERIODS AND IT ALSO TRIPPED AS A RESULT OF SUPERNATE PUMP FAILURES.

THE S-2 MODULE WAS OFF LINE ONCE DUE TO BROKEN SUPERNATE LINE, AND ONCE DUE TO FAULTY PH PROBES IN SEPTEMBER. THE SCRUBBING SYSTEM WAS OFF LINE FOR SEVERAL SHORT PERIODS DUE TO MINOR PROBLEMS.

10/79	SYSTEM	.0			.0			744	0	0	.0

SPRINGFIELD CITY UTILITIES: SOUTHWEST 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
		A SCHEDULED BOILER/SCRUBBER OVERHAUL BEGAN ON SEPTEMBER 29 AND CONTINUED THROUGH OCTOBER 31.									
		BOTH SCRUBBER TOWERS WERE COMPLETELY CLEANED DURING THE OUTAGE.									
		THE SLURRY TANKS AND RELATED PIPING WERE CLEANED DURING OCTOBER.									
		THE SCRUBBER OUTLET DUCTWORK WAS RELINED WITH PLASITE.									
		ON AREAS OF THE SCRUBBING SYSTEM WHERE FIBERGLASS PIPING WAS BEING USED, REPLACEMENTS WERE MADE WITH LINED CARBON STEEL PIPING.									
		THE PH PROBES WERE REPAIRED.									
		REPAIRS WERE MADE TO THE LIMESTONE FEED BELT ON THE CONVEYOR SYSTEM.									
		REPAIRS WERE MADE TO THE S-2 MODULE HOLD TANK AGITATOR SHAFT DURING THE OUTAGE									
		A PRESATURATOR SPRAY NOZZLE WAS REPLACED.									
		THE SCRUBBER DAMPERS WERE REPAIRED AND ADJUSTED.									
		THE SLUDGE DISPOSAL CONVEYOR SYSTEM WAS REPAIRED AND MODIFIED.									
		PUMP REPAIRS WERE MADE ON THE SUPERNATE PUMPS AND NEW STANDBY PUMPS WERE INSTALLED AT THE SCRUBBING SYSTEM FACILITY.									
11/79	S-1	.0	.0	.0	.0						
	S-2	41.9	41.3	41.3	40.6						
	SYSTEM	20.9	20.6	20.6	20.3			720	708	146	58.1
	** PROBLEMS/SOLUTIONS/COMMENTS										
		FOR THE FIRST WEEK OF NOVEMBER NEITHER MODULE WAS AVAILABLE DUE TO AN OVERRUN ON SCHEDULED OUTAGE CAUSED BY A LACK OF MANPOWER.									
		THE S-1 MODULE WAS UNAVAILABLE FOR THE LAST THREE WEEKS OF THE MONTH BECAUSE OF THE LACK OF MANPOWER TO FINISH THE ABSORBER SECTION AND HOLD TANK CLEANOUT.									
		PROBLEMS WITH THE S-2 MODULE RECYCLE PUMPS WERE ENCOUNTERED. THE MODULE WAS REMOVED FROM SERVICE SO THAT THE REPAIRS COULD BE MADE.									
		SEVERAL ATTEMPTS TO RETURN THE S-1 MODULE TO SERVICE WERE ABORTED DUE TO VARIOUS PIPING PROBLEMS.									
12/79	S-1	53.7	23.7	23.7	21.2						
	S-2	64.8	40.6	40.6	36.2						
	SYSTEM	59.3	32.2	32.2	28.7			744	664	213	53.2
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE S-1 ABSORBER SECTION AND HOLD TANK CLEANOUT WAS COMPLETED DURING DECEMBER. THE MODULE WAS RETURNED TO SERVICE.									
		THE PRESATURATION NOZZLES CAUSED SOME PROBLEMS AND HAD TO BE REMOVED AND CLEANED.									
		AT THE END OF THE MONTH THE ID FAN EXPANSION JOINT BROKE AND HAD TO BE REPLACED.									

SPRINGFIELD CITY UTILITIES: SOUTHWEST 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
				PERFORMANCE DATA							

THE DENSITY METER ON THE RECYCLE LINE WAS REMOVED AND REPAIRED.

THE DRAINS ON THE MIST ELIMINATOR PUMPS HAD TO BE REPLACED.

THE WEIGH FEEDER WEIGH BELT AND CALIBRATED FEEDER WERE REPLACED AND THE CALIBRATION FEEDER WAS CHECKED DURING DECEMBER.

1/80	S-1	54.5	38.7	47.9	36.3						
	S-2	68.7	72.6	73.1	68.1						
	SYSTEM	61.6	55.7	60.5	52.2			744	698	388	65.4

** PROBLEMS/SOLUTIONS/COMMENTS

AT THE BEGINNING OF JANUARY AN S-1 ID FAN EXPANSION JOINT FAILED. THE BOILER WAS SHUTDOWN SOON AFTER FOR BOILER-RELATED PROBLEMS.

DURING THE LATTER PART OF THIS PERIOD THE S-1 MIST ELIMINATOR AND TRAP OUT TRAY HEADER FROZE. AFTER REPAIRS WERE MADE BOTH MODULES WERE PUT ON LINE. BOTH WERE KEPT RUNNING UNTIL JANUARY 20 WHEN A FLANGE BROKE LOOSE ON THE MIST ELIMINATOR HEADER.

AFTER MIST ELIMINATOR REPAIRS WERE COMPLETED THE S-1 MODULE OPERATED UNTIL JANUARY 27 WHEN FREEZING AIR LINES TO THE BALL MILLS PREVENTED THE USE OF BOTH MODULES DUE TO THE LACK OF SLURRY.

THE S-2 MODULE WAS ON LINE AT THE BEGINNING OF THE MONTH BUT DEVELOPED PRESATURATOR SPRAY NOZZLE PROBLEMS. WHILE THIS WAS BEING REPAIRED THE UNIT WAS TAKEN OFF LINE. APART FROM THIS TIME THE MODULE WAS ON LINE.

2/80	S-1	36.7	29.1	31.5	29.1						
	S-2	73.8	71.7	73.2	71.6						
	SYSTEM	55.3	50.4	52.4	50.4			696	695	350	59.9

** PROBLEMS/SOLUTIONS/COMMENTS

THE S-1 MODULE WAS OUT OF SERVICE IN THE FIRST PART OF FEBRUARY DUE TO FROZEN AND BROKEN LINES. THE SUPERNATE LINE BROKE IN SEVERAL PLACES TAKING BOTH MODULES OUT OF SERVICE FOR SEVERAL DAYS. ONCE THIS WAS REPAIRED BOTH MODULES WERE IN SERVICE AS REQUIRED BY LOAD EXCEPT FOR A FEW MINOR TRIPS.

THE S-2 MODULE WAS EITHER IN SERVICE OR AVAILABLE FOR MOST OF THE MONTH.

3/80	S-1	64.5	64.1	64.4	64.1						
	S-2	22.0	5.8	6.9	5.8						
	SYSTEM	43.3	35.0	35.7	35.0			744	744	260	57.7

** PROBLEMS/SOLUTIONS/COMMENTS

DURING MARCH THE S-1 MODULE WAS OUT FOR 11 DAYS TO CLEAN THE ABSORBER SECTION.

THE S-2 MODULE WAS OUT OF SERVICE FOR CLEANING THE ABSORBER SECTIONS AND MIST ELIMINATORS FOR NEARLY ALL THE PERIOD BUT WAS AVAILABLE ON MARCH 25. IT WAS NOT OPERATED, HOWEVER, BECAUSE OF LOW UNIT LOAD DEMANDS.

4/80	S-1	78.2	69.1		59.6						
	S-2	15.1	6.9		6.0						
	SYSTEM	46.7	37.9	37.9	32.8			720	621	236	42.4

** PROBLEMS/SOLUTIONS/COMMENTS

THE S-1 MODULE EXPERIENCED SHORT OUTAGES DURING APRIL CAUSED BY SLURRY DRAW-OFF PUMP FAILURES AND MIST ELIMINATOR AND PRESATURATOR SPRAY SYSTEM PROBLEMS.

SPRINGFIELD CITY UTILITIES: SOUTHWEST 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
		THE S-2 MODULE EXPERIENCED RECURRING HIGH FLUE GAS TEMPERATURE-RELATED PROBLEMS DURING THE MONTH. THIS WAS CORRECTED BY REPAIRING THE SCRUBBER INLET SCREEN.									
5/80	S-1	72.9	60.7	69.1	60.6						
	S-2	43.6	30.7	35.2	30.7						
	SYSTEM	58.3	45.7	52.2	45.7			744	744	340	56.7
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING MAY THE S-1 SCRUBBER REQUIRED CLEANING.									
		PUMP AND PUMP CONTROL PROBLEMS ON THE S-1 SCRUBBING TRAIN OCCURRED DURING THE PERIOD.									
		THE S-2 MODULE WAS OFF LINE SEVERAL DAYS BECAUSE OF RECYCLE PUMP AND RECYCLE SYSTEM REPAIRS.									
		FLUE GAS OUTLET DUCT REPAIRS WERE REQUIRED ON THE S-2 MODULE IN MAY.									
6/80	S-1	85.6	85.6	85.5	84.9						
	S-2	12.8	6.8	7.2	6.8						
	SYSTEM	49.2	45.8	47.4	45.8			720	720	330	66.6
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE S-1 MODULE WAS IN CONTINUOUS SERVICE DURING JUNE WITH SHORT DURATION OUTAGES FOR CLEANING, CONTROL SYSTEM DAMAGE CAUSED BY LIGHTNING, AND OTHER MINOR MISCELLANEOUS PROBLEMS.									
		THE S-2 MODULE WAS OUT OF SERVICE FOR APPROXIMATELY 23 DAYS IN JUNE BECAUSE OF A BROKEN SLURRY HOLD TANK AGITATOR SHAFT.									
		IN ADDITION TO THE OUTAGE CAUSED BY THE BROKEN SHAFT, THE S-2 MODULE HAD SHORT DURATION OUTAGES CAUSED BY RECYCLE PUMP AGITATOR PROBLEMS, CONTROL SYSTEM PROGRAMMING, AND OTHER MINOR MISCELLANEOUS PROBLEMS.									
7/80	S-1	80.5	69.6		69.5						
	S-2	57.0	39.0		39.0						
	SYSTEM	68.7	54.3	72.4	54.3			744	743	404	80.6
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING JULY THE S-1 MODULE WAS CLEANED AND THE SPHERES WERE REPLACED.									
		THE S-1 MODULE DUCTWORK NEEDED REPAIR DURING JULY CAUSING SOME OUTAGE TIME.									
		THE SLUDGE DEWATERING FILTER BELT AND THE HOLD TANK BEARING FAILED ACCOUNTING FOR SOME OF THE S-1 MODULE DOWNTIME.									
		THE S-1 MODULE SPRAY CONTROL VALVE FAILED ADDING TO THE OUTAGE TIME.									
		HIGH FLUE GAS TEMPERATURE CONDITIONS RESULTED IN A SHUTDOWN OF BOTH THE FGD MODULES.									
		THE S-2 MODULE AGITATOR SHAFT IN THE HOLD TANK FAILED CAUSING THE MODULE TO COME OFF LINE.									
		PROBLEMS WERE ENCOUNTERED WITH THE SLURRY DRAW OFF PUMP, SUPERNATANT PUMP AND THE RECYCLE PUMP CAUSING THE S-2 MODULE TO SHUTDOWN.									
		A POWER SUPPLY EQUIPMENT FAILURE RESULTED IN A S-2 MODULE OUTAGE.									
		AN EXPANSION JOINT FAILURE OCCURRED ON THE S-2 MODULE SEAL AIR FAN.									

SPRINGFIELD CITY UTILITIES: SOUTHWEST 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR

A HIGH LEVEL CONDITION IN THE DRAW OFF SUMP WAS ALSO A CAUSE OF THE S-2 MODULE LOW AVAILABILITY. THE PROBLEMS EXPERIENCED WITH THE CONTROL SYSTEM CONTRIBUTED ALSO.

8/80	S-1	73.7	67.4		67.4						
	S-2	71.9	55.4		55.4						
	SYSTEM	72.8	61.4	62.4	61.4			744	744	457	86.2

** PROBLEMS/SOLUTIONS/COMMENTS

THICKENER PROBLEMS ENCOUNTERED DURING AUGUST CAUSED BOTH MODULES TO SHUT DOWN FOR PART OF THE MONTH.

THE OUTLET DUCT EXPERIENCED LEAKAGE CAUSING SOME SYSTEM DOWN TIME.

THE S-1 MODULE DAMPER DRIVE FAILED CAUSED ADDITIONAL OUTAGE TIME.

THE LIMESTONE FEEDER FOR MODULE S-2 FAILED CAUSING THE S-2 MODULE TO SHUT DOWN FOR PART OF THE MONTH.

THE FGD SYSTEM WAS SHUT DOWN DURING PART OF THE MONTH SO THAT VALVE REPAIRS COULD BE MADE.

PROBLEMS WERE ENCOUNTERED WITH THE S-2 MODULE RECYCLE PUMP.

9/80	S-1	78.5	85.8	87.4	78.5						
	S-2	57.5	.6	.2	.2						
	SYSTEM	68.0	43.2	43.8	39.4			720	658	283	80.3

** PROBLEMS/SOLUTIONS/COMMENTS

DURING SEPTEMBER, THE SCRUBBER OUTLET DUCTS EXPERIENCED LEAKING CAUSING THE SYSTEM TO SHUTDOWN FOR PART OF THE MONTH.

THE S-1 MODULE EXPERIENCED INLET DAMPER PROBLEMS.

THE RECYCLE SPRAY NOZZLES ON THE S-2 MODULE PLUGGED CAUSING ADDITIONAL OUTAGE TIME.

THE RADIAN CORP. BEGAN PREPARING THE SYSTEM FOR TESTING IN THE FORCED OXIDATION MODE. THIS IS IN CONJUNCTION WITH THE ADIPIC ACID TEST PROGRAM.

10/80	S-1										
	S-2										
	SYSTEM	.0	.0	.0	.0			744	572	0	67.3

** PROBLEMS/SOLUTIONS/COMMENTS

BOTH SCRUBBER MODULES WERE OUT OF SERVICE FOR THE ENTIRE PERIOD DUE TO MAINTENANCE REQUIREMENTS THAT COULD NO LONGER BE DEFERRED.

THE BOILER WAS BROUGHT OFF LINE ON OCTOBER 24 FOR AN ANNUAL MAINTENANCE OUTAGE. THIS OUTAGE HAD BEEN DELAYED FOR APPROXIMATELY ONE MONTH BECAUSE OF SYSTEM ELECTRICAL DEMAND AND THE UNAVAILABILITY OF ALTERNATE POWER PRODUCTION FACILITIES.

11/80	S-1										
	S-2										
	SYSTEM	.0	.0	.0	.0			720	147	0	11.9

EPA UTILITY FGD SURVEY: OCTOBER - DECEMBER 1980

SPRINGFIELD CITY UTILITIES: SOUTHWEST 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE SCRUBBER MODULES WERE NOT RETURNED TO SERVICE AT THE CONCLUSION OF THE ANNUAL MAINTENANCE OUTAGE DURING NOVEMBER. WORK WAS IN PROGRESS TO PREPARE THE MODULES FOR TESTING IN THE FORCED OXIDATION MODE OF OPERATION IN CONJUNCTION WITH THE EPA ADIPIC ACID TEST PROGRAM.									
12/80	S-1	37.4	.0	.0	.0						
	S-2	48.4	12.5	16.9	8.7						
	SYSTEM	42.9	6.3	7.7	4.4			744	520	65	49.3
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING DECEMBER, DOWN TIME RESULTED DUE TO PIPING SYSTEM MODIFICATIONS, AN INLET DAMPER DRIVE FAILURE, FROZEN AND BROKEN PIPING, AND PROGRAMMABLE CONTROLLER PROBLEMS.									

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	SPRINGFIELD WATER, LIGHT & PWR	
PLANT NAME	DALLMAN	
UNIT NUMBER	3	
CITY	SPRINGFIELD	
STATE	ILLINOIS	
REGULATORY CLASSIFICATION	B	
PARTICULATE EMISSION LIMITATION - NG/J	43.	(.100 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	516.	(1.200 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	301.	(.700 LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	350	
GROSS UNIT GENERATING CAPACITY - MW	205	
NET UNIT GENERATING CAPACITY W/FGD - MW	190	
NET UNIT GENERATING CAPACITY WO/FGD - MW	202	
EQUIVALENT SCRUBBED CAPACITY - MW	205	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	COMBUSTION ENGINEERING	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	401.11	(850000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	137.8	(280 F)
STACK HEIGHT - M	152.	(500 FT)
STACK SHELL	******	
STACK TOP DIAMETER - M	*******	(***** FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	******	
AVERAGE HEAT CONTENT - J/G	24423.	(10500 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		10000-11000
AVERAGE ASH CONTENT - %	8.30	
RANGE ASH CONTENT - %	10-12	
AVERAGE MOISTURE CONTENT - %	17.50	
RANGE MOISTURE CONTENT - %	10-20	
AVERAGE SULFUR CONTENT - %	3.30	
RANGE SULFUR CONTENT - %	2.5-3.5	
AVERAGE CHLORIDE CONTENT - %	.11	
RANGE CHLORIDE CONTENT - %	******	
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	BITUMINOUS	
AVERAGE HEAT CONTENT - J/G	25353.	(10900 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		10500-11500
AVERAGE ASH CONTENT - %	11.50	
RANGE ASH CONTENT - %	10-14	
AVERAGE MOISTURE CONTENT - %	13.50	
RANGE MOISTURE CONTENT - %	10-15	
AVERAGE SULFUR CONTENT - %	2.90	
RANGE SULFUR CONTENT - %	2.7-3.1	
AVERAGE CHLORIDE CONTENT - %	********	
RANGE CHLORIDE CONTENT - %	******	
*** PARTICLE CONTROL		
** MECHANICAL COLLECTOR		
SUPPLIER	JOY MANUFACTURING CO.	
** ESP		
NUMBER	1	
TYPE	HOT SIDE	
SUPPLIER	AIR CORRECTION DIVISION, UOP	
INLET FLUE GAS TEMPERATURE - C	137.8	(280 F)
** PARTICLE SCRUBBER		
GENERIC TYPE	NONE	
SPECIFIC TYPE	N/A	

EPA UTILITY FGD SURVEY: OCTOBER - DECEMBER 1980

SPRINGFIELD WATER, LIGHT & PWR: DALLMAN 3 (CONT.)

*** FGD SYSTEM

** GENERAL DATA

SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT	
SO2 REMOVAL MODE	WET SCRUBBING	
PROCESS TYPE	LIMESTONE	
PROCESS ADDITIVES	NONE	
SYSTEM SUPPLIER	RESEARCH-COTTRELL	
A-E FIRM	BURNS & MCDONNELL	
DEVELOPMENT LEVEL	FULL SCALE	
NEW/RETROFIT	NEW	
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.50	
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	95.00	
CURRENT STATUS	1	
COMMERCIAL START-UP	1/81	
INITIAL START-UP	10/80	
CONTRACT AWARDED	12/77	

** DESIGN AND OPERATING PARAMETERS

OPER. & MAINT. REQUIREMENT - MANHR/DAY	312.0	

** ABSORBER

NUMBER	2	
NUMBER OF SPARES	0	
GENERIC TYPE	COMBINATION	
SPECIFIC TYPE	SPRAY/PACKED	
SUPPLIER	RESEARCH-COTTRELL	
DIMENSIONS - FT	30 DIA X 92.5 HIGH	
GAS CONTACTING DEVICE TYPE	CORRUGATED POLYPROPYLENE	
NUMBER OF CONTACTING ZONES	5	
DISTANCE BETWEEN GAS CONTACTING ZONES - CM	61.0	(24.0IN)
GAS-SIDE PRESSURE DROP - KPA	.2	(.7 IN-H2O)
SUPERFICAL GAS VELOCITY - M/SEC	2.8	(9.1 FT/S)
INLET GAS FLOW - CU. M/S	182.86	(387500 ACFM)
INLET GAS TEMPERATURE - C	137.8	(280 F)
SO2 REMOVAL EFFICIENCY - %	95.0	

** MIST ELIMINATOR

PRE-MIST ELIMINATOR/MIST ELIMINATOR	MIST ELIMINATOR	
NUMBER PER SYSTEM	2	
CONFIGURATION	HORIZONTAL	
DISTANCE BETWEEN STAGES - CM	2.54	(1.0 IN)
VANE ANGLES - DEGREES	30	
CONSTRUCTION MATERIAL GENERIC TYPE	904-L	

** REHEATER

GENERIC TYPE	NONE	
SPECIFIC TYPE	N/A	
TRADE NAME/COMMON TYPE	N/A	

** FANS

NUMBER	2	
NUMBER OF SPARES	0	
SUPPLIER	AMERICAN STANDARD	
FUNCTION	BOOSTER	
SERVICE	DRY	
FLUE GAS TEMPERATURE - C	137.8	(280 F)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	

** REAGENT PREPARATION EQUIPMENT

FUNCTION	LIMESTONE GRINDING	
DEVICE	BALL MILL	
MANUFACTURER	KENNEDY VAN SAUN	
NUMBER	2	

** TANKS

SERVICE	NUMBER
-------	------
SO2 REMOVAL	2
ABSORBER FEED	1

SPRINGFIELD WATER, LIGHT & PWR: DALLMAN 3 (CONT.)

REAGENT FEED	1
DEMISTER WASH	1
RETURN WATER	1
WET-WELL	1

** PUMPS

SERVICE	NUMBER
ABSORBER FEED	3
QUENCHER	2
DEMISTER WASH	2
SUMP	2
MILL SLURRY	4
VACUUM	2
FILTRATE	2

** SOLIDS CONCENTRATING/DEWATERING

DEVICE	VACUUM FILTER
NUMBER	2
NUMBER OF SPARES	1

*** SLUDGE

MOISTURE CONTENT - % TOTAL FREE WATER	85.0

** DISPOSAL

NATURE	FINAL
TYPE	LANDFILL
SITE TRANSPORTATION METHOD	TRUCK

** PROCESS CONTROL AND INSTRUMENTATION

CHEMICAL PARAMETERS	PH
PROCESS CONTROL MANNER	AUTOMATIC
PROCESS CHEMISTRY MODE	FEEDBACK

** WATER BALANCE

WATER LOOP TYPE	CLOSED	
MAKEUP WATER ADDITION - LITERS/S	15.1	(239 GPM)

** FGD SPARE CAPACITY INDICES

ABSORBER - %	.0

** FGD SPARE COMPONENT INDICES

ABSORBER	.0

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
10/80	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

FGD SYSTEM OPERATION AT DALLMAN 3 COMMENCED IN OCTOBER 1980.

11/80	SYSTEM							720			
12/80	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

SINCE STARTUP NO MAJOR FGD-RELATED PROBLEMS HAVE BEEN ENCOUNTERED. THE UTILITY HAS REPORTED SOME CONDENSER TUBE PROBLEMS HAVE BEEN EXPERIENCED WITH THE BOILER.

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	ST. JOE ZINC	
PLANT NAME	G.F. WEATON	
UNIT NUMBER	1	
CITY	MONACA	
STATE	PENNSYLVANIA	
REGULATORY CLASSIFICATION	B	
PARTICULATE EMISSION LIMITATION - NG/J	43.	(.100 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	516.	(1.200 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	120	
GROSS UNIT GENERATING CAPACITY - MW	60	
NET UNIT GENERATING CAPACITY W/FGD - MW	60	
NET UNIT GENERATING CAPACITY WO/FGD - MW	*****	
EQUIVALENT SCRUBBED CAPACITY - MW	60	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	COMBUSTION ENGINEERING	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	******	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	75.03	(159000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	148.9	(300 F)
STACK HEIGHT - M	23.	(75 FT)
STACK SHELL	******	
STACK TOP DIAMETER - M	3.2	(10.5 FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	BITUMINOUS	
AVERAGE HEAT CONTENT - J/G	29075.	(12500 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		******
AVERAGE ASH CONTENT - %	11.50	
RANGE ASH CONTENT - %	******	
AVERAGE MOISTURE CONTENT - %	********	
RANGE MOISTURE CONTENT - %	******	
AVERAGE SULFUR CONTENT - %	2.00	
RANGE SULFUR CONTENT - %	2.0-4.5	
AVERAGE CHLORIDE CONTENT - %	.20	
RANGE CHLORIDE CONTENT - %	******	
*** PARTICLE CONTROL		
** ESP		
NUMBER	2	
TYPE	COLD SIDE	
INLET FLUE GAS TEMPERATURE - C	148.9	(300 F)
PARTICLE REMOVAL EFFICENCY - %	99.6	
** PARTICLE SCRUBBER		
GENERIC TYPE	NONE	
SPECIFIC TYPE	N/A	
*** FGD SYSTEM		
** GENERAL DATA		
SALEABLE PRODUCT/THROWAWAY PRODUCT	SALEABLE PRODUCT	
SO2 REMOVAL MODE	WET SCRUBBING	
PROCESS TYPE	CITRATE	
SYSTEM SUPPLIER	MORRISON & KNUDSEN/U.S.B.M.	
A-E FIRM	MORRISON & KNUDSEN	
DEVELOPMENT LEVEL	PROTOTYPE	
NEW/RETROFIT	RETROFIT	
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.60	
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	90.00	
CURRENT STATUS	1	
COMMERCIAL START-UP	1/80	
INITIAL START-UP	11/79	

ST. JOE ZINC: G.F. WEATON 1 (CONT.)

** DESIGN AND OPERATING PARAMETERS

** ABSORBER

NUMBER	1
GENERIC TYPE	PACKED TOWER
SPECIFIC TYPE	GRID PACKING
DIMENSIONS - FT	26 DIA. X 85 HIGH (20 PACKED SECTION)
SHELL GENERIC MATERIAL	CARBON STEEL
SHELL SPECIFIC MATERIAL	AISI 1110
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A
LINER GENERIC MATERIAL	ORGANIC
LINER SPECIFIC MATERIAL	VINLY ESTER
LINER MATERIAL TRADE NAME/COMMON TYPE	FLAKEGLASS
GAS CONTACTING DEVICE TYPE	SIZE 2 POLYPROPYLENE INTALOX SADDLES
NUMBER OF CONTACTING ZONES	1
LIQUID RECIRCULATION RATE - LITER/S	283. (4500 GPM)
INLET GAS FLOW - CU. M/S	73.62 (156000 ACFM)
INLET GAS TEMPERATURE - C	48.9 (120 F)
SO2 REMOVAL EFFICIENCY - %	90.0

** MIST ELIMINATOR

PRE-MIST ELIMINATOR/MIST ELIMINATOR	MIST ELIMINATOR
NUMBER PER SYSTEM	2
GENERIC TYPE	IMPINGEMENT
SPECIFIC TYPE	BAFFLE
TRADE NAME/COMMON TYPE	CHEVRON VANE
CONSTRUCTION MATERIAL GENERIC TYPE	CHLORINATE PVC

** REHEATER

NUMBER	1
GENERIC TYPE	INDIRECT HOT AIR
SPECIFIC TYPE	EXTERNAL HEAT EXCHANGER
TRADE NAME/COMMON TYPE	STEAM TUBE BUNDLES

** FANS

NUMBER	1
APPLICATION	FLUE GAS, DOUBLE INLET MECHANICAL DRAFT TYPE
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL

** TANKS

SERVICE	NUMBER
SULFUR FLOTATION	1
SULFUR SLURRY	1
CITRATE SOLUTION STORAGE TANK	1
MAKE-UP WATER	1
SULFUR STORAGE	1

** PUMPS

SERVICE	NUMBER
SULFUR SLURRY	2
LEAN SOLUTION	2
******	1
SULFUR TRANSFER	1
SCRUBBER RECIRCULATION	4
SULFUR LOADING	1
RICH CITRATE SOLUTION	2

*** SALEABLE BYPRODUCTS

NATURE	ELEMENTAL SULFUR
QUALITY - %	99.5

** WATER BALANCE

WATER LOOP TYPE	CLOSED

ST. JOE ZINC: G.F. WEATON 1 (CONT.)

** FGD SPARE CAPACITY INDICES
ABSORBER - % .0

** FGD SPARE COMPONENT INDICES
ABSORBER .0

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
11/79	SYSTEM							720			
12/79	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

SINCE START-UP IN NOVEMBER THE UNIT HAS BEEN DOWN DUE TO MECHANICAL PROBLEMS.

THE ELECTRIC MOTOR IN THE SCRUBBER LIQUOR RECYCLE UNIT HAS BEEN A PROBLEM SINCE START-UP.

LEAKS HAVE BEEN ENCOUNTERED IN THE PIPING OF THE PRESCRUBBER SOLUTION. SOME OF THE PIPING FAILURES WERE A RESULT OF FREEZING WEATHER CONDITIONS.

BECAUSE OF THE SMELTER SHUT DOWN AT ST. JOE ZINC, THE UNIT HAS BEEN OPERATING AT A LOAD OF NO MORE THAN 20 TO 30 MW.

1/80	SYSTEM							744			
2/80	SYSTEM							696			
3/80	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

THE SYSTEM IS STILL GOING THROUGH THE DEBUGGING PHASE OF OPERATION. SOME EQUIPMENT PROBLEMS HAVE OCCURRED, ESPECIALLY WITH THE HYDROGEN SULFIDE GENERATOR AND HEAT EXCHANGERS, ONE OF WHICH HAD TO BE REMOVED AND RETURNED TO THE MANUFACTURER. NO OPERATING HOURS WERE LOGGED DURING THE FIRST QUARTER OF 1980 BRINGING THE TOTAL SYSTEM OPERATING HOURS TO DATE TO 42.

4/80	SYSTEM							720			
5/80	SYSTEM							744			
6/80	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

THE GEORGE F. WHEATON STATION HAS BEEN OPERATING AT A REDUCED LOAD OF 20 TO 30 MW SINCE DECEMBER, 1979 DUE TO THE SHUTDOWN OF THE ST. JOE ZINC CO. SMELTER. ALTHOUGH A NUMBER OF TRIAL RUNS OF THE CITRATE DEMONSTRATION PLANT HAVE BEEN MADE DURING THE PAST SIX MONTHS, MECHANICAL BREAKDOWNS OF EQUIPMENT AND PROBLEMS RELATED TO LOW TEMPERATURE OPERATION HAVE PREVENTED CONTINUOUS OPERATION TO OBTAIN MEANINGFUL DATA. ST. JOE IS ATTEMPTING TO NEGOTIATE A POWER SALES AGREEMENT THAT WILL PERMIT FULL UTILIZATION OF THE STATION CAPACITY AND ALSO PROVIDE DESIGN FLUE GAS QUANTITIES TO THE DEMONSTRATION PLANT. OPERATION OF THE POWER PLANT AT THE DESIGN RATES IS REQUIRED FOR ACCEPTANCE AND DEMONSTRATION TESTING.

7/80	SYSTEM							744			
8/80	SYSTEM							744			

ST. JOE ZINC: G.F. WEATON 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
					PERFORMANCE DATA						
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE CITRATE PROCESS DID NOT OPERATE DURING THE MONTHS OF JULY AND AUGUST 1980.									
		NEGOTIATIONS TO PERMIT THE POWER PLANT TO OPERATE AT HIGHER RATES AND ALLOW THE DEMONSTRATION PLANT TEST PROGRAM TO PROCEED AS PLANNED ARE CONTINUING.									
9/80	SYSTEM				11.9			720		86	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		NEGOTIATIONS MENTIONED EARLIER CONTINUED THROUGH SEPTEMBER. MINIMAL FGD OPERATIONS WERE REPORTED FOR THE MONTH.									
10/80	SYSTEM				37.5			744		279	
11/80	SYSTEM				13.9			720		100	
12/80	SYSTEM				24.9			744		185	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE FGD SYSTEM OPERATED 279 HRS DURING OCTOBER BUT RETURNED TO A MINIMAL LEVEL OF OPERATION DURING NOVEMBER AND DECEMBER. LIMITED OPERATIONS HAVE RESUMED AT THE ST. JOE ZINC SMELTER AND THE BOILER IS NOW OPERATING AT 40 MW. CURRENTLY, NEGOTIATIONS ARE UNDERWAY TO GAIN APPROVAL TO RUN THE FGD SYSTEM PERFORMANCE TEST AT 40 MW INSTEAD OF THE PLANNED 55 MW.									

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	TENNESSEE VALLEY AUTHORITY	
PLANT NAME	SHAWNEE	
UNIT NUMBER	10A	
CITY	PADUCAH	
STATE	KENTUCKY	
REGULATORY CLASSIFICATION	E	
PARTICULATE EMISSION LIMITATION - NG/J	43.	(.100 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	516.	(1.200 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	1750	
GROSS UNIT GENERATING CAPACITY - MW	10	
NET UNIT GENERATING CAPACITY W/FGD - MW	10	
NET UNIT GENERATING CAPACITY WO/FGD - MW	*****	
EQUIVALENT SCRUBBED CAPACITY - MW	10	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	******	
BOILER TYPE	******	
BOILER SERVICE LOAD	******	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	********	(******* ACFM)
BOILER FLUE GAS TEMPERATURE - C	*******	(**** F)
STACK HEIGHT - M	******	(**** FT)
STACK SHELL	******	
STACK TOP DIAMETER - M	*******	(***** FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	BITUMINOUS	
AVERAGE HEAT CONTENT - J/G	******	(****** BTU/LB)
RANGE HEAT CONTENT - BTU/LB		******
AVERAGE ASH CONTENT - %	********	
RANGE ASH CONTENT - %	******	
AVERAGE MOISTURE CONTENT - %	********	
RANGE MOISTURE CONTENT - %	******	
AVERAGE SULFUR CONTENT - %	2.90	
RANGE SULFUR CONTENT - %	******	
AVERAGE CHLORIDE CONTENT - %	********	
RANGE CHLORIDE CONTENT - %	******	
*** PARTICLE CONTROL		
** PARTICLE SCRUBBER		
GENERIC TYPE	PACKED TOWER	
SPECIFIC TYPE	MOBILE BED PACKING	
*** FGD SYSTEM		
** GENERAL DATA		
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT	
SO2 REMOVAL MODE	WET SCRUBBING	
PROCESS TYPE	LIME/LIMESTONE	
PROCESS ADDITIVES	VARIABLE - TEST FACILITY	
SYSTEM SUPPLIER	AIR CORRECTION DIVISION, UOP	
A-E FIRM	BECHTEL	
DEVELOPMENT LEVEL	PROTOTYPE	
NEW/RETROFIT	RETROFIT	
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	90.00	
CURRENT STATUS	1	
INITIAL START-UP	4/72	
** DESIGN AND OPERATING PARAMETERS		
** ABSORBER		
NUMBER	1	
GENERIC TYPE	PACKED TOWER	
SPECIFIC TYPE	MOBILE BED PACKING	
TRADE NAME/COMMON TYPE	TURBULENT CONTACT ABSORBER	
SUPPLIER	AIR CORRECTION DIVISION, UOP	
GAS CONTACTING DEVICE TYPE	1 7/8 IN DIA 11.5 GRAM NITRILE FOAM SPHERES	

TENNESSEE VALLEY AUTHORITY: SHAWNEE 10A (CONT.)

NUMBER OF CONTACTING ZONES	3	
DISTANCE BETWEEN GAS CONTACTING ZONES - CM	12.7	(5.0IN)
INLET GAS FLOW - CU. M/S	16.52	(35000 ACFM)
INLET GAS TEMPERATURE - C	148.9	(300 F)

** MIST ELIMINATOR

PRE-MIST ELIMINATOR/MIST ELIMINATOR	MIST ELIMINATOR
NUMBER PER SYSTEM	1
GENERIC TYPE	IMPINGEMENT
SPECIFIC TYPE	BAFFLE
TRADE NAME/COMMON TYPE	CHEVRON VANE

** REHEATER

GENERIC TYPE	DIRECT COMBUSTION
TRADE NAME/COMMON TYPE	OIL

** TANKS

SERVICE	NUMBER
EFFLUENT HOLD TANK	****

** SOLIDS CONCENTRATING/DEWATERING

DEVICE	CENTRIFUGE
NUMBER	1

** SOLIDS CONCENTRATING/DEWATERING

DEVICE	THICKENER
NUMBER	1

** WATER BALANCE

WATER LOOP TYPE	CLOSED

** FGD SPARE CAPACITY INDICES

ABSORBER - %	.0

** FGD SPARE COMPONENT INDICES

ABSORBER	.0

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
0/80	SYSTEM										

** PROBLEMS/SOLUTIONS/COMMENTS

REFER TO THE PERFORMANCE UPDATE INFORMATION FOR SHAWNEE 10B.

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	TENNESSEE VALLEY AUTHORITY	
PLANT NAME	SHAWNEE	
UNIT NUMBER	10B	
CITY	PADUCAH	
STATE	KENTUCKY	
REGULATORY CLASSIFICATION	E	
PARTICULATE EMISSION LIMITATION - NG/J	43.	(.100 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	516.	(1.200 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	1750	
GROSS UNIT GENERATING CAPACITY - MW	10	
NET UNIT GENERATING CAPACITY W/FGD - MW	10	
NET UNIT GENERATING CAPACITY WO/FGD - MW	*****	
EQUIVALENT SCRUBBED CAPACITY - MW	10	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	******	
BOILER TYPE	******	
BOILER SERVICE LOAD	******	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	********	(******* ACFM)
BOILER FLUE GAS TEMPERATURE - C	*******	(**** F)
STACK HEIGHT - M	******	(**** FT)
STACK SHELL	******	
STACK TOP DIAMETER - M	*******	(***** FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	BITUMINOUS	
AVERAGE HEAT CONTENT - J/G	******	(****** BTU/LB)
RANGE HEAT CONTENT - BTU/LB		******
AVERAGE ASH CONTENT - %	********	
RANGE ASH CONTENT - %	******	
AVERAGE MOISTURE CONTENT - %	********	
RANGE MOISTURE CONTENT - %	******	
AVERAGE SULFUR CONTENT - %	2.90	
RANGE SULFUR CONTENT - %	******	
AVERAGE CHLORIDE CONTENT - %	********	
RANGE CHLORIDE CONTENT - %	******	
*** PARTICLE CONTROL		
** PARTICLE SCRUBBER		
NUMBER	1	
GENERIC TYPE	VENTURI TOWER	
SPECIFIC TYPE	VARIABLE-THROAT/TOP-ENTRY PLUMB BOB	
SUPPLIER	CHEMICO	
INLET GAS FLOW RATE - CU.M/S	1.7	(3500 ACFM)
INLET GAS TEMPERATURE - C	148.9	(300 F)
*** FGD SYSTEM		
** GENERAL DATA		
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT	
SO2 REMOVAL MODE	WET SCRUBBING	
PROCESS TYPE	LIME/LIMESTONE	
PROCESS ADDITIVES	VARIABLE - TEST FACILITY	
SYSTEM SUPPLIER	CHEMICO DIVISION, ENVIROTECH	
A-E FIRM	BECHTEL	
DEVELOPMENT LEVEL	PROTOTYPE	
NEW/RETROFIT	RETROFIT	
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	90.00	
CURRENT STATUS	1	
INITIAL START-UP	4/72	
** DESIGN AND OPERATING PARAMETERS		
** ABSORBER		
NUMBER	1	
GENERIC TYPE	SPRAY TOWER	

TENNESSEE VALLEY AUTHORITY: SHAWNEE 10B (CONT.)

SPECIFIC TYPE	OPEN COUNTERCURRENT SPRAY
SUPPLIER	CHEMICO DIVISION, ENVIROTECH
INLET GAS FLOW - CU. M/S	16.52 (35000 ACFM)
INLET GAS TEMPERATURE - C	148.9 (300 F)

** MIST ELIMINATOR

PRE-MIST ELIMINATOR/MIST ELIMINATOR	MIST ELIMINATOR
NUMBER PER SYSTEM	1
GENERIC TYPE	IMPINGEMENT
SPECIFIC TYPE	BAFFLE
TRADE NAME/COMMON TYPE	CHEVRON VANE

** REHEATER

GENERIC TYPE	DIRECT COMBUSTION
TRADE NAME/COMMON TYPE	OIL

** TANKS

SERVICE	NUMBER
SPRAY TOWER EFFLUENT HOLD TANK	****
OXIDATION TANK	****
DESUPERSATURATION TANK	****

** WATER BALANCE

WATER LOOP TYPE	CLOSED

** FGD SPARE CAPACITY INDICES

ABSORBER - %	.0

** FGD SPARE COMPONENT INDICES

ABSORBER	.0

PERFORMANCE DATA

PERIOD	MODULE AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
0/72	SYSTEM									

** PROBLEMS/SOLUTIONS/COMMENTS

IN JUNE 1968, THE EPA INITIATED A PROGRAM TO TEST PROTOTYPE LIME AND LIMESTONE SYSTEMS FOR REMOVAL OF SULFUR DIOXIDE AND PARTICULATE MATTER FROM COAL FIRED BOILER FLUE GASES. THE PROGRAM WAS CARRIED OUT IN A TEST FACILITY INCORPORATED INTO THE FLUE GAS DUCTWORK OF UNIT 10, A COAL-FIRED-BOILER AT THE TVA SHAWNEE POWER STATION, PADUCAH, KENTUCKY. TVA IS THE CONSTRUCTION AND FACILITY OPERATOR, AND BECHTEL CORP. IS CONTRACTOR, TEST DIRECTOR AND REPORT WRITER.

THE TEST FACILITY CONSISTS OF THREE PARALLEL SCRUBBING SYSTEMS OF PROTOTYPE SIZE, TREATING PART OF THE FLUE GAS FROM THE BOILER. EACH SCRUBBER TRAIN IS CAPABLE OF TREATING APPROXIMATELY 30,000 ACFM OR THE EQUIVALENT OF APPROXIMATELY 10 MW OF POWER PLANT GENERATING CAPACITY.

THREE PARALLEL WET SCRUBBING SYSTEMS WERE SELECTED FOR THE TEST PROJECT: 1) A VENTURI WITH A SPRAY TOWER AFTER ABSORBER, 2) A TURBULENT CONTACT ABSORBER (TCA), AND 3) A MARBLE-BED ABSORBER. THE VENTURI SYSTEM, MANUFACTURED BY CHEMICAL CONSTRUCTION CO., CONTAINS AN ADJUSTABLE THROAT THAT PERMITS CONTROL AND VARIATION OF PRESSURE DROP OVER A WIDE RANGE OF FLOW CONDITIONS. THE TCA UNIT, MANUFACTURED BY UNIVERSAL OIL PRODUCTS, INCORPORATES A FLUIDIZED BED OF LOW DENSITY PLASTIC SPHERES THAT ARE FREE TO MOVE BETWEEN RETAINING GRIDS. THE MARBLE BED ABSORBER, SUPPLIED BY COMBUSTION ENGINEERING CO., USES A PACKING OF 3 TO 4 INCH GLASS MARBLE SPHERES AND A TURBULENT LAYER OF LIQUID AND GAS ABOVE THE MARBLE LAYER TO ENHANCE MASS TRANSFER.

IN JUNE 1974, THE EPA BEGAN A 3-YEAR ADVANCED TEST PROGRAM AT THE SHAWNEE FACILITY WITH THESE MAJOR GOALS: (1) CONTINUATION OF LONG-TERM TESTING, WITH EMPHASIS PLACED UPON THE RELIABLE OPERATION OF MIST ELIMINATION SYSTEMS AT INCREASED GAS VELOCITY, (2) INVESTIGATION OF ADVANCED PROCESS AND EQUIPMENT DESIGN VARIATIONS FOR IMPROVING EQUIPMENT RELIABILITY AND PROCESS ECONOMICS, AND (3) LONG-TERM RELIABILITY TESTING ON PROMISING

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR

PROCESS AND EQUIPMENT DESIGN VARIATIONS.

THE TWO PARALLEL SCRUBBING SYSTEMS OPERATING DURING THE ADVANCED PROGRAM ARE THE VENTURI/SPRAY TOWER SYSTEM AND THE TCA UNIT. OPERATION OF THE MARBLE-BED ABSORBER UNIT HAS BEEN PERMANENTLY DISCONTINUED.

EACH OF THE SCRUBBING SYSTEMS CONTAINS ITS OWN SLURRY HANDLING FACILITIES AND CAN TREAT APPROXIMATELY 30,000 ACFM OF GAS AT 300 F CONTAINING 1800 TO 4000 PPM OF SULFUR DIOXIDE AND 2 TO 4 GRAINS/SCF OF PARTICULATE MATTER BOILER 10 NORMALLY BURNS A HIGH-SULFUR BITUMINOUS COAL.

FROM JUNE 1974 TO JANUARY 1976, MIST ELIMINATION AND LIMESTONE UTILIZATION TESTS WERE CONDUCTED AT THE SHAWNEE FACILITY. DURING THIS TEST PERIOD THE VENTURI/SPRAY TOWER SYSTEM WAS OPERATED ON BOTH LIME AND LIMESTONE AND THE TCA SYSTEM WITH LIMESTONE. TESTING WAS PERFORMED UNDER A CLOSED WATER OPERATION MODE. DURING THIS PERIOD THE SLURRY SOLIDS CONTAINED APPROXIMATELY 40 TO 50% (BY WEIGHT) FLY ASH BECAUSE OF RELATIVELY HIGH GAS INLET PARTICULATE LOADING. THIS TESTING PROGRAM IS SCHEDULED TO RUN THROUGH TO FEBRUARY 1978.

ADDITIONAL INFORMATION AND DATA CONCERNING THE DETAILS OF THE ADVANCED TEST PROGRAM ARE PRESENTED IN THE PERFORMANCE HISTORY THAT FOLLOWS.

9/75	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

THIS EXPERIMENTAL EPA-FUNDED OPERATION IS PROCEEDING WITH THE TEST PROGRAM. TWO ABSORBER MODULES ARE CURRENTLY OPERATIONAL (10 MW EACH). THE MARBLE-BED ABSORBER IS STILL INOPERATIVE (SINCE JULY 1973). CURRENT EXPERIMENTS ARE RELATED TO THE MIST ELIMINATOR SECTION.

10/75	SYSTEM							744			
11/75	SYSTEM							720			
12/75	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

RECENT TESTING AT SHAWNEE HAS SHOWN THAT THE CHEVRON MIST ELIMINATORS IN BOTH THE SPRAY TOWER AND THE TCA CAN BE KEPT FREE OF SOLIDS BUILDUP AT HIGH ALKALI UTILIZATION (GREATER THAN 90%), USING ONLY INTERMITTANT WASHING WITH AVAILABLE RAW WATER. THIS HIGH UTILIZATION IS NORMALLY ACHIEVED WITH LIME. IT HAS BEEN ACHIEVED WITH LIMESTONE AT REDUCED SCRUBBER INLET SLURRY PH (ABOUT 5.2) AND WITH THREE EFFLUENT TANKS IN SERIES TO SIMULATE A PLUG-FLOW REACTOR. TESTING IS CONTINUING TO DETERMINE THE EFFECTS OF PROCESS VARIABLES ON MIST ELIMINATOR PERFORMANCE AND LIMESTONE UTILIZATION. FUTURE PLANS INCLUDE: (1) FACTORIAL TESTING WITH LIME AND LIMESTONE TO DETERMINE THE EFFECTS OF PROCESS VARIABLES ON SO2 REMOVAL AND (2) TESTING THE OXIDATION OF SLUDGE TO GYPSUM IN THE VENTURI/SPRAY TOWER SYSTEM USING AIR SPARGING OF AN ACIDIFIED SLURRY BLEED STREAM.

1/76	SYSTEM							744			
2/76	SYSTEM							696			

** PROBLEMS/SOLUTIONS/COMMENTS

THE ADVANCED TEST PROGRAM IS CONTINUING. HIGHLIGHTS OF THE PROGRAM ARE AS FOLLOWS:
EVALUATE SCRUBBER OPERABILITY DURING VARIABLE LOAD OPERATION.
CONTINUE LONG-TERM RELIABILITY TESTING.
INVESTIGATE METHODS FOR IMPROVING WASTE SOLIDS SEPARATION.
CONTINUE SLUDGE OXIDATION AND SLUDGE FIXATION STUDY PROGRAMS.
EVALUATE SYSTEM PERFORMANCE AT REDUCED FLY ASH LOADING.

TENNESSEE VALLEY AUTHORITY: SHAWNEE 10B (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR

DETERMINE THE PRACTICAL UPPER LIMITS OF SO2 REMOVAL EFFICIENCY.
EVALUATE ADDITION OF MAGNESIUM ION TO THE SCRUBBING SLURRY.
CHARACTERIZE ALL STACK GAS EMISSION COMPONENTS.
EVALUATE MATERIALS OF CONSTRUCTION OF ALL SCRUBBER AND PLANT-RELATED COMPONENTS.
DEVELOPE A COMPUTER PROGRAM FOR DESIGN AND COST ANALYSIS OF FULL-SCALE LIME/LIMESTONE SYSTEM.

3/76 SYSTEM 744

4/76 SYSTEM 720

** PROBLEMS/SOLUTIONS/COMMENTS

BECHTEL REPORTED THAT THE FACTORIAL TEST PROGRAM, EVALUATING THE PERFORMANCE OF THE LIME/LIMESTONE SCRUBBING SYSTEMS WITH AND WITHOUT MAGNESIUM ADDITION, HAS BEEN COMPLETED. CURRENTLY TESTING IS PROCEEDING ON THE EVALUATION OF SYSTEM PERFORMANCE AS A FUNCTION OF LOW RESIDENCE TIMES (1.5 TO 5.0 MINUTES) IN THE RECYCLE TANKS. IN ADDITION, A FLY ASH-FREE DUCT IS BEING INSTALLED AT THE TEST FACILITY, TO ENABLE EVALUATION OF THE-SYSTEM PERFORMANCE IN THE ABSENCE OF FLY ASH.

5/76 SYSTEM 744

6/76 SYSTEM 720

** PROBLEMS/SOLUTIONS/COMMENTS

THE TEST DIRECTOR, BECHTEL, PROVIDED THE FOLLOWING INPUT CONCERNING THE OPERATION OF THE EXPERIMENTAL SCRUBBING SYSTEMS DURING MAY AND JUNE.

THE EFFECT OF MGO ADDITION WAS EXPLORED IN BOTH SCRUBBER SYSTEMS. RESULTS INDICATE MAGNESIUM ION IN THE SCRUBBER SLURRY LIQUOR ENHANCES SO2 REMOVAL AND CAN DEPRESS SULFATE SUPERSATURATION. IT WAS FOUND THAT THE MAGNESIUM ION CONCENTRATION HAD TO EXCEED THE EQUIVALENT CHLORIDE ION CONCENTRATION TO HAVE AN EFFECT ON SO2 REMOVAL.
IN THE TCA UNIT, WITH LIMESTONE SLURRY, SO2 REMOVAL WAS INCREASED FROM 75 TO 95% BY INCREASING THE MAGNESIUM ION CONCENTRATION TO 9,000 PPM IN EXCESS OF EQUIVALENT CHLORIDE ION. TO ACHIEVE THIS CONCENTRATION MAGNESIUM WAS ADDED AT A RATE EQUAL TO 6% BY WEIGHT OF LIMESTONE ADDITION RATE. IN THE VENTURI/SPRAY TOWER SYSTEM, WITH LIME SLURRY, SO2 REMOVAL WAS INCREASED FROM 75 TO 90% BY INCREASING THE MAGNESIUM ION CONCENTRATION TO 2,000 PPM IN EXCESS OF EQUIVALENT CHLORIDE ION. THE MAGNESIUM OXIDE ADDITION RATE WAS 2% BY WEIGHT OF THE LIME ADDITION RATE. BOTH SCRUBBING SYSTEMS OPERATED IN THE SUBSATURATED SULFATE MODE WHEN MAGNESIUM OXIDE WAS ADDED. INLET SO2 CONCENTRATIONS DURING THE TESTS AVERAGE APPROXIMATELY 3,000 PPM DURING THESE TESTS.
FOLLOWING THE TEST BLOCKS MENTIONED ABOVE, BOTH SCRUBBERS BEGAN OPERATING WITH LIME SLURRY SCRUBBING SOLUTIONS, THE TCA SYSTEM ON FLUE GAS CONTAINING FLY ASH AND THE VENTURI/SPRAY TOWER SYSTEM ON FLY ASH-FREE FLUE GAS.

7/76 SYSTEM 744

8/76 SYSTEM 744

** PROBLEMS/SOLUTIONS/COMMENTS

EXPERIMENTAL OPERATION OF THE EPA/TVA ALKALI SCRUBBING TEST FACILITY CONTINUED DURING THE JULY AND AUGUST. BECHTEL, THE TEST DIRECTOR PROVIDED THE FOLLOWING INPUT CONCERNING THE OPERATION OF THE PROTOTYPE TEST UNITS.
VENTURI/SPRAY TOWER SYSTEM: THIS SYSTEM RAN OFF FLY ASH-FREE FLUE GAS USING A LIME SLURRY SCRUBBING SOLUTION. NO SIGNIFICANT DIFFERENCES IN SO2 REMOVAL, GYPSUM SATURATION AND SULFITE OXIDATION WERE DETECTED (VS FLY ASH-LADEN FLUE GAS). ONE DIFFERENCE NOTED WAS THE FILTER CAKE SOLIDS

TENNESSEE VALLEY AUTHORITY: SHAWNEE 10B (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR

CONTENT WHICH WAS APPROXIMATELY 10% LOWER FOR THE FLY ASH-FREE SLUDGE (40 TO 50% SOLIDS) VERSUS THE FLY ASH-LADEN SLUDGE 50 TO 60% SOLIDS IN ADDITION, OPERATION IN A LOW RESIDENCE TIME MODE (3 MINUTES) WAS EXPLORED. SCALE-FREE OPERATION WAS ACHIEVED IN THIS MODE UNDER THE FOL- - LOWING CONDITIONS: 8% SOLIDS (NO FLY ASH) IN THE RECIRCULATED SLURRY, PH OF THE SCRUBBER LIQUID INLET WAS 8.0, SUPERFICIAL GAS VELOCITY OF 9.4 FT/SEC, AND A TOTAL LIQUID-TO-GAS RATIO (L-G) OF 7.1 GAL/MCF. SOME SCALE FORMATION OCCURRED WHEN THE SOLIDS CONTENT OF THE RECIRCULATED SLURRY DROPPED BELOW THE 4% LEVEL.
TCA SYSTEM: THIS SYSTEM OPERATED ON FLY ASH-LADEN FLUE GAS USING A LIME SLURRY SCRUBBING SOLUTION INNOCULATED WITH MAGNESIUM OXIDE. GYPSUM SUB- - SATURATION OPERATION WAS ACHIEVED UNDER THE FOLLOWING CONDITIONS: MAGNES- IUM ION CONCENTRATION EXCEEDED THE CHLORIDE ION CONCENTRATION BY 2000 PPM, SUPERFICIAL GAS VELOCITY WAS 12.5 FT/SEC., L/G WAS 50. THE SCRUB- BING SOLUTION INLET PH WAS 7.0, AND RESIDENCE TIME WAS 4 MINUTES. THE SO2 REMOVAL EFFICIENCY WAS APPROXIMATELY 90%. WHEN L/G WAS REDUCED TO 37, WHILE ALL OTHER CONDITIONS REMAINED CONSTANT, SEVERE GYPSUM SCALE FORMATION RESULTED. INCREASING THE EFFECTIVE MAGNESIUM CONCENTRATION TO 4000 PPM AND THE SCRUBBER LIQUID INLET PH TO 8.0 DID NOT AMELIORATE THE SCALE PROBLEM. PRESENTLY THE VENTURI/SPRAY TOWER SYSTEM IS OPERATING ON E FLY ASH-FREE FLUE GAS WITH MAGNESIUM OXIDE-INNOCULATED LIME SCRUBBING SLURRY.

9/76	SYSTEM		720
10/76	SYSTEM		744

** PROBLEMS/SOLUTIONS/COMMENTS

IN SEPTEMBER AND OCTOBER 1976 THE VENTURI/SPRAY SYSTEM WAS OPERATED WITH FLY ASH-FREE FLUE GAS USING LIME SLURRY WITH MGO ADDITION. TYPICAL TEST CONDITIONS WERE 9.4 FT/SEC SPRAY TOWER GAS VELOCITY, 21 GAL/MCF VENTURI L/G, 50 GAL/MCF SPRAY TOWER L/G, 8% SLURRY SOLIDS (FLY ASH FREE), 3 MINUTES RESIDENCE TIME, 7.0 SCRUBBER INLET PH, AND 2000 PPM EFFECTIVE MAGNESIUM ION CONCENTRATION (I.E., EXCESS OVER EQUIVALENT CHLORIDE ION). RESULTS WERE NOT CONSISTENT AT THESE CONDITIONS. DURING ONE PERIOD, SCRUB- BING INLET LIQUOR GYPSUM SATURATION AVERAGED 85% WITH 80% SO2 REMOVAL EF- FICIENCY AND SOME GYPSUM SCALE FORMATION. IN A LATER PERIOD, AT SEEMINGLY IDENTICAL TEST CONDITIONS GYPSUM SATURATIONS DROPPED TO 10% WITH 98% SO2 REMOVAL AND THE SCRUBBER DESCALED. A SEVEN-WEEK PROGRAM OF IN- TENSIVE FLUE GAS CHARACTERIZATION TESTING WAS STARTED IN MID-OCTOBER ON THE VENTURI/SPRAY TOWER SYSTEM. THESE TESTS ARE BEING MADE TO MEASURE SIMULATANEOUS INLET AND OUTLET FLUE GAS PARTICULATE MASS LOADING, PARTI- CULATE SIZE DISTRIBUTION AND GASEOUS SO3 CONCENTRATION. THE TCA SYSTEM CONTINUED TO OPERATE DURING THIS PERIOD ON FLY ASH-LADEN FLUE GAS USING LIME SLURRY WITH ADDED MGO. THE TEST RESULTS SO FAR INDICATED THAT THE DEGREE OF SULFATE (GYPSUM) SATURATION IS A SENSITIVE FUNCTION OF THE EFFLUENT RESIDENCE TIME CONDITIONS: GAS VELOCITY 12.5 FT/SEC, L/G OF 50, PH OF 7.0, 2000 PPM OF MG ION, AND 8% SOLIDS. AT THESE CONDITIONS GYPSUM SATURATIONS WERE 95, 50, AND 92%, AT RESIDENCE TIMES OF 3, 4, AND 12 MINUTES, RESPECTIVELY. FURTHER TESTS WERE RUN AT 37 GAL/MCF L/G, AND 8.0 INLET PH WITH OTHER CONDITIONS THE SAME. DURING THESE TESTS GYPSUM SA- TIONS WERE 95, 95, 50, AND 90% AT 3, 4, 5.4, AND 16 MINUTES RESI- DENCE TIMES, RESPECTIVELY.

11/76	SYSTEM		720
12/76	SYSTEM		744

** PROBLEMS/SOLUTIONS/COMMENTS

FROM MID-OCTOBER THROUGH EARLY DECEMBER AN INTENSIVE FLUE GAS CHARACTERI- ZATION TESTING PROGRAM WAS CONDUCTED ON THE VENTURI/SPRAY TOWER SYSTEM WITH LIME SLURRY. OVER THE RANGE TESTED, OUTLET PARTICULATE MASS LOADING

TENNESSEE VALLEY AUTHORITY: SHAWNEE 10B (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
				PERFORMANCE DATA							

WAS FOUND TO BE INDEPENDENT OF SLURRY COMPOSITION (8 TO 15% SUSPENDED SOLIDS, 3,000 TO 16,000 PPM DISSOLVED SOLIDS), GAS FLOW RATE (20,000 TO 35,000, ACFM), SPRAY TOWER LIQUID RATE (0 TO 1,400 GPM) AND VENTURI PRESSURE DROP (3 TO 9 INCHES H2O). WITH 4 TO 6 GR/DSCF PARTICULATE MATTER IN THE INLET, TYPICAL OUTLET LOADINGS WERE 0.02 TO 0.04 GR/DSCF. WHEN OPERATING WITH FLUE GAS FROM THE ELECTROSTATIC PRECIPITATOR (.1 TO .4 GR/DSCF TO THE SCRUBBER), THE SCRUBBER OUTLET LOADING AVERAGED 0.005 GR/DSCF. THUS, ENTRAINED SLURRY FROM THE MIST ELIMINATOR MUST HAVE BEEN LESS THAN 0.005 GR/DSCF. SIZE DISTRIBUTION DATA ARE STILL BEING ANALYZED. SULFURIC ACID MIST VALUES WERE APPROXIMATELY 2 TO 25 PPM AT THE SCRUBBER INLET AND REMOVALS HAVE BEEN ABOUT 50 TO 75%.

DURING THE REMAINDER OF DECEMBER THE VENTURI/SPRAY TOWER SYSTEM WAS DOWN FOR MODIFICATIONS FOR TWO-STAGE OXIDATION TESTING.

DURING NOVEMBER THE TCA WAS OPERATING WITH FLY ASH-CONTAINING FLUE GAS USING LIME SLURRY WITHOUT ADDED MAGNESIUM OXIDE. OPERATING CONDITIONS WERE 12.5 FT/SEC GAS VELOCITY, 50 GAL/MCF L/G, 8.0 SCRUBBER INLET PH, AND 8 TO 15% SLURRY SOLIDS. AT THESE CONDITIONS THE SO2 REMOVAL WAS ABOUT 80%.

FLY ASH-FREE LIMESTONE TESTS WITHOUT MAGNESIUM OXIDE ADDITION BEGAN ON THE TCA SYSTEM IN LATE NOVEMBER. TYPICAL OPERATING CONDITIONS WERE 12.5 FT/SEC GAS VELOCITY, 50 GAL/MCF L/G, AND 1.1 TO 1.2 STOICHIOMETRIC RATIO. AT THE SAME STOICHIOMETRY, THE PH OF THE FLY ASH-FREE SLURRY WAS 0.2 TO 0.3 UNITS HIGHER THAN OBSERVED IN PREVIOUS RUNS WITH FLY ASH.

1/77	SYSTEM							744			
2/77	SYSTEM							672			

** PROBLEMS/SOLUTIONS/COMMENTS

THE VENTURI/SPRAY TOWER SYSTEM HAS BEEN OPERATED IN A TWO-SERIES-SCRUBBER MODE WITH FORCED OXIDATION SINCE EARLY JANUARY 1977 AFTER SYSTEM MODIFICATIONS TO ALLOW OPERATION OF THE VENTURI AND SPRAY TOWER WITH INDEPENDENT SLURRY RECIRCULATION LOOPS. SULFITE OXIDATION WAS CARRIED OUT IN AN 8 FT DIAMETER VENTURI (PRE-SCRUBBER) EFFLUENT HOLD TANK WHICH HAD AN AIR SPARGER WITH 130-1/8 INCH HOLES IMMERSED IN 18 FT OF SLURRY. THE SPRAY TOWER (AFTER SCRUBBER) FUNCTIONED AS A PRIMARY SO2 ABSORBER.

TYPICAL OPERATION CONDITIONS, USING LIMESTONE SLURRY, WERE 6.7 FT/SEC SPRAY TOWER GAS VELOCITY, 20-30 GAL/MCF VENTURI L/G, 70 GAL/MCF SPRAY TOWER L/G 15% SOLIDS (WITH FLY ASH) IN VENTURI RECIRCULATED SLURRY, 4.5-5 VENTURI INLET (OXIDATION TANK) PH, AND 11.3 MINUTES OXIDATION TANK RESIDENCE TIME (BASED ON 600 GPM SLURRY FLOW TO VENTURI). DURING THESE TESTS, AVERAGE OVERALL SULFITE OXIDATION RANGED FROM 93 TO 99% AT AIR STOICHIOMETRIC RATIO OF 1.0 TO 4.7 LB-ATOMS OXYGEN/LB-MOLE SO2 ABSORBED. CORRESPONDING AVERAGE OXIDATION IN THE SPRAY TOWER RANGED FROM 10 TO 16% AVERAGE OVERALL LIMESTONE UTILIZATION RANGED FROM 83 TO 96%. NO SCALING WAS EXPERIENCED IN EITHER SCRUBBER. AVERAGE FILTER CAKE SOLIDS WERE 79 TO 86% BY WEIGHT COMPARED WITH 55 TO 65% WITHOUT FORCED OXIDATION. SLURRY SOLIDS SETTLING RATE RANGED 0.5 TO 1.4 CM/MIN, 5 TO 10 TIMES FASTER THAN THAT FOR UNOXIDIZED SLURRY. FINAL SETTLED DENSITY RANGED 65 TO 80% SOLIDS COMPARED WITH 45 TO 60% FOR SLURRY WITHOUT FORCED OXIDATION.

FLY ASH-FREE LIMESTONE TESTING ON THE TCA SYSTEM WAS COMPLETED IN EARLY FEBRUARY. THE PH OF THE FLY ASH-FREE SLURRY WAS 0.2 TO 0.3 UNITS HIGHER THAN OBSERVED IN PREVIOUS RUNS WITH FLY ASH. IN ADDITION THE FLY ASH-FREE SLURRY APPEARED TO HAVE INFERIOR SOLIDS DEWATERING CHARACTERISTICS. FOR EXAMPLE THE CENTRIFUGE CAKE SOLIDS AVERAGED ABOUT 50% COMPARED WITH ABOUT 60% FOR SLUDGE CONTAINING FLY ASH.

INTENSIVE FLUE GAS CHARACTERIZATION TESTING WITH LIMESTONE SLURRY ON THE TCA SYSTEM BEGAN IN EARLY FEBRUARY AND ENDED IN EARLY MARCH 1977. PRELIMINARY ANALYSIS OF THE DATA SHOWED AN OUTLET MASS LOADING OF 0.4-0.8 GR/DSCF FLY ASH AND 0.02-0.03 GR/DSCF FOR FLUE GAS WITHDRAWN DOWNSTREAM OF THE ESP. IT WAS ESTIMATED THAT THESE OUTLET MASS LOADINGS CONTAINED ABOUT 0.03 GR/DSCF FLY ASH, 0.02 GR/DSCF REENTRAINED SLURRY SOLIDS AND 0.015

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
				PERFORMANCE DATA							

ENTRAINED DISSOLVED SOLIDS (WHEN A CONTINUOUS MIST ELIMINATOR UNDER WASH WAS USED). THESE VALUES VARY DEPENDING ON THE MIST ELIMINATOR WASH SCHEME AND GAS FLOW RATE.

3/77 SYSTEM 744

** PROBLEMS/SOLUTIONS/COMMENTS

DURING MARCH THE VENTURI/SPRAY TOWER WAS TESTED WITH LIME SLURRY AND FLY ASH LADEN FLUE GAS IN A TWO-STAGE SCRUBBER MODE WITH FORCED OXIDATION. OPERATION WITH LIME WAS SIMILAR TO THE PREVIOUSLY REPORTED LIMESTONE OPERATION WITH GREATER THAN 95% OXIDATION AT AN AIR STOICHIOMETRIC RATIO OF 1.5 LB-ATOMS OXYGEN/LB-MOLE SO2 ABSORBED WITH A SIMPLE AIR SPARGER IN VENTURI HOLD TANK. SLURRY SOLIDS SETTLING RATE VARIED FROM 0.6 TO 1.9 CM/MIN (A 5 TO 10-FOLD ENHANCEMENT OVER UNOXIDIZED SLURRY) AND FILTER CAKE SOLIDS RANGED FROM 74 TO 88% (COMPARED TO 45 TO 60% WITH UNOXIDIZED SLURRY).
TWO MAJOR DIFFERENCES BETWEEN LIME AND LIMESTONE WERE OBSERVED IN A TWO-STAGE FORCED OXIDATION SYSTEM. TO MAINTAIN PH CONTROL IT WAS NECESSARY TO FEED LIME TO BOTH STAGES. WITH LIMESTONE, FEED TO THE SECOND STAGE ONLY WAS ADEQUATE. TO MAINTAIN 80% SO2 REMOVAL, IT WAS NECESSARY TO OPERATE WITH A HIGHER SLURRY SOLIDS CONCENTRATION IN THE SPRAY TOWER LOOP WITH LIMESTONE (15%) THAN WITH LIME (6%), RESULTING IN A TIGHTER WATER BALANCE WITH LIMESTONE AND INADEQUATE WATER TO FLUSH THE MIST ELIMINATOR.
PRELIMINARY LIMESTONE TYPE AND GRIND TESTS MADE ON THE TCA SYSTEM DURING MARCH INDICATED THAT SO2 REMOVAL IS IMPROVED BY THE USE OF FINER GROUND LIMESTONE. SO2 REMOVAL WITH EQUIVALENTLY GROUND FREDONIA WHITE AND LONGVIEW, ALABAMA LIMSTONES WAS THE SAME. BLEEDSTREAM FORCED OXIDATION TESTS ARE BEING CONDUCTED WITH A PENBERTHY ELL-3 INJECTOR IN A CLOSED LOOP AROUND A BLEED STREAM HOLD TANK. INITIAL TESTS WERE UNSUCESSFUL DUE TO HIGH PH OF 7 TO 8 IN THE HOLD TANK. BY LOWERING THE HOLD TANK PH TO 5 OR 6, SULFITE OXIDATIONS OF UP TO 98% WERE ACHIEVED.

4/77 SYSTEM 720

5/77 SYSTEM 744

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT 10 BOILER WAS SHUT DOWN FOR A SCHEDULED TWO-MONTH MAINTENANCE OUTAGE. BECAUSE OF THE BOILER OUTAGE, THE SHAWNEE SCRUBBERS DID NOT OPERATE DURING APRIL OR MAY.

6/77 SYSTEM 720

7/77 SYSTEM 744

** PROBLEMS/SOLUTIONS/COMMENTS

SCRUBBER OPERATION RESUMED ON JUNE 15 AFTER A 10-WEEK SCHEDULED MAINTENANCE OUTAGE ON THE BOILER.
THE VENTUR/SPRAY TOWER SYSTEM CONTINUED TO OPERATED WITH TWO SCRUBBER STAGES AND FORCED OXIDATION BY MEANS OF AN AIR SPARGING RING IN THE VENTURI HOLD TANK. IN JUNE AND JULY, OPERATION WAS WITH LIME SLURRY AND FLY ASH-FREE FLUE GAS. THE SYSTEM PERFORMED WELL WITH LITTLE DIFFERENCE FROM THE PREVIOUS LIME SLURRY TEST BLOCK WHEN THERE WAS FLY ASH IN THE FLUE GAS. TYPICAL RESULTS WERE ABOUT 97% SULFITE OXIDATION AT AN AIR STOICHOMETRY OF 1.6 LB-ATOMS OXYGEN/LB-MOLE SO2 ABSORBED AN OXIDATION TANK PH OF 5.5. TYPICAL SOLIDS SETTLING RATE WAS ABOUT 2 CM/MIN (AN ORDER OF MAGNITUDE BETTER THAN WITH UNOXIDIZED SLURRY) AND FILTER CAKE SOLIDS AVERAGED ABOUT 80% (COMPARED WITH 45 TO 60% WITH UNOXIDIDED SLURRY).
THE TCA SYSTEM OPERATED WITH FORCED OXIDATION IN THE HOLD TANK ACHIEVED BY CIRCULATING SLURRY THROUGH AN AIR EDUCTOR. IN JUNE AND JULY, OPERATION WAS WITH LIMESTONE SLURRY AND FLY ASH IN THE FLUE GAS. SULFITE OXIDATION WAS

TENNESSEE VALLEY AUTHORITY: SHAWNEE 10B (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER BOILER HOURS	FGD HOURS	CAP. FACTOR

POOR IN THE INITIAL TEST (LESS THAN 90%) MAINLY BECAUSE OF INADEQUATE AIR/SLURRY CONTACT IN THE HOLD TANK. BY INCREASING AGITATOR SPEED(TO 68 RPM), HOLD TANK SLURRY LEVEL (TO 12 FT) AND DECREASING PH (TO LESS THAN 5.5) IN THE SLURRY TO THE EDUCTOR, SULFITE OXIDATION OF 90% WAS CONSISTANTLY ACHIEVED AT AN AIR STOICHIOMETRY OF ABOUT 4.5 LB-ATOMS OXYGEN/LB-MOLE SO2 ABSORBED. WASTE SOLIDS PROPERTIES WERE ENHANCED WITH OXIDATION TO ABOUT THE SAME EXTENT AS OBSERVED IN THE VENTURI/SPRAY TOWER SYSTEM. ADDITIONAL TESTING WILL BE DIRECTED TOWARD ACHIEVING 90% OR BETTER SULFITE OXIDATION AT A REDUCED AIR STOICHIOMETRY.

8/77	SYSTEM							744		
9/77	SYSTEM							720		

** PROBLEMS/SOLUTIONS/COMMENTS

THE VENTURI/SPRAY TOWER SYSTEM CONTINUED TO OPERATE WITH TWO SCRUBBING STAGES AND FORCED OXIDATION USING AN AIR SPARGER IN THE VENTURI HOLD TANK. OPERATION DURING AUGUST AND SEPTEMBER WAS WITH LIMESTONE SLURRY AND FLUE GAS WITH LOW FLY ASH LOADING (FLUE GAS FROM DOWNSTREAM OF THE ESP). THE SYSTEM PERFORMED WELL AT 4.5 TO 5.0 OXIDATION PH, WITH LITTLE DIFFERENCE FROM THE PREVIOUS LIMESTONE TESTS WHEN THE FLUE GAS HAD FLY ASH LOADING. (THE PREVIOUS TESTS HAD BEEN MADE ONLY AT OXIDATION PH OF 4.5 AND 5.0). FOR THE AUGUST AND SEPTEMBER TESTS, THE OXIDATION PH WAS FURTHER INCREASED TO 5.5, APPROACHING THE PH IN THE SPRAY TOWER. THIS CAUSED SOME DIFFICULTIES IN THE OXIDATION PH CONTROL AND WIDER FLUCTUATIONS IN VENTURI AND SPRAY TOWER LIMSTONE STOICHIOMETRIC RATIOS. HOWEVER NEAR COMPLETE OXIDATION WAS STILL ACHIEVED AT THE HIGHER PH. TYPICAL RESULTS WERE BETTER THAN 97% SULFITE OXIDATION AT AN AIR STOICHIOMETRY OF 1.7 ATOMS OXYGEN/MOLE SO2 ABSORBED AND AN OXIDATION PH OF 5.5. THE FILTER CAKE SOLIDS CONTENT AVERAGED BETTER THAN 85%. TESTS WERE ALSO CONDUCTED WITHOUT THE DESUPERSATURATION TANK IN THE VENTURI SLURRY LOOP AND WITH THE OXIDATION TANK LEVEL DROPPED FROM 18 TO 14 FT WITHOUT ADVERSE EFFECTS.
DURING AUGUST AND SEPTEMBER THE TCA SYSTEM WAS OPERATED MOSTLY IN A TWO-TANK FORCE OXIDATION MODE USING AN AIR EDUCTOR. THE TCA EFFLUENT (LIMESTONE SLURRY WITH A HIGH FLY ASH LOADING) WAS COLLECTED IN A SMALL LOW-PH SLURRY HOLD TANK WHERE LIMESTONE WAS ADDED THUS TAKING ADVANTAGE OF THE LOW PH SLURRY THROUGH THE AIR EDUCTOR FOR IMPROVED SULFITE OXIDATION AND HIGH PH SLURRY TO TCA FOR BETTER SO2 REMOVAL.
TESTS WERE MADE BOTH WITH THE AIR EDUCTOR MOUNTED ON TOP OF THE EFFLUENT HOLD TANK WITH DOWNWARD SLURRY DISCHARGE TO THE BOTTOM OF THE TANK. AVERAGE SULFITE OXIDATION RANGE FROM 93 TO 98% AT ABOUT 2.5 AIR STOICHIOMETRYY AND 5.2 EDUCTOR INLET PH. DURING TWO OF THE RUNS MADE IN AUGUST WHEN THE ROTARY DRUM FILTER WAS USED THE FILTER CAKE SOLIDS CONTENT AVERAGED 85 AND 88%.
A TEN-DAY RUN WAS MADE IN SEPTEMBER ON THE TCA SYSTEM WITH AUTOMATIC LIMESTONE FEED CONTROL BASED ON STOICHIOMETRY. THE LIMESTONE SLURRY FEED RATE WAS CONTROLLED BY THE FLUE GAS FLOW RATE AND THE INLET SO2 CONCENTRATION. THE CONTROL SYSTEM WORKED WELL ACCORDING TO THE SPECIFICATIONS.

10/77	SYSTEM							744		
11/77	SYSTEM							720		

** PROBLEMS/SOLUTIONS/COMMENTS

THE VENTURI/SPRAY TOWER SYSTEM CONTINUED TO OPERATE WITH TWO SCRUBBING STAGES AND FORCED OXIDATION IN THE VENTURI HOLD TANK. IN OCTOBER, THE FOLLOWING IMPROVEMENTS WERE MADE WITH NO SIGNIFICANT DROP IN OXIDATION EFFICIENCY WITH SATISFACTORY SO2 REMOVAL EFFICIENCY:
THE SPRAY TOWER GAS VELOCITY WAS INCREASED FROM 6.7 TO 9.4 FT/SEC.
THE OXIDATION TANK LEVEL WAS DROPPED FROM 18 TO 14 FT.
THE AIR SPARGER RING CONTAINING 40 14-INCH DIAMETER HOLES, WAS REPLACED WITH A SINGLE 3-INCH DIAMETER PIPE DISCHARGING DOWNWARD AT THE

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER BOILER HOURS	FGD HOURS	CAP. FACTOR

CENTER OF THE OXIDATION TANK 3 INCHES FROM THE BOTTOM.
WITH AIR DISCHARGED FROM AN OPEN-ENDED PIPE IT WAS APPARENT THAT THE AIR DISPERSION IN THE OXIDATION TANK WAS ACCOMPLISHED MAINLY BY THE TURBINE AGITATOR RATHER THAN THE SPARGER. IN NOVEMBER, A ONE-MONTH RELIABILITY TEST WAS STARTED ON THE VENTURI/SPRAY TOWER SYSTEM USING FORCED OXIDATION WITH TWO SCRUBBER STAGES AND LIMESTONE SLURRY WITH HIGH FLY ASH LOADING. THE FLUE GAS RATE TO THE SCRUBBER SYSTEM WAS VARIED ACCORDING TO THE BOILER LOAD WHICH RANGED BETWEEN 100 AND 155 MW. TEST CONDITIONS WERE SELECTED TO MEET THE EPA NEW SOURCE PERFORMANCE STANDARDS OF 1.2 LBS SO2 AND 0.1 LB PARTICULATE PER MILLION BTU. THIS RUN WAS STILL IN PROGRESS AT THE END OF NOVEMBER. ON THE TCA SYSTEM, FORCED OXIDATION WITH A SINGLE SCRUBBER STAGE USING AN AIR EDUCTOR WAS DISCONTINUED IN EARLY OCTOBER AFTER A HOLE ERODED THROUGH THE EDUCTOR BODY. FORCED OXIDATION TESTING WILL BE RESUMED IN EARLY DECEMBER AFTER AN AIR SPARGER IS INSTALLED. DURING THE OCTOBER-NOVEMBER PERIOD, A ONE-MONTH RELIABILITY TEST WITHOUT FORCED OXIDATION WAS CONDUCTED ON THE TCA SYSTEM WITH LIMESTONE SLURRY, FLUE GAS WITH HIGH FLY ASH LOADING, THREE HOLD TANKS IN SERIES, AND 7.5 INCHES STATIC HEIGHT OF NITRILE FOAM SPHERES IN EACH OF 3 BEDS IN THE TCA. GAS RATE TO THE SCRUBBER WAS VARIED WITH BOILER LOAD AND STOICHIOMETRIC RATIO WAS CONTROLLED BY AN AUTOMATIC LIMESTONE FEED SYSTEM. CONDITIONS WERE SELECTED TO MEET THE EPA NEW SOURCE PERFORMANCE STANDARDS AT A LOW STOICHIOMTRIC RATIO OF 1.2 MOLES CA/MOLE SO2 ABSORBED. THE AVERAGE SO2 REMOVAL FOR THE ENTIRE RUN WAS 86% AT 2800 PPM WHICH WAS BETTER THAN THE 83% REQUIRED TO MEET THE EMISSIONS STANDARD. HOWEVER, THE STANDARD WAS FREQUENTLY EXCEEDED FOR PERIODS GREATER THAN THE 3 HOURS ALLOWED BY THE EPA REGULATIONS. AVERAGE OUTLET PARTICULATE MASS LOADING WAS 0.043 GRAIN/SCF DRY WHICH WAS BETTER THAN THE 0.052 GRAIN/SCF DRY (AT 30% EXCESS AIR) REQUIRED TO MEET THE STANDARD. THE RANGE OF THE OUTLET MASS LOADING WAS 0.026 TO 0.069 GRAIN/SCF DRY.

12/77	SYSTEM							744		
1/78	SYSTEM							744		

** PROBLEMS/SOLUTIONS/COMMENTS

A LIMESTONE RELIABILITY TEST ON THE VENTURI/SPRAY TOWER SYSTEM WAS COMPLETED IN MID-DECEMBER, 1977 AFTER 965 OPERATING HOURS. THE TEST WAS CONDUCTED WITH TWO SCRUBBER LOOPS WITH FORCED OXIDATION IN THE FIRST (VENTURI) LOOP. THE FLUE GAS FLOW RATE WAS VARIED ACCORDING TO THE BOILER LOAD WHICH RANGED BETWEEN 100 AND 155 MW.
TEST CONDITIONS WERE SELECTED TO MEET THE EPA NEW SOURCE PERFORMANCE STANDARDS OF 1.2 LB SO2 AND 0.1 LB PARTICULATE PER MILLION BTU. THE OPERATING RELIABILITY OF THE SYSTEM WAS DEMONSTRATED. HOWEVER, DUE TO WIDE VARIATION IN THE INLET SO2 CONCENTRATION (2500-3400 PPM) AND THE SLOW SYSTEM RESPONSE TIME THE SO2 EMISSION STANDARD WAS FREQUENTLY EXCEEDED FOR PERIODS GREATER THAN THE THREE HOURS ALLOWED BY EPA REGULATIONS. AVERAGE SO2 REMOVAL FOR THE ENTIRE RUN WAS 86% AT 2950 PPM AVERAGE INLET SO2 WHICH WAS HIGHER THAN THE 84% REQUIRED TO MEET THE STANDARD FOR 2800 PPM INLET SO2. THE OUTLET PARTICULATE LOADING RANGED FROM 0.021 TO 0.063 GRAIN/DRY SCF, WITH A RUN AVERAGE OF 0.042 GRAIN/DRY SCF. THESE VALUES COMPARE WITH LOADING OF 0.052 GR/DRY SCF OR LESS REQUIRED TO MEET THE EPA PARTICULATE STANDARD, ASSUMING 30% TOTAL BOILER EXCESS AIR.

ANOTHER RELIABILITY RUN ON THE VENTURI/SPRAY TOWER SYSTEM WAS STARTED IN MID DECEMBER USING LIME SCRUBBING. THE RUN WAS COMPLETED IN JANUARY 1978. WITH THE EXCEPTION OF HIGHER SPRAY TOWER INLET PH AND HIGHER ALKALI UTILIZATION INHERENT WITH THE LIME SYSTEM, THE OPERATING CONDITIONS AND THE TEST RESULTS WERE SIMILAR TO THOSE OF THE LIMESTONE RELIABILITY RUN.

ON THE TCA SYSTEM, TWO RUNS WERE MADE WITH THE NITRILE FOAM SPHERES REPLACED BY A 46 INCH HEIGHT (23 LAYERS) OF CEILCOTE PACKING SUPPORT PLATES. AT FULL GAS FLOW RATE OF 30,000 ACFM, THE SO2 REMOVAL FOR THE CEILCOTE PLATES WAS SLIGHTLY LESS THAN THAT OF A 3-BED, 4-GRID TCA WITH FIVE INCHES

TENNESSEE VALLEY AUTHORITY: SHAWNEE 10B (CONT.)

PERFORMANCE DATA

PERIOD	MODULE AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR

OF STATIC SPHERE HEIGHT PER BED. HOWEVER, AT 18,000 ACFM THE SO2 REMOVAL FOR THE CEILCOTE PLATES WAS A FEW PERCENTAGE POINTS HIGHER THAN THAT EXPERIENCED WITH THE TCA BEDS.

FORCED OXIDATION TESTS WERE CONDUCTED ON THE TCA SYSTEM WITH AN AIR SPARGER USING LIMESTONE SLURRY WITH HIGH FLY ASH LOADING. BOTH ONE-TANK (AIR SPARGING AND LIMESTONE ADDITION IN THE SAME TANK) AND TWO-TANK (AIR SPARGING IN THE FIRST TANK AND LIMESTONE ADDITION IN THE SECOND) CONFIGURATIONS WERE USED. NEAR COMPLETE SULFITE OXIDATION WAS ACHIEVED IN BOTH CONFIGURATIONS AT AN AIR STOICHIOMETRY OF 1.8 ATOMS OXYGEN/MOLE SO2 ABSORBED AND OXIDATION PH OF 5.4-5.7. THE OXIDATION TANK LEVEL WAS 18 FT.

2/78	SYSTEM						672			
3/78	SYSTEM						744			

* PROBLEMS/SOLUTIONS/COMMENTS

MAJOR SYSTEM DOWNTIMES DURING THE PERIOD INCLUDEDD JANUARY 26 THROUGH FEBRUARY 4 FOR THE VENTURI/SPRAY TOWER AND JANUARY 26 THROUGH FEBRUARY 2 FOR THE TCA SYSTEM DUE TO FREEZING WEATHER, AND MARCH 6 THROUGH MARCH 17 FOR BOTH SYSTEMS DUE TO BOILER OUTAGE.
THE EFFECT OF THE SLURRY LEVEL IN THE AIR SPARGED OXIDATION TANK WAS INVESTIGATED IN THE TWO SCRUBBER LOOP VENTURI/SPRAY TOWER SYSTEM WHICH IS OPERATING ON LIME SLURRY WITH HIGH FLY ASH LOADING. NEAR COMPLETE SULFITE OXIDATION (98%) WAS ACHIEVED WITH 14 FT AND 18 FT OXIDATION TANK LEVELS AT AN AIR STOICHIOMETRIC RATIO OF 1.8 ATOMS OXYGEN/MOLE SO2 ABSORBED. AN AIR STOICHIOMETRIC RATIO UP TO ABOUT 3.8 WAS NEEDED TO YIELD NEAR COMPLETE OXIDATION WHEN THE TANK LEVEL WAS DROPPED TO 10 FEET.
A NEW TEST BLOCK WAS STARTED ON MARCH 1 ON THE VENTURI/SPRAY TOWER SYSTEM. MAGNESIUM OXIDE WAS ADDED TO THE SPRAY TOWER SLURRY LOOP IN A TWO SCRUBBER LOOP OPERATION WITH FORCED OXIDATION IN THE VENTURI LOOP. THE SYSTEM WAS OPERATED IN A LIMESTONE SLURRY MODE WITH HIGH FLY ASH LOADING. THE PRIMARY OBJECTIVE OF MAGNESIUM ADDITION IS TO IMPROVE THE SO2 REMOVAL EFFICIENCY. BECAUSE OF THE SHORTAGE OF COAL CAUSED BY THE LOCAL MINERS' STRIKE, COALS FROM DIFFERENT SOURCES WERE BURNED IN THE BOILER. AS A RESULT, INLET SO2 CONCENTRATION FLUCTUATED AS MUCH AS TENFOLD (350-3500 PPM) CAUSING PROBLEMS IN SYSTEM CONTROL.
TCA WAS OPERATED WITH BOTH LIME AND LIMESTONE AND WITH MEGNESIUM OXIDE ADDITION. FLUE GAS WITH HIGH FLY ASH LOADING WAS USED. THESE TESTS WERE CONDUCTED PRIMARILY TO RESOLVE SOME OF THE INCONSISTENT RESULTS OBTAINED DURING EARLIER LIME/MGO AND LIMESTONE/MGO TEST MADE IN APRIL THROUGH NOVEMBER 1976. AIR LEAKAGE THROUGH THE SCRUBBER DOWNCOMER WAS SUSPECTED IN SOME OF THOSE EARLIER RUNS, RESULTING IN HIGHER-THAN-NORMAL SULFITE OXIDATION AND GYPSUM SATURATION. TEST RESULTS SO FAR WERE INCONCLUSIVE DUE TO THE FLUTUATION IN INLET SO2 AND CONTROL PROBLEMS MENTIONED ABOVE.

4/78	SYSTEM						720			
5/78	SYSTEM						744			

** PROBLEMS/SOLUTIONS/COMMENTS

THE VENTURI/SPRAY TOWER SYSTEM CONTINUED TO OPERATE THROUGH EARLY MAY WITH MGO ADDITION AND WITH TWO SCRUBBER LOOPS. THE SYSTEM WAS OPERATED WITH LIMESTONE SLURRY AND WITH HIGH FLY ASH LOADING. MGO WAS ADDED TO THE SPRAY TOWER SLURRY LOOP TO MAINTAIN AN EFFECTIVE MG++ ION CONCENTRATION OF 5000 PPM (ABOUT 8000 PPM IN THE VENTURI SLURRY LOOP) TO IMPROVE THE SO2 REMOVAL EFFICIENCY IN THE SPRAY TOWER. OXIDATION WAS FORCED IN THE VENTURI SLURRY HOLD TANK. UNDER TYPICAL OPERATING CONDITONS, THE OVERALL SO2 REMOVAL WAS 96% AT 2300 PPM INLET SO2 CONCETRATION, COMPARED TO 86% REMOVAL AT 1600 PPM INLET SO2 WITHOUT MGO ADDITION. SO2 REMOVAL BY VENTURI ALONE WAS 30%, ABOUT THE SAME AS THE CASE WITHOUT MGO ADDITION.
NEAR COMPLETE SULFITE OXIDATION COULD BE ACHIEVED AT AN

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
				PERFORMANCE DATA							

AIR STOICHIOMETRIC RATIO AS LOW AS 1.3 ATOMS OXYGEN/MOLE OF SO2 ABSORBED, IN THE SAME ORDER AS THE CASE WITHOUT MGO ADDITION.
FORCED OXDATION WAS ALSO CONDUCTED ON THE LIMESTONE SLURRY BLEED STREAM FROM THE VENTURI/SPRAY TOWER SYSTEM. A SINGLE EFFLUENT HOLD TANK WAS USED FOR BOTH VENTURI AND SPRAY TOWER. MGO WAS ADDED TO THE EFFLUENT HOLD TANK TO MAINTAIN AN EFFECTIVE MG++ ION CONCENTRATION OF 5000 PPM. A SLURRY STREAM WAS TAKEN FROM THE SCRUBBER DOWNCOMER AND SENT TO AN OXIDATION TANK INTO WHICH AIR WAS SPARGED. A RECYCLE STREAM OF ABOUT 30 GPM WAS SENT BACK FROM THE OXIDATION TANK TO THE EFFLUENT HOLD TANK TO CONTROL PH IN THE OXIDATION TANK AND TO PROVIDE GYPSUM SEEDS IN THE SCRUBBER SLURRY. FINAL SYSTEM BLEED WAS WITHDRAWN FROM THE OXIDATION TANK. AT AVERAGE OXIDATION TANK PH OF 6, SULFITE OXIDATION AVERAGED 98%. FILTER CAKE SOLIDS CONTENT WAS 85%, SIMILAR TO THAT OBTAINED WITH TWO SCRUBBER LOOP OPERATIONS. HOWEVER, THE SLURRY SOLIDS SETTLING RATE WAS ONLY ABOUT 0.4 CM/MIN, COMPARED TO ABOUT 0.8 CM/MIN FOR THE TWO LOOP OPERATION. SETTLING RATE FOR UNOXIDIZED SLURRY CONTAINING MAGNESIUM ION NORMALLY DID NOT EXCEED 0.1 CM/MIN WITH 50 TO 60% FILTER CAKE SOLIDS.
TCA CONTINUED TO OPERATE WITH MGO ADDITION WITH BOTH LIME AND LIMESTONE SCRUBBING. FLUE GAS WITH HIGH FLY ASH LOADING WAS USED. THE INTENT OF THE TESTS WAS TO CLARIFY SOME OF THE INCONSISTANT RESULTS OBTAINED DURING EARLIER RUNS MADE IN APRIL-NOVEMBER 1976, DURING WHICH SCRUBBER DOWNCOMER AIR LEAKAGE WAS SUSPECTED IN SOME OF THE TESTS. IN GENERAL, TEST RUNS MADE IN 1976 HAD HIGHER SO2 CONCENTRATION, MOSTLY GREATER THAN 3000 PPM, WHILE THE RECENT RUNS HAD ONLY ABOUT 2500 PPM. AT THE HIGHER INLET SO2 AND THE HIGHER RESULTANT SO2 MAKE-PER-PASS, THE 1976 TESTS OPERATED EITHER UNSATURATED OR SUPERSATURATED WITH RESPECT TO GYPSUM, DEPENDING ON THE SULFITE OXIDATION LEVEL. SEVERE GYPSUM SCALING OCCURRED WHEN THE OPERATION WAS UNDER GYPSUM-SATURATED MODE. IN THE RECENT RUNS, OPERATION WAS MOSTLY UNDER GYPSUM-SATURATED MODE. HOWEVER, BECAUSE OF THE LOWER INLET SO2 AND LOWER SO2 MAKE-PER-PASS, THE GYPSUM SATURATION LEVELS WERE NOT HIGH ENOUGH TO CAUSE ANY SIGNIFICANT SCALING.

6/78	SYSTEM							720			
7/78	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

FORCED OXIDATION FEED STREAM FROM THE VENTURI/SPRAY TOWER SYSTEM CONTINUED THROUGH MID-JUNE. TWO TEST RUNS WERE MADE IN WHICH MGO WAS ADDED TO MAINTAIN AN EFFECTIVE MG++ CONCENTRATION OF 5000 PPM IN THE SCRUBBER SLURRY AND NO RECYCLE STREAM WAS SENT BACK FROM THE OXIDATION TANK (8 FT DIAMTER AND 18 FT TANK LEVEL) TO THE EFFLUENT HOLD TANK. AVERAGE SULFITE OXIDATION WAS 96% OR HIGHER AT AN AIR STOICHIOMETRIC RATIO OF 1.6 ATOMS OXYGEN/MOLE SO2 ABSORBED. THE OXIDATION TANK PH WAS 5.4 TO 5.6 ONLY 0.2 UNITS HIGHER THAN THE EFFLUENT HOLD TANK PH. THE FILTER CAKE SOLIDS WAS 85% AND THE SOLIDS SETTLING RATE WAS 0.4 TO 0.5 CM/MIN.
BOTH SCRUBBER SYSTEMS WERE SHUT DOWN FOR TWO WEEKS FROM JUNE 19 DUE TO A BOILER OUTAGE SCHEDULED FOR RE-ROUTING THE FLUF GAS DUCT FROM THE 800 FT STACK TO THE NO. 11 SMALL STACK.
FOLLOWING THE BOILER OUTAGE BOTH SCRUBBER SYSTEMS STARTED ON NEW LIME AND LIMESTONE TEST BLOCKS IN WHICH ADIPIC ACID, AN ORGANIC PH BUFFER, WAS ADDED TO THE SCRUBBER SLURRY TO IMPROVE SO2 REMOVAL EFFICIENCY.
INITIAL TEST RUNS WERE CONDUCTED WITHOUT ADIPIC ACID ADDITION TO ESTABLISH THE BASE CASE SO2 REMOVAL IN BOTH LIME AND LIMESTONE SCRUBBING FOR BOTH SCRUBBING SYSTEMS. THE VENTURI/SPRAY TOWER SYSTEM WAS OPERATED WITH TWO-SCRUBBER-LOOP CONFIGURATIONS WITH FORCED OXIDATION IN THE FIRST LOOP WHILE THE TCA WAS OPERATED IN A ONE-SCRUBBER-LOOP SCHEME WITHOUT FORCED OXIDATION.
PRELIMINARY RESULTS SHOWED THAT 96 TO 99% SO2 REMOVAL WAS CONSISTANTLY ACHIEVED IN THE VENTUR/SPRAY TOWER SYSTEM OPERATING WITH ABOUT 1600 PPM AND 1400 PPM ADIPIC ACID IN THE VENTURI AND SPRAY TOWER RESPECTIVELY. THESE SO2 REMOVALS COMPARE VERY FAVORABLY WITH THE 66% REMOVAL FOR THE BASE CASE LIME RUN WITHOUT ADIPIC ACID. ON THE TCA SYSTEM, A LIME RUN

TENNESSEE VALLEY AUTHORITY: SHAWNEE 10B (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
				PERFORMANCE DATA							

WITH ABOUT 400 PPM ADIPIC ACID GAVE ABOUT 80% SO2 REMOVAL, COMPARED TO 67% FOR THE BASE CASE RUN.

8/78 SYSTEM 744

9/78 SYSTEM 720

** PROBLEMS/SOLUTIONS/COMMENTS

TESTING WITH ADIPIC ACID AS ADDITIVE FOR IMPROVING SO2 REMOVAL EFFICIENCY CONTINUED THROUGH AUGUST AND SEPTEMBER. BOTH VENTURI/SPRAY TOWER AND TCA SYSTEMS WERE OPERATED ON LIMESTONE SLURRY WITH HIGH FLY ASH LOADING DURING THIS PERIOD. THE TCA WAS OPERATED WITHOUT FORCED OXIDATION AND THE VENTURI SPRAY TOWER WITH TWO-SCRUBBER-LOOP FORCED OXIDATION. AS IN THE LIME TESTS WITH ADIPIC ACID ADDITION CONDUCTED IN JULY SIGNIFICANT IMPROVEMENT IN SO2 REMOVAL EFFICIENCY WAS ALSO OBSERVED IN THE LIMSTONE TESTS. UNDER TYPICAL OPERATION, SO2 REMOVAL HIGHER THAN 90% COULD BE ACHIEVED BY THE VENTURI/SPRAY TOWER WITH ABOUT 2100 PPM AND 1500 PPM ADIPIC ACID IN THE VENTURI AND SPRAY TOWER RESPECTIVELY. UNDER THE SAME OPERATING CONDITONS BUT WITHOUT ADIPIC ACID, THE SO2 REMOVAL WAS ONLY 57%. THE SULFITE OXIDATION EFFICIENCY AND WASTE SLUDGE DEWATERING PROPERTIES DID NOT APPEAR TO BE AFFECTED BY THE PRESENCE OF ADIPIC ACID.
IN THE TCA, HIGHER THAN 90% SO2 REMOVALS WERE OBTAINED WITH 750 TO 1500 PPM ADIPIC ACID COMPARED TO 71% REMOVAL FOR A BASE CASE RUN WITHOUT ADIPIC ACID.
IN BOTH SCRUBBING SYSTEMS THE PH IN THE SCRUBBER SLURRY NEEDS TO BE HIGHER THAN ABOUT 5.0, THE UPPER PH BUFFER POINT OF ADIPIC ACID, FOR THIS ADDITIVE TO BE FULLY EFFECTIVE.
DETERIORATION OR DECOMPOSITION OF ADIPIC ACID APPARENTLY TAKES PLACE IN THE SCRUBBER. ACTUAL FEED RATES OF ADIPIC ACID WERE 2 TO 3 TIMES HIGHER THAN COULD BE ACCOUNTED FOR IN THE SYSTEM DISCHARGE SLUDGE.

10/78 SYSTEM 744

11/78 SYSTEM 720

** PROBLEMS/SOLUTIONS/COMMENTS

A ONE MONTH LONG-TERM RELIABILITY RUN WAS CONDUCTED ON BOTH THE VENTURI/SPRAY TOWER AND TCA SYSTEMS USING LIMESTONE SLURRY WITH ADIPIC ACID AS AN ADDITIVE FOR ENHANCING SO2 REMOVAL EFFICIENCY. STEADY-STATE SO2 REMOVAL IN BOTH RUNS WAS CONSISTANTLY HIGH IN THE RANGE OF 96 TO 99% UNDER TYPICAL OPERATING CONDITIONS. THE VENTURI/SPRAY TOWER SYSTEM WAS OPERATED WITH TWO-SCRUBBER-LOOP FORCED OXIDATION. ADIPIC ACID CONCENTRATIONS WERE 1500 PPM IN THE TCA AND THE SPRAY TOWER, AND 2400 PPM IN THE VENTURI. BOTH SCRUBBER SYSTEMS OPERATED FREE OF SCALING AND PLUGGING.
LONG-TERM TESTS BEGAN IN MID-NOVEMBER TO COMPARE CONVENTIONAL LIME SCRUBBING WITH ADVANCED LIMSTONE SCRUBBING USING CHEMICAL ADDITIVES AND FORCED OXIDATION. EACH TEST WILL LAST ONE MONTH OR LONGER. THE VENTURI/SPRAY TOWER SYSTEM IS BEING OPERATED WITH TWO-SCRUBBER-LOOP FORCED OXIDATION AND LIMESTONE SLURRY AND ADIPIC ACID ADDITION. THE TCA SYSTEM IS BEING OPERATED WITH LIME SLURRY (NO ADDITIVES) AND WITHOUT FORCED OXIDATION. DURING THESE TESTS CONTINUOUS SO2 EMISSIONS MONITORING PROCEDURES WILL BE ASSESSED.

12/78 SYSTEM 744

1/79 SYSTEM 744

** PROBLEMS/SOLUTIONS/COMMENTS

LONG-TERM TESTS ON BOTH SCRUBBER SYSTEMS. WHICH BEGAN IN MID-NOVEMBER 1978 WERE COMPLETED NEAR THE END OF JANUARY 1979. THESE TESTS WERE CONDUCTED TO COMPARE CONVENTIONAL LIME SCRUBBING WITH ADVANCED LIMESTONE SCRUBBING

TENNESSEE VALLEY AUTHORITY: SHAWNEE 10B (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR

USING CHEMICAL ADDITIVES AND FORCED OXIDATION. THE VENTURI/SPRAY TOWER WAS OPERATED WITH TWO-SCRUBBER-LOOP FORCED OXIDATION AND WITH LIMESTONE SLURRY AND ADIPIC ACID ADDITION. THE TCA SYSTEM WAS OPERATED WITH LIME SLURRY (NO ADDITIVE) AND WITHOUT FORCED OXIDATION. DURING THESE TESTS CONTINUOUS SO2 EMISSIONS MONITORING PROCEDURES WERE ASSESSED.

2/79	SYSTEM							672			
3/79	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

ONE TEST RUN WAS CONDUCTED ON EACH OF THE TWO SCRUBBER SYSTEMS IN EARLY FEBRUARY TO PROVIDE SAMPLES FOR LEVEL 1 BIOASSY TESTING BY LITTON BIONETICS CORPORATION UNDER CONTRACT WITH EPA. ACTUAL SAMPLING OF SLURRIES AND CONDENSATES FROM THE SCRUBBER AND OXIDATION TANK OFF-GASES WAS PERFORMED BY BATTELLE COLUMBUS LABORATORY. FOR THIS PURPOSE, THE TCA WAS OPERATED WITH LIMESTONE/FLYASH SLURRY AS A BASE CASE, AND THE VENTURI/SPRAY TOWER WAS OPERATED WITH LIMESTONE/FLYASH SLURRY AND WITH ADIPIC ACID ADDITIVE AND TWO-SCRUBBER-LOOP FORCED OXIDATION.
A SERIES OF TESTS WAS CONDUCTED ON THE VENTURI/SPRAY TOWER SYSTEM FROM MID-FEBRUARY THROUGH THE END OF MARCH TO SIMULATE THE PLANNED TVA WIDOWS CREEK UNIT 8 FULL-SCALE, TWO-SCRUBBER-LOOP FORCED-OXIDATION SCHEME. SPECIAL WIDOWS CREEK LIMESTONE (STONEMAN) AND COAL (PITTSBURGH MIDWAY) WERE USED AT SHAWNEE DURING THESE TESTS. NEAR COMPLETE SULFITE OXIDATION WAS ACHIEVED AT OXIDATION TANK PH UP TO 6.0 AND AN AIR STOICHIOMETRY AS LOW AS 1.5 ATOMS OXYGEN/ MOLE SO2 ABSORBED. EXPECTED SLURRY CARRY-OVER FROM THE FIRST TO THE SECOND SCRUBBER LOOP AT WIDOWS CREEK WAS SIMULATED BY AN ARTIFICIAL BACKMIX STREAM OF UP TO 65 GPM.
A NEW LIME/ADIPIC ACID TEST BLOCK WITH AND WITHOUT FORCED OXIDATION BEGAN IN EARLY FEBRUARY ON THE SINGLE-LOOP TCA SYSTEM USING FLUE GAS WITH HIGH FLYASH LOADINGS. AT TCA INLET PH OF 7.0, 2400 TO 2900 PPM INLET SO2, L/G OF 50 GAL/ MCF, AND 15 INCHES TOTAL STATIC BED HEIGHT OF 1-7/8 INCH NITRILE FOAM SPHERES, SO2 REMOVALS WERE 83, 93, AND 97% WITH ZERO, 600, AND 1200 PPM ADIPIC ACID, RESPECTIVELY, WITHOUT FORCED OXIDATION. SO2 REMOVAL REMAINED HIGH AT 91% WITH 1200 PPM ADIPIC ACID WHEN L/G WAS REDUCED FROM 50 TO 37 GAL/MCF. WHEN OXIDATION WAS FORCED WITH ABOUT 1.8 AIR STOICHIOMETRY, NEAR COMPLETE SULFITE OXIDATION WAS ACHIEVED AT OXIDATION TANK PH (TCA INLET PH) UP TO ABOUT 5.5, AND 1200 PPM ADIPIC ACID. SO2 REMOVAL ABOVE 90% WAS OBTAINED AT TCA INLET PH AS LOW AS 5.0 WITH FORCED OXIDATION.

4/79	SYSTEM							720			
5/79	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

A SERIES OF BLEED STREAM OXIDATION TESTS USING LIMESTONE AND ADIPIC ACID WAS CONDUCTED ON THE VENTURI/SPRAY TOWER DURING THE MONTH OF APRIL. NEAR COMPLETE SULFITE OXIDATION WAS ACHIEVED UNDER CONDITIONS OF EITHER LOW FLUE GAS THROUGHPUT, WHICH RESULTED IN LOW BLEED RATES AND SUBSEQUENTLY HIGHER RESIDENCE TIMES IN THE OXIDATION TANK, OR RECIRCULATION AT LIQUOR BACK TO THE EFFLUENT HOLD TANK WHICH ARTIFICIALLY MAINTAINED A LOW PH IN THE OXIDATION TANK.
DURING THE MONTH OF APRIL, THE TCA WAS OPERATED WITH LIMESTONE, ADIPIC ACID AND FORCED OXIDATION USING A SINGLE TANK. AT AIR STOICHIOMETRIC RATIOS OF 1.7-2.0 ATOMS OXYGEN/MOLE SO2 ABSORBED, AN UNUSUAL SET OF CONDITIONS WAS ENCOUNTERED DURING WHICH THE LIQUID SULFITE ION LEVEL INCREASED TO A RANGE OF 800 TO 1700 PPM AND THE DEMAND FOR LIMESTONE TO MAINTAIN THE SCRUBBER INLET PH AT 5.1 INCREASED TO A RANGE OF 1.8 TO 4.0 MOLES LIMESTONE/MOLE SO2 ABSORBED. THE CAUSE HAS NOT YET BEEN DETERMINED ALTHOUGH IT WAS FOUND THAT THE SITUATION COULD BE ALLEVIATED BY EITHER INCREASING THE AIR STOICHIOMETRY TO GREATER THAN 2.2, OR BY MOVING THE

TENNESSEE VALLEY AUTHORITY: SHAWNEE 10B (CONT.)

PERIOD	MODULE	PERFORMANCE DATA AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR

LIMESTONE FEED TO A SECOND TANK DOWNSTREAM OF THE OXIDATION TANK. BOILER NO. 10 WENT DOWN ON MAY 5TH FOR A SCHEDULED 6 WEEK BOILER OUTAGE. DURING THIS PERIOD, THE VENTURI/SPRAY TOWER WILL BE DOWN BUT THE TCA IS BEING OPERATED ON FLUE GAS FROM BOILER NO. 9 THROUGH THE NEWLY INSTALLED DUCT. DURING THIS PERIOD, THE TCA WILL COMPLETE A SERIES OF LIMESTONE/ADIPIC ACID FACTORIAL TESTS WITH AND WITHOUT FORCED OXIDATION.

6/79	SYSTEM							720			
7/79	SYSTEM							744			
8/79	10A		96.7	78.6							
	10B		93.6	73.0							
	SYSTEM							744			
9/79	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

BOILER NO. 10 WAS RESTARTED ON JULY 6, 1979 AFTER NINE WEEKS OF SCHEDULED MAINTENANCE OUTAGE.

LIMESTONE FACTORIAL TESTING WITH ADIPIC ACID ADDITION ON THE VENTURI/SPRAY TOWER SYSTEM CONTINUED THROUGHOUT THE THIRD QUARTER. THESE TESTS WERE MADE WITH TWO-LOOP OPERATION WITH FORCED OXIDATION AND SPRAY TOWER ONLY OPERATION WITHOUT FORCED OXIDATION, BOTH UNDER CLOSED-LOOP CONDITIONS. OPEN-LIQUOR-LOOP TESTS WITH TWO-LOOP OPERATION AND WITHOUT FORCED OXIDATION WERE ALSO CONDUCTED TO COMPARE THE RESULTS WITH "FRESH" ADIPIC ACID AGAINST THOSE WITH "AGED" ACID OBTAINED UNDER CLOSED-LIQUOR-LOOP CONDITIONS.

DURING THE THIRD QUARTER, ADDITIONAL LIMESTONE FACTORIAL TESTS WITH ADIPIC ACID WERE CONDUCTED ON THE TCA SYSTEM TO SUPPLEMENT THOSE MADE IN MAY AND JUNE. IN ADDITION, A SERIES OF LIMESTONE TESTS WITHOUT ADIPIC ACID WERE PERFORMED USING A SINGLE TANK TO INVESTIGATE THE EFFECT OF AIR STOICHIOMETRY AND OXIDATION TANK AGITATOR SPEED ON SULFITE OXIDATION. IN A SIMILAR SERIES OF TESTS CONDUCTED IN APRIL BUT WITH ADIPIC ACID, AN UNUSUAL SET OF CONDITIONS WAS ENCOUNTERED WHICH GAVE HIGH LIQUOR SULFITE CONCENTRATION (800-1700 PPM) AND DEMANDED HIGH LIMESTONE STOICHIOMETRY (1.8-4.0 MOLES CA/MOLE SO2 ABSORBED) TO MAINTAIN A SCRUBBER INLET PH OF 5.1. THESE PHENOMENA WERE ALSO OBSERVED DURING TESTS WITHOUT ADIPIC ACID. INSUFFICIENT SULFITE OXIDATION RATE (CAUSED BY REDUCED AIR STOICHIOMETRY AND/OR REDUCED AGITATION IN THE OXIDATION TANK) AND DECREASED AMOUNT OF SOLID CASO3 SEEDS WERE BELIEVED TO CAUSE HIGH SULFITE SUPERSATURATION (HIGH SULFITE CONCENTRATIONS) AND THE RESULTANT BLINDING OF LIMESTONE BY SULFITE (HIGH LIMESTONE STOICHIOMETRY).

10/79	10A		99.8	58.7							
	10B		96.5	55.6							
	SYSTEM							744			
11/79	10A			.0							
	10B		99.7	94.7							
	SYSTEM							720			
12/79	10A			.0							
	10B		98.4	74.9							
	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

THE TRAP-OUT FUNNEL, WHICH HAD BEEN INSTALLED EARLIER IN THE SPRAY TOWER TO SEPARATE VENTURI AND SPRAY TOWER SLURRIES FOR TWO-SCRUBBER-LOOP OPERATION, WAS REMOVED IN EARLY OCTOBER.

TENNESSEE VALLEY AUTHORITY: SHAWNEE 10B (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR

THE SYSTEM WAS OPERATED THROUGHOUT THE FOURTH QUARTER IN A CONVENTIONAL MODE IN WHICH THE VENTURI AND SPRAY TOWER USED A COMMON HOLD TANK. ADDITIONAL FACTORIAL TESTS WERE CONDUCTED IN THIS MODE OF OPERATION THROUGH MID-DECEMBER USING LIMESTONE/ADIPIC ACID SLURRY WITHOUT FORCED OXIDATION. A NEW TEST BLOCK WAS INITIATED IN MID-DECEMBER TO OPTIMIZE THE LEVELS OF PH AND ADIPIC ACID CONCENTRATION AT A DESIRED DEGREE OF SO2 REMOVAL WITH LIMESTONE SCRUBBING AND WITHOUT FORCED OXIDATION. IT HAS BEEN OBSERVED THAT THE DECOMPOSITION RATE OF ADIPIC ACID IS DECREASED WITH REDUCING PH.

THE TESTING ON THE EFFECTS OF AIR STOICHIOMETRY AND OXIDATION TANK AGITATOR SPEED ON SULFITE OXIDATION WAS CONCLUDED ON THE TCA SYSTEM IN MID-OCTOBER. THE TCA SYSTEM WAS TEMPORARILY TRANSFERRED TO TVA/UOP EPRI IN MID-OCTOBER FOR THE DEMONSTRATION OF THE DOWA BASIC ALUMINUM SULFATE SCRUBBING PROCESS.

1/80	SYSTEM							744			
2/80	10A				.0						
	10B			100.0	81.5						
	SYSTEM							696			
3/80	10A				.0						
	10B			99.0	54.7						
	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE FIRST QUARTER OF 1980, ONLY THE VENTURI/SPRAY TOWER SYSTEM WAS OPERATED. THE TCA SYSTEM CONTINUED TO OPERATE DURING THE QUARTER ON DOWA BASIC ALUMINUM SULFATE PROCESS UNDER EPRI/UOP/TVA SPONSORSHIP.
THE LIMESTONE/ADIPIC ACID TEST SERIES ON THE VENTURI/SPRAY TOWER SYSTEM, WHICH HAD BEEN INITIATED IN MID-DECEMBER TO INVESTIGATE THE RELATIONSHIP BETWEEN THE SLURRY PH AND THE ADIPIC ACID CONSUMPTION (DEGRADATION) RATE, WAS COMPLETED IN MID-FEBRUARY. THE TESTS WERE CONDUCTED WITHOUT FORCED OXIDATION AND WITH A SINGLE HOLD TANK. AT THE SCRUBBER INLET PH OF 4.6 TO 5.0, ESSENTIALLY ALL OF THE ADIPIC ACID ADDED WAS ACCOUNTED FOR IN THE LIQUID PHASE OF THE WASTE SLUDGE DISCHARGED FROM THE SYSTEM. AT THE SCRUBBER INLET PH 5.25 AND 5.5, THE ADIPIC ACID UNACCOUNTED FOR WERE 6% AND 26% , RESPECTIVELY. THEREFORE, IT APPEARS THAT THE ADIPIC ACID (OR CARBOXYLIC ACID) DEGRADATION TAKES PLACE AT SCRUBBER INLET PH ABOVE ABOUT 5.1 UNDER CONDITIONS ASKED.
A SERIES OF LIMESTONE/ADIPIC ACID TESTS WERE CONDUCTED FROM MID-FEBRUARY TO EARLY MARCH USING THE VENTURI SCRUBBER ONLY WITH A SINGLE TANK AND WITHOUT FORCED OXIDATION TO INVESTIGATE THE SO2 REMOVAL CAPABILITY OF THE VENTURI AT 5.1 INLET PH AND HIGH ADIPIC ACID CONCENTRATION. AT 4000 PPM ADIPIC ACID, L/G OF 21 GAL/MCF, AND 8.3 INCHES H20 PRESSURE DROP, SO2 REMOVAL WAS 65% WITH 2200 PPM INLET SO2 CONCENTRATION.
FORCED OXIDATION USING A SINGLE TANK WITH LIMESTONE/ADIPIC ACID SLURRY ON THE VENTURI/SPRAY TOWER SYSTEM BEGAN IN MID-MARCH. AS IN THE CORRESPONDING TEST SERIES CONDUCTED ON TCA IN APRIL 1979, LIMESTONE BLINDING BY CALCIUM SULFITE OCCURRED. SOLUTION OF THE PROBLEM CAN BE EXPECTED BY USING TWO TANKS IN SERIES WITH FORCED OXIDATION IN THE FIRST TANK AND LIMESTONE ADDITION IN THE SECOND. THIS MODE IS PLANNED ON BEING DEMONSTRATED NEXT QUARTER.

4/80	SYSTEM							720			
5/80	10A				.0						
	10B			96.2	84.8						
	SYSTEM							744			
6/80	10A				.0						
	10B			95.4	37.1						
	SYSTEM							720			

TENNESSEE VALLEY AUTHORITY: SHAWNEE 10B (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PERFORMANCE DATA PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
				THE VENTURI/SPRAY TOWER SYSTEM (TRAIN 100) WAS SHUT DOWN FROM MAY 28 THROUGH JUNE 17 FOR CONVERSION TO A SPRAY TOWER-ONLY SYSTEM BY THE PHYSICAL REMOVAL OF THE VENTURI SECTION. THE SPRAY TOWER-ONLY TESTING BEGAN JUNE 17 ON A SERIES OF LIMESTONE FACTORIAL TESTS, BOTH WITH AND WITHOUT FORCED OXIDATION, TO CHARACTERIZE THE EFFECTS OF LIQUID-TO-GAS RATIO AND SLURRY PH ON SO2 REMOVAL IN THE SPRAY TOWER (THE FIRST SPRAY TOWER-ONLY TESTING AT SHAWNEE).							
7/80	10A			96.4	51.1						
	10B			97.2	88.3						
	SYSTEM							744			
8/80	10A		94.2	94.2	94.2						
	10B			99.1	42.2						
	SYSTEM							744		744	
9/80	10A			89.9	88.8						
	10B			94.0	93.1						
	SYSTEM							720			
	** PROBLEMS/SOLUTIONS/COMMENTS										
				TRAIN 100 WAS AGAIN SHUT DOWN FROM AUGUST 11-28 FOR MODIFICATION OF THE SLURRY PIPING AND INTERNAL HEADERS TO INCREASE THE SLURRY FLOW CAPACITY FROM 1600 TO 2400 GPM. TESTING RESUMED ON AUGUST 28 ON ANOTHER LIMESTONE FACTORIAL TEST SERIES WITH AND WITHOUT FORCED OXIDATION, BUT AT HIGHER LIQUID-TO-GAS RATIOS (UP TO 150 GAL/MCF AT 20,000 ACFM AT 300 F GAS RATE AND 2400 GPM MAXIMUM SLURRY FLOW RATE). THIS TEST SERIES IS EXPECTED TO BE COMPLETED BY MID OCTOBER. TESTING OF THE TCA SYSTEM (TRAIN 200) RESUMED ON JULY 15 AFTER THE SYSTEM HAD BEEN RESTORED FROM THE DOWA PROCESS OPERATING MODE. AS PART OF THE EPA FULL-SCALE ADIPIC ACID DEMONSTRATION PROGRAM, THE SYSTEM HAD BEEN USED THROUGHOUT THE THIRD QUARTER TO SIMULATE THE OPERATION OF THE FULL-SCALE TCA UNITS OPERATING WITH LIMESTONE/ADIPTIC ACID SLURRY AT THE SOUTHWEST STATION OF THE SPRINGFIELD CITY UTILITIES, AT SPRINGFIELD MISSOURI. TESTS HAVE BEEN CONDUCTED BOTH WITH AND WITHOUT FORCED OXIDATION TO GENERATE INFORMATION USEFUL FOR THE FULL-SCALE DEMONSTRATION.							
10/80	10A			96.5	85.9						
	10B			99.4	88.0						
	SYSTEM							744			
11/80	10A			98.1	86.9						
	10B			99.6	64.3						
	SYSTEM							720			
12/80	SYSTEM							744			
	** PROBLEMS/SOLUTIONS/COMMENTS										
				THE LIMESTONE FACTORIAL TEST SERIES WITH AND WITHOUT FORCED OXIDATION ON THE SPRAY TOWER SYSTEM (TRAIN 100) WAS COMPLETED ON OCTOBER 11, 1980. THIS WAS FOLLOWED BY A LIMESTONE FACTORIAL SERIES WITH ADIPIC ACID ADDITION, WITH AND WITHOUT FORCED OXIDATION, TO INVESTIGATE THE EFFECTS OF ADIPIC ACID CONCENTRATION, PH, AND L/G ON SO2 REMOVAL. A LONG-TERM (UP TO 2000 HOURS) SPRAY TOWER DEMONSTRATION TEST BEGAN ON DECEMBER 26. THE LONG-TERM RUN IS BEING OPERATED WITH LIMESTONE ENHANCED WITH 1300 PPM ADIPIC ACID AT A PH OF 5.0 AND WITH FORCED OXIDATION TO DEMONSTRATE LONG-TERM RELIABILITY AND BETTER THAN 90% SO2 REMOVAL AND LIMESTONE UTILIZATION. SIMULATION OF THE SPRINGFIELD CITY UTILITIES' FULL-SCALE TCA ON TRAIN 200							

TENNESSEE VALLEY AUTHORITY: SHAWNEE 10B (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER BOILER HOURS	FGD HOURS	CAP. FACTOR
						PERFORMANCE DATA				

WAS COMPLETED ON NOVEMBER 16. ADIPIC ACID-ENHANCED LIMESTONE SCRUBBING TESTS WITH AND WITHOUT FORCED OXIDATION WERE CONDUCTED TO GENERATE INFORMATION USEFUL FOR THE EPA FULL-SCALE ADIPIC ACID DEMONSTRATION PROJECT NOW UNDER WAY.

TRAIN 200 WAS SHUT DOWN DURING THE WEEK OF NOVEMBER 17 TO INSTALL "GLITSCH GRID" PACKING IN PLACE OF THE MOBILE SPHERES. SHORT TESTS WERE CONDUCTED THROUGH THE END OF THE FOURTH QUARTER TO CHARACTERIZE THE PACKING PRESSURE DROP, SCALING AND PLUGGING POTENTIAL, AND SO2 REMOVAL PERFORMANCE.

DOE IS ASSUMING SHAWNEE PROGRAM RESPONSIBILITY IN JANUARY 1981. TRAIN 200 IS TO BE SHUT DOWN IN JANUARY 1981 DUE TO LACK OF FUNDS. TRAIN 300 (COCURRENT SCRUBBER) HAD BEEN IDLE SINCE JULY 7, 1980. CONTINUED OPERATION OF TRAIN 100 INTO 1981 IS PLANNED.

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	TENNESSEE VALLEY AUTHORITY	
PLANT NAME	WIDOWS CREEK	
UNIT NUMBER	8	
CITY	BRIDGEPORT	
STATE	ALABAMA	
REGULATORY CLASSIFICATION	E	
PARTICULATE EMISSION LIMITATION - NG/J	52.	(.120 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	516.	(1.200 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	*****	
GROSS UNIT GENERATING CAPACITY - MW	550	
NET UNIT GENERATING CAPACITY W/FGD - MW	516	
NET UNIT GENERATING CAPACITY WO/FGD - MW	542	
EQUIVALENT SCRUBBED CAPACITY - MW	550	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	COMBUSTION ENGINEERING	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	755.04	(1600000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	137.8	(280 F)
STACK HEIGHT - M	******	(**** FT)
STACK SHELL	******	
STACK TOP DIAMETER - M	*******	(***** FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	******	
AVERAGE HEAT CONTENT - J/G	23260.	(10000 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		******
AVERAGE ASH CONTENT - %	25.00	
RANGE ASH CONTENT - %	******	
AVERAGE MOISTURE CONTENT - %	10.00	
RANGE MOISTURE CONTENT - %	******	
AVERAGE SULFUR CONTENT - %	3.70	
RANGE SULFUR CONTENT - %	******	
AVERAGE CHLORIDE CONTENT - %	********	
RANGE CHLORIDE CONTENT - %	******	
*** PARTICLE CONTROL		
** ESP		
NUMBER	1	
SUPPLIER	KOPPERS	
PARTICLE REMOVAL EFFICENCY - %	50.0	
** PARTICLE SCRUBBER		
NUMBER	4	
GENERIC TYPE	VENTURI TOWER	
SPECIFIC TYPE	VARIABLE-THROAT/SIDE-MOVABLE BLADES	
SUPPLIER	TVA/POLYCON	
DIMENSIONS - FT	23 WIDE X 28 DEEP (THROAT)	
SHELL GENERIC MATERIAL	STAINLESS STEEL	
SHELL SPECIFIC MATERIAL	AUSTENITIC	
LINER GENERIC MATERIAL	NONE	
LINER SPECIFIC MATERIAL	N/A	
GAS CONTACTING DEVICE TYPE	NONE	
NUMBER OF CONTACTING ZONES	1	
L/G RATIO - LITER/CU.M	1.3	(10.0 GAL/1000ACF)
PRESSURE DROP - KPA	1.2	(5.0 IN-H2O)
INLET GAS FLOW RATE - CU.M/S	188.8	(400000 ACFM)
INLET GAS TEMPERATURE - C	137.8	(280 F)
SO2 REMOVAL EFFICENCY - %	10.0	
PARTICLE REMOVAL EFFICIENCY - %	99.5	
*** FGD SYSTEM		

TENNESSEE VALLEY AUTHORITY: WIDOWS CREEK 8 (CONT.)

** GENERAL DATA		
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT	
SO2 REMOVAL MODE	WET SCRUBBING	
PROCESS TYPE	LIMESTONE	
PROCESS ADDITIVES	NONE	
SYSTEM SUPPLIER	TENNESSEE VALLEY AUTHORITY	
A-E FIRM	NONE	
DEVELOPMENT LEVEL	FULL SCALE	
NEW/RETROFIT	RETROFIT	
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.50	
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	70.00	
CURRENT STATUS	1	
COMMERCIAL START-UP	1/78	
INITIAL START-UP	5/77	
CONTRACT AWARDED	2/73	
** DESIGN AND OPERATING PARAMETERS		
** ABSORBER		
NUMBER	1	
GENERIC TYPE	PACKED TOWER	
SPECIFIC TYPE	MOBILE BED PACKING	
SUPPLIER	POLYCON	
DIMENSIONS - FT	30 WIDE X 16 DEEP X 34 HIGH	
SHELL GENERIC MATERIAL	CARBON STEEL,STAINLESS STEEL	
SHELL SPECIFIC MATERIAL	AISI 1110,AUSTENITIC	
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A,316L	
LINER GENERIC MATERIAL	ORGANIC	
LINER SPECIFIC MATERIAL	SYNTHETIC RUBBER	
LINER MATERIAL TRADE NAME/COMMON TYPE	NEOPRENE	
GAS CONTACTING DEVICE TYPE	GRIDS	
NUMBER OF CONTACTING ZONES	5	
L/G RATIO - L/CU.M	8.0	(60.0 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	.5	(2.0 IN-H2O)
SUPERFICAL GAS VELOCITY - M/SEC	3.7	(12.0 FT/S)
INLET GAS FLOW - CU. M/S	188.76	(400000 ACFM)
INLET GAS TEMPERATURE - C	137.8	(280 F)
SO2 REMOVAL EFFICIENCY - %	70.0	
** ABSORBER		
NUMBER	3	
GENERIC TYPE	PACKED TOWER	
SPECIFIC TYPE	GRID PACKING	
SUPPLIER	POLYCON	
DIMENSIONS - FT	30 WIDE X 16 DEEP X 34 HIGH	
SHELL GENERIC MATERIAL	CARBON STEEL,STAINLESS STEEL	
SHELL SPECIFIC MATERIAL	AISI 1110,AUSTENITIC	
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A,316L	
LINER GENERIC MATERIAL	ORGANIC	
LINER SPECIFIC MATERIAL	SYNTHETIC RUBBER	
LINER MATERIAL TRADE NAME/COMMON TYPE	NEOPRENE	
GAS CONTACTING DEVICE TYPE	GRIDS	
NUMBER OF CONTACTING ZONES	5	
L/G RATIO - L/CU.M	8.0	(60.0 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	.5	(2.0 IN-H2O)
SUPERFICAL GAS VELOCITY - M/SEC	3.7	(12.0 FT/S)
INLET GAS FLOW - CU. M/S	188.76	(400000 ACFM)
INLET GAS TEMPERATURE - C	137.8	(280 F)
SO2 REMOVAL EFFICIENCY - %	70.0	
** MIST ELIMINATOR		
PRE-MIST ELIMINATOR/MIST ELIMINATOR	MIST ELIMINATOR	
NUMBER PER SYSTEM	4	
GENERIC TYPE	IMPINGEMENT	
SPECIFIC TYPE	BAFFLE	
TRADE NAME/COMMON TYPE	CHEVRON VANE	
CONFIGURATION	VERTICAL	
NUMBER OF STAGES	2	
NUMBER OF PASSES PER STAGE	3	
FREEBOARD DISTANCE - M	4.27	(14.0 FT)

TENNESSEE VALLEY AUTHORITY: WIDOWS CREEK 8 (CONT.)

DISTANCE BETWEEN STAGES - CM	2.54	(1.0 IN)
DISTANCE BETWEEN VANES - CM	3.8	(1.50 IN)
PRESSURE DROP - KPA	.2	(1.0 IN-H2O)
SUPERFICAL GAS VELOCITY - M/S	3.8	(12.5 FT/S)
CONSTRUCTION MATERIAL GENERIC TYPE	316L SS	
WASH WATER SOURCE	FRESH WATER	

** REHEATER

NUMBER	4	
GENERIC TYPE	INDIRECT HOT AIR	
SPECIFIC TYPE	EXTERNAL HEAT EXCHANGER	
TRADE NAME/COMMON TYPE	STEAM TUBE BUNDLES	
TEMPERATURE INCREASE - C	10.0	(50 F)
INLET FLUE GAS TEMPERATURE - C	51.7	(125 F)
NUMBER OF TUBES PER BUNDLE	80	
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	

** FANS

NUMBER	4	
SUPPLIER	PHILADELPHIA	
APPLICATION	BOILER I.D.	
SERVICE	DRY	
FLUE GAS FLOW RATE - CU.M/S	188.76	(400000 ACFM)
FLUE GAS TEMPERATURE - C	137.8	(280 F)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	

** REAGENT PREPARATION EQUIPMENT

FUNCTION	LIMESTONE GRINDING	
DEVICE	BALL MILL	
NUMBER	1	
FULL LOAD DRY FEED CAPACITY - M.TONS/HR	36.3	(40 TPH)
PRODUCT QUALITY - % SOLIDS	40.0	

** TANKS

SERVICE	NUMBER
ABSORBER RECYCLE	4
VENTURI RECYCLE	4
LIMESTONE SLURRY	1
RECIRC TNK UNDRFLW SURGE TANK	1

** PUMPS

SERVICE	NUMBER
VENTURI RECIRCULATION	10
POND RETURN	****
RIVER WATER TRANSFER	****
ABSORBER RECIRCULATION	12

*** SLUDGE

** DISPOSAL

NATURE	FINAL	
TYPE	POND	
SITE DIMENSIONS	110 ACRES X 30 FT DEEP	
SITE CAPACITY - CU.M	4035900	(3300.0 ACRE-FT)

** PROCESS CONTROL AND INSTRUMENTATION

CHEMICAL PARAMETERS	PH, PRESSURE CHANGE, OUTLET SO2
MONITOR LOCATION	PH-ABSORBER RECYCLE LINE

** FGD SPARE CAPACITY INDICES

ABSORBER - %	.0

** FGD SPARE COMPONENT INDICES

ABSORBER	.0

TENNESSEE VALLEY AUTHORITY: WIDOWS CREEK 8 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
5/77	SYSTEM	1.5	2.6		1.5			744	426	11	40.9

** PROBLEMS/SOLUTIONS/COMMENTS

STARTUP AND SHAKEDOWN PROCEDURES OFFICIALLY BEGAN ON APRIL 30, 1977. SCRUBBING OPERATIONS BEGAN ON MAY 16 WHEN FLUE GAS WAS PASSED THROUGH A AND B TRAINS.

6/77	SYSTEM	10.9	18.0		10.9			720	438	79	36.3

** PROBLEMS/SOLUTIONS/COMMENTS

C AND D TRAINS WERE STILL UNDERGOING PRESCRUBBING PREPARATIONS THROUGH JUNE. BECAUSE OF BOILER RELATED PROBLEMS SUFFICIENT STEAM WAS NOT AVAILABLE TO OPERATE THE FLUE GAS REHEATERS.

7/77	SYSTEM	24.7	28.1		24.7			744	654	184	49.6
8/77	A	20.0	22.8		20.0						
	B	40.0	45.7		40.0						
	C	36.7	42.0		36.7						
	D	8.3	9.5		8.3						
	SYSTEM	26.3	30.0		26.3			744	651	195	47.5

** PROBLEMS/SOLUTIONS/COMMENTS

27 SEPARATE INSTRUMENTATION FAILURES OCCURRED DURING THE PERIOD. THE PROBLEMS WERE ASSOCIATED WITH FLOW METERS, VARIABLE-SPEED CONTROLS, SO2 MONITORS, PH MONITORS, AND SOLIDS MONITORS. AUTOMATIC SCRUBBER CONTROLS WERE INOPERATIVE. SCRUBBING OPERATIONS HAVE BEEN CONDUCTED MANUALLY BASED ON PERIODIC SAMPLING.

MAJOR PROBLEMS HAVE BEEN ASSOCIATED WITH THE GUILLOTINE BYPASS AND DOUBLE LOUVER SEAL-OFF GAS DAMPERS. SO2 REACTS WITH RUBBER SEALS. DETERIORATION RESULTS IN SO2 AND FLYASH LEAKING. SUBSEQUENT FAILURE OF THE AUTOMATIC GEAR BOXES NECESSITATES MANUAL DAMPER OPERATIONS. IT HAS NOT BEEN POSSIBLE TO ENTIRELY ISOLATE MODULES FOR REPAIR WORK BECAUSE OF THIS LEAKAGE.

LOW ESP PARTICULATE REMOVAL EFFICIENCY HAS RESULTED IN HIGH FAN ROTOR EROSION, MOTOR BURNOUTS AND LUBRICATION PROBLEMS.

THERE WAS EVIDENCE OF SCALE ACCUMULATION IN THE SCRUBBING SYSTEM, HOWEVER, THIS WAS NOT SEVERE.

EROSION HAS OCCURRED IN THE CERAMIC VENTURI THROAT LININGS. THIS IS ALSO A RESULT OF THE POOR ESP EFFICIENCY.

RUBBER LINING FAILURES HAVE OCCURRED IN THE VENTURIS, ABSORBERS AND TANKS. IT IS BELIEVED THAT THESE WERE APPLICATION-RELATED FAILURES. THE RUBBER IN THE ABSORBER SECTION OF ALL FOUR TRAINS HAS DETACHED IN VARIOUS PLACES. THE SUPPLIER HAS REPAIRED THE DEFECTIVE SECTIONS.

SOFT SCALE FORMATION MAY RESULT FROM IMPROPER STOICHIOMETRIC RATIOS. STOICHIOMETRIC RATIOS OF 2.0, 3.0 AND 6.0 HAVE OCCURRED PERIODICALLY BECAUSE OF MANUAL CONTROL AND OPERATOR JUDGEMENTS. IDEALLY THE RATIO SHOULD FALL IN THE 1.4 TO 1.6 RANGE.

THE BALL MILL HAS NOT BEEN ABLE TO OPERATE AT DESIGN CAPACITY. THE BALL MILL HAS A DESIGN CAPACITY OF GRINDING 50 TPH BUT HAS ONLY BEEN ABLE TO PRODUCE 35 TPH OF LIMESTONE SLURRY.

9/77	A	33.3	41.1		17.8						

TENNESSEE VALLEY AUTHORITY: WIDOWS CREEK 8 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	B	72.7	68.2		57.8						
	C	97.4	97.0		82.1						
	D	98.4	98.2		83.1						
	SYSTEM	75.5	71.1		60.2			720	609	433	45.5

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THIS MONTH THE BOILER WAS OPERATED AT A REDUCED LOAD OF ABOUT 300 MW. AT THIS REDUCED LOAD, ONLY 3 TRAINS WERE REQUIRED TO HANDLE ALL OF THE BOILER FLUE GAS.

SOME SCALING WAS DISCOVERED IN THE ABSORBER COLUMN AND ENTRAINMENT SEPARATOR OUTLET OF ONE TRAIN.

SERIOUS EROSION PROBLEMS CONTINUE WITH THE ID FAN ROTORS.

THE UNIT WENT OFF LINE SEPTEMBER 30 FOR A SCHEDULED OUTAGE TO REPAIR BOILER TUBES. DURING THE OUTAGE, AN ATTEMPT WILL BE MADE TO CORRECT MANY OF THE MECHANICAL PROBLEMS.

10/77	SYSTEM	100.0			.0			744	0	0	.0

** PROBLEMS/SOLUTIONS/COMMENTS

UNIT 8 WAS OFF-LINE FOR THE ENTIRE MONTH DURING A SCHEDULED OUTAGE FOR REPAIR OF BOILER TUBES. DURING THIS PERIOD, MANY MECHANICAL AND INSTRUMENTAL SCRUBBER PROBLEMS WERE CORRECTED.

11/77	A		85.5		49.0						
	B		89.8		51.5						
	C		99.8		57.2						
	D		75.8		43.5						
	SYSTEM	57.0	87.7		50.3			720	413	362	38.8

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS BROUGHT BACK IN SERVICE ON NOVEMBER 11 FOLLOWING THE SCHEDULED BOILER OUTAGE (AVAILABILITY WAS CALCUATED FROM NOVEMBER 11 THROUGH NOVEMBER 30).

ALL ID FANS HAVE BEEN REBUILT IN AN ATTEMPT TO CORRECT THE CORROSION AND DRIVE MOTOR PROBLEMS.

GAS LEAKAGE FROM THE DAMPERS WAS CORRECTED BY WELDING A COVER PLATE OVER THE SEAL DOORS. THE SUPPLIER IS CURRENTLY WORKING ON A NEW DESIGN FOR DAMPERS.

INSTRUMENTATION PROBLEMS CONTINUE TO HAMPER PROPER SCRUBBER OPERATION.

12/77	A	59.3	98.1		56.1						
	B	55.9	97.9		56.0						
	C	58.7	97.2		55.6						
	D	57.7	95.4		54.6						
	SYSTEM	57.9	97.2		56.0			744	426	414	42.9

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS OFF-LINE FROM DECEMBER 20 TO DECEMBER 31 FOR REPAIRS OF A BOILER TUBE LEAK.

DURING THE BOILER OUTAGE, AN INSPECTION WAS MADE OF THE SCRUBBER MODULES.

THE RUBBER LINER WAS FOUND TO BE MISSING IN SEVERAL AREAS OF ALL FOUR MODULES AND WAS REPAIRED DURING THE OUTAGE.

TENNESSEE VALLEY AUTHORITY: WIDOWS CREEK 8 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
1/78	A	90.2	98.5		81.9						
	B	86.7	94.5		78.5						
	C	84.6	91.9		76.4						
	D	88.8	97.0		80.6						
	SYSTEM	87.6	95.5		79.4			744	618	590	60.1

** PROBLEMS/SOLUTIONS/COMMENTS

ALL FOUR SCRUBBER MODULES RETURNED TO SERVICE THIS MONTH FOLLOWING REPAIR WORK ON THE RUBBER LINER DURING THE RECENT BOILER OUTAGE.

MINOR PROBLEMS WERE ENCOUNTERED WITH FREEZING AND BURSTING OF PIPING.

FEED HOPPERS AT THE LIMESTONE STORAGE AREA HAVE BEEN PLUGGING DUE TO FROZEN GRAVEL.

THE BALL MILL SUMP PUMP LINERS HAVE BEEN WEARING OUT.

SOME PLUGGING OF THE VENTURI SPRAY NOZZLES WAS ENCOUNTERED DURING JANUARY.

INSTRUMENTATION CONTINUES TO BE A MAJOR PROBLEM WITH OPERATION OF THE SCRUBBER.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
2/78	A	25.5	29.3		25.5						
	B	69.4	68.4		59.7						
	C	67.8	63.1		55.1						
	D	56.5	53.6		46.8						
	SYSTEM	54.8	53.6		46.8			672	586	314	49.7

** PROBLEMS/SOLUTIONS/COMMENTS

THE OUTAGE TIME FOR TRAINS A AND B WAS REQUIRED TO REPLACE THE RUBBER LINERS IN THE DOWNCOMER AREA WITH STAINLESS STEEL. C AND D TRAINS WILL WILL RECEIVE THE SAME MODIFICATION.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
3/78	A	81.9	90.8		78.6						
	B	48.4	53.4		46.2						
	C	26.8	30.9		26.8						
	D	81.6	90.5		78.3						
	SYSTEM	59.7	66.4		57.5			744	644	428	43.7

** PROBLEMS/SOLUTIONS/COMMENTS

TRAIN B WAS OUT OF SERVICE MARCH 1 THROUGH MARCH 13 TO INSTALL STAINLESS STEEL IN THE ABSORBER AND VENTURI DOWNCOMER AREAS.

STAINLESS STEEL COVERS WERE INSTALLED AROUND TWO EXPANSION JOINTS ON TRAIN C IN ORDER TO PREVENT FLUE GAS LEAKAGE.

A STAINLESS STEEL PLATE WAS WELDED OVER THE ENTRY DOOR OPENINGS TO TRAIN C OUTLET AND BYPASS GUILLOTINE DAMPERS FOR THE PURPOSE OF ELIMINATING GAS LEAKAGE.

TRAIN C WAS OUT OF SERVICE MARCH 14 THROUGH MARCH 29 TO INSTALL STAINLESS STEEL ABSORBER AND VENTURI DOWNCOMER AREAS.

SEVERAL LIFTER BARS ON THE FEED AND DISCHARGE ENDS OF THE BALL MILL WERE FOUND TO BE BADLY WORN.

THE UTILITY HAS HAD WEAR PROBLEMS WITH THE SLURRY SUMP PUMP LINERS AT THE BALL MILL.

TENNESSEE VALLEY AUTHORITY: WIDOWS CREEK 8 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PERFORMANCE DATA PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
4/78	A	80.0	38.8		66.6						
	B	67.7	85.8		64.4						
	C	90.0	100.0		80.0						
	D	38.1	50.8		38.1						
	SYSTEM	69.0	81.4		62.3			720	540	448	44.4

** PROBLEMS/SOLUTIONS/COMMENTS

DURING A BRIEF INSPECTION OF THE SCRUBBING SYSTEM IN EARLY APRIL, SOLIDS DEPOSITION WAS NOTICED IN THE MIST ELIMINATOR SECTION OF ALL TRAINS DUE TO PLUGGING THAT HAD OCCURRED IN SEVERAL OF THE MIST ELIMINATOR SPRAY NOZZLES TRAIN D WAS OUT OF SERVICE FOR 17 DAYS WHILE THE MIST ELIMINATOR WAS DISASSEMBLED AND CLEANED.

A STAINLESS STEEL LINER WAS INSTALLED ON THE SLOPING SECTIONS OF THE ABSORBER AND VENTURI OF TRAIN D.

STAINLESS STEEL PLATES WERE INSTALLED OVER THE ENTRY DOOR OPENINGS TO TRAIN D INLET, OUTLET AND BYPASS GUILLOTINE DAMPERS TO REDUCE GAS LEAKAGE

STAINLESS STEEL COVERS WERE INSTALLED AROUND THE FIVE EXPANSION JOINTS ON TRAIN D, TWO EXPANSION JOINTS ON TRAIN A, AND ONE EXPANSION JOINT ON TRAIN B TO REDUCE GAS LEAKAGE.

THERE CONTINUES TO BE A WEAR PROBLEM WITH PUMP LINERS AT THE BALL MILL. NO CAUSE OR SOLUTION OF THE PROBLEM HAS BEEN ASCERTAINED AS YET.

5/78	A		52.0		34.0						
	B		100.0		68.7						
	C		100.0		69.9						
	D		100.0		66.1						
	SYSTEM	97.2	88.0		59.7			744	486	444	44.4

** PROBLEMS/SOLUTIONS/COMMENTS

BEGINNING MAY 1978 AVAILABILITY CALCULATIONS EXCLUDED UNAVAILABLE HOURS RESULTING FROM THE ID FAN SINCE THE ID FAN IS INTENDED PRIMARILY FOR MAINTAINING BOILER FURNACE DRAFT. FGD SYSTEM AVAILABILITY CALCULATORS DO INCLUDE UNAVAILABLE HOURS RESULTING FROM THE LIMESTONE PREPARATION FACILITY.

ON MAY 29 A SMALL PERFORATION IN THE RIVERSIDE VERTICAL WALL OF THE ABSORBER VESSEL WAS DISCOVERED (LEAKING SLURRY). FURTHER EXAMINATION SHOWED THAT A STRIP OF LOOSE NEOPRENE HAD ALLOWED SLURRY TO CORRODE AND/OR ERODE THE BARE CARBON STEEL VESSEL. BECAUSE OF THE SMALL SIZE OF THE LEAK, NO ATTEMPT WILL BE MADE TO PROVIDE A PERMANENT PATCH UNTIL THE NEXT EXTENDED OUTAGE ON TRAIN A. THERE WAS NO EVIDENCE OF ANY CORROSIVE OR EROSIVE ATTACK ON THE NEWLY-APPLIED STAINLESS STEEL ON THE SLOPING PORTIONS OF THE VESSEL.

6/78	A		100.0		70.1						
	B		100.0		73.8						
	C		100.0		71.7						
	D		100.0		70.7						
	SYSTEM	91.7	100.0		71.6			720	472	518	39.8

** PROBLEMS/SOLUTIONS/COMMENTS

SEVERE FAILURE OF THE BALL MILL OUTBOARD FLANGED FOURNAL BOLTS RESULTED IN A LOSS OF SLURRY PRODUCTION SEVERAL TIMES DURING JUNE.

7/78	A		96.9		75.3						
	B		98.8		76.7						

TENNESSEE VALLEY AUTHORITY: WIDOWS CREEK 8 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	C		90.7		70.4						
	D		100.0		88.8						
	SYSTEM	91.7	96.6		77.8			744	578	579	53.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE BUCKET ELEVATOR SUPPLYING LIMESTONE TO THE BALL MILL FAILED ON JULY 21. APPARENTLY, THE CHAIN CARRYING THE BUCKETS GOT OFF TRACK DAMAGING SEVERAL BUCKETS BEFORE THE CONDITION WAS DISCOVERED. REPAIRS WERE NOT COMPLETED UNTIL JULY 24.

BECAUSE OF THE NECESSITY FOR KEEPING UNIT 8 ON-LINE, THE SCRUBBER WAS RUN WITHOUT LIMESTONE ADDITION(THERE IS AN APPROXIMATE 8-HOUR RESERVE OF GROUND LIMESTONE WHEN THE SLURRY STORAGE TANK IS FULL).

SINCE THERE IS NO RESERVE BUCKET ELEVATOR, AN OPENING WAS CUT IN THE TOP OF THE BALL MILL FEED HOPPER AND A CHUTE WAS INSTALLED EXTENDING OUTWARD FROM THE OPENING TO ALLOW LOADING A LIMESTONE INTO THE BALL MILL FEED HOPPER USING A CRANE WITH A CLAMSHELL LOADER. THIS WILL ALLOW CONTINUED OPERATION OF THE BALL MILL IN THE EVENT OF FUTURE BUCKET ELEVATOR FAILURES.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
8/78	A		100.0		87.8						
	B		56.9		49.2						
	C		58.6		50.7						
	D		95.6		82.7						
	SYSTEM	91.4	77.8		67.6			744	643	503	44.6

** PROBLEMS/SOLUTIONS/COMMENTS

ABSORBER SPRAY NOZZLE CONES CONTINUE TO DROP TO THE TOP GRID, DISTORTING SPRAY PATTERNS. INSPECTIONS ON AUGUST 18 SHOWED CONSIDERABLE TOP GRID WEAR OF THE 316 STAINLESS STEEL GRIDS, PROBABLY AGGRAVATED BY LOSS OF NOZZLE CONES. FOUR SPRAYCO 1969F 5-INCH ORIFICE NOZZLES WERE BORROWED FROM THE SHAWNEE STEAM PLANT TEST FACILITY AND INSTALLED IN ABSORBER B ON AUGUST 18 FOR EVALUATION AS POSSIBLE CANDIDATES FOR REPLACING NOZZLES IN CURRENT USE. THESE SPRAYCO NOZZLES HAVE SUBSTANTIAL INTERNAL DEFLECTORS AND ARE EXPECTED TO DEMONSTRATE IMPROVED PERFORMANCE.

SPRAYING SYSTEMS COMPANY WILL ALSO LEND FOUR OF THEIR 5-INCH SCRUBBER NOZZLES FOR TESTING. THESE ARE EXPECTED TO ARRIVE IN SEPTEMBER.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
9/78	A		100.0		76.1						
	B		100.0		82.9						
	C		29.0		20.6						
	D		83.9		59.4						
	SYSTEM	98.7	78.2		59.8			720	510	430	39.5

** PROBLEMS/SOLUTIONS/COMMENTS

REPAIRS ON THE BUCKET ELEVATOR WERE COMPLETED ON SEPTEMBER 24.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
10/78	A		100.0		23.0						
	B		100.0		19.9						
	C		100.0		22.2						
	D		.0		.0						
	SYSTEM	22.4	75.0		16.3			744	146	121	10.1

** PROBLEMS/SOLUTIONS/COMMENTS

THE LIMESTONE BUCKET ELEVATOR FAILED ON OCTOBER 4. THE ELEVATOR HAD BEEN LAST REPAIRED ON SEPTEMBER 24. THE BUCKET ELEVATOR FAILURES ARE CAUSED BY THE DRIVE SPROCKETS BECOMING LOOSE ALLOWING THE CHAINS TO WORK OFF OF THE SPROCKET AND THE HOUSING NOT BEING PLUMB.

TENNESSEE VALLEY AUTHORITY: WIDOWS CREEK 8 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR

SHORT-TERM PLANS ARE TO REBUILD THE BUCKET ELEVATOR DURING THE SCHEDULED BOILER OUTAGE. THE LONG-TERM SOLUTION IS TO REPLACE THE BUCKET ELEVATOR WITH CONVEYORS.

11/78	SYSTEM				.0			720	0	0	.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS DOWN FOR A SCHEDULED SCRUBBER/BOILER OUTAGE IN NOVEMBER.

A FIRE ON NOVEMBER 28 IN TRAIN A ABSORBER CAUSED BY WELDING DESTROYED THE TURBULENT CONTACT ABSORBER (TCA) SPHERES INSTALLED DURING THE PRESENT OUTAGE.

12/78	A			.0	.0						
	B			100.0	15.2						
	C			100.0	11.8						
	D			100.0	15.3						
	SYSTEM	67.7		75.0	10.6			744	37	79	2.4

** PROBLEMS/SOLUTIONS/COMMENTS

CLEANUP OF THE FIRE-DAMAGED TRAIN A ABSORBER WAS COMPLETED ON DECEMBER 5.

THE BUCKET ELEVATOR REPAIRS CONTINUED IN DECEMBER. A PORTABLE CONVEYOR IS BEING USED TO SUPPLY LIMESTONE UNTIL THE BUCKET ELEVATOR REPAIRS ARE COMPLETE.

1/79	SYSTEM	75.0			.0			744	0	0	

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT REMAINED OUT OF SERVICE BECAUSE OF TURBINE ROTOR PROBLEMS.

FOLLOWING THE NOVEMBER 28 FIRE, THE DECISION WAS MADE NOT TO RESTORE THE DAMAGED NEOPRENE ABSORBER VESSEL LINING, BUT TO REPLACE IT WITH 316L STAINLESS STEEL. TWO PRINCIPAL REASONS FOR NOT RESTORING THE RUBBER WERE HIGH COST AND A STATEMENT BY THE RUBBER APPLICATOR THAT HE COULD NOT GUARANTEE ANY RUBBER APPLIED TO THE VESSELS WITH THE AMBIENT TEMPERATURE BELOW ABOUT 55 F. STAINLESS STEEL (TYPE 316L) IS CHEAPER (APPLIED COST) THAN RUBBER QUICKER TO APPLY, AND HAS BEEN DEMONSTRATED AT WIDOWS CREEK STEAM PLANT TO BE VERY DURABLE FOR APPLICATION WITHIN THE ABSORBER VESSEL.

AN ESTIMATED 4,200 SQUARE FEET OF DAMAGED RUBBER WAS REMOVED AND 3/16-INCH-THICK 316L STAINLESS STEEL WAS PURCHASED FOR REPLACEMENT. THIS ARRIVED AT THE PLANT ON JANUARY 16. PREPARATION OF THE ABSORBER VESSEL INTERIOR FOR INSTALLATION OF THE STAINLESS STEEL CONTINUED DURING JANUARY. SINCE TRAIN A ABSORBER STAINLESS STEEL GRID (DIRECTLY BELOW THE SPRAY NOZZLES) WAS DESTROYED BY THE FIRE, THE LOWER STAINLESS STEEL GRID FROM TRAIN B WAS REMOVED AND INSTALLED AS THE TOP GRID IN TRAIN A. A NEW COMPLEMENT OF FIBERGLASS-REINFORCED PLASTIC (FRP) ABSORBER VESSEL GRIDS WAS ORDERED AND WAS SCHEDULED TO ARRIVE ONSITE DURING FEBRUARY.

2/79	A			.0	.0						
	B			100.0	70.5						
	C			100.0	68.6						
	D			100.0	52.4						
	SYSTEM	66.4		75.0	47.9			672	314	323	25.6

** PROBLEMS/SOLUTIONS/COMMENTS

TRAIN D BECAME AVAILABLE FEBRUARY 10 FOR THE INSTALLATION OF FORCED-OXIDATION TEST EQUIPMENT. BY FEBRUARY 10, INSTALLATION WAS COMPLETED ON PUMPS, TANKS, VACUUM FILTERS, AND MODIFICATION OF THE ABSORBER AND VENTURI

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR

AGITATOR CONTROL CIRCUITS. BY LATE FEBRUARY, ERECTION OF THE ELECTRICAL/ CONTROL BUILDING AND INSTALLATION OF FLOCCULENT PIPING WAS BEGUN. CONSTRUCTION OF THE FACILITY IS EXPECTED TO BE COMPLETED IN MARCH.

NEW AGITATORS WERE INSTALLED ON THE TRAIN D ABSORBER AND VENTURI CIRCULATION TANKS. THE NEW, MORE POWERFUL AGITATORS ARE NEEDED FOR THE FORCED-OXIDATION TESTS.

3/79	A		78.6	69.6							
	B		100.0	93.0							
	C		100.0	92.7							
	D		100.0	91.7							
	SYSTEM	99.6	94.7	86.8				744	659	646	62.1

** PROBLEMS/SOLUTIONS/COMMENTS

REPAIRS OF DAMAGE RESULTING FROM THE FIRE IN TRAIN A LAST NOVEMBER WERE COMPLETED BY MARCH 1, 1979. TRAIN A REMAINED OUT OF SERVICE UNTIL MARCH 8 TO REBUILD THE INDUCED-DRAFT FAN-A FLUID DRIVE.

BECAUSE THE REPLACEMENT FIBERGLASS-REINFORCED PLASTIC (FRP) GRATING DID NOT ARRIVE AT THE PLANT BY MARCH 1, 1979, ORDINARY CARBON STEEL FLOOR GRATING WAS INSTALLED FOR THE MARCH 8 STARTUP. INSPECTIONS LATE IN MARCH REVEALED THAT CORROSION AND EROSION HAD DESTROYED APPROXIMATELY 70-80% OF THE CARBON STEEL GRATING.

4/79	A		100.0	85.0							
	B		100.0	77.9							
	C		100.0	75.8							
	D		100.0	81.5							
	SYSTEM	96.4	100.0	80.1				720	519	577	46.8

** PROBLEMS/SOLUTIONS/COMMENTS

FOLLOWING THE BALLMILL TEST ON MARCH 21, 1979, WHERE SLURRY BEGAN TO OVERFLOW OUT THE FEED END OF THE MILL, THE CLASSIFIERS WERE EXAMINED FOR POSSIBLE PLUGGING. ONE CLASSIFIER LINER WAS WORN, AND THE CYCLONE INLET PIPE WAS PARTIALLY PLUGGED WITH SLURRY. REPAIRS WERE MADE, AND THE BALL MILL RESUMED OPERATION WITH NO OVERFLOW PROBLEMS. WHEN THE CYCLONE LINERS ARE WORN OR THE CYCLONES ARE PARTIALLY PLUGGED, TOO MUCH MATERIAL IS RETURNED TO THE MILL CAUSING OVERFLOW OF SLURRY OUT THE FED END OF THE MILL.

5/79	A	100.0	97.5	83.6							
	B	100.0	59.3	50.8							
	C	100.0	100.0	89.7							
	D	100.0	100.0	87.9							
	SYSTEM	100.0	89.2	78.0	80.20			744	638	580	54.9

** PROBLEMS/SOLUTIONS/COMMENTS

THE VENTURI HEADERS AND NOZZLES HAVE PLUGGED WITH SCALE AND SOLIDS. A NEW VENTURI HEADER HAS BEEN INSTALLED AND IS BEING TESTED ON TRAIN B. THE NEW HEADER CONSISTS OF SIX 5-INCH FULL-CONE NOZZLES WITH A 3-INCH DISCHARGE ORIFICE. THE HEADER IS INSTALLED OVER THE VENTURI THROAT TO PROVIDE GOOD THROAT COVERAGE. IF THE NEW HEADER PROVES SUCCESSFUL, NEW HEADERS WILL BE INSTALLED IN ALL VENTURIS.

6/79	A	100.0	93.6	75.7							
	B	100.0	89.9	72.6							
	C	100.0	91.1	73.6							
	D	99.6	93.8	75.8							
	SYSTEM	99.9	92.1	74.4	84.20	99.50		720	582	536	51.4

TENNESSEE VALLEY AUTHORITY: WIDOWS CREEK 8 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE NEW HEADER IN TRAIN B PROVED SATISFACTORY SO NEW HEADERS WILL BE INSTALLED ON ALL FOUR VENTURIS.									
		OPTIMIZATION TESTS ON THE UNIT 8 SCRUBBER HAVE BEGUN AND WILL BE COMPLETED BY THE END OF OCTOBER. THE TESTS WILL INCLUDE TESTING THE ADDITIONAL FIBERGLASS REINFORCED PLASTIC GRIDS, NEW ABSORBER FULL-CONE SPRAY NOZZLES, POLYPROPYLENE GRID-TYPE PACKING, AND TURBULENT CONTACT ABSORBER SPHERES.									
		THE 99.5% PARTICLE REMOVAL EFFICIENCY REPORTED FOR JUNE WAS THE AVERAGE OF TWO EFFICIENCY TESTS RUN AS PART OF THE SCRUBBER OPTIMIZATION TESTS.									
7/79	A	100.0	100.0		44.6						
	B	100.0	100.0		41.8						
	C	100.0	100.0		42.5						
	D	100.0	89.4		35.0						
	SYSTEM	100.0	100.0		41.0	86.40	99.01	744	291	305	23.7
	** PROBLEMS/SOLUTIONS/COMMENTS										
		CORROSION WAS FOUND IN THE REHEAT TUBES IN TRAIN A. MATERIAL COLLECTED ON THE TUBES CONSISTED OF FLY ASH AND FERROUS CORROSION PRODUCTS. CHLORIDE AND SLURRY SOLIDS WERE ALSO DETECTED. THE CHLORIDE COULD HAVE BEEN DEPOSITED DURING THE FIRE IN TRAIN A IN NOVEMBER 1978. THE NEOPRENE SCRUBBER LINING CONTAINS CHLORIDE WHICH IS LIBERATED WHEN BURNED. A DETAILED ANALYSIS OF THE TUBE CORROSION IS BEING PERFORMED.									
		THE 99.01% PARTICLE REMOVAL EFFICIENCY REPORTED FOR JULY WAS AN AVERAGE OF THE EFFICIENCY TESTS RUN AS A PART OF THE SCRUBBER OPTIMIZATION TESTS.									
8/79	A	99.2	100.0		74.3						
	B	100.0	100.0		80.6						
	C	96.2	94.9		70.2						
	D	96.1	100.0		74.9						
	SYSTEM	97.9	99.0		75.0	87.90	99.00	744	550	558	48.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE BALL MILL WAS OUT OF SERVICE BECAUSE OF BROKEN BOLTS WHICH SECURE THE INBOARD BEARING JOURNAL TO THE BALL MILL. THE BOLTS WERE REPLACED AND THE DISCHARGE END OF THE MILL WAS CLEANED. BOLT HOLES WERE REAMED TO ACCOMODATE THE LARGER DIAMETER BOLTS AND LOCK NUTS WERE USED.									
		THE SCRUBBER OPTIMIZATION TEST CONTINUED DURING AUGUST.									
9/79	A	100.0	100.0		71.7						
	B	100.0	100.0		75.0						
	C	95.0	96.7		65.6						
	D	94.4	100.0		72.8						
	SYSTEM	97.4	99.2		71.3	83.00	99.10	720	488	513	43.8
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE LIMESTONE BUCKET ELEVATOR, WHICH FEEDS LIMESTONE INTO THE BALL MILL SURGE HOPPER, FAILED ON SEPTEMBER 28. THE FAILURE, WHICH HAS OCCURRED BEFORE, WAS CAUSED BY LIMESTONE PARTICLE BUILDUP ON THE BUCKETS AND IN THE BOTTOM OF THE HOUSING, RESULTING IN THE ELEVATOR JAMMING AND BREAKING OF THE BUCKET GUIDE CHAINS. THE ELEVATOR WILL BE REPLACED WITH BELT CONVEYORS IN THE SUMMER OF 1980.									
10/79	A	58.3	72.7		51.1						

TENNESSEE VALLEY AUTHORITY: WIDOWS CREEK 8 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	B	100.0	95.8		67.3						
	C	100.0	95.2		66.9						
	D	93.4	100.0		70.3						
	SYSTEM	87.9	90.9		63.9			744	523	476	3.8

** PROBLEMS/SOLUTIONS/COMMENTS

A PORTABLE CONVEYOR WAS USED TO SUPPLY LIMESTONE TO THE BALL MILL WHILE THE BUCKET WAS BEING REPAIRED.

THE REPAIR OF THE BUCKET ELEVATOR CONSISTED OF THE REPLACEMENT OF 25 BUCKETS, REPLACEMENT OF 50 FEET OF DRIVE CHAIN ON EACH SIDE OF THE BUCKETS, AND REMOVAL OF LIMESTONE ACCUMULATIONS ON ALL SURFACES WITH HIGH-PRESSURE WATER. THE BUCKET ELEVATOR WAS RETURNED TO SERVICE ON OCTOBER 6, 1979.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
11/79	A	96.9	87.5		63.9						
	B	100.0	100.0		78.6						
	C	90.0	83.3		60.8						
	D	80.3	92.2		67.4						
	SYSTEM	91.8	90.8		67.7	87.60		720	526	487	36.3

** PROBLEMS/SOLUTIONS/COMMENTS

CONSTRUCTION OF AN ON-SITE AREA IN WHICH TO STACK GYPSUM WAS COMPLETED DURING EARLY NOVEMBER AND STACKING (LANDFILL) OPERATIONS BEGAN ON NOVEMBER 15. THE TRAIN D SCRUBBER SLUDGE IS OXIDIZED BY AIR SPARGING, DEWATERED, AND TRANSPORTED TO THE SITE IN TRUCKS. THE GYPSUM PILE IS FORMED WITH A BULLDOZER, AND RUNOFF AND LEACHATE ARE MONITORED FROM LEACHATE WELLS, A LEACHATE POND, AND A RUNOFF POND. THE GYPSUM IS TO BE STACKED AS HIGH AS 10 FEET.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
12/79	A	87.6	83.6		67.7						
	B	100.0	100.0		85.6						
	C	100.0	64.0		51.9						
	D	95.8	65.7		53.2						
	SYSTEM	95.9	78.3		64.6			744	603	481	37.5

** PROBLEMS/SOLUTIONS/COMMENTS

ON DECEMBER 29, 1979 OPTIMIZATION TESTS WERE COMPLETED. THE DATA OBTAINED WILL BE ANALYZED TO DETERMINE THE T MODIFICATIONS THAT CAN BE INSTALLED TO INCREASE THE SO2 REMOVAL ON THE SCRUBBER.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
1/80	A	70.4	79.8		39.2						
	B	83.5	100.0		56.3						
	C	100.0	100.0		55.5						
	D	28.3	54.7		26.9						
	SYSTEM	70.6	83.6		44.5	83.60		744	366	331	23.9

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JANUARY THE UNIT 8 BOILER EXPERIENCED LOW AVAILABILITY, CAUSING THE FORCED OXIDATION TESTS TO BE DISCONTINUED UNTIL AFTER THE SCHEDULED MAINTENANCE OUTAGE WHICH WILL BEGIN IN SEPTEMBER 1980. THE FORCED OXIDATION TESTS ARE EXPECTED TO RESUME IN JANUARY 1981.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
2/80	A	80.0	88.6		72.7						
	B	86.5	90.2		74.0						
	C	91.1	97.6		80.0						
	D	87.6	98.2		80.6						
	SYSTEM	86.3	93.7		76.8	84.00		696	571	535	43.6

TENNESSEE VALLEY AUTHORITY: WIDOWS CREEK 8 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
		BY FEBRUARY 27, 1980, THE DIFFERENTIAL PRESSURE ACROSS THE TRAIN C ABSORBER HAD REACHED 19 INCHES WATER GAGE. THE HIGH ABSORBER DIFFERENTIAL PRESSURE WAS CAUSED BY PLUGGING OF TURBULENT CONTACT ABSORBER (TCA) SPHERES WHICH WERE INSTALLED DURING SCRUBBER OPTIMIZATION TESTS. THE TCA SPHERES WILL BE REMOVED IN MARCH.									
3/80	A	93.6	88.0		85.4						
	B	93.0	90.6		87.9						
	C	71.9	73.3		71.1						
	D	93.3	63.9		62.0						
	SYSTEM	86.0	79.0		76.6	82.60		744	722	570	50.4
	** PROBLEMS/SOLUTIONS/COMMENTS										
		ON MARCH 3 THE TCA SPHERES INSTALLED IN TRAIN C AS PART OF THE OPTIMIZATION TESTS WERE REMOVED. THE SPHERES HAD BECOME PLUGGED, RESULTING IN AN ABSORBER DIFFERENTIAL PRESSURE OF 20 INCHES WATER GAGE. THE SPHERES HAD BEEN IN USE SINCE NOVEMBER 17, 1979.									
4/80	A	96.8	82.7		46.5						
	B	97.2	79.5		44.7						
	C	96.3	90.4		50.8						
	D	95.0	70.9		39.9						
	SYSTEM	96.3	80.9		45.5	86.00		720	405	328	30.3
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE SCRUBBER SLURRY SPRAY NOZZLES WERE CLEANED AS PART OF A SCHEDULED MAINTENANCE OUTAGE.									
		BALL MILL LINERS AND LIFTER BARS WERE REPLACED IN APRIL DURING A SCHEDULED MAINTENANCE OUTAGE.									
5/80	A	99.2	74.5		56.2						
	B	96.1	80.9		61.0						
	C	96.1	87.7		66.1						
	D	96.1	75.2		56.7						
	SYSTEM	96.9	79.6		60.0	83.00		744	561	447	38.3
	** PROBLEMS/SOLUTIONS/COMMENTS										
		ON MAY 16 THE LIMESTONE BUCKET ELEVATOR FAILED CAUSING UNIT 8 TO BE REMOVED FROM SERVICE FOR SIX HOURS.									
		THE SCRUBBER SLURRY SPRAY NOZZLES ON THE B, C AND D MODULES WERE CLEANED DURING MAY. THE CLEANING KEPT THE SYSTEM OFF LINE FOR 23 HOURS.									
		THE UNIT 8 BALL MILL MALFUNCTIONED ON MAY 28, DUE TO FAILURE OF INLET BEARING BOLTS.									
6/80	A	100.0	5.3	100.0	4.9						
	B	100.0	100.0	100.0	91.8						
	C	99.6	93.9	99.5	86.3						
	D	100.0	98.6	100.0	90.6						
	SYSTEM	99.9	74.5	99.8	68.3	82.20		720	661	492	44.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING JUNE THE BALL MILL REMAINED OUT OF SERVICE FOR MAJOR REPAIRS THAT INCLUDED REPAIR OF THE BALL MILL SHELL (CRACKS PRESENT). THE UNIT 7 SCRUBBER BALL MILL WAS USED IN PLACE OF THE UNIT 8 BALL MILL.									

TENNESSEE VALLEY AUTHORITY: WIDOWS CREEK 8 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
		PERFORMANCE DATA									
7/80	A	100.0	79.9	100.0	71.6						
	B	96.9	75.1	95.6	67.3						
	C	96.9	88.3	96.2	79.2						
	D	100.0	48.7	100.0	43.7						
	SYSTEM	98.5	73.0	98.0	65.5	87.40		744	667	487	43.7

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT 8 BALL MILL SHELL WAS SHIPPED TO THE FACTORY FOR REPAIRS ON JULY 24.

CLEANING OF THE SLURRY SPRAY NOZZLES REMAINS A SIGNIFICANT SCRUBBER MAINTENANCE ITEM.

8/80	SYSTEM		744
9/80	SYSTEM		720

** PROBLEMS/SOLUTIONS/COMMENTS

INFORMATION FOR THE MONTHS OF AUGUST AND SEPTEMBER IS NOT AVAILABLE AT THIS TIME.

10/80	SYSTEM		744
11/80	SYSTEM		720
12/80	SYSTEM		744

** PROBLEMS/SOLUTIONS/COMMENTS

INFORMATION FOR THE FOURTH QUARTER 1980 IS NOT AVAILABLE AT THIS TIME.

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	TEXAS POWER & LIGHT	
PLANT NAME	SANDOW	
UNIT NUMBER	4	
CITY	ROCKDALE	
STATE	TEXAS	
REGULATORY CLASSIFICATION	B	
PARTICULATE EMISSION LIMITATION - NG/J	43.	(.100 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	516.	(1.200 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	*****	
GROSS UNIT GENERATING CAPACITY - MW	545	
NET UNIT GENERATING CAPACITY W/FGD - MW	545	
NET UNIT GENERATING CAPACITY WO/FGD - MW	*****	
EQUIVALENT SCRUBBED CAPACITY - MW	382	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	COMBUSTION ENGINEERING	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	********	(******* ACFM)
BOILER FLUE GAS TEMPERATURE - C	*******	(**** F)
STACK HEIGHT - M	******	(**** FT)
STACK SHELL	******	
STACK TOP DIAMETER - M	*******	(***** FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	LIGNITE	
AVERAGE HEAT CONTENT - J/G	******	(****** BTU/LB)
RANGE HEAT CONTENT - BTU/LB		******
AVERAGE ASH CONTENT - %	13.00	
RANGE ASH CONTENT - %	******	
AVERAGE MOISTURE CONTENT - %	35.00	
RANGE MOISTURE CONTENT - %	******	
AVERAGE SULFUR CONTENT - %	1.60	
RANGE SULFUR CONTENT - %	******	
AVERAGE CHLORIDE CONTENT - %	********	
RANGE CHLORIDE CONTENT - %	******	
*** PARTICLE CONTROL		
** ESP		
TYPE	COLD SIDE	
SUPPLIER	C.E. WALTHER	
** PARTICLE SCRUBBER		
GENERIC TYPE	NONE	
SPECIFIC TYPE	N/A	
*** FGD SYSTEM		
** GENERAL DATA		
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT	
SO2 REMOVAL MODE	WET SCRUBBING	
PROCESS TYPE	LIMESTONE	
SYSTEM SUPPLIER	COMBUSTION ENGINEERING	
A-E FIRM	BROWN & ROOT	
DEVELOPMENT LEVEL	FULL SCALE	
NEW/RETROFIT	NEW	
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.70	
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	75.00	
CURRENT STATUS	1	
COMMERCIAL START-UP	1/81	
INITIAL START-UP	12/80	
** DESIGN AND OPERATING PARAMETERS		
SPACE REQUIREMENTS - SQ M	4046.7	(43560 SQ FT)

TEXAS POWER & LIGHT: SANDOW 4 (CONT.)

** ABSORBER

NUMBER	3
GENERIC TYPE	SPRAY TOWER
SPECIFIC TYPE	OPEN COUNTERCURRENT SPRAY
SUPPLIER	COMBUSTION ENGINEERING

** REHEATER

GENERIC TYPE	BYPASS
SPECIFIC TYPE	COLD SIDE
TRADE NAME/COMMON TYPE	N/A
PERCENT GAS BYPASSED - AVG	30.0

*** SLUDGE

** DISPOSAL

NATURE	FINAL
TYPE	POND

** WATER BALANCE

WATER LOOP TYPE	CLOSED

** FGD SPARE CAPACITY INDICES

ABSORBER - %	.0

** FGD SPARE COMPONENT INDICES

ABSORBER	.0

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
12/80	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

OPERATIONS AT SANDOW 4 COMMENCED IN DECEMBER 1980. THE SYSTEM IS PRESENTLY IN THE SHAKEDOWN/DEBUGGING PHASE OF OPERATION.

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	TEXAS UTILITIES	
PLANT NAME	MARTIN LAKE	
UNIT NUMBER	1	
CITY	TATUM	
STATE	TEXAS	
REGULATORY CLASSIFICATION	B	
PARTICULATE EMISSION LIMITATION - NG/J	43.	(.100 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	516.	(1.200 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	3000	
GROSS UNIT GENERATING CAPACITY - MW	793	
NET UNIT GENERATING CAPACITY W/FGD - MW	750	
NET UNIT GENERATING CAPACITY WO/FGD - MW	760	
EQUIVALENT SCRUBBED CAPACITY - MW	595	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	COMBUSTION ENGINEERING	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	1494.51	(3167000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	168.3	(335 F)
STACK HEIGHT - M	******	(**** FT)
STACK SHELL	******	
STACK TOP DIAMETER - M	*******	(***** FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	LIGNITE	
AVERAGE HEAT CONTENT - J/G	17166.	(7380 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		6972-7894
AVERAGE ASH CONTENT - %	8.00	
RANGE ASH CONTENT - %	5.6-13.2	
AVERAGE MOISTURE CONTENT - %	33.00	
RANGE MOISTURE CONTENT - %	29.0-37.9	
AVERAGE SULFUR CONTENT - %	.90	
RANGE SULFUR CONTENT - %	0.5-1.5	
AVERAGE CHLORIDE CONTENT - %	********	
RANGE CHLORIDE CONTENT - %	******	
*** PARTICLE CONTROL		
** ESP		
NUMBER	1	
TYPE	COLD SIDE	
SUPPLIER	RESEARCH-COTTRELL	
INLET FLUE GAS CAPACITY - CU.M/S	1494.5	(3167000 ACFM)
INLET FLUE GAS TEMPERATURE - C	168.3	(335 F)
PRESSURE DROP - KPA	.5	(2. IN-H2O)
PARTICLE REMOVAL EFFICENCY - %	99.4	
** PARTICLE SCRUBBER		
GENERIC TYPE	NONE	
SPECIFIC TYPE	N/A	
*** FGD SYSTEM		
** GENERAL DATA		
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT	
SO2 REMOVAL MODE	WET SCRUBBING	
PROCESS TYPE	LIMESTONE	
PROCESS ADDITIVES	NONE	
SYSTEM SUPPLIER	RESEARCH-COTTRELL	
A-E FIRM	C.T. MAIN	
DEVELOPMENT LEVEL	FULL SCALE	
NEW/RETROFIT	NEW	
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.40	
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	71.00	
CURRENT STATUS	1	
COMMERCIAL START-UP	10/78	

TEXAS UTILITIES: MARTIN LAKE 1 (CONT.)

INITIAL START-UP	4/77

** DESIGN AND OPERATING PARAMETERS

**** ABSORBER**		
NUMBER	6	
GENERIC TYPE	COMBINATION	
SPECIFIC TYPE	SPRAY/PACKED	
SUPPLIER	RESEARCH-COTTRELL	
DIMENSIONS - FT	28 DIA. X 100 TALL	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	AISI 1110	
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A	
GAS CONTACTING DEVICE TYPE	2 FT WETTED FILM CONTACTOR (MUNTERS PACKING)	
NUMBER OF CONTACTING ZONES	4	
DISTANCE BETWEEN GAS CONTACTING ZONES - CM	91.4	(36.0IN)
GAS-SIDE PRESSURE DROP - KPA	1.1	(4.5 IN-H2O)
INLET GAS FLOW - CU. M/S	177.13	(375350 ACFM)
INLET GAS TEMPERATURE - C	162.8	(325 F)
SO2 REMOVAL EFFICIENCY - %	95.0	
**** MIST ELIMINATOR**		
PRE-MIST ELIMINATOR/MIST ELIMINATOR	MIST ELIMINATOR	
NUMBER PER SYSTEM	12	
GENERIC TYPE	IMPINGEMENT	
SPECIFIC TYPE	BAFFLE	
TRADE NAME/COMMON TYPE	CHEVRON VANE	
CONFIGURATION	HORIZONTAL	
NUMBER OF STAGES	2	
NUMBER OF PASSES PER STAGE	3	
PRESSURE DROP - KPA	.2	(1.0 IN-H2O)
SUPERFICAL GAS VELOCITY - M/S	2.4	(8.0 FT/S)
CONSTRUCTION MATERIAL GENERIC TYPE	POLYPROPYLENE	
WASH WATER SOURCE	ASH POND RETURN WATER	
WASH RATE - L/S	7.9	(126 GAL/MIN)
**** REHEATER**		
GENERIC TYPE	BYPASS	
SPECIFIC TYPE	COLD SIDE	
TRADE NAME/COMMON TYPE	N/A	
PERCENT GAS BYPASSED - AVG	25.0	
TEMPERATURE INCREASE - C	22.2	(72 F)
INLET FLUE GAS FLOW RATE - CU. M/S	144.17	(305500 ACFM)
INLET FLUE GAS TEMPERATURE - C	57.2	(135 F)
**** FANS**		
NUMBER	4	
FUNCTION	BALANCED DRAFT	
APPLICATION	BOILER I.D.	
SERVICE	DRY	
FLUE GAS FLOW RATE - CU.M/S	375.48	(795680 ACFM)

** TANKS

SERVICE	NUMBER
ABSORBER FEED	3
QUENCHER SUMP	6

** PUMPS

SERVICE	NUMBER
QUENCHER FEED PUMP	****
SLURRY FEED	****
ABSORBER RECIRCULATION	54

**** SOLIDS CONCENTRATING/DEWATERING**		
DEVICE	CENTRIFUGE	
NUMBER	3	
FEED STREAM CHARACTERISTICS	35% SOLIDS	
OUTLET STREAM CHARACTERISTICS	69% SOLIDS	

TEXAS UTILITIES: MARTIN LAKE 1 (CONT.)

** SOLIDS CONCENTRATING/DEWATERING

DEVICE	THICKENER
NUMBER	1
DIMENSIONS - FT	140 (DIA) X 12 (DEPTH)
FEED STREAM CHARACTERISTICS	15% SOLIDS
OUTLET STREAM CHARACTERISTICS	35% SOLIDS

*** SLUDGE

** TREATMENT

METHOD	FLYASH STABILIZATION

** DISPOSAL

NATURE	FINAL
TYPE	LANDFILL
LOCATION	ON SITE
SITE TRANSPORTATION METHOD	RAIL

** PROCESS CONTROL AND INSTRUMENTATION

CHEMICAL PARAMETERS	PH, LIQUID LEVEL, LIQUID & GAS FLOW

** WATER BALANCE

WATER LOOP TYPE	CLOSED
MAKEUP WATER ADDITION - LITERS/S	34.6 (550 GPM)

** FGD SPARE CAPACITY INDICES

ABSORBER - %	.0

** FGD SPARE COMPONENT INDICES

ABSORBER	.0

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
8/77	SYSTEM							744			
9/77	SYSTEM							720			
10/77	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

INSTALLATION OF THE LIMESTONE SCRUBBING SYSTEM AND THE ESP WAS COMPLETED BY OCTOBER 1977. THE INITIAL OPERATING PHASE IS EXPECTED TO CONTINUE THROUGH THE FIRST QUARTER OF 1978. COMPLIANCE TESTING WAS CONDUCTED IN AUGUST 1977 AND CERTIFICATION OF COMMERCIAL AVAILABILITY IS AWAITED.

THE FGD SYSTEM IS CURRENTLY EXPERIENCING GENERAL MECHANICAL PROBLEMS AND INSTRUMENTATION PROBLEMS.

THE UTILITY EXPERIENCED SOME DIFFICULTIES IN THE SLUDGE HANDLING SYSTEM. AS A RESULT OF EQUIPMENT UNAVAILABILITY THE WASTE SLURRY IS CURRENTLY BEING DIRECTED TO THE ASH DISPOSAL AREA.

11/77	SYSTEM							720			
12/77	SYSTEM							744			
1/78	SYSTEM							744			

TEXAS UTILITIES: MARTIN LAKE 1 (CONT.)

PERIOD	MODULE AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
				PERFORMANCE DATA						
	** PROBLEMS/SOLUTIONS/COMMENTS									
		THE SLUDGE HANDLING SYSTEM DOES NOT OPERATE UNIFORMLY OVER EXTENDED PERIODS.								
2/78	SYSTEM							672		
3/78	SYSTEM							744		
	** PROBLEMS/SOLUTIONS/COMMENTS									
		CERTIFICATION WAS RECEIVED FROM THE EPA DURING THE PERIOD. THE BOILER AND FGD SYSTEM OPERATED THROUGHOUT THE PERIOD.								
		THE UTILITY IS STILL HAVING SOME PROBLEMS WITH THE SLUDGE HANDLING SYSTEM. SOME FORCED OUTAGE TIME OCCURRED.								
4/78	SYSTEM							720		
5/78	SYSTEM							744		
	** PROBLEMS/SOLUTIONS/COMMENTS									
		THE UNIT WAS TAKEN OFF LINE IN APRIL FOR AN ANNUAL TWO WEEK OUTAGE.								
		GENERATOR PROBLEMS WERE ENCOUNTERED IN MAY CAUSING THE UNIT TO BE TAKEN OFF LINE THROUGH THE END OF THE MONTH.								
6/78	SYSTEM							720		
7/78	SYSTEM							744		
	** PROBLEMS/SOLUTIONS/COMMENTS									
		THE DAMPERS FOR EACH ABSORBER MODULE WERE NOT FUNCTIONING PROPERLY. IT HAS BEEN IMPOSSIBLE TO ISOLATE INDIVIDUAL MODULES FOR REPAIRS (THE ENTIRE SYSTEM WOULD HAVE TO BE SHUT DOWN IF REPAIRS WERE REQUIRED ON ONLY ONE MODULE).								
		THE UNIT IS NOW CONSIDERED TO BE OPERATING COMMERCIALLY. OPERATIONS HAVE BEEN SATISFACTORY. DEPENDING ON THE LIGNITE BURNED THE SCRUBBER CAN BE OPERATED WITH ONLY FOUR OR SIX TOWERS ON LINE AND STILL BE IN COMPLIANCE.								
		THERE HAVE BEEN PROBLEMS WITH THE PH METERS. THE METERS HAVE NOT OPERATED PROPERLY FOR SOME TIME NOW.								
		THE UTILITY HAS GENERALLY ONLY HAD TO PERFORM GENERAL MAINTENANCE ON THE SCRUBBER TOWERS.								
8/78	SYSTEM							744		
9/78	SYSTEM							720		
	** PROBLEMS/SOLUTIONS/COMMENTS									
		ISOLATION DAMPER PROBLEMS CONTINUED.								
		THE UNIT CONTINUES TO REQUIRE EXCESSIVE MAINTENANCE. FGD SYSTEM ACCEPTANCE TEST WERE PERFORMED BY THE UTILITY DURING AUGUST. RESULTS ARE NOT YET AVAILABLE.								
		FLOW MEASUREMENT INSTRUMENTATION HAS BEEN FAILING.								

TEXAS UTILITIES: MARTIN LAKE 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR

OPACITY HAS OCCASIONALLY BEEN HIGHER THAN EXPECTED (20-25%) RESULTING FROM ESP PROBLEMS.

10/78	SYSTEM							744			
11/78	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

NO FGD SYSTEM PROBLEMS WERE REPORTED FOR THE OCTOBER-NOVEMBER PERIOD.

OUTAGES ARE PRIMARILY A RESULT OF ESP PROBLEMS. THE UTILITY IS RELUCTANT TO OPERATE SCRUBBERS WHEN THE ESP SHOWS HIGH OPACTIY FOR FEAR OF PLUGGING PROBLEMS.

12/78	SYSTEM							744			
1/79	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS SHUT DOWN WHILE THE BOTTOM ASH POND WAS CLEANED OUT. THE UTILITY HAS BEEN DUMPING SLUDGE INTO THE BOTTOM ASH POND WHICH WAS DESIGNED FOR BOTTOM ASH ONLY. ALSO SLUDGE IS PRODUCED FASTER THAN IT CAN BE REMOVED BY RAIL CAR. THE ACTUAL PROBLEM IS REPORTEDLY IN THE DEWATERING SYSTEM. HEAVY RAIN FALL HAS AGGREVATED THE SLUDGE DISPOSAL PROBLEM BY FOULING THE THICKENER OPERATIONS AND BY THREATENING POND OVERFLOW.

SOME MIST ELIMINATOR WASH PROBLEMS WERE ENCOUNTERED.

THE FGD SYSTEM REPORTEDLY FUNCTIONED ACCEPTABLY WHEN OPERATED DURING DECEMBER AND JANUARY.

COAL HANDLING WAS A SERIOUS PROBLEM DUE TO FREEZING OF THE COAL IN THE HOPPERS. THIS PROBLEM EFFECTED ALL UNITS AT MARTIN LAKE FORCING THE UTILITY'S GAS AND OIL UNITS TO CARRY THE POWER LOAD. ALL OF THE MARTIN LAKE UNITS WERE DOWN FOR AN EXTENDED PERIOD IN LATE JANUARY.

THERE IS EVIDENCE THAT THE SULFUR CONTENT IN THE COAL IS INCREASING AS THE MATERIAL IS MINED DEEPER. IF THE SULFUR CONTENT CONTINUES TO INCREASE ADDITIONAL SCRUBBER TOWERS MAY HAVE TO BE INSTALLED.

2/79	SYSTEM							672			
3/79	SYSTEM							744			
4/79	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

UNIT 1 IS NOW IN FULL OPERATION ALTHOUGH A SLUDGE DISPOSAL PROBLEM STILL EXISTS.

THE UTILITY HAS REPLACED THE LOUVER DAMPERS WITH GUILLOTINE DAMPERS WHICH SEEM TO WORK BETTER. HOWEVER, THEY STILL HAVE PROBLEMS WITH THE GUILLOTINE DAMPERS FAILING TO SEAL WHEN THEY BECOME SCALED.

THERE HAVE BEEN REPORTS OF TOWER LEAKS RESULTING FROM LINER FAILURE BUT THE PROBLEM IS NOT SERIOUS.

5/79	SYSTEM							744			
6/79	SYSTEM							720			

TEXAS UTILITIES: MARTIN LAKE 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
		PERFORMANCE DATA									
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE SLUDGE DISPOSAL SYSTEM IS STILL CAUSING SOME OPERATING PROBLEMS. THE PROBLEMS REPORTED LAST QUARTER WERE CAUSED BY HEAVY RAINS WHICH FORCED THE THICKENERS OUT OF SERVICE.									
		THE FGD SYSTEM OPERATED THROUGHOUT MOST OF THE REPORT PERIOD.									
7/79	SYSTEM								744		
8/79	SYSTEM								744		
9/79	SYSTEM								720		
	** PROBLEMS/SOLUTIONS/COMMENTS										
		ENGINEERING WORK IS IN PROGRESS TO ADD TWO NEW SCRUBBING TOWERS TO EACH MARTIN LAKE UNIT. THIS IS BEING DONE FOR THREE REASONS: 1) THE LIGNITE CURRENTLY DELIVERED HAS A GREATER SULFUR CONTENT THAN THAT FOR WHICH THE FGD SYSTEM WAS ORIGINALLY DESIGNED. 2) THE BOILER FLUE GAS FLOW IS GREATER THAN THAT FOR WHICH THE FGD SYSTEM WAS ORIGINALLY DESIGNED. 3) AS A RESULT OF CURRENT FGD SYSTEM MAINTENANCE REQUIREMENTS THE UTILITY FEELS IT IS BEST THAT ONE SPARE MODULE BE AVAILABLE SO THAT AT LEAST ONE CAN BE DOWN FOR CLEANING AT ALL TIMES. THE TWO NEW TOWERS FOR EACH UNIT WILL BE DESIGNED FOR A LARGER CAPACITY THAN THE ORIGINAL TOWERS.									
		DURING THE THIRD QUARTER THE UTILITY REPORTED THE SYSTEM OPERATED WELL. HOWEVER EXCESSIVE MAINTENANCE WAS REQUIRED. THE SLUDGE DISPOSAL SYSTEM PROBLEMS PLAGUING THE UNIT HAVE BEEN SOLVED.									
10/79	SYSTEM								744		
11/79	SYSTEM								720		
12/79	SYSTEM								744		
	** PROBLEMS/SOLUTIONS/COMMENTS										
		PLUGGING PROBLEMS HAVE BEEN ENCOUNTERED DURING THE FOURTH QUARTER REQUIRING HEAVY MAINTENANCE.									
1/80	SYSTEM								744		
2/80	SYSTEM								696		
3/80	SYSTEM								744		
	** PROBLEMS/SOLUTIONS/COMMENTS										
		PLUGGING PROBLEMS CONTINUED IN THE FIRST QUARTER OF 1980, PARTICULARLY IN THE WETTED FILM CONTACT AREA AND THE MIST ELIMINATOR SECTION. THE MIST ELIMINATOR PLUGGING WAS RECENTLY SOLVED BY SWITCHING BACK TO LAKE WATER FOR MIST ELIMINATOR WASH FROM AN ASH POND WATER WASH THE UTILITY HAD BEEN TESTING.									
		THE FRP STRUCTURAL WORK IS BECOMING A PROBLEM. MUCH OF THE FRP SUPPORT WORK HAS HAD TO BE REPLACED WITH STAINLESS STEEL.									
		THE UTILITY HAS PLANS TO INSTALL TWO NEW SCRUBBING TOWERS IN EARLY 1982. THE NEW TOWERS HAVE BECOME NECESSARY DUE TO THE INCREASING LIGNITE SULFUR CONTENT AND THE NEED FOR SPARE SCRUBBER CAPACITY.									

TEXAS UTILITIES: MARTIN LAKE 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
		PERFORMANCE DATA									
4/80	SYSTEM							720			
5/80	SYSTEM							744			
6/80	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

HIGH MAINTENANCE PROBLEMS REPORTED IN PREVIOUS MONTHS CONTINUED THROUGHOUT THE SECOND QUARTER OF 1980. THE ABSORBERS ARE STILL EXPERIENCING PLUGGING PROBLEMS.

7/80	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

CORROSION IN THE SCRUBBER MODULES WAS A PROBLEM DURING JULY.

THE FOUNDATION FOR THE TWO NEW SCRUBBING TOWERS WAS COMPLETED DURING THE MONTH.

8/80	SYSTEM							744			
9/80	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE FGD SYSTEM OPERATED WITHOUT ANY MAJOR PROBLEMS DURING AUGUST AND SEPTEMBER.

10/80	SYSTEM							744			
11/80	SYSTEM							720			
12/80	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

NO OPERATIONAL PROBLEMS WERE REPORTED FOR THE MARTIN LAKE 1 FGD SYSTEM DURING THE FOURTH QUARTER 1980.

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	TEXAS UTILITIES	
PLANT NAME	MARTIN LAKE	
UNIT NUMBER	2	
CITY	TATUM	
STATE	TEXAS	
REGULATORY CLASSIFICATION	B	
PARTICULATE EMISSION LIMITATION - NG/J	43.	(.100 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	516.	(1.200 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	3000	
GROSS UNIT GENERATING CAPACITY - MW	793	
NET UNIT GENERATING CAPACITY W/FGD - MW	750	
NET UNIT GENERATING CAPACITY WO/FGD - MW	760	
EQUIVALENT SCRUBBED CAPACITY - MW	595	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	COMBUSTION ENGINEERING	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	1494.51	(3167000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	168.3	(335 F)
STACK HEIGHT - M	******	(**** FT)
STACK SHELL	******	
STACK TOP DIAMETER - M	*******	(***** FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	LIGNITE	
AVERAGE HEAT CONTENT - J/G	17166.	(7380 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		6972-7894
AVERAGE ASH CONTENT - %	8.00	
RANGE ASH CONTENT - %	5.6-13.2	
AVERAGE MOISTURE CONTENT - %	33.00	
RANGE MOISTURE CONTENT - %	29.0-37.9	
AVERAGE SULFUR CONTENT - %	.90	
RANGE SULFUR CONTENT - %	0.5-1.5	
AVERAGE CHLORIDE CONTENT - %	********	
RANGE CHLORIDE CONTENT - %	******	
*** PARTICLE CONTROL		
** ESP		
NUMBER	1	
TYPE	COLD SIDE	
SUPPLIER	RESEARCH-COTTRELL	
INLET FLUE GAS CAPACITY - CU.M/S	1494.5	(3167000 ACFM)
INLET FLUE GAS TEMPERATURE - C	168.3	(335 F)
PRESSURE DROP - KPA	.5	(2. IN-H2O)
PARTICLE REMOVAL EFFICENCY - %	99.4	
** PARTICLE SCRUBBER		
GENERIC TYPE	NONE	
SPECIFIC TYPE	N/A	
*** FGD SYSTEM		
** GENERAL DATA		
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT	
SO2 REMOVAL MODE	WET SCRUBBING	
PROCESS TYPE	LIMESTONE	
PROCESS ADDITIVES	NONE	
SYSTEM SUPPLIER	RESEARCH-COTTRELL	
A-E FIRM	C.T. MAIN	
DEVELOPMENT LEVEL	FULL SCALE	
NEW/RETROFIT	NEW	
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.40	
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	71.00	
CURRENT STATUS	1	
INITIAL START-UP	5/78	

TEXAS UTILITIES: MARTIN LAKE 2 (CONT.)

** DESIGN AND OPERATING PARAMETERS

** ABSORBER		
NUMBER	6	
GENERIC TYPE	COMBINATION	
SPECIFIC TYPE	SPRAY/PACKED	
SUPPLIER	RESEARCH-COTTRELL	
DIMENSIONS - FT	28 DIA. X 200 TALL	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	AISI 1110	
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A	
GAS CONTACTING DEVICE TYPE	2 FT WETTED FILM CONTACTOR (MUNTERS PACKING)	
NUMBER OF CONTACTING ZONES	4	
GAS-SIDE PRESSURE DROP - KPA	1.1	(4.5 IN-H2O)
INLET GAS FLOW - CU. M/S	177.13	(375350 ACFM)
INLET GAS TEMPERATURE - C	162.8	(325 F)
SO2 REMOVAL EFFICIENCY - %	95.0	
** MIST ELIMINATOR		
PRE-MIST ELIMINATOR/MIST ELIMINATOR	MIST ELIMINATOR	
NUMBER PER SYSTEM	12	
GENERIC TYPE	IMPINGEMENT	
SPECIFIC TYPE	BAFFLE	
TRADE NAME/COMMON TYPE	CHEVRON VANE	
CONFIGURATION	HORIZONTAL	
NUMBER OF STAGES	2	
NUMBER OF PASSES PER STAGE	3	
PRESSURE DROP - KPA	.2	(1.0 IN-H2O)
SUPERFICAL GAS VELOCITY - M/S	2.4	(8.0 FT/S)
CONSTRUCTION MATERIAL GENERIC TYPE	POLYPROPYLENE	
WASH WATER SOURCE	ASH POND RETURN WATER	
WASH RATE - L/S	7.9	(126 GAL/MIN)
** REHEATER		
GENERIC TYPE	BYPASS	
SPECIFIC TYPE	COLD SIDE	
TRADE NAME/COMMON TYPE	N/A	
PERCENT GAS BYPASSED - AVG	25.0	
TEMPERATURE INCREASE - C	22.2	(72 F)
INLET FLUE GAS FLOW RATE - CU. M/S	144.17	(305500 ACFM)
INLET FLUE GAS TEMPERATURE - C	57.2	(135 F)
** FANS		
NUMBER	4	
FUNCTION	BALANCED DRAFT	
APPLICATION	BOILER I.D.	
SERVICE	DRY	
FLUE GAS FLOW RATE - CU.M/S	375.48	(795680 ACFM)
FLUE GAS TEMPERATURE - C	168.3	(335 F)

** TANKS

SERVICE	NUMBER
ABSORBER FEED	3
QUENCHER SUMP	6

** PUMPS

SERVICE	NUMBER
QUENCHER FEED PUMP	****
SLURRY FEED	****
ABSORBER RECIRCULATION	54

** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	CENTRIFUGE
NUMBER	3
FEED STREAM CHARACTERISTICS	35% SOLIDS
OUTLET STREAM CHARACTERISTICS	69% SOLIDS

TEXAS UTILITIES: MARTIN LAKE 2 (CONT.)

** SOLIDS CONCENTRATING/DEWATERING

DEVICE	THICKENER
NUMBER	1
DIMENSIONS - FT	140 (DIA) X 12 (DEPTH)
FEED STREAM CHARACTERISTICS	15% SOLIDS
OUTLET STREAM CHARACTERISTICS	35% SOLIDS

*** SLUDGE

** TREATMENT

METHOD	FLYASH STABILIZATION

** DISPOSAL

NATURE	FINAL
TYPE	LANDFILL
LOCATION	ON SITE
SITE TRANSPORTATION METHOD	RAIL

** PROCESS CONTROL AND INSTRUMENTATION

CHEMICAL PARAMETERS	PH, LIQUID LEVEL, LIQUID & GAS FLOW

** WATER BALANCE

WATER LOOP TYPE	CLOSED
MAKEUP WATER ADDITION - LITERS/S	34.6 (550 GPM)

** FGD SPARE CAPACITY INDICES

ABSORBER - %	.0

** FGD SPARE COMPONENT INDICES

ABSORBER	.0

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
5/78	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT BEGAN OPERATIONS IN MAY 1978. THE COMPLIANCE TESTING IS SCHEDULED FOR AUGUST.

6/78	SYSTEM							720			
7/78	SYSTEM							744			
8/78	SYSTEM							744			
9/78	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS TESTED FOR COMPLIANCE WITH ALL SIX MODULES IN THE GAS STREAM DURING THE FIRST PART OF AUGUST. TEST RESULTS HAVE NOT YET BEEN PUBLISHED. NO MAJOR FGD-RELATED PROBLEMS WERE REPORTED.

THE ESP PROBLEMS AT UNIT 1 HAVE NOT BEEN EXPERIENCED AT THIS UNIT.

10/78	SYSTEM							744			
11/78	SYSTEM							720			

TEXAS UTILITIES: MARTIN LAKE 2 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
				PERFORMANCE DATA							
	** PROBLEMS/SOLUTIONS/COMMENTS										
		COMPLIANCE TEST RESULTS ARE STILL BEING REVIEWED AND RESULTS ARE NOT YET AVAILABLE.									
12/78	SYSTEM							744			
1/79	SYSTEM							744			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		COAL HANDLING WAS A SERIOUS PROBLEM DUE TO FREEZING OF THE COAL IN THE HOPPERS. THIS PROBLEM EFFECTED ALL UNITS AT MARTIN LAKE FORCING THE UTILITY'S GAS AND OIL UNITS TO CARRY THE LOAD. ALL OF THE MARTIN LAKE UNITS WERE DOWN FOR AN EXTENDED PERIOD IN LATE JANUARY.									
		THE FGD UNIT REPORTEDLY FUNCTIONED ACCEPTABLY WHEN OPERATED DURING DECEMBER AND JANUARY.									
		THE FGD SYSTEM WAS SHUT DOWN WHILE THE BOTTOM ASH POND WAS CLEANED OUT. THE UTILITY HAS BEEN DUMPING SLUDGE INTO THE BOTTOM ASH POND WHICH WAS DESIGNED FOR BOTTOM ASH ONLY. ALSO SLUDGE IS PRODUCED FASTER THAN IT CAN BE REMOVED BY RAIL CAR. THE ACTUAL PROBLEM IS REPORTEDLY IN THE DEWATERING SYSTEM. HEAVY RAIN FALL HAS AGGREVATED THE SLUDGE DISPOSAL PROBLEM BY FOULING THE THICKENER OPERATIONS AND BY THREATENING POND OVERFLOW.									
		SOME MIST ELIMINATOR PROBLEMS WERE ENCOUNTERED DURING DECEMBER AND JANUARY.									
		THERE IS EVIDENCE THAT THE SULFUR CONTENT IN THE COAL IS INCREASING AS THE MATERIAL IS MINED DEEPER. IF THE SULFUR CONTENT CONTINUES TO INCREASE ADDITIONAL SCRUBBER TOWERS MAY HAVE TO BE INSTALLED.									
2/79	SYSTEM							672			
3/79	SYSTEM							744			
4/79	SYSTEM							720			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UTILITY REPORTS THAT OPERATIONAL PROBLEMS HAVE INCLUDED ABSORBER LINER FAILURES AND TOWER LEAKS.									
		UNIT 2 IS NOW IN FULL OPERATION ALTHOUGH A SLUDGE DISPOSAL PROBLEM STILL EXISTS.									
		THE UTILITY HAS REPLACED THE LOUVER DAMPERS WITH GUILLOTINE DAMPERS WHICH SEEM TO WORK BETTER. HOWEVER, THEY STILL HAVE PROBLEMS WITH THE GUILLOTINE DAMPERS FAILING TO SEAL WHEN THEY BECOME SCALED.									
5/79	SYSTEM							744			
6/79	SYSTEM							720			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE SLUDGE DISPOSAL SYSTEM IS STILL CAUSING SOME OPERATING PROBLEMS. THE PROBLEMS REPORTED LAST QUARTER WERE CAUSED BY HEAVY RAINS WHICH FORCED THE THICKENERS OUT OF SERVICE.									
		THE FGD SYSTEM OPERATED THROUGHOUT MOST OF THE PERIOD.									
7/79	SYSTEM							744			

TEXAS UTILITIES: MARTIN LAKE 2 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
8/79	SYSTEM							744			
9/79	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

ENGINEERING WORK IS IN PROGRESS TO ADD TWO NEW SCRUBBING TOWERS TO EACH MARTIN LAKE UNIT. THIS IS BEING DONE FOR THREE REASONS:

1) THE LIGNITE CURRENTLY DELIVERED HAS A GREATER SULFUR CONTENT THAN THAT FOR WHICH THE FGD SYSTEM WAS ORIGINALLY DESIGNED.
2) THE BOILER FLUE GAS FLOW IS GREATER THAN THAT FOR WHICH THE FGD SYSTEM WAS ORIGINALLY DESIGNED.
3) AS A RESULT OF CURRENT FGD SYSTEM MAINTENANCE REQUIREMENTS THE UTILITY FEELS IT IS BEST THAT ONE SPARE MODULE BE AVAILABLE SO THAT AT LEAST ONE CAN BE DOWN FOR CLEANING AT ALL TIMES.

THE TWO NEW TOWERS FOR EACH UNIT WILL BE DESIGNED FOR A LARGER CAPACITY THAN THE ORIGINAL TOWERS.

DURING THE THIRD QUARTER THE UTILITY REPORTED THE SYSTEM OPERATED WELL. HOWEVER EXCESSIVE MAINTENANCE WAS REPORTED. THE SLUDGE DISPOSAL SYSTEM PROBLEMS PLAGUING THE UNIT WERE SOLVED.

10/79	SYSTEM							744			
11/79	SYSTEM							720			
12/79	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

PLUGGING PROBLEMS HAVE BEEN ENCOUNTERED DURING THE FOURTH QUARTER REQUIRING HEAVY MAINTENANCE.

1/80	SYSTEM							744			
2/80	SYSTEM							696			
3/80	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

PLUGGING PROBLEMS CONTINUED IN THE FIRST QUARTER OF 1980, PARTICULARLY IN THE WETTED FILM CONTACT AREA AND THE MIST ELIMINATOR SECTION. THE MIST ELIMINATOR PLUGGING WAS RECENTLY SOLVED BY SWITCHING BACK TO LAKE WATER FOR MIST ELIMINATOR WASH FROM AN ASH POND WATER WASH THE UTILITY HAD BEEN TESTING.

THE FRP STRUCTURAL WORK IS BECOMING A PROBLEM. MUCH OF THE FRP SUPPORT WORK HAS HAD TO BE REPLACED WITH STAINLESS STEEL.

THE UTILITY HAS PLANS TO INSTALL TWO NEW SCRUBBING TOWERS IN EARLY 1983. THE NEW TOWERS HAVE BECOME NECESSARY DUE TO THE INCREASING LIGNITE SULFUR CONTENT AND THE NEED FOR SPARE SCRUBBER CAPACITY.

4/80	SYSTEM							720			
5/80	SYSTEM							744			
6/80	SYSTEM							720			

TEXAS UTILITIES: MARTIN LAKE 2 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
				PERFORMANCE DATA							
	** PROBLEMS/SOLUTIONS/COMMENTS										
		HIGH MAINTENANCE PROBLEMS REPORTED IN PREVIOUS MONTHS CONTINUED THROUGHOUT THE SECOND QUARTER OF 1980. THE ABSORBERS ARE STILL EXPERIENCING PLUGGING PROBLEMS.									
7/80	SYSTEM							744			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		CORROSION IN THE SCRUBBER MODULES WAS A PROBLEM DURING JULY.									
		THE FOUNDATION FOR THE TWO NEW SCRUBBING TOWERS WAS COMPLETED DURING THE MONTH.									
8/80	SYSTEM							744			
9/80	SYSTEM							720			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UTILITY REPORTED THAT THE FGD SYSTEM OPERATED WITHOUT ANY MAJOR PROBLEMS DURING AUGUST AND SEPTEMBER.									
10/80	SYSTEM							744			
11/80	SYSTEM							720			
12/80	SYSTEM							744			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		NO OPERATIONAL PROBLEMS WERE REPORTED FOR THE MARTIN LAKE 2 FGD SYSTEM DURING THE FOURTH QUARTER 1980.									

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	TEXAS UTILITIES	
PLANT NAME	MARTIN LAKE	
UNIT NUMBER	3	
CITY	TATUM	
STATE	TEXAS	
REGULATORY CLASSIFICATION	B	
PARTICULATE EMISSION LIMITATION - NG/J	43.	(.100 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	516.	(1.200 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	3000	
GROSS UNIT GENERATING CAPACITY - MW	793	
NET UNIT GENERATING CAPACITY W/FGD - MW	750	
NET UNIT GENERATING CAPACITY WO/FGD - MW	760	
EQUIVALENT SCRUBBED CAPACITY - MW	595	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	COMBUSTION ENGINEERING	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	1494.51	(3167000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	168.3	(335 F)
STACK HEIGHT - M	******	(**** FT)
STACK SHELL	******	
STACK TOP DIAMETER - M	*******	(***** FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	LIGNITE	
AVERAGE HEAT CONTENT - J/G	17166.	(7380 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		6972-7894
AVERAGE ASH CONTENT - %	8.00	
RANGE ASH CONTENT - %	5.6-13.2	
AVERAGE MOISTURE CONTENT - %	33.00	
RANGE MOISTURE CONTENT - %	29.0-37.9	
AVERAGE SULFUR CONTENT - %	.90	
RANGE SULFUR CONTENT - %	0.5-1.5	
AVERAGE CHLORIDE CONTENT - %	********	
RANGE CHLORIDE CONTENT - %	******	
*** PARTICLE CONTROL		
** ESP		
NUMBER	1	
TYPE	COLD SIDE	
SUPPLIER	RESEARCH-COTTRELL	
INLET FLUE GAS CAPACITY - CU.M/S	1494.5	(3167000 ACFM)
INLET FLUE GAS TEMPERATURE - C	168.3	(335 F)
PRESSURE DROP - KPA	.5	(2. IN-H2O)
PARTICLE REMOVAL EFFICENCY - %	99.4	
** PARTICLE SCRUBBER		
GENERIC TYPE	NONE	
SPECIFIC TYPE	N/A	
*** FGD SYSTEM		
** GENERAL DATA		
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT	
SO2 REMOVAL MODE	WET SCRUBBING	
PROCESS TYPE	LIMESTONE	
PROCESS ADDITIVES	NONE	
SYSTEM SUPPLIER	RESEARCH-COTTRELL	
A-E FIRM	C.T. MAIN	
DEVELOPMENT LEVEL	FULL SCALE	
NEW/RETROFIT	NEW	
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.40	
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	71.00	
CURRENT STATUS	1	
INITIAL START-UP	2/79	

TEXAS UTILITIES: MARTIN LAKE 3 (CONT.)

** DESIGN AND OPERATING PARAMETERS

** ABSORBER			
NUMBER	6		
GENERIC TYPE	COMBINATION		
SPECIFIC TYPE	SPRAY/PACKED		
SUPPLIER	RESEARCH-COTTRELL		
SHELL GENERIC MATERIAL	CARBON STEEL		
SHELL SPECIFIC MATERIAL	AISI 1110		
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A		
GAS CONTACTING DEVICE TYPE	2 FT WETTED FILM CONTACTOR (MUNTERS PACKING)		
NUMBER OF CONTACTING ZONES	4		
DISTANCE BETWEEN GAS CONTACTING ZONES - CM	91.4	(36.0IN)	
GAS-SIDE PRESSURE DROP - KPA	1.1	(4.5 IN-H2O)	
INLET GAS FLOW - CU. M/S	177.13	(375350 ACFM)	
INLET GAS TEMPERATURE - C	162.8	(325 F)	
SO2 REMOVAL EFFICIENCY - %	95.0		
** MIST ELIMINATOR			
PRE-MIST ELIMINATOR/MIST ELIMINATOR	MIST ELIMINATOR		
NUMBER PER SYSTEM	12		
GENERIC TYPE	IMPINGEMENT		
SPECIFIC TYPE	BAFFLE		
TRADE NAME/COMMON TYPE	CHEVRON VANE		
CONFIGURATION	HORIZONTAL		
NUMBER OF STAGES	2		
NUMBER OF PASSES PER STAGE	3		
PRESSURE DROP - KPA	.2	(1.0 IN-H2O)	
SUPERFICAL GAS VELOCITY - M/S	2.4	(8.0 FT/S)	
CONSTRUCTION MATERIAL GENERIC TYPE	POLYPROPYLENE		
WASH WATER SOURCE	ASH POND RETURN WATER		
WASH RATE - L/S	7.9	(126 GAL/MIN)	
** REHEATER			
GENERIC TYPE	BYPASS		
SPECIFIC TYPE	COLD SIDE		
TRADE NAME/COMMON TYPE	N/A		
PERCENT GAS BYPASSED - AVG	25.0		
** FANS			
NUMBER	4		
FUNCTION	BALANCED DRAFT		
APPLICATION	BOILER I.D.		
SERVICE	DRY		
FLUE GAS FLOW RATE - CU.M/S	375.48	(795680 ACFM)	
FLUE GAS TEMPERATURE - C	168.3	(335 F)	

** TANKS

SERVICE	NUMBER
ABSORBER FEED	3
QUENCHER SUMP	6

** PUMPS

SERVICE	NUMBER
QUENCHER FEED PUMP	****
SLURRY FEED	****
ABSORBER RECIRCULATION	54

** SOLIDS CONCENTRATING/DEWATERING			
DEVICE	CENTRIFUGE		
NUMBER	3		
FEED STREAM CHARACTERISTICS	35% SOLIDS		
OUTLET STREAM CHARACTERISTICS	69% SOLIDS		
** SOLIDS CONCENTRATING/DEWATERING			
DEVICE	THICKENER		
NUMBER	1		
DIMENSIONS - FT	140 (DIA) X 12 (DEPTH)		

TEXAS UTILITIES: MARTIN LAKE 3 (CONT.)

FEED STREAM CHARACTERISTICS	15% SOLIDS
OUTLET STREAM CHARACTERISTICS	35% SOLIDS

*** SLUDGE

** TREATMENT

METHOD	FLYASH STABILIZATION

** DISPOSAL

NATURE	FINAL
TYPE	LANDFILL
LOCATION	ON SITE
SITE TRANSPORTATION METHOD	RAIL

** PROCESS CONTROL AND INSTRUMENTATION

CHEMICAL PARAMETERS	PH, LIQUID LEVEL, LIQUID & GAS FLOW

** FGD SPARE CAPACITY INDICES

ABSORBER - %	.0

** FGD SPARE COMPONENT INDICES

ABSORBER	.0

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
3/79	SYSTEM							744			
4/79	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

MARTIN LAKE UNIT 3 BECAME OPERATIONAL DURING MARCH. NO OPERATIONAL DETAILS WERE AVAILABLE.

5/79	SYSTEM							744			
6/79	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS IN OPERATION DURING THIS PERIOD ALTHOUGH OPERATIONAL DATA WERE NOT AVAILABLE.

THE SLUDGE DISPOSAL SYSTEM IS EXPERIENCING SOME OPERATIONAL PROBLEMS.

7/79	SYSTEM							744			
8/79	SYSTEM							744			
9/79	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

ENGINEERING WORK IS IN PROGRESS TO ADD TWO NEW SCRUBBING TOWERS TO EACH MARTIN LAKE UNIT. THIS IS BEING DONE FOR THREE REASONS:

1) THE LIGNITE CURRENTLY DELIVERED HAS A GREATER SULFUR CONTENT THAN THAT FOR WHICH THE FGD SYSTEM WAS ORIGINALLY DESIGNED.
2) THE BOILER FLUE GAS FLOW IS GREATER THAN THAT FOR WHICH THE FGD SYSTEM WAS ORIGINALLY DESIGNED.
3) AS A RESULT OF CURRENT FGD SYSTEM MAINTENANCE REQUIREMENTS THE UTILITY FEELS IT IS BEST THAT ONE SPARE MODULE BE AVAILABLE SO THAT AT LEAST ONE CAN BE DOWN FOR CLEANING AT ALL TIMES.

THE TWO NEW TOWERS FOR EACH UNIT WILL BE DESIGNED FOR A LARGER CAPACITY THAN THE ORIGINAL TOWERS.

TEXAS UTILITIES: MARTIN LAKE 3 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER BOILER HOURS	FGD HOURS	CAP. FACTOR

DURING THE THIRD QUARTER THE UTILITY REPORTED THAT THE FGD SYSTEM OPERATED WITHOUT ANY MAJOR OPERATIONAL PROBLEMS, HOWEVER, EXCESSIVE MAINTENANCE WAS REQUIRED. THE SLUDGE DISPOSAL PROBLEMS PLAGUING THE UNIT HAVE BEEN SOLVED.

10/79	SYSTEM							744		
11/79	SYSTEM							720		
12/79	SYSTEM							744		

** PROBLEMS/SOLUTIONS/COMMENTS

PLUGGING PROBLEMS HAVE BEEN ENCOUNTERED DURING THE FOURTH QUARTER REQUIRING HEAVY MAINTENANCE.

1/80	SYSTEM							744		
2/80	SYSTEM							696		
3/80	SYSTEM							744		

** PROBLEMS/SOLUTIONS/COMMENTS

PLUGGING PROBLEMS CONTINUED IN THE FIRST QUARTER OF 1980, PARTICULARLY IN THE WETTED FILM CONTACT AREA AND THE MIST ELIMINATOR SECTION. THE MIST ELIMINATOR PLUGGING WAS RECENTLY SOLVED BY SWITCHING BACK TO LAKE WATER FOR MIST ELIMINATOR WASH FROM AN ASH POND WATER WASH THE UTILITY HAD BEEN TESTING.

THE FRP STRUCTURAL WORK IS BECOMING A PROBLEM. MUCH OF THE FRP SUPPORT WORK HAS HAD TO BE REPLACED WITH STAINLESS STEEL.

THE UTILITY HAS PLANS TO INSTALL TWO NEW SCRUBBING TOWERS IN EARLY 1983. THE NEW TOWERS HAVE BECOME NECESSARY DUE TO THE INCREASING LIGNITE SULFUR CONTENT AND THE NEED FOR SPARE SCRUBBER CAPACITY.

4/80	SYSTEM							720		
5/80	SYSTEM							744		
6/80	SYSTEM							720		

** PROBLEMS/SOLUTIONS/COMMENTS

HIGH MAINTENANCE PROBLEMS REPORTED IN PREVIOUS MONTHS CONTINUED THROUGHOUT THE SECOND QUARTER OF 1980. THE ABSORBERS ARE STILL EXPERIENCING PLUGGING PROBLEMS.

7/80	SYSTEM							744		

** PROBLEMS/SOLUTIONS/COMMENTS

CORROSION IN THE SCRUBBER MODULES WAS A PROBLEM DURING JULY.

THE FOUNDATION FOR THE TWO NEW SCRUBBING TOWERS WAS COMPLETED DURING THE MONTH.

8/80	SYSTEM							744		
9/80	SYSTEM							720		

TEXAS UTILITIES: MARTIN LAKE 3 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
				PERFORMANCE DATA							

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE FGD SYSTEM OPERATED WITHOUT ANY MAJOR PROBLEMS DURING AUGUST AND SEPTEMBER.

10/80	SYSTEM							744			
11/80	SYSTEM							720			
12/80	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

NO OPERATIONAL PROBLEMS WERE REPORTED FOR THE MARTIN LAKE 3 FGD SYSTEM DURING THE FOURTH QUARTER 1980.

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	TEXAS UTILITIES	
PLANT NAME	MONTICELLO	
UNIT NUMBER	3	
CITY	MT. PLEASANT	
STATE	TEXAS	
REGULATORY CLASSIFICATION	B	
PARTICULATE EMISSION LIMITATION - NG/J	43.	(.100 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	516.	(1.200 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	1900	
GROSS UNIT GENERATING CAPACITY - MW	800	
NET UNIT GENERATING CAPACITY W/FGD - MW	750	
NET UNIT GENERATING CAPACITY WO/FGD - MW	*****	
EQUIVALENT SCRUBBED CAPACITY - MW	800	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	COMBUSTION ENGINEERING	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	1650.71	(3498000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	168.3	(335 F)
STACK HEIGHT - M	******	(**** FT)
STACK SHELL	******	
STACK TOP DIAMETER - M	*******	(***** FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	LIGNITE	
AVERAGE HEAT CONTENT - J/G	******	(****** BTU/LB)
RANGE HEAT CONTENT - BTU/LB		6500-7500
AVERAGE ASH CONTENT - %	18.90	
RANGE ASH CONTENT - %	******	
AVERAGE MOISTURE CONTENT - %	31.90	
RANGE MOISTURE CONTENT - %	******	
AVERAGE SULFUR CONTENT - %	1.50	
RANGE SULFUR CONTENT - %	******	
AVERAGE CHLORIDE CONTENT - %	.04	
RANGE CHLORIDE CONTENT - %	******	
*** PARTICLE CONTROL		
** ESP		
NUMBER	2	
TYPE	COLD SIDE	
SUPPLIER	C.E. WALTHER	
INLET FLUE GAS CAPACITY - CU.M/S	1650.7	(3498000 ACFM)
INLET FLUE GAS TEMPERATURE - C	168.3	(335 F)
PRESSURE DROP - KPA	.4	(2. IN-H2O)
PARTICLE REMOVAL EFFICENCY - %	99.5	
** PARTICLE SCRUBBER		
GENERIC TYPE	NONE	
SPECIFIC TYPE	N/A	
*** FGD SYSTEM		
** GENERAL DATA		
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT	
SO2 REMOVAL MODE	WET SCRUBBING	
PROCESS TYPE	LIMESTONE	
PROCESS ADDITIVES	NONE	
SYSTEM SUPPLIER	CHEMICO DIVISION, ENVIROTECH	
A-E FIRM	C.T. MAIN	
DEVELOPMENT LEVEL	FULL SCALE	
NEW/RETROFIT	NEW	
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.50	
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	74.00	
CURRENT STATUS	1	
COMMERCIAL START-UP	10/78	

TEXAS UTILITIES: MONTICELLO 3 (CONT.)

INITIAL START-UP	5/78

** DESIGN AND OPERATING PARAMETERS

** ABSORBER			
NUMBER	3		
GENERIC TYPE	SPRAY TOWER		
SPECIFIC TYPE	OPEN COUNTERCURRENT SPRAY		
SUPPLIER	CHEMICO DIVISION, ENVIROTECH		
SHELL GENERIC MATERIAL	CARBON STEEL		
SHELL SPECIFIC MATERIAL	AISI 1110		
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A		
LINER GENERIC MATERIAL	INORGANIC,ORGANIC		
LINER SPECIFIC MATERIAL	HYDRAULICALLY BONDED-CEMENT,GLASS-FLAKE FILLED P		
LINER MATERIAL TRADE NAME/COMMON TYPE	PRE-KRETE G-8,CEILOTE 103,CEILCRETE 2500AR		
NUMBER OF CONTACTING ZONES	4		
LIQUID RECIRCULATION RATE - LITER/S	4000.	(63490 GPM)	
L/G RATIO - L/CU.M	9.4	(70.0 GAL/1000 ACF)	
GAS-SIDE PRESSURE DROP - KPA	1.2	(5.0 IN-H2O)	
INLET GAS FLOW - CU. M/S	428.01	(907000 ACFM)	
INLET GAS TEMPERATURE - C	60.6	(141 F)	
SO2 REMOVAL EFFICIENCY - %	74.0		
** MIST ELIMINATOR			
PRE-MIST ELIMINATOR/MIST ELIMINATOR	MIST ELIMINATOR		
NUMBER PER SYSTEM	3		
GENERIC TYPE	IMPINGEMENT		
SPECIFIC TYPE	BAFFLE		
TRADE NAME/COMMON TYPE	CHEVRON VANE		
CONFIGURATION	HORIZONTAL		
NUMBER OF STAGES	1		
NUMBER OF PASSES PER STAGE	4		
SUPERFICAL GAS VELOCITY - M/S	3.0	(10.0 FT/S)	
CONSTRUCTION MATERIAL GENERIC TYPE	POLYPROPYLENE		
WASH WATER SOURCE	FRESH WATER BLENDED WITH FLY ASH POND RETURN		
WASH RATE - L/S	7.9	(126 GAL/MIN)	
** REHEATER			
GENERIC TYPE	INDIRECT HOT AIR		
SPECIFIC TYPE	EXTERNAL HEAT EXCHANGER		
TRADE NAME/COMMON TYPE	STEAM TUBE BUNDLES		
TEMPERATURE INCREASE - C	-7.8	(18 F)	
INLET FLUE GAS FLOW RATE - CU. M/S	856.03	(1814000 ACFM)	
INLET FLUE GAS TEMPERATURE - C	60.6	(141 F)	
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL		
** FANS			
NUMBER	3		
FUNCTION	BALANCED DRAFT		
APPLICATION	BOILER I.D.		
SERVICE	DRY		
FLUE GAS FLOW RATE - CU.M/S	539.38	(1143000 ACFM)	
FLUE GAS TEMPERATURE - C	168.3	(335 F)	

** TANKS

SERVICE	NUMBER
LIMESTONE SLURRY	****
RECYCLE	****

** PUMPS

SERVICE	NUMBER
ABSORBER RECIRCULATION	3
SLURRY FEED	****

*** SLUDGE

TEXAS UTILITIES: MONTICELLO 3 (CONT.)

** TREATMENT		
METHOD	FLYASH STABILIZATION	
** DISPOSAL		
NATURE	FINAL	
TYPE	LANDFILL	
LOCATION	ON SITE	
** WATER BALANCE		
WATER LOOP TYPE	CLOSED	
MAKEUP WATER ADDITION - LITERS/S	34.4	(546 GPM)
** FGD SPARE CAPACITY INDICES		
ABSORBER - %	.0	
** FGD SPARE COMPONENT INDICES		
ABSORBER	.0	

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
4/78	SYSTEM							720			
5/78	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

THE TEXAS AIR CONTROL BOARD REPORTED THAT THE TEXAS UTILITIES 750 MW MONTICELLO UNIT 3 BEGAN FGD OPERATIONS DURING EARLY MAY. AS OF YET THE UNIT HAS NOT RUN AT FULL LOAD BUT IS EXPECTED TO DO SO BY THE END OF AUGUST.

6/78	SYSTEM							720			
7/78	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT IS NOT AT FULL LOAD YET. THE UNIT IS OPERATING AT NO MORE THAN A 300 MW LOAD (OF THE 750 MW TOTAL). ONE OF THE THREE FGD MODULES IS FULLY OPERATIONAL. ANOTHER ONE IS PARTIALLY OPERATIONAL, WHILE THE THIRD IS NOT OPERATING AT ALL.

8/78	SYSTEM							744			
9/78	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

THE COMPLIANCE TEST HAS NOT YET TAKEN PLACE. THE FGD SYSTEM IS OPERATIONAL. INSTRUMENTATION INDICATES THAT THE UNIT IS IN COMPLIANCE.

10/78	SYSTEM							744			
11/78	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

CONTINUOUS NOX, O2, AND SO2 MONITORS ARE A PROBLEM AREA.

THE SLUDGE IS CURRENTLY NOT FIXATED. IT IS BEING PUMPED DIRECTLY TO THE POND.

THE FGD SYSTEM IS FULLY OPERATIONAL. A PRELIMINARY TEST WAS PERFORMED ON DECEMBER 14. RESULTS OF THE TEST ARE NOT YET AVAILABLE.

12/78	SYSTEM							744			

PERIOD	MODULE	PERFORMANCE DATA AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
1/79	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM REPORTEDLY HAS BEEN PERFORMING WELL.

THE ESP IS NOT OPERATING WELL. COLLECTION EFFICIENCY IS UNEXPECTEDLY LOW. AMMONIA INJECTION HAS BEEN TRIED TO IMPROVE REMOVAL EFFICIENCY. THE PROBLEM REPORTEDLY IS THE RESULT OF STRUCTURAL DAMAGE. THE UNIT DID NOT PASS THE EPA OPACITY TEST.

2/79	SYSTEM							672			
3/79	SYSTEM							744			
4/79	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT IS CURRENTLY DOWN FOR A SCHEDULED OVERHAUL. THE TOWERS HAVE BEEN INSPECTED AND NO SCALING WAS FOUND.

SOME MINOR RECYCLE PUMP LINER PROBLEMS HAVE BEEN REPORTED.

DUE TO HIGH ASH LEVELS SOME PLATES IN THE ESP WERE FORCED OUT OF ALIGNMENT CAUSING AN OPACITY PROBLEM.

THE NEXT COMPLIANCE TEST IS SCHEDULED FOR THE WEEK OF JUNE 18.

5/79	SYSTEM							744			
6/79	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS IN OPERATION DURING THIS PERIOD ALTHOUGH OPERATIONAL DATA WERE NOT AVAILABLE.

7/79	SYSTEM							744			
8/79	SYSTEM							744			
9/79	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

THE ESP WAS REBUILT AND SINCE THE INITIATION OF GAS CONDITIONING WITH AMMONIA THE OPACITY PROBLEM HAS BEEN MINIMIZED.

DURING THE THIRD QUARTER THE UNIT OPERATED WITHOUT ANY MAJOR PROBLEMS. SOME MINOR ABSORBER RECYCLE PUMP LINER FAILURES HAVE BEEN ENCOUNTERED.

10/79	SYSTEM							744			
11/79	SYSTEM							720			
12/79	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

NO PROBLEMS HAVE BEEN ENCOUNTERED DURING THE FOURTH QUARTER. SINCE GAS CONDITIONING WITH AMMONIA BEGAN, THE OPACITY HAS BEEN ACCEPTABLE.

1/80	SYSTEM							744			

TEXAS UTILITIES: MONTICELLO 3 (CONT.)

PERIOD	MODULE	PERFORMANCE DATA: AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
2/80	SYSTEM							696			
3/80	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

NO PROBLEMS WERE ENCOUNTERED DURING THE FIRST QUARTER OF 1980.

4/80	SYSTEM							720			
5/80	SYSTEM							744			
6/80	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

THE MONTICELLO 3 SCRUBBING SYSTEM PERFORMED WELL THROUGHOUT THE SECOND QUARTER OF 1980. THE TEXAS AIR CONTROL BOARD REPORTED THAT IT HAD RECEIVED VERY FEW EXCESS EMISSIONS REPORTS FROM THE STATION DURING THE APRIL-JUNE PERIOD.

7/80	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING JULY.

8/80	SYSTEM							744			
9/80	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE RECYCLE PUMP LININGS HAVE BEEN A CONTINUAL PROBLEM DURING AUGUST AND SEPTEMBER. AT ONE TIME DURING THE TWO MONTH PERIOD THREE RECYCLE PUMP LINERS FAILED.

THE FGD SYSTEM HAS REPORTEDLY PERFORMED WELL AND IS IN COMPLIANCE MORE THAN 95% OF THE TIME.

10/80	SYSTEM							744			
11/80	SYSTEM							720			
12/80	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

THE MONTICELLO 3 FGD SYSTEM CONTINUED TO OPERATE DURING THE FOURTH QUARTER 1980 WITH NO MAJOR OPERATIONAL PROBLEMS REPORTED FOR THE THREE MONTH PERIOD.

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	UTAH POWER & LIGHT	
PLANT NAME	HUNTER	
UNIT NUMBER	1	
CITY	CASTLE DALE	
STATE	UTAH	
REGULATORY CLASSIFICATION	B	
PARTICULATE EMISSION LIMITATION - NG/J	43.	(.100 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	516.	(1.200 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	*****	
GROSS UNIT GENERATING CAPACITY - MW	400	
NET UNIT GENERATING CAPACITY W/FGD - MW	400	
NET UNIT GENERATING CAPACITY WO/FGD - MW	*****	
EQUIVALENT SCRUBBED CAPACITY - MW	360	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	COMBUSTION ENGINEERING	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	822.05	(1742000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	130.0	(266 F)
STACK HEIGHT - M	183.	(600 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	7.3	(24.0 FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	BITUMINOUS	
AVERAGE HEAT CONTENT - J/G	29075.	(12500 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		12,200 - 12,700
AVERAGE ASH CONTENT - %	10.00	
RANGE ASH CONTENT - %	9 - 12	
AVERAGE MOISTURE CONTENT - %	6.50	
RANGE MOISTURE CONTENT - %	******	
AVERAGE SULFUR CONTENT - %	.55	
RANGE SULFUR CONTENT - %	******	
AVERAGE CHLORIDE CONTENT - %	.00	
RANGE CHLORIDE CONTENT - %	******	
*** PARTICLE CONTROL		
** ESP		
NUMBER	1	
SUPPLIER	BUELL DIVISION, ENVIROTECH	
INLET FLUE GAS CAPACITY - CU.M/S	886.2	(1878000 ACFM)
INLET FLUE GAS TEMPERATURE - C	127.8	(262 F)
** PARTICLE SCRUBBER		
GENERIC TYPE	NONE	
SPECIFIC TYPE	N/A	
*** FGD SYSTEM		
** GENERAL DATA		
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT	
SO2 REMOVAL MODE	WET SCRUBBING	
PROCESS TYPE	LIME	
PROCESS ADDITIVES	NONE	
SYSTEM SUPPLIER	CHEMICO DIVISION, ENVIROTECH	
A-E FIRM	STEARNS-ROGER	
DEVELOPMENT LEVEL	FULL SCALE	
NEW/RETROFIT	NEW	
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.50	
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	80.00	
CURRENT STATUS	1	
COMMERCIAL START-UP	5/79	
INITIAL START-UP	5/79	
CONTRACT AWARDED	4/76	

UTAH POWER & LIGHT: HUNTER 1 (CONT.)

** DESIGN AND OPERATING PARAMETERS

** ABSORBER

NUMBER	4	
GENERIC TYPE	SPRAY TOWER	
SPECIFIC TYPE	OPEN COUNTERCURRENT SPRAY	
SUPPLIER	CHEMICO DIVISION, ENVIROTECH	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	AISI 1110	
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A	
LINER GENERIC MATERIAL	ORGANIC	
LINER SPECIFIC MATERIAL	GLASS FLAKE-FILLED POLYESTER	
LINER MATERIAL TRADE NAME/COMMON TYPE	FLAKEGLASS	
NUMBER OF CONTACTING ZONES	4	
L/G RATIO - L/CU.M	5.7	(43.0 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	.6	(2.5 IN-H2O)
INLET GAS FLOW - CU. M/S	205.51	(435500 ACFM)
INLET GAS TEMPERATURE - C	130.0	(266 F)
SO2 REMOVAL EFFICIENCY - %	80.0	

** MIST ELIMINATOR

PRE-MIST ELIMINATOR/MIST ELIMINATOR	MIST ELIMINATOR	
NUMBER PER SYSTEM	4	
GENERIC TYPE	IMPINGEMENT	
SPECIFIC TYPE	BAFFLE	
TRADE NAME/COMMON TYPE	CHEVRON VANE	
CONFIGURATION	HORIZONTAL	
NUMBER OF STAGES	1	
NUMBER OF PASSES PER STAGE	4	
FREEBOARD DISTANCE - M	3.66	(12.0 FT)
SUPERFICAL GAS VELOCITY - M/S	.3	(1.0 FT/S)
CONSTRUCTION MATERIAL GENERIC TYPE	POLYPROPYLENE	

** REHEATER

GENERIC TYPE	INDIRECT HOT AIR	
SPECIFIC TYPE	EXTERNAL HEAT EXCHANGER	
TRADE NAME/COMMON TYPE	STEAM TUBE BUNDLES	
TEMPERATURE INCREASE - C	8.9	(48 F)
INLET FLUE GAS TEMPERATURE - C	43.3	(110 F)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	

** FANS

NUMBER	2	
SUPPLIER	STURTEVANT DIV., WESTINGHOUSE	
FUNCTION	BALANCED DRAFT	
APPLICATION	FORCED DRAFT	
SERVICE	DRY	
FLUE GAS FLOW RATE - CU.M/S	411.02	(871000 ACFM)
FLUE GAS TEMPERATURE - C	130.0	(266 F)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	

** PUMPS

SERVICE	NUMBER
ABSORBER RECIRCULATION	16

*** SLUDGE

** TREATMENT

METHOD	FLYASH STABILIZATION

** DISPOSAL

NATURE	FINAL
TYPE	POND
LOCATION	ON SITE

UTAH POWER & LIGHT: HUNTER 1 (CONT.)

** WATER BALANCE
WATER LOOP TYPE OPEN

** FGD SPARE CAPACITY INDICES
ABSORBER - % .0

** FGD SPARE COMPONENT INDICES
ABSORBER .0

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
		PERFORMANCE DATA									
5/79	SYSTEM		78.6	32.8				744	311	244	

** PROBLEMS/SOLUTIONS/COMMENTS

INITIAL FGD OPERATIONS BEGAN IN MAY 1979.

THE FIGURES REPORTED BY UTAH POWER AND LIGHT ARE NOT CONSISTENT WITH THE FIGURES AS DEFINED BY PEDCO FOR THIS REPORT. IN THIS SURVEY "FGD SYSTEM HOURS" IS THE AVERAGE OF THE MODULAR HOURS ACCUMULATED BY EACH ABSORBER DURING A GIVEN MONTH. UP&L DEFINES "FGD SYSTEM HOURS" AS ACCUMULATED HOURS WHEN ANY OR ALL OF THE ABSORBERS IS IN OPERATION DURING A GIVEN MONTH. THE OPERABILITY AND UTILIZATION FIGURES REPORTED ARE BASED UPON "FGD SYSTEM HOURS" AS DEFINED BY UP&L AND THEREFORE MAY YIELD DEPENDABILITY FACTORS THAT ARE NOT COMPARABLE WITH OTHER DEPENABILITY FACTORS INCLUDED IN THIS SURVEY.

6/79	SYSTEM		98.0	96.9				720	713	698	
7/79	SYSTEM		100.0	99.1				744	738	738	
8/79	SYSTEM		100.0	100.0				744	744	744	
9/79	SYSTEM		100.0	100.0				720	720	720	

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR OPERATIONAL PROBLEMS WERE REPORTED BY THE UTILITY FOR THIS UNIT DURING THE THIRD QUARTER OF 1979.

10/79	SYSTEM		100.0	95.6				744	711	711	
11/79	SYSTEM		100.0	91.1				720	656	656	
12/79	SYSTEM		100.0	98.2				744	731	731	
1/80	SYSTEM		100.0	95.9				744	713	713	
2/80	SYSTEM		100.0	86.8				696	604	604	

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THERE WERE NO MAJOR FGD PROBLEMS ENCOUNTERED FROM OCTOBER 1979 THROUGH FEBRUARY 1980.

3/80	SYSTEM		57.8	56.9				744	732	423	

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS FORCED OUT OF SERVICE IN MARCH BECAUSE THE THICKENER RAKE SHAFT FAILED AND THE TANK HAD TO BE DRAINED. THIS OUTAGE KEPT THE SYSTEM DOWN FOR APPROXIMATELY 309 HOURS.

4/80	SYSTEM		100.0	60.1				720	433	433	
5/80	SYSTEM		100.0	64.0				744	476	476	

UTAH POWER & LIGHT: HUNTER 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
		PERFORMANCE DATA									
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE LOW FGD HOURS DURING APRIL AND MAY RESULTED FROM THE ANNUAL OUTAGE FOR GENERAL FGD SYSTEM MAINTENANCE.									
6/80	SYSTEM		100.0		97.9			720	705	705	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		NO FGD SYSTEM PROBLEMS WERE REPORTED FOR JUNE.									
7/80	SYSTEM		100.0		100.0			744	744	744	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		NO MAJOR FGD-RELATED PROBLEMS WERE REPORTED DURING JULY.									
8/80	SYSTEM	100.0						744	744		
9/80	SYSTEM	100.0						720	713		
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UTILITY REPORTED THAT NO MAJOR FGD PROBLEMS WERE ENCOUNTERED DURING THE MONTHS OF AUGUST AND SEPTEMBER.									

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	UTAH POWER & LIGHT	
PLANT NAME	HUNTER	
UNIT NUMBER	2	
CITY	CASTLE DALE	
STATE	UTAH	
REGULATORY CLASSIFICATION	B	
PARTICULATE EMISSION LIMITATION - NG/J	43.	(.100 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	516.	(1.200 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	*****	
GROSS UNIT GENERATING CAPACITY - MW	400	
NET UNIT GENERATING CAPACITY W/FGD - MW	400	
NET UNIT GENERATING CAPACITY WO/FGD - MW	*****	
EQUIVALENT SCRUBBED CAPACITY - MW	360	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	COMBUSTION ENGINEERING	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	********	(******* ACFM)
BOILER FLUE GAS TEMPERATURE - C	*******	(**** F)
STACK HEIGHT - M	******	(**** FT)
STACK SHELL	******	
STACK TOP DIAMETER - M	*******	(***** FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	******	
AVERAGE HEAT CONTENT - J/G	29075.	(12500 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		12,200 - 12,700
AVERAGE ASH CONTENT - %	10.00	
RANGE ASH CONTENT - %	9 - 12	
AVERAGE MOISTURE CONTENT - %	6.50	
RANGE MOISTURE CONTENT - %	******	
AVERAGE SULFUR CONTENT - %	.55	
RANGE SULFUR CONTENT - %	******	
AVERAGE CHLORIDE CONTENT - %	********	
RANGE CHLORIDE CONTENT - %	******	
*** PARTICLE CONTROL		
** ESP		
NUMBER	1	
SUPPLIER	BUELL DIVISION, ENVIROTECH	
INLET FLUE GAS CAPACITY - CU.M/S	886.2	(1878000 ACFM)
INLET FLUE GAS TEMPERATURE - C	127.8	(262 F)
** PARTICLE SCRUBBER		
GENERIC TYPE	NONE	
SPECIFIC TYPE	N/A	
*** FGD SYSTEM		
** GENERAL DATA		
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT	
SO2 REMOVAL MODE	WET SCRUBBING	
PROCESS TYPE	LIME	
SYSTEM SUPPLIER	CHEMICO DIVISION, ENVIROTECH	
A-E FIRM	STEARNS-ROGER	
DEVELOPMENT LEVEL	FULL SCALE	
NEW/RETROFIT	NEW	
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.50	
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	80.00	
CURRENT STATUS	1	
COMMERCIAL START-UP	6/80	
INITIAL START-UP	6/80	

UTAH POWER & LIGHT: HUNTER 2 (CONT.)

** DESIGN AND OPERATING PARAMETERS

** ABSORBER	
GENERIC TYPE	SPRAY TOWER
SPECIFIC TYPE	OPEN COUNTERCURRENT SPRAY
SUPPLIER	CHEMICO DIVISION, ENVIROTECH
SHELL GENERIC MATERIAL	CARBON STEEL
SHELL SPECIFIC MATERIAL	AISI 1110
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A
LINER GENERIC MATERIAL	ORGANIC
LINER SPECIFIC MATERIAL	GLASS FLAKE-FILLED POLYESTER
LINER MATERIAL TRADE NAME/COMMON TYPE	FLAKEGLASS
** MIST ELIMINATOR	
PRE-MIST ELIMINATOR/MIST ELIMINATOR	MIST ELIMINATOR
GENERIC TYPE	IMPINGEMENT
SPECIFIC TYPE	BAFFLE
TRADE NAME/COMMON TYPE	CHEVRON VANE
** REHEATER	
GENERIC TYPE	INDIRECT HOT AIR
SPECIFIC TYPE	EXTERNAL HEAT EXCHANGER
TRADE NAME/COMMON TYPE	N/A
*** SLUDGE	
** TREATMENT	
METHOD	FLYASH STABILIZATION
** DISPOSAL	
NATURE	FINAL
TYPE	POND
LOCATION	ON SITE
** WATER BALANCE	
WATER LOOP TYPE	OPEN

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
0/80	SYSTEM										

** PROBLEMS/SOLUTIONS/COMMENTS

THE FIGURES REPORTED BY UTAH POWER AND LIGHT ARE NOT CONSISTENT WITH THE FIGURES AS DEFINED BY PEDCO FOR THIS REPORT. IN THIS SURVEY "FGD SYSTEM HOURS" IS THE AVERAGE OF THE MODULAR HOURS ACCUMULATED BY EACH ABSORBER DURING A GIVEN MONTH. UP&L DEFINES "FGD SYSTEM HOURS" AS ACCUMULATED HOURS WHEN ANY OR ALL OF THE ABSORBERS IS IN OPERATION DURING A GIVEN MONTH. THE OPERABILITY AND UTILIZATION FIGURES REPORTED ARE BASED UPON "FGD SYSTEM HOURS" AS DEFINED BY UP&L AND THEREFORE MAY YIELD DEPENDABILITY FACTORS THAT ARE NOT COMPARABLE WITH OTHER DEPENDABILITY FACTORS INCLUDED IN THIS SURVEY.

6/80	SYSTEM		100.0		99.5			720	717	717	

** PROBLEMS/SOLUTIONS/COMMENTS

INITIAL OPERATIONS AT HUNTER 2 BEGAN IN JUNE AND THE FGD SYSTEM WAS DECLARED COMMERICAL. NO MAJOR STARTUP PROBLEMS WITH THE FGD SYSTEM WERE ENCOUNTERED.

7/80	SYSTEM		100.0		98.9			744	736	736	

UTAH POWER & LIGHT: HUNTER 2 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
				PERFORMANCE DATA							
	** PROBLEMS/SOLUTIONS/COMMENTS										
			NO MAJOR FGD-RELATED PROBLEMS WERE REPORTED DURING JULY.								
8/80	SYSTEM	99.7						744	743		
9/80	SYSTEM	100.0						720	720		
	** PROBLEMS/SOLUTIONS/COMMENTS										
			THE UTILITY REPORTED THAT NO MAJOR FGD PROBLEMS WERE ENCOUNTERED DURING AUGUST AND SEPTEMBER.								

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	UTAH POWER & LIGHT	
PLANT NAME	HUNTINGTON	
UNIT NUMBER	1	
CITY	PRICE	
STATE	UTAH	
REGULATORY CLASSIFICATION	B	
PARTICULATE EMISSION LIMITATION - NG/J	43.	(.100 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	516.	(1.200 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	810	
GROSS UNIT GENERATING CAPACITY - MW	430	
NET UNIT GENERATING CAPACITY W/FGD - MW	400	
NET UNIT GENERATING CAPACITY WO/FGD - MW	407	
EQUIVALENT SCRUBBED CAPACITY - MW	366	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	COMBUSTION ENGINEERING	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	822.05	(1742000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	130.0	(266 F)
STACK HEIGHT - M	183.	(600 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	7.3	(24.0 FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	BITUMINOUS	
AVERAGE HEAT CONTENT - J/G	29075.	(12500 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		12200-12700
AVERAGE ASH CONTENT - %	10.00	
RANGE ASH CONTENT - %	9-12	
AVERAGE MOISTURE CONTENT - %	6.50	
RANGE MOISTURE CONTENT - %	******	
AVERAGE SULFUR CONTENT - %	.55	
RANGE SULFUR CONTENT - %	******	
AVERAGE CHLORIDE CONTENT - %	********	
RANGE CHLORIDE CONTENT - %	******	
*** PARTICLE CONTROL		
** ESP		
NUMBER	1	
TYPE	COLD SIDE	
SUPPLIER	BUELL DIVISION, ENVIROTECH	
INLET FLUE GAS CAPACITY - CU.M/S	822.0	(1742000 ACFM)
INLET FLUE GAS TEMPERATURE - C	127.8	(262 F)
** PARTICLE SCRUBBER		
GENERIC TYPE	NONE	
SPECIFIC TYPE	N/A	
*** FGD SYSTEM		
** GENERAL DATA		
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT	
SO2 REMOVAL MODE	WET SCRUBBING	
PROCESS TYPE	LIME	
PROCESS ADDITIVES	NONE	
SYSTEM SUPPLIER	CHEMICO DIVISION, ENVIROTECH	
A-E FIRM	STEARNS-ROGER	
DEVELOPMENT LEVEL	FULL SCALE	
NEW/RETROFIT	NEW	
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.50	
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	80.00	
CURRENT STATUS	1	
COMMERCIAL START-UP	5/78	
INITIAL START-UP	5/78	
CONTRACT AWARDED	1/75	

UTAH POWER & LIGHT: HUNTINGTON 1 (CONT.)

** DESIGN AND OPERATING PARAMETERS

** ABSORBER		
NUMBER	4	
GENERIC TYPE	SPRAY TOWER	
SPECIFIC TYPE	OPEN COUNTERCURRENT SPRAY	
SUPPLIER	CHEMICO DIVISION, ENVIROTECH	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	AISI 1110	
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A	
LINER GENERIC MATERIAL	ORGANIC	
LINER SPECIFIC MATERIAL	GLASS FLAKE-FILLED POLYESTER	
LINER MATERIAL TRADE NAME/COMMON TYPE	FLAKEGLASS	
NUMBER OF CONTACTING ZONES	4	
L/G RATIO - L/CU.M	5.7	(43.0 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	.6	(2.5 IN-H2O)
INLET GAS FLOW - CU. M/S	205.51	(435500 ACFM)
INLET GAS TEMPERATURE - C	130.0	(266 F)
SO2 REMOVAL EFFICIENCY - %	80.0	
** MIST ELIMINATOR		
PRE-MIST ELIMINATOR/MIST ELIMINATOR	MIST ELIMINATOR	
NUMBER PER SYSTEM	4	
GENERIC TYPE	IMPINGEMENT	
SPECIFIC TYPE	BAFFLE	
TRADE NAME/COMMON TYPE	CHEVRON VANE	
CONFIGURATION	HORIZONTAL	
NUMBER OF STAGES	1	
NUMBER OF PASSES PER STAGE	4	
FREEBOARD DISTANCE - M	3.66	(12.0 FT)
SUPERFICAL GAS VELOCITY - M/S	.3	(1.0 FT/S)
CONSTRUCTION MATERIAL GENERIC TYPE	POLYPROPYLENE	
** REHEATER		
GENERIC TYPE	INDIRECT HOT AIR	
SPECIFIC TYPE	EXTERNAL HEAT EXCHANGER	
TRADE NAME/COMMON TYPE	STEAM TUBE BUNDLES	
TEMPERATURE INCREASE - C	8.9	(48 F)
INLET FLUE GAS TEMPERATURE - C	43.3	(110 F)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	
** FANS		
NUMBER	2	
SUPPLIER	STURTEVANT DIV., WESTINGHOUSE	
FUNCTION	BALANCED DRAFT	
APPLICATION	FORCED DRAFT	
SERVICE	DRY	
FLUE GAS FLOW RATE - CU.M/S	411.02	(871000 ACFM)
FLUE GAS TEMPERATURE - C	130.0	(266 F)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	

** TANKS

SERVICE	NUMBER
RECYCLE	4

** PUMPS

SERVICE	NUMBER
ABSORBER RECIRCULATION	16

** SOLIDS CONCENTRATING/DEWATERING		
DEVICE	VACUUM FILTER	
OUTLET STREAM CHARACTERISTICS	60% SOLIDS	
** SOLIDS CONCENTRATING/DEWATERING		
DEVICE	THICKENER	
NUMBER	1	
CONFIGURATION	CYLINDRICAL	
DIMENSIONS - FT	60 DIA	

UTAH POWER & LIGHT: HUNTINGTON 1 (CONT.)

SHELL GENERIC MATERIAL TYPE	CARBON STEEL
LINER SPECIFIC MATERIAL TYPE	GLASS FLAKE-FILLED POLYESTER
OUTLET STREAM CHARACTERISTICS	27.5% SOLIDS

*** SLUDGE

** TREATMENT

METHOD	FLYASH STABILIZATION

** DISPOSAL

NATURE	FINAL
TYPE	LANDFILL
LOCATION	ON SITE
SITE TRANSPORTATION METHOD	TRUCK

** WATER BALANCE

WATER LOOP TYPE	CLOSED
MAKEUP WATER ADDITION - LITERS/S	18.9 (300 GPM)

** FGD SPARE CAPACITY INDICES

ABSORBER - %	.0

** FGD SPARE COMPONENT INDICES

ABSORBER	.0

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
0/78	SYSTEM										

** PROBLEMS/SOLUTIONS/COMMENTS

THE FIGURES REPORTED BY UTAH POWER AND LIGHT ARE NOT CONSISTENT WITH THE FIGURES AS DEFINED BY PEDCO FOR THIS REPORT. IN THIS SURVEY "FGD SYSTEM HOURS" IS THE AVERAGE OF THE MODULAR HOURS ACCUMULATED BY EACH ABSORBER DURING A GIVEN MONTH. UP&L DEFINES "FGD SYSTEM HOURS" AS ACCUMULATED HOURS WHEN ANY OR ALL OF THE ABSORBERS IS IN OPERATION DURING A GIVEN MONTH. THE OPERABILITY AND UTILIZATION FIGURES REPORTED ARE BASED UPON "FGD SYSTEM HOURS" AS DEFINED BY UP&L AND THEREFORE MAY YIELD DEPENDABILITY FACTORS THAT ARE NOT COMPARABLE WITH OTHER DEPENABILITY FACTORS INCLUDED IN THIS SURVEY.

5/78	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

INITIAL OPERATIONS BEGAN ON MAY 10, 1978. COMMERCIAL FGD SYSTEM OPERATIONS ARE EXPECTED TO BEGIN IN JUNE.

6/78	SYSTEM			55.3		65.3		720	720	470	
7/78	SYSTEM			97.7		95.9		744	731	714	

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT BECAUSE 10-20% OF THE FLUE GAS BYPASSED THE FGD SYSTEM AS DAMPERS ARE VARRIED BY THE OPERATOR, IT IS DIFFICULT TO DETERMINE OVERALL SO2 REMOVAL EFFICIENCY.

8/78	SYSTEM			100.0		73.1		744	544	544	
9/78	SYSTEM			100.0		68.9		720	496	496	

UTAH POWER & LIGHT: HUNTINGTON 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
		AN EXPLOSION CAUSED A THREE WEEK BOILER OUTAGE DURING THE AUGUST-SEPTEMBER PERIOD.									
		THE UTILITY REPORTED THAT THERE WERE NO FORCED FGD OUTAGES DURING AUGUST AND SEPTEMBER.									
10/78	SYSTEM	100.0	100.0					744	744	744	
11/78	SYSTEM	62.4	62.4					720	720	449	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE THICKENER HAD SOLIDS BUILDUP THE LAST OF NOVEMBER AND THE FIRST PART OF DECEMBER RENDERING THE RAKE INOPERATIVE. THE FGD SYSTEM WAS TAKEN OUT OF SERVICE TO ALLOW MANUAL REMOVAL OF THE SOLIDS.									
		TO PREVENT FUTURE SOLIDS BUILDUP IN THE THICKENER THE UTILITY IS CONSIDERING LOWERING THE PH AND POSSIBLY ADDING A FORCED OXIDATION SYSTEM. FOR NOW THE UTILITY IS ATTEMPTING TO BE MORE CONSCIENTIOUS IN MAINTAINING PROPER SOLIDS CONTENT IN THE THICKENERS.									
12/78	SYSTEM	34.0	32.7					744	715	243	
1/79	SYSTEM	76.2	65.7					744	642	489	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		FREEZE-UP PROBLEMS CAUSED OUTAGES TOTALLING A FEW WEEKS DURATION DURING DECEMBER AND JANUARY.									
2/79	SYSTEM	90.1	58.2					672	434	391	
3/79	SYSTEM	100.0	86.6					744	644	644	
4/79	SYSTEM	100.0	76.8					720	553	553	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UTILITY REPORTED THAT THE PROBLEMS ENCOUNTERED DURING FEBRUARY-APRIL INCLUDED LINING FAILURES (BOTH DESIGN-RELATED AND APPLICATION-RELATED), PUMP PROBLEMS AND DAMPER PROBLEMS.									
		PROBLEMS HAVE BEEN EXPERIENCED WITH DAMPER MECHANISMS CLOGGING. THE CLOGGING CAN RESULT IN DAMPER LEAKING AS MUCH AS 50%.									
		THE UTILITY HAS BEEN OPERATING THE FGD SYSTEM AT A PH OF 5 RATHER THAN THE DESIGN 6.5 TO YIELD A BETTER QUALITY SLUDGE PRODUCT.									
5/79	SYSTEM	100.0	92.6					744	689	689	
6/79	SYSTEM	62.5	54.9					720	632	395	
7/79	SYSTEM	79.7	79.5					744	742	591	
8/79	SYSTEM	30.1	27.0					744	669	201	
9/79	SYSTEM	54.9	54.2					720	712	391	

UTAH P(WER & LIGHT: HUNTINGTON 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE PROBLEMS ENCOUNTERED DURING THE THIRD QUARTER 1979 INCLUDED FAILURE OF CONTROL VALVES AND SOME AGITATOR PROBLEMS.									
10/79	SYSTEM							744	497		
	** PROBLEMS/SOLUTIONS/COMMENTS										
		ON OCTOBER 15 FGD OPERATIONS WITH LIMESTONE WERE INITIATED FOR TESTING PURPOSES. IF THE FGD SYSTEM OPERATIONS ARE ADEQUATE WITH LIMESTONE THE UTILITY WILL STUDY THE ECONOMIC TRADEOFFS OF LIME VS LIMESTONE SUCH AS PUMP WEAR ETC. IF THE RESULTS FAVOR LIMESTONE THE HUNTINGTON 1 FGD SYSTEM PROCESS MAY BE SHIFTED FROM LIME TO LIMESTONE.									
11/79	SYSTEM							720	28		
12/79	SYSTEM							744	642		
1/80	SYSTEM							744	668		
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DUE TO A LACK OF RECORDS, DATA CONCERNING THE FGD SYSTEM OPERATIONS WAS UNAVAILABLE FOR THE MONTHS OF OCTOBER 1979 THROUGH JANUARY 1980. IN NOVEMBER THE BOILER WAS DOWN MOST OF THE MONTH FOR A SCHEDULED UNIT OVERHAUL.									
2/80	SYSTEM		100.0		86.9			696	605	605	
3/80	SYSTEM		100.0		89.2			744	664	664	
4/80	SYSTEM		98.1		92.1			720	676	663	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE FGD SYSTEM OPERATED ALONG WITH THE BOILER DURING FEBRUARY AND MARCH WITH NO MAJOR PROBLEMS.									
5/80	SYSTEM		100.0		99.7			744	742	742	
6/80	SYSTEM		100.0		99.2			720	714	714	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE FGD SYSTEM OPERATED ALONG WITH THE BOILER DURING THE APRIL THROUGH JUNE PERIOD EXCEPT FOR A FEW HOURS IN APRIL. THE UTILITY REPORTED THAT NO MAJOR PROBLEMS OCCURRED DURING THIS TIME.									
7/80	SYSTEM		100.0		87.2			744	649	649	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		NO MAJOR FGD-RELATED PROBLEMS WERE REPORTED DURING JULY.									
8/80	SYSTEM	100.0						744	695		
	** PROBLEMS/SOLUTIONS/COMMENTS										
		NO MAJOR OPERATIONAL PROBLEMS WERE REPORTED IN AUGUST.									
9/80	SYSTEM	.0			.0			720	0	0	

UTAH POWER & LIGHT: HUNTINGTON 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE FGD SYSTEM AND BOILER WERE DOWN THROUGHOUT SEPTEMBER FOR A SCHEDULED MAINTENANCE OVERHAUL.									
10/80	SYSTEM	100.0		97.5				744	726	726	
11/80	SYSTEM	100.0		100.0				720	720	720	
12/80	SYSTEM	100.0		99.5				744	741	741	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE FOURTH QUARTER 1980.									

APPENDIX B

DEFINITIONS

DEFINITIONS

Boiler Commercial Service Date	Date when boiler and auxiliary equipment (including FGD system for new boilers) has met initial supplier guarantees and begins to contribute electrical power to the power grid.
Byproduct Nature	The nature (e.g. elemental sulfur, sulfuric acid) and disposition (e.g. stockpile on site, marketed) of the end product by systems that generate a saleable product.
Commercial Service Date (FGD System)	Date when the FGD system successfully completes compliance testing and the utility is satisfied that the system meets supplier contractual guarantees.
Company Name	Name of corporation as it appears in Electrical World - Directory of Electrical Utilities, McGraw-Hill - Current Edition - as space permits.
Disposal	Disposal method for throwaway product systems producing sludge including: interim and final disposal sites and disposal type (minefill, landfill, etc.) as well as disposal location and site capacity.
Efficiency:	
Total Unit Design Particle Removal Efficiency	The actual percentage of particulate matter removed by the emission control system (mechanical collectors, ESP, or fabric filter and FGD) from the untreated flue gas.
Total Unit SO_2 Design Removal Efficiency	The actual percentage of SO_2 removed from the flue gas by the FGD system.

FGD Viability Indexes

Several parameters have been developed to quantify the viability of FGD system technology. Various terms such as "availability," "reliability," "operability," and "utilization" are used to accurately represent the operation of any FGD system during a given period. The above-mentioned parameters are defined below and discussed briefly. The objectives of this discussion are to make the reader aware that several different definitions are being used and to select appropriate parameters that can be used for reporting purposes so that reasonably consistent comparisons can be made.

Availability Index

Hours the FGD system is available for operation (whether operated or not) divided by hours in period, expressed as a percentage. This parameter tends to overestimate the viability of the FGD system because it does not penalize for election not to operate the system when it could have been operated. Boiler downtime may tend to increase the magnitude of the parameter because FGD failures generally cannot occur during such periods.

Reliability Index

Hours the FGD system was operated divided by the hours the FGD system was called upon to operate, expressed as a percentage. This parameter has been developed in order not to penalize the FGD system for elected outages, e.g., periods when the FGD system could have been run but was not run because of chemical shortages, lack of manpower, short duration boiler operations, etc. The main problem in using this

	formula is the concise determination whether or not the system was "called upon to operate" during a given time period. In addition, an undefined value can result when the FGD system is not called upon to operate for a given period (e.g., turbine or boiler outage when FGD system is available).
FGD Operability Index	Hours the FGD system was operated divided by boiler operating hours in period, expressed as a percentage. This parameter indicates the degree to which the FGD system is actually used, relative to boiler operating time. The parameter is penalized when options are exercised not to use the FGD system in periods when the system is operable. In addition, an undefined value can result when the FGD system is not called upon to operate for a given period (e.g., turbine or boiler outage when FGD system is available).
FGD Utilization Index	Hours that the FGD system operated divided by total hours in period. This parameter is a relative stress factor for the FGD system. It is not a complete measure of FGD system viability because the parameter can be strongly influenced by conditions that are external to the FGD system (e.g., infrequent boiler operation will lower the value of the parameter although the FGD system may be highly dependable in its particular application).
End Product Sludge	The SO_2 removed from the flue gas is not recovered in a usable or marketable form and resulting sulfur-bearing waste

	products must be disposed in an environmentally acceptable fashion.
Recoverable Byproduct	The SO_2 removed from the flue gas is recovered in a usable or marketable form (e.g., sulfur, sulfuric acid, gypsum, ammonium sulfate, sodium sulfate).
Energy Consumption, %	The percentage of gross unit electrical generating capacity consumed by the FGD system, as defined by the following equation: [Net MW w/o FGD - Net MW w/FGD]/ [Gross unit rating]
Equivalent Scrubbed Capacity (ESC)	The effective scrubbed flue gas in equivalent MW based on the percent of flue gas scrubbed by the FGD system.
FGD Status:	
Category 1	Operational - FGD system is in service removing SO_2.
Category 2	Under construction - ground has been broken for installation of FGD system, but FGD system has not become operational.
Category 3	Planned, Contract Awarded - contract has been signed for purchase of FGD system but ground has not been broken for installation.
Cateogry 4	Planned, Letter of Intent Signed - letter of intent has been signed, but legal contract for purchase has not been awarded.
Category 5	Planned, Requesting/Evaluating Bids - bid requests have been released but no letter of intent or contract has been issued.

Category 6	Considering only FGD Systems - an FGD system is proposed as a means to meet an SO_2 regulation.
Category 7	Considering an FGD system as well as alternative methods.
Category 8	Nonoperational - FGD system has been operated in the past but has been shut down permanently or for an extended indefinite period of time.
Fuel Firing Rate - TPH	Boiler fuel firing rate in terms of tons per hour at maximum continuous load.
Initial Start-Up (FGD System)	Date when flue gas first passes through any component of the FGD system (or is scheduled to do so).
New	FGD unit and boiler were designed at the same time or space for addition of an FGD unit was reserved when boiler was constructed.
Plant Name	Unit identification as it appears in Electrical World - Directory of Electrical Utilities, McGraw-Hill - Current Edition - or as indicated by utility representative for installations in planning stages.
Process Additives	A chemical compound or element which is added to the process or normally found with the main process reagent in small quantities (e.g., Mg, adipic acid) to promote improved process operation (e.g., scale reduction, increased SO_2 removal efficiency).
Process Type	Company name if process is patented. Generic name if several companies have similar processes (e.g., Lime, Limestone, Wellman Lord, Thoroughbred 121).

Regulatory Class	A. Unit(s) subject to Federal New Source Performance Standards (NSPS) promulgated in June 1979. B. Unit(s) subject to Federal New Source Performance Standards (NSPS) promulgated in December 1971. C. Unit(s) subject to standard(s) more stringent than NSPS (6/79). D. Unit(s) subject to standard(s) more stringent than NSPS (12/71), but not more stringent than NSPS (6/79) E. Unit(s) subject to standard(s) equal to or less stringent than NSPS (12/71).
Retrofit	FGD unit will be/was added to an existing boiler not specifically designed to accommodate FGD unit.
SO_2 Removal Mode	The manner in which the SO_2 from the flue gas is collected, e.g., wet scrubbing, spray drying, dry adsorption.
Spare Capacity Index - %	The summation of the individual component capacities (%) minus 100%.
Spare Component Index	The equipment spare capacity index (%) divided by the individual component capacity (%).
System Supplier	A firm that fabricates and supplies flue gas desulfurization systems.
Total Controlled Capacity (TCC)	The gross rating (MW) of a unit brought into compliance with FGD, regardless of the

	percent of flue gas treated at the facility. In the case of prototype and demonstration FGD systems, this figure will be identical to the Equivalent Scrubbed Capacity rather than the gross unit rating if the system is not meant to bring the facility into compliance with SO_2 emission standards.
Unit Rating	
Gross	Operational - Maximum continuous gross generation capacity in MW; Preoperational - maximum continuous design generation capacity in MW.
Net w/FGD	Gross unit rating less the energy required to operate ancillary station equipment, inclusive of emission control systems.
Net w/o FGD	Gross unit rating less the energy required to operate ancillary station equipment, exclusive of emission control systems.

APPENDIX C

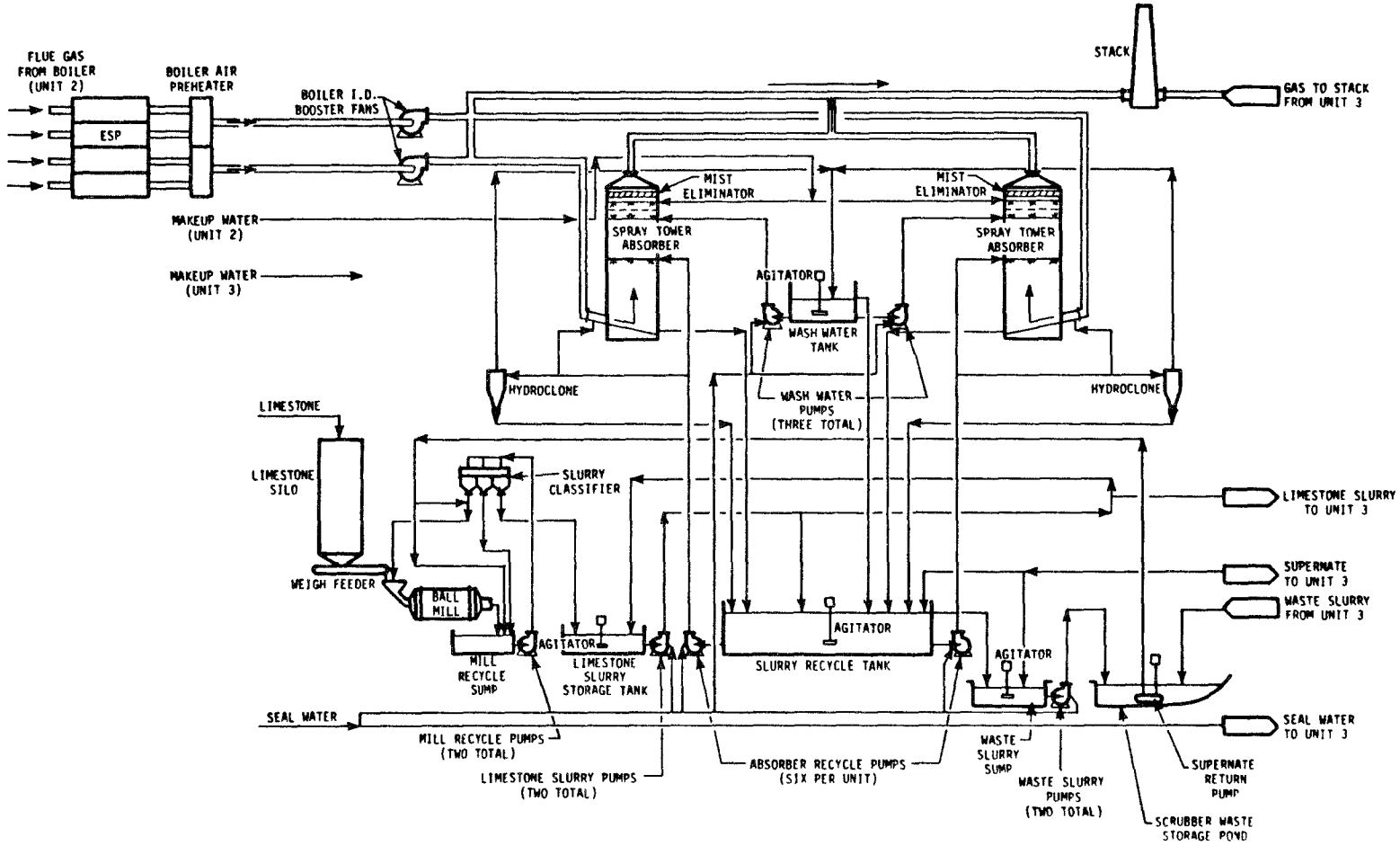
TABLE OF UNIT NOTATION

TABLE OF UNIT NOTATION

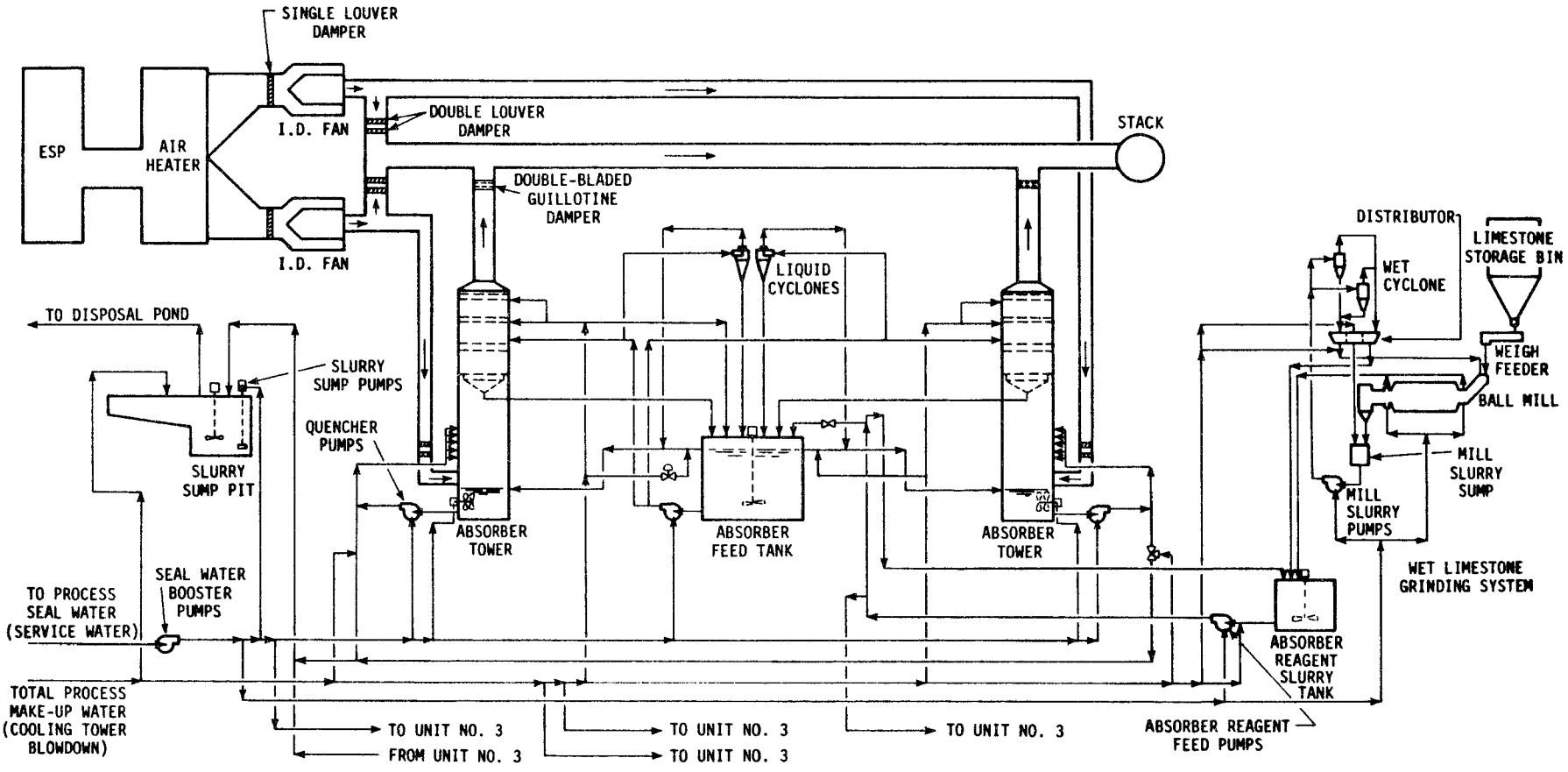
Classification	English Unit	Symbol	Survey Report Notation	ASTM/SI Unit	Symbol	Survey Report Notation
Area	Acre	acre	ACRE	Square meter	M^2	SQ.M
	Square foot	ft^2	SQ.FT	Square meter	M^2	SQ.M
Concentration	Grains per standard cubic foot	gr/scf	GR/SCF	Grams per cubic meter	g/m^3	G/CU.M
	Parts per million	ppm	PPM	Parts per million	ppm	PPM
	Pounds per million Btu	$lb/10^6$ Btu	LB/MMBTU	Nanograms per joule	ng/J	NG/J
Flow	Actual cubic feet per minute	ft^3/min (actual)	ACFM	Cubic meters per second	m^3/s	CU.M/S
	Gallons per minute	gal/min	GPM	Liters per second	liter/s	LITER/S
	Pounds per minute	lb/min	LB/MIN	Kilogram per second	kg/s	KG/S
	Ton per day	t/day	TPD	Metric ton per day	M t/d	M T/D
	Ton per hour	t/h	TPH	Metric ton per hour	M t/h	M T/H
Heat Content	Btu per pound	Btu/lb	BTU/LB	Joules per gram	J/q	J/G
Length	Foot	ft	FT	Meter	m	M
	Inch	in	IN	Centimeter	cm	CM
	Mile	mi	MI	Kilometer	km	KM
L/G Ratio	Gallons per thousand actual cubic feet	gal/1000 ft^3 (actual)	GAL/1000ACF	Liters per cubic meter	$liter/m^3$	LITER/CU.M
Mass/Weight	Pound	lb	LB	Kilogram	kg	KG
	Ton	t	T	Megagram	Mg	MG
Pressure	Inches of water	in. H_2O	IN. H_2O	Kilopascal	kPa	KPA
Temperature	Degree Fahrenheit	°F	F	Degree Celsius	°C	C
Volume	Cubic feet	ft^3	CU.F	Cubic meter	m^3	CU.M
	Acre-feet	Acre-ft	ACRE-FT	Cubic meter	m^3	CU.M

APPENDIX D

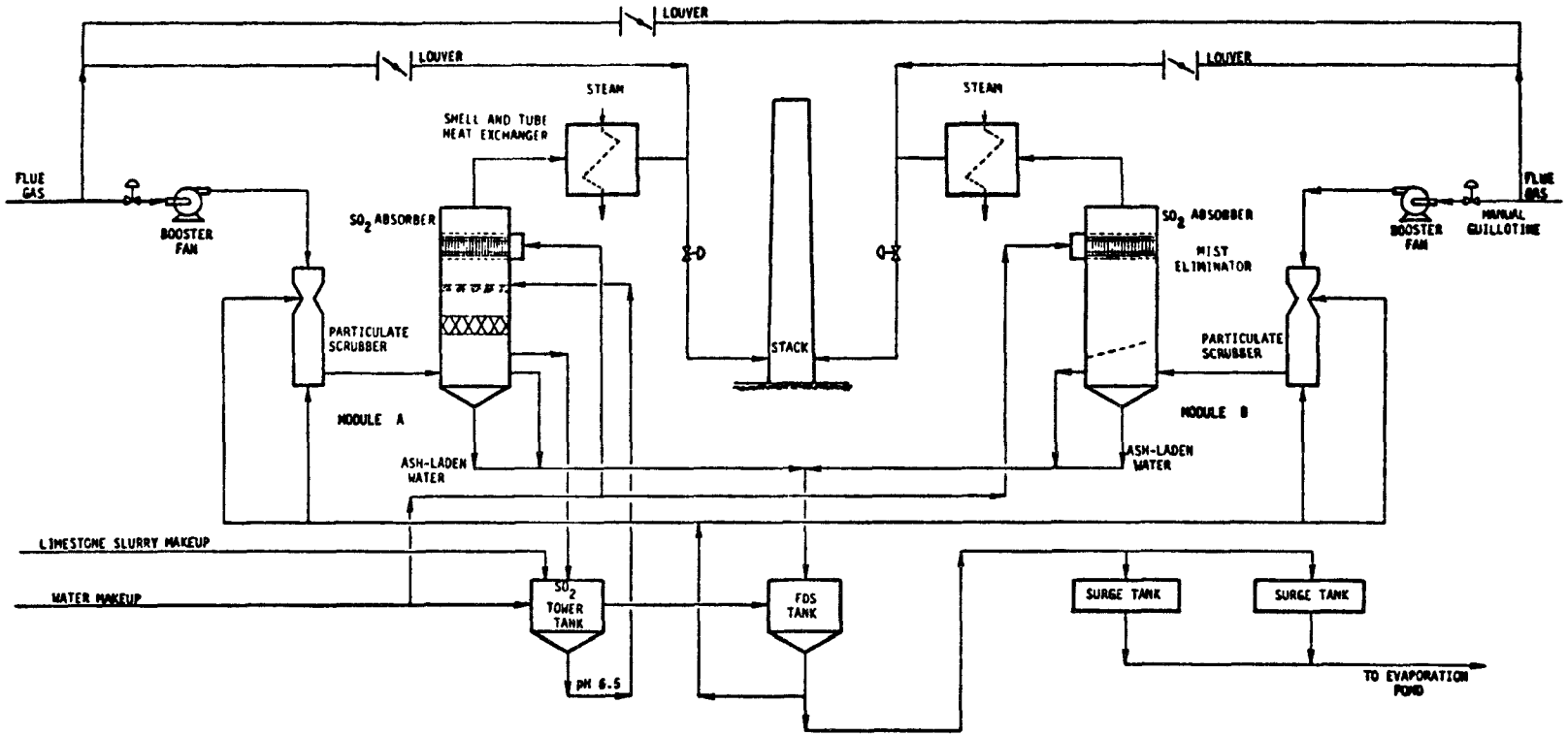
FGD PROCESS FLOW DIAGRAMS



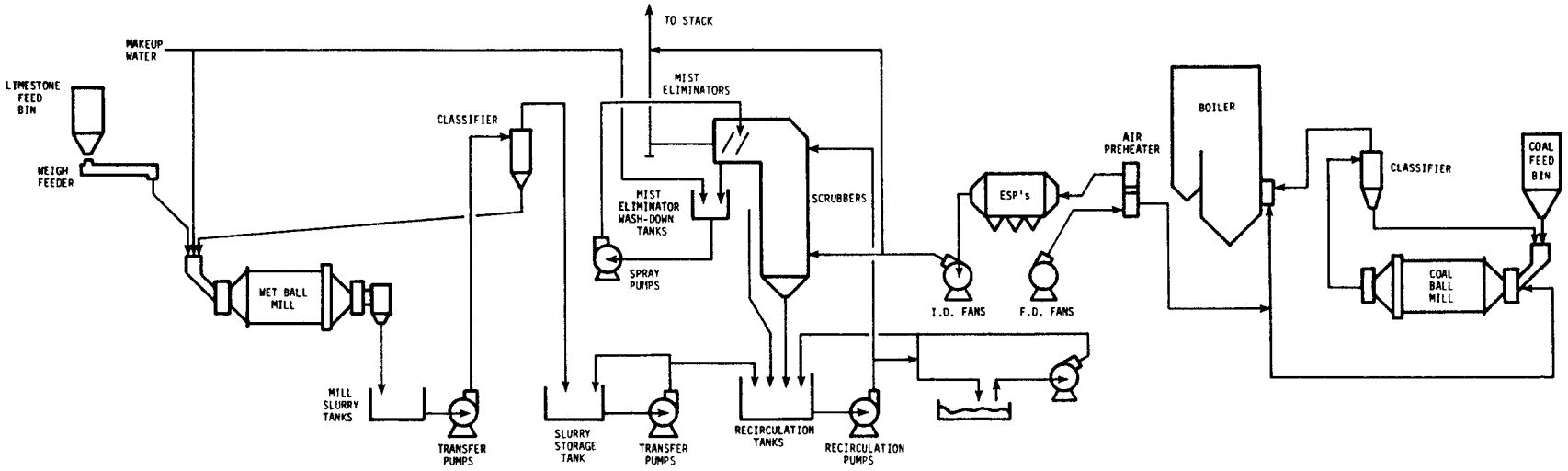
Alabama Electric,
Simplified Process Flow Diagram for Tombigbee 2 and 3



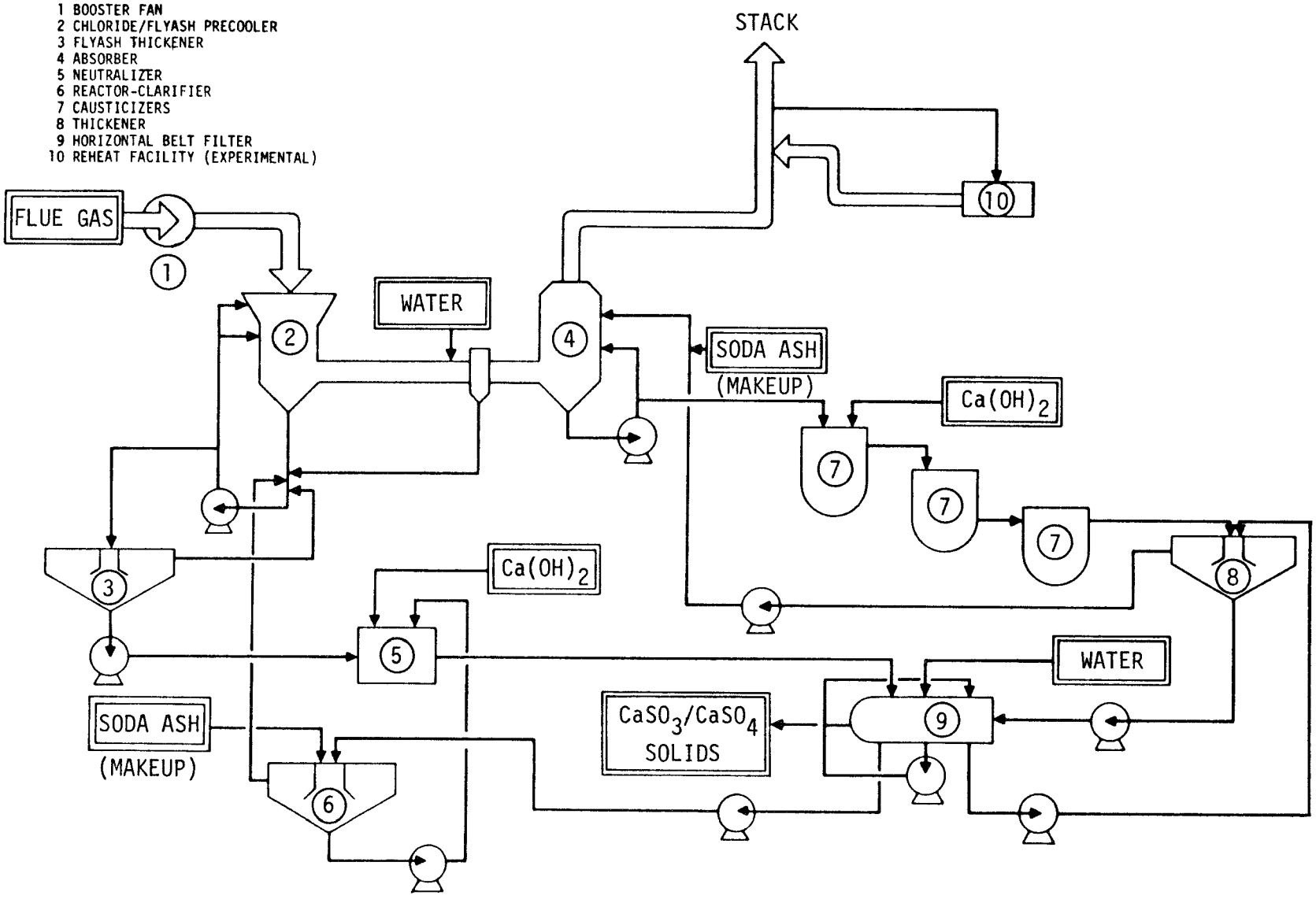
Arizona Electric Power Coop, Apache 2 and 3
Process Flow Diagram



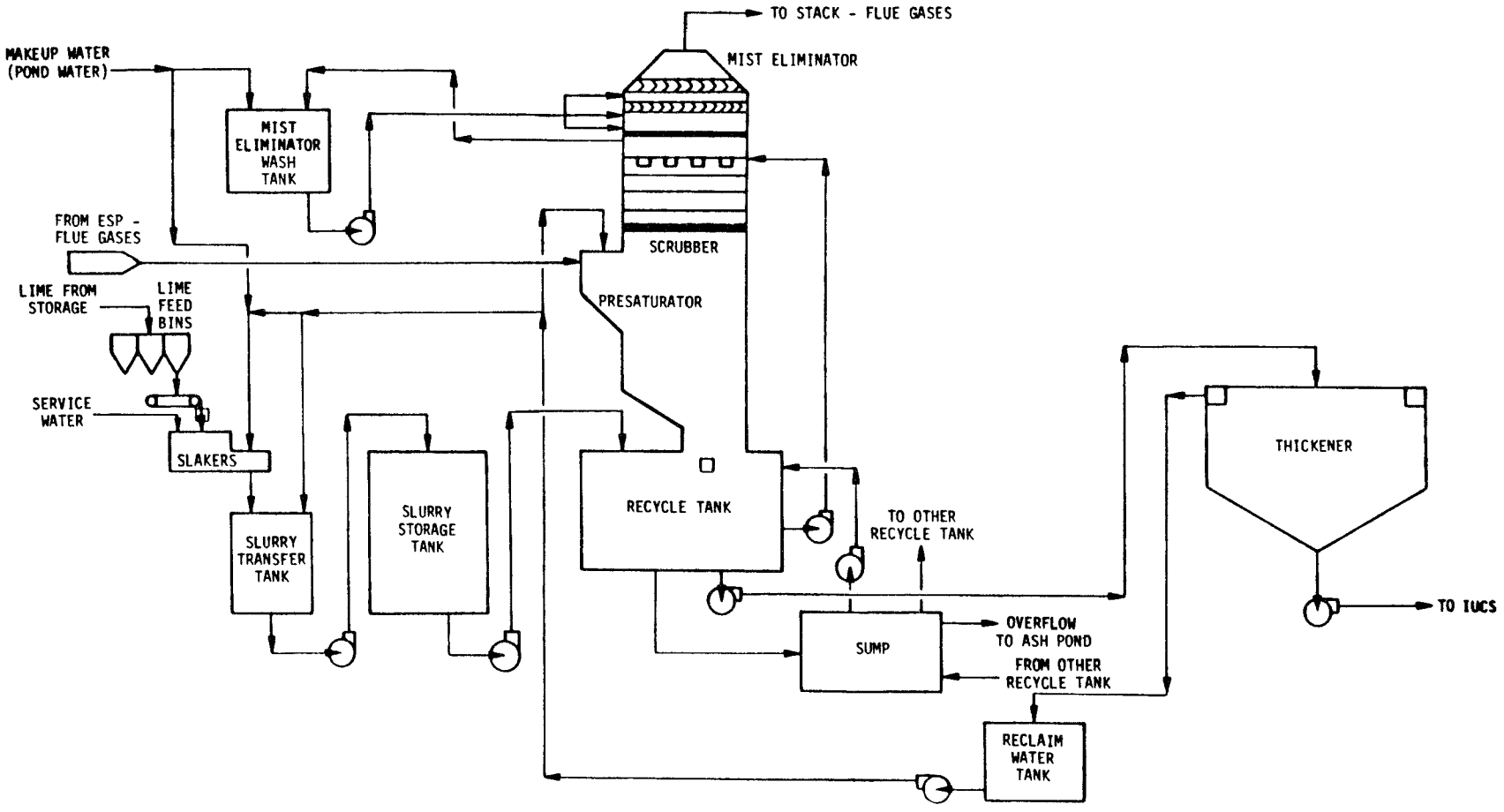
Arizona Public Service, Cholla 1:
Simplified Process Flow Diagram



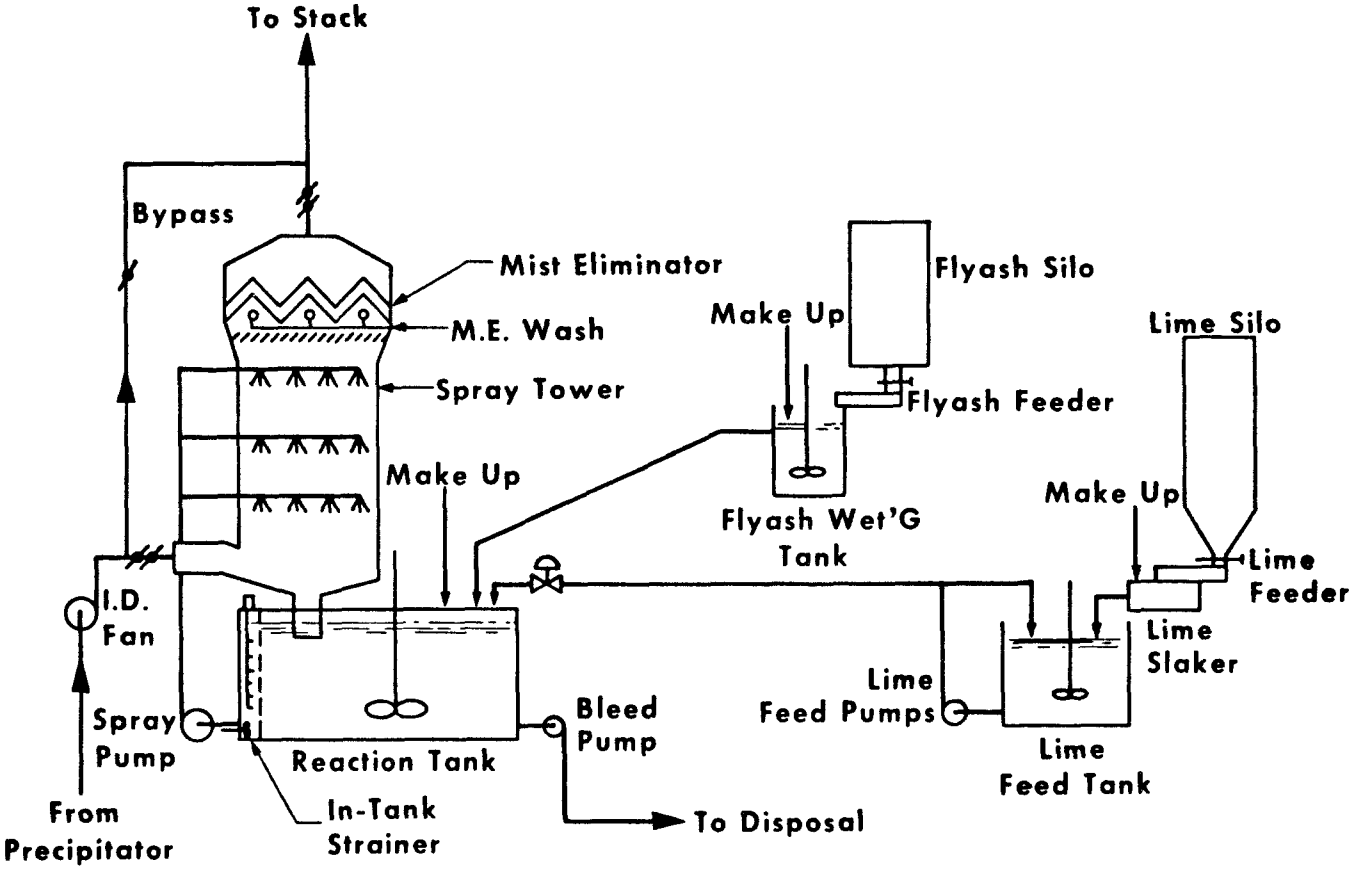
Central Illinois Light,
Simplified Process Flow Diagram of Duck Creek 1
Power Plant and Emission Control System



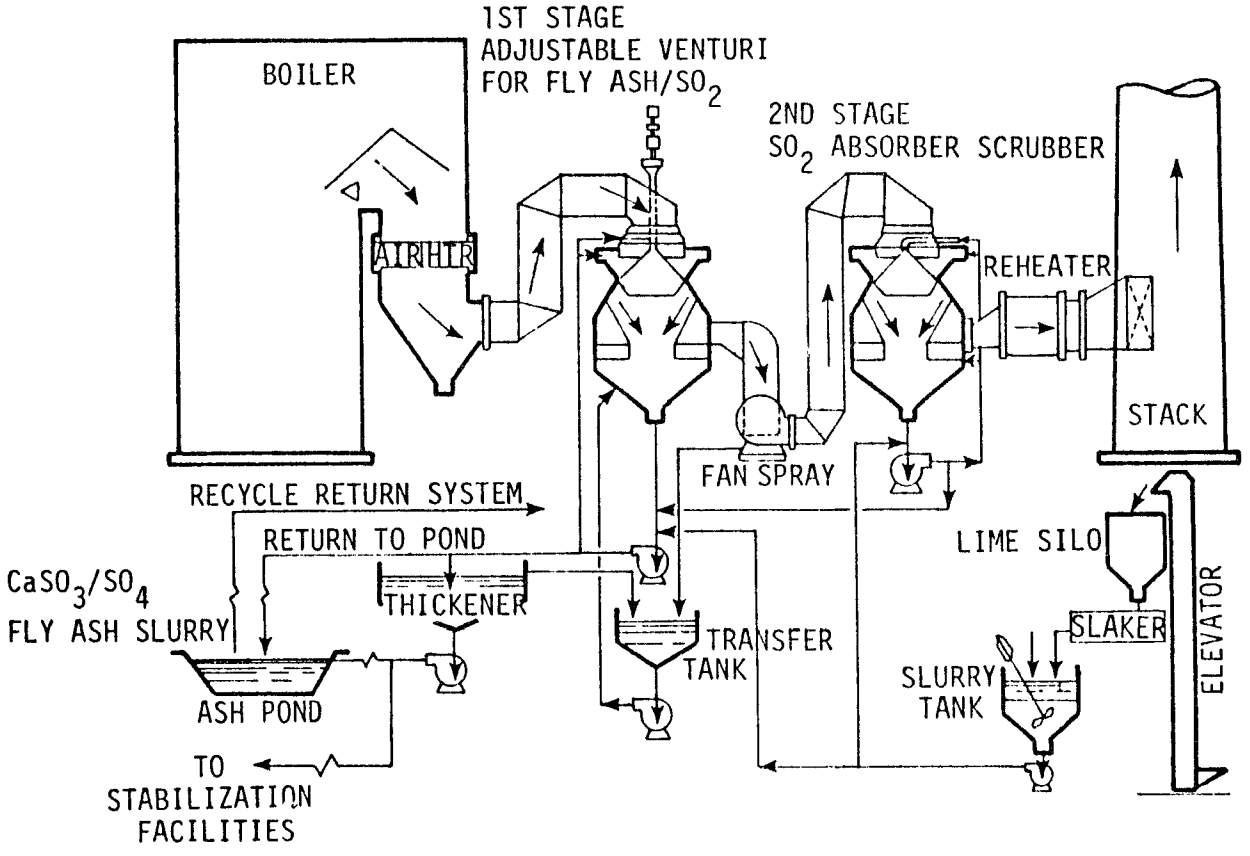
Central Illinois Public Service, Newton 1:
Simplified Process Flow Diagram Showing One of Four Absorbers



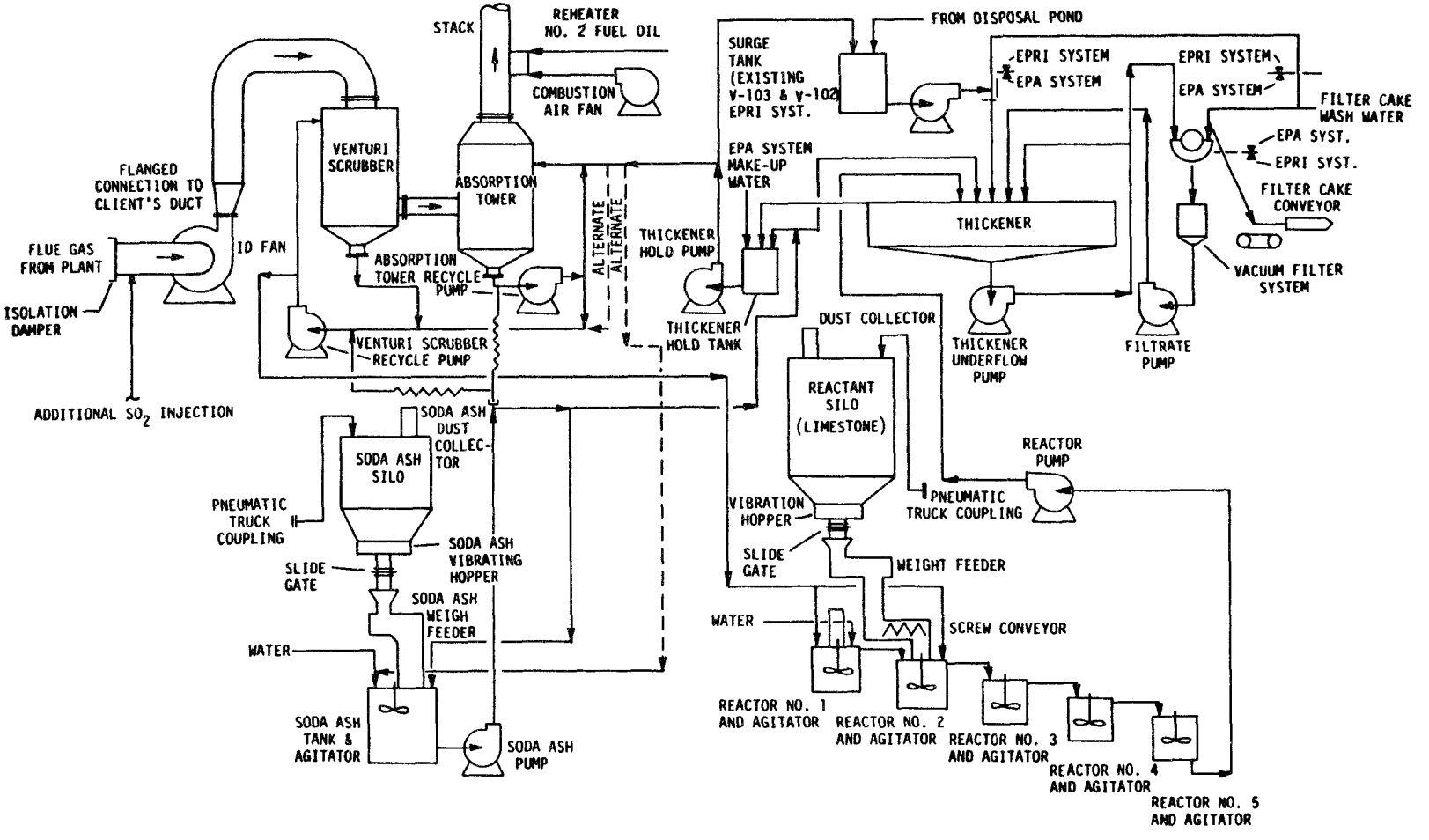
Columbus and Southern Ohio Electric, Conesville 5 and 6:
Simplified Process Flow Diagram for a Given Module



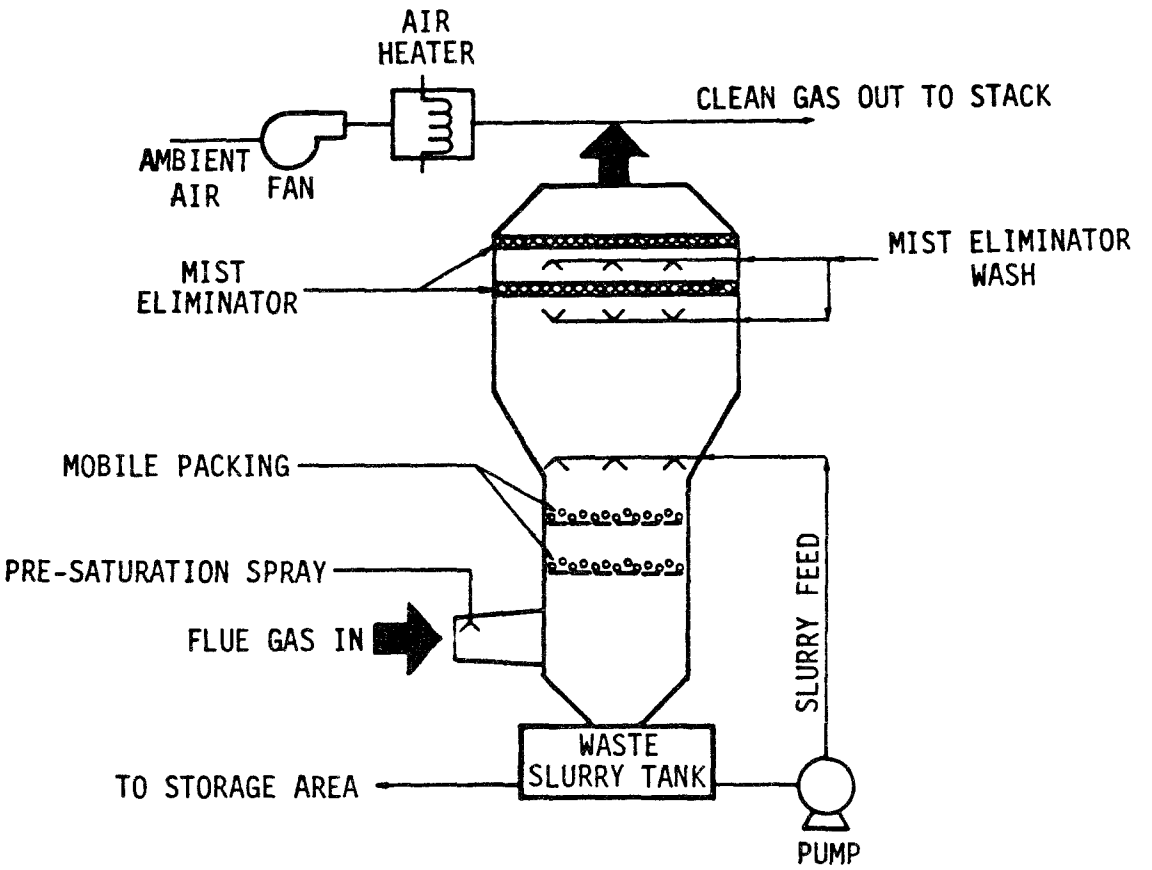
Cooperative Power Association, Coal Creek 1 and 2:
Simplified Process Flow Diagram



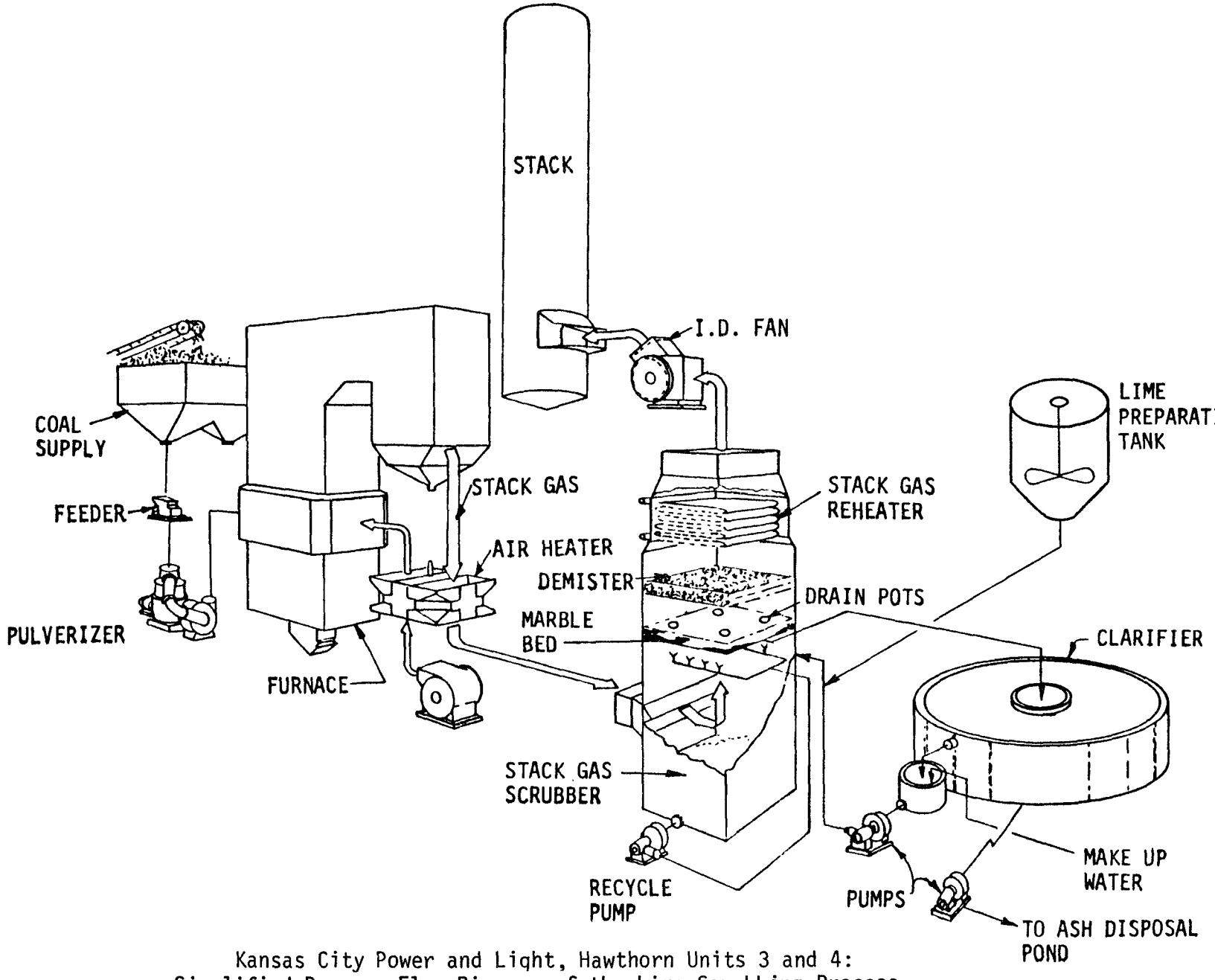
Duquesne Light, F. R. Phillips FGD System:
General Diagram.



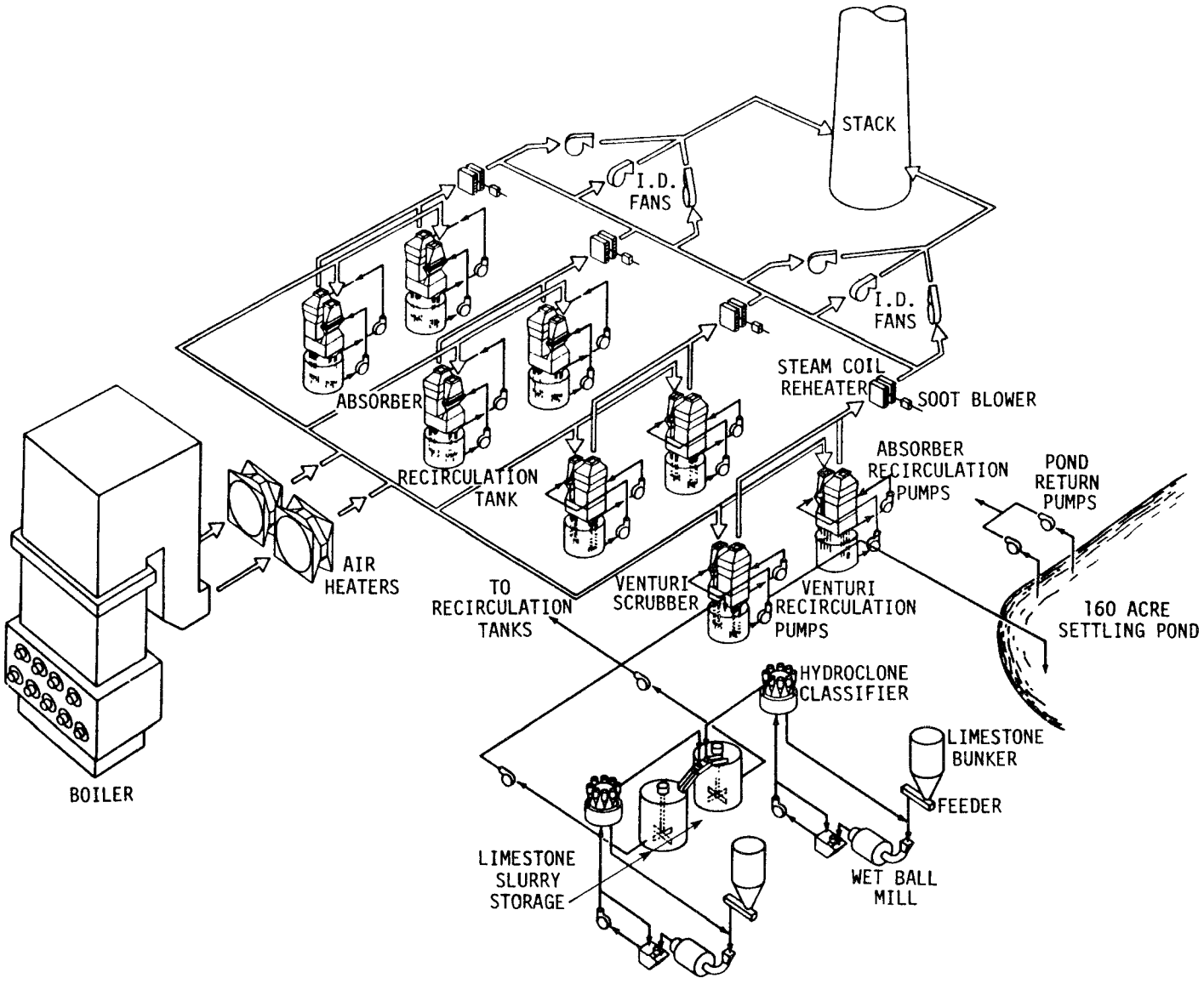
Gulf Power, Scholz 1:
Simplified Process Flow Diagram of the Demonstration
Soda Ash/Limestone Dual Alkali Process



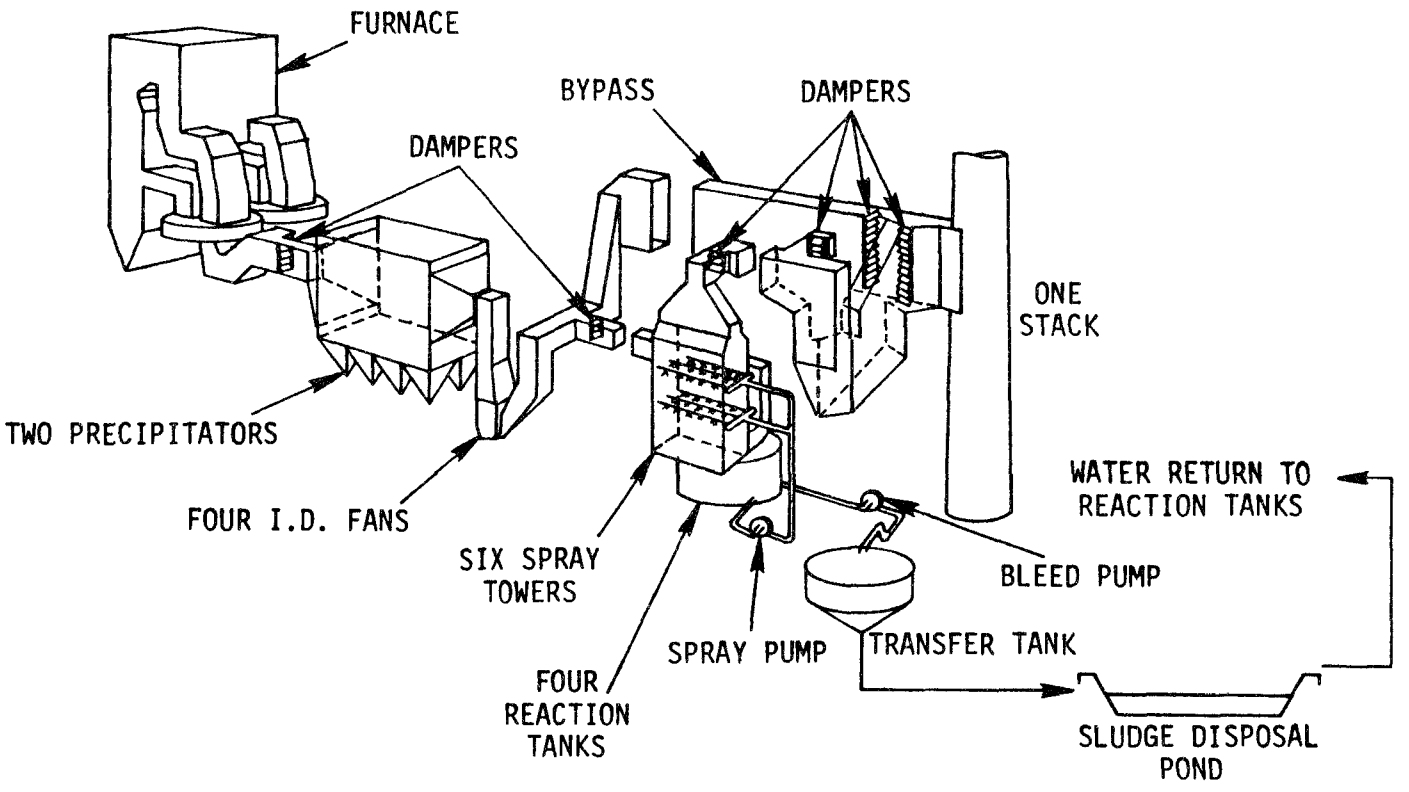
Indianapolis Power and Light, Petersburg 3:
Simplified Process Flow Diagram for One of Four Absorbers



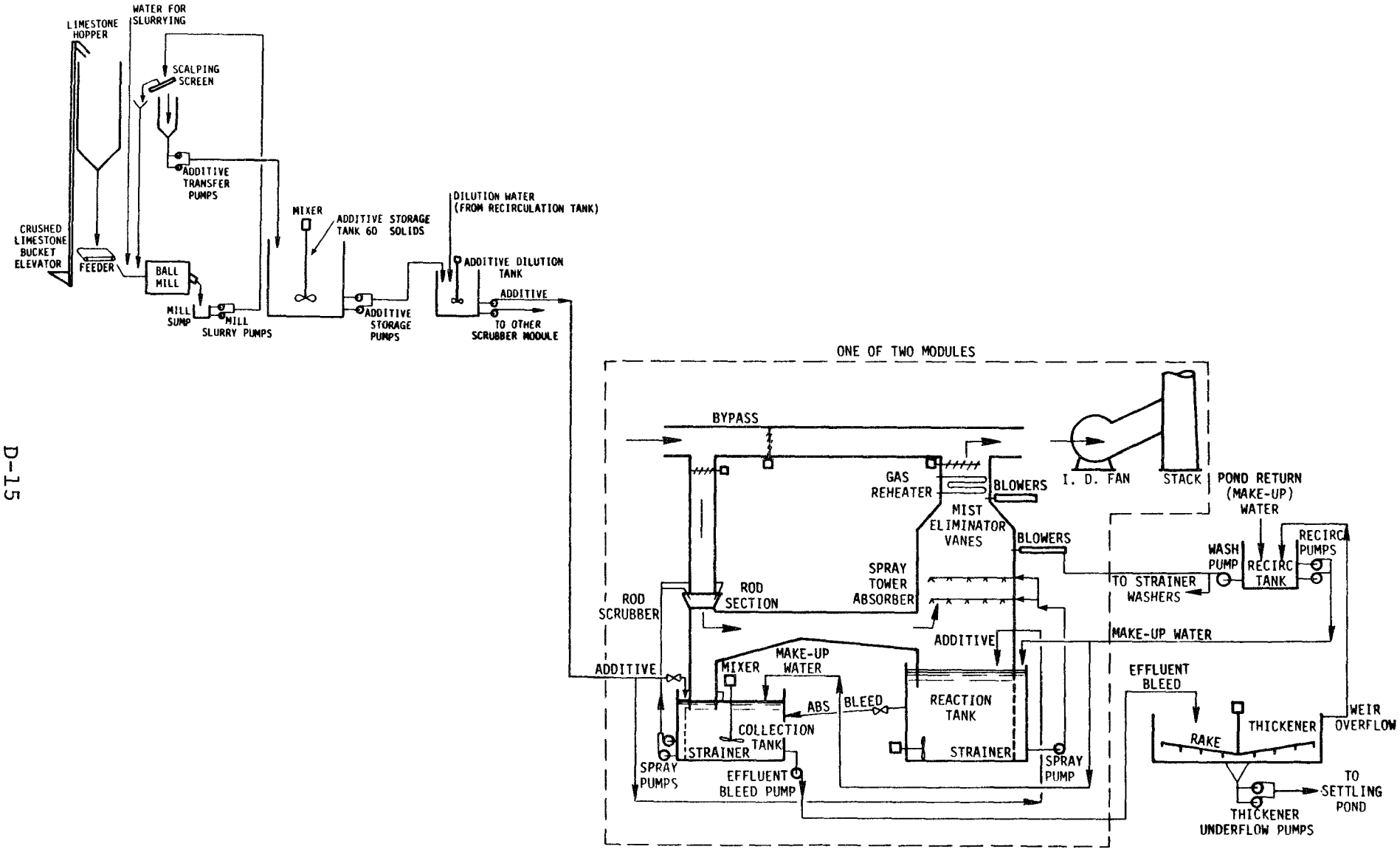
Kansas City Power and Light, Hawthorn Units 3 and 4:
Simplified Process Flow Diagram of the Lime Scrubbing Process



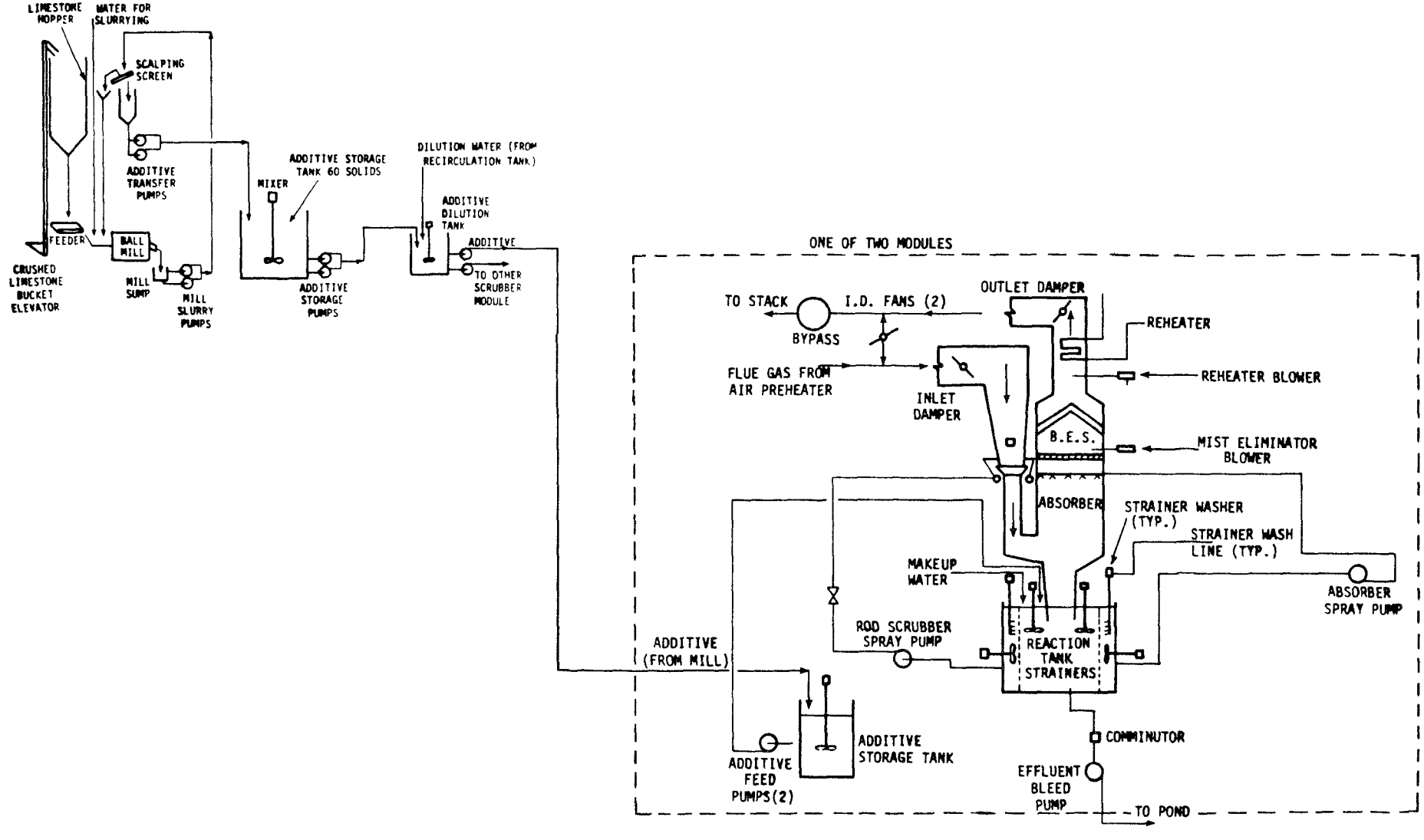
Kansas City Power and Light,
LaCygne 1 FGD System: General Diagram



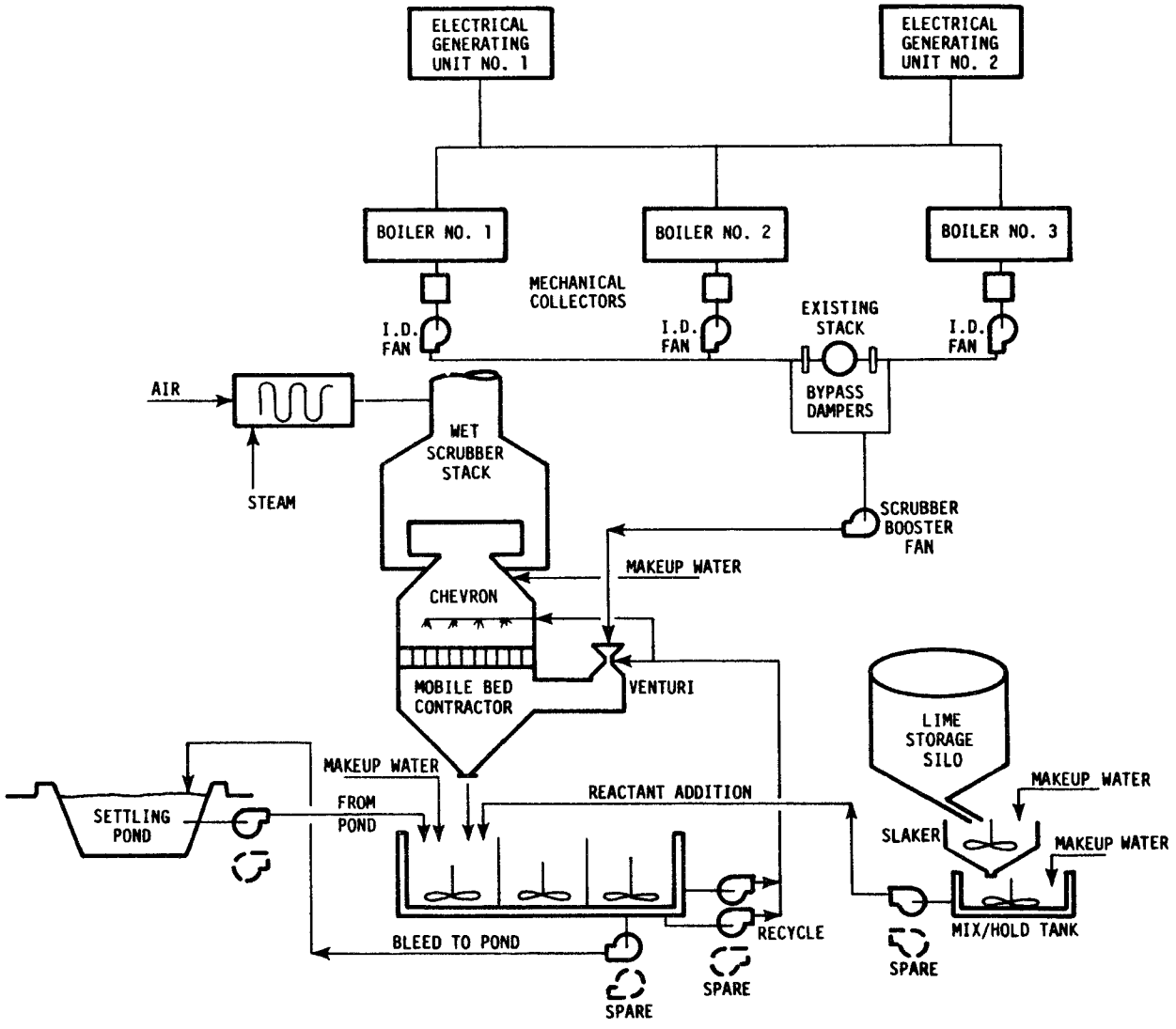
Kansas Power and Light,
Schematic of Jeffrey Steam Generator and Emission Control Equipment



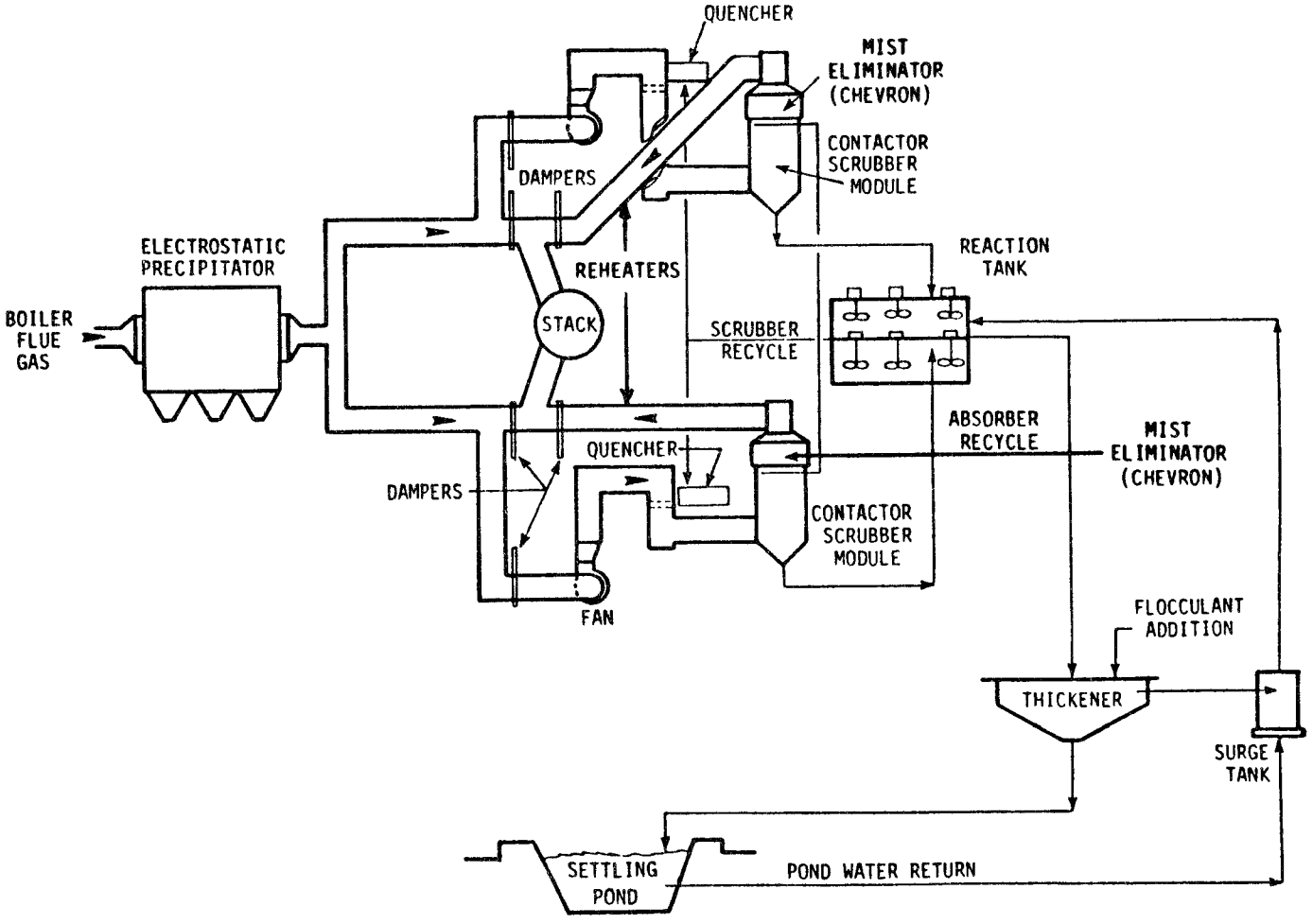
Kansas Power and Light,
Lawrence 4 Operational FGD System:
Simplified Process Flow Diagram



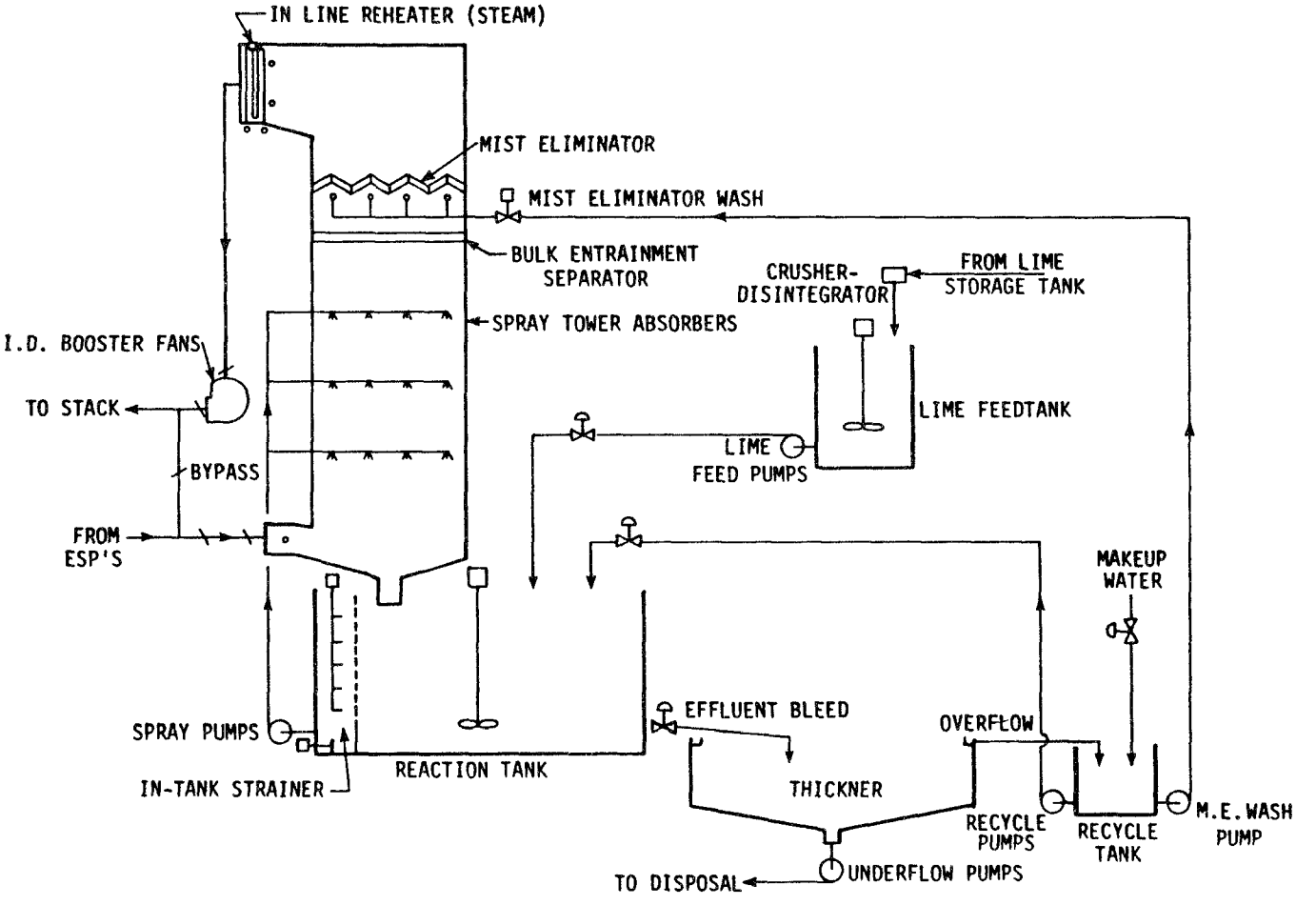
Kansas Power and Light,
Lawrence 5 Operational FGD System:
Simplified Process Flow Diagram



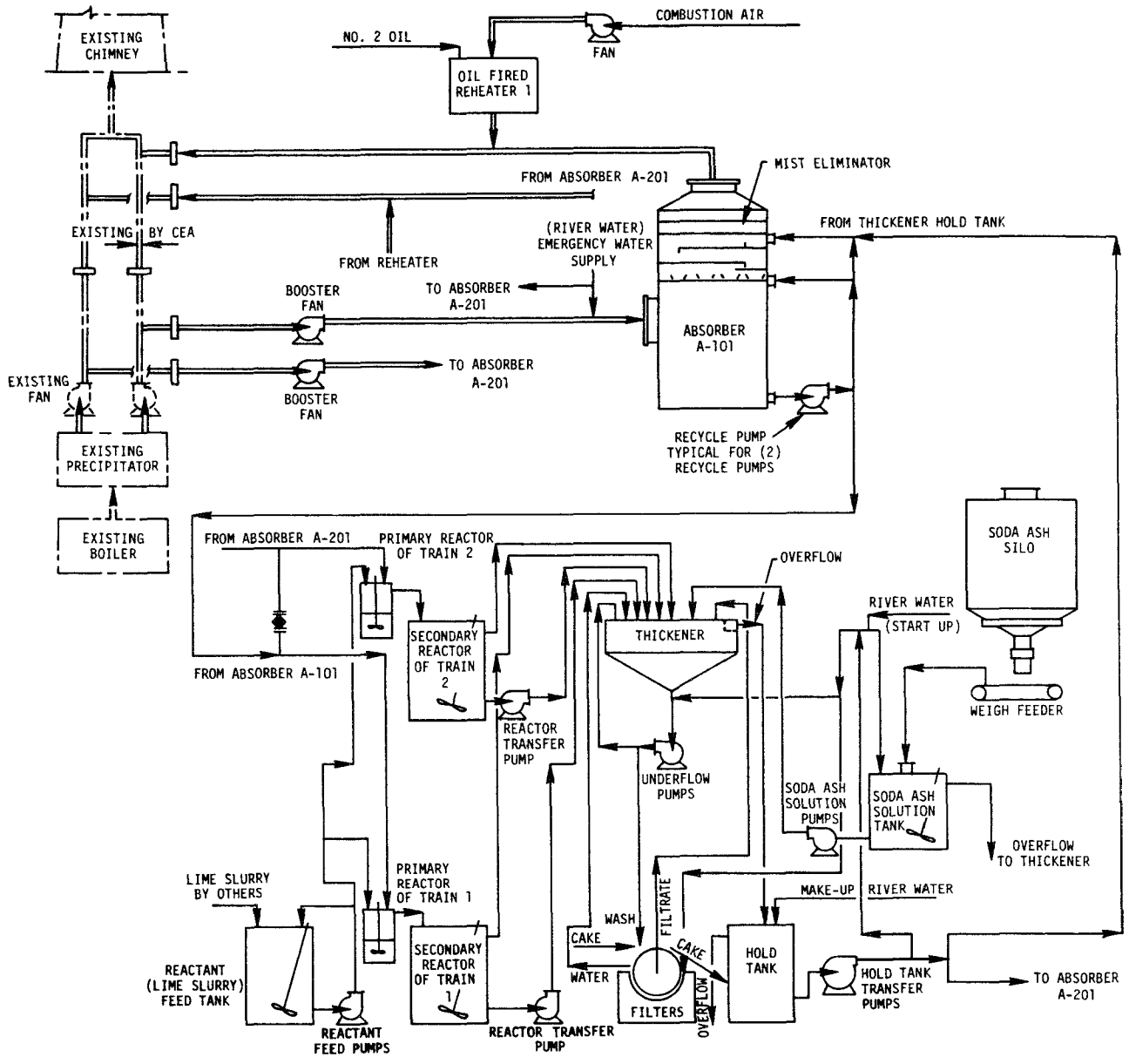
Kentucky Utilities,
Green River FGD System: General Process Diagram



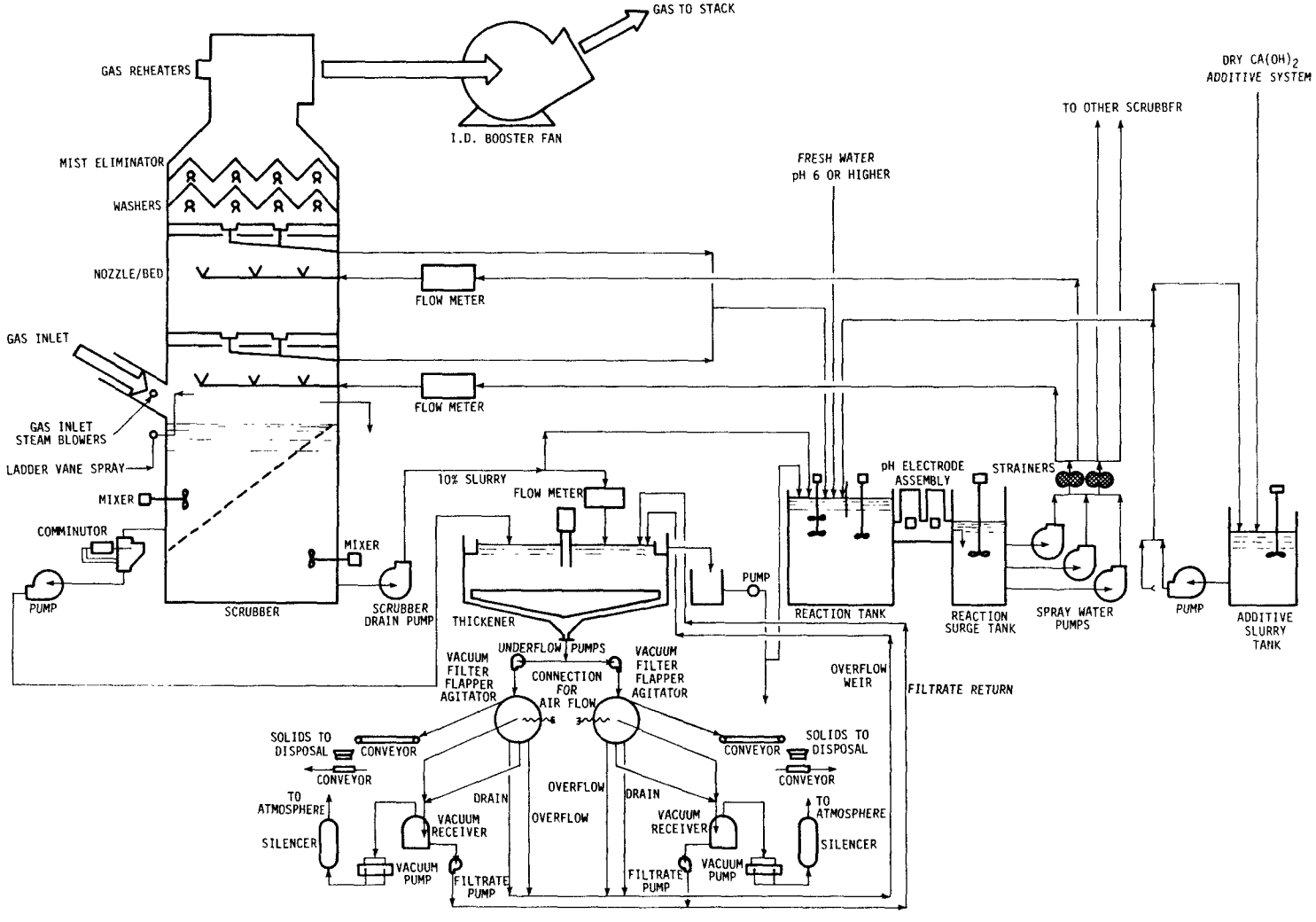
Louisville Gas and Electric, Cane Run 4
FGD System: Simplified Process Flow Diagram



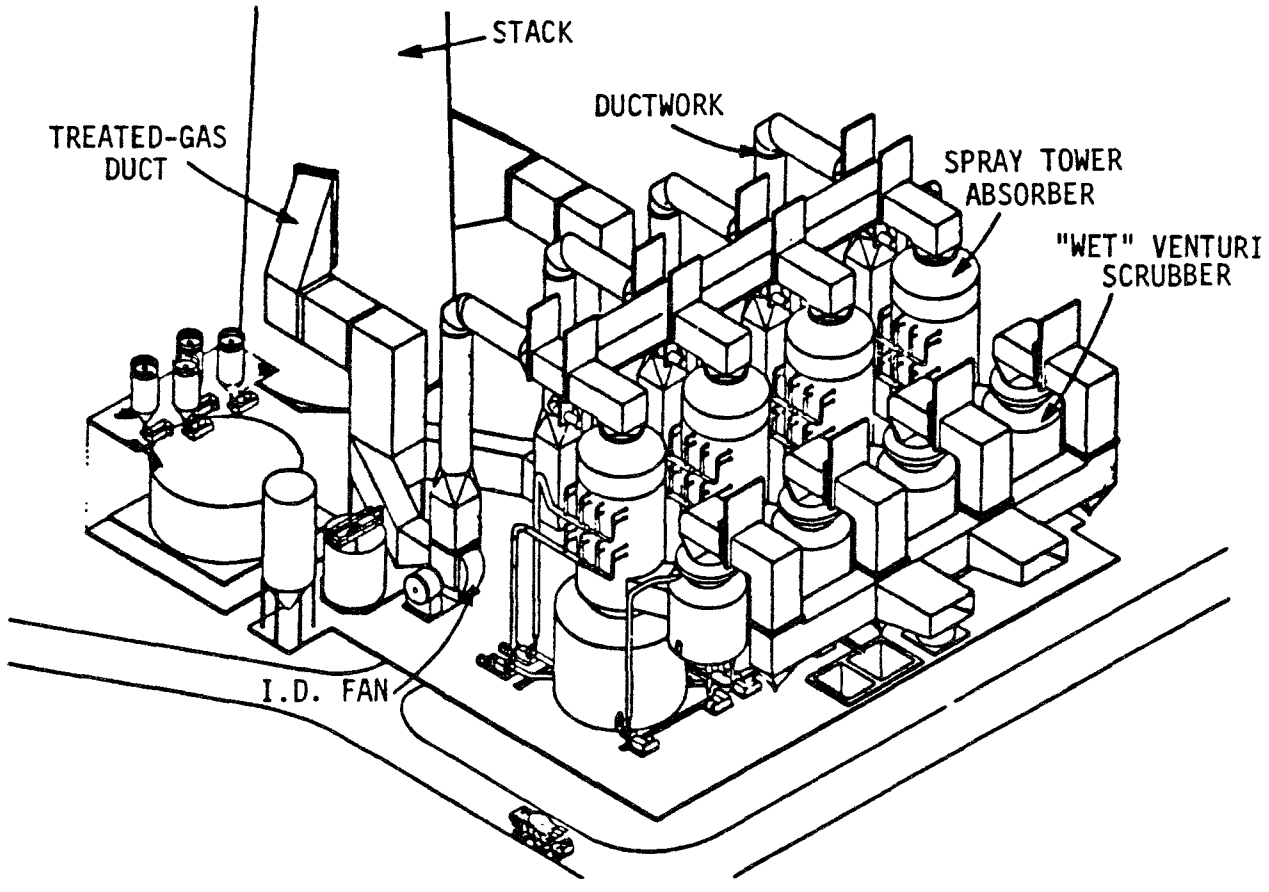
Louisville Gas and Electric, Cane Run 5
FGD System: Simplified Process Flow Diagram



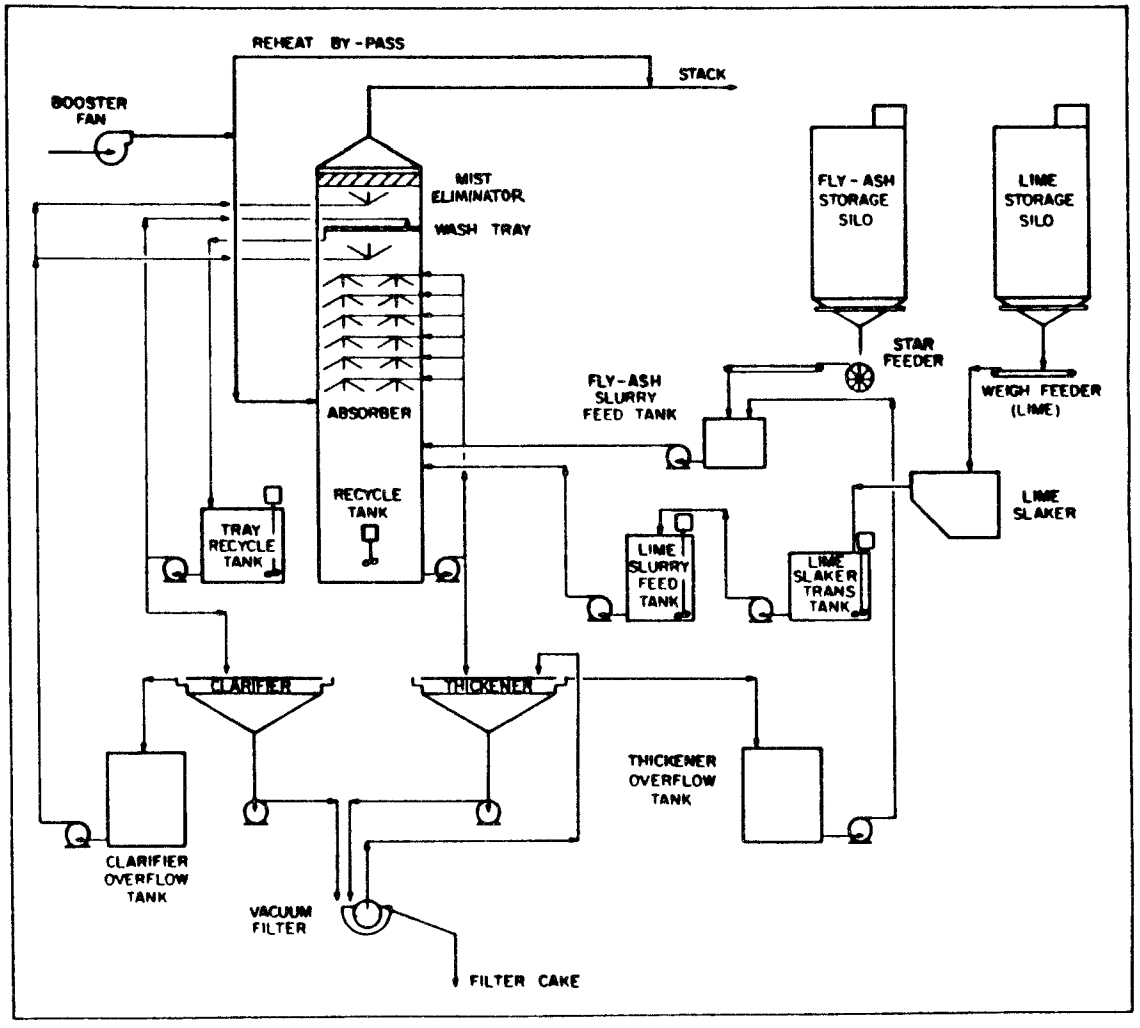
Louisville Gas and Electric, Cane Run 6
Dual Alkali FGD System: Simplified Process Flow Diagram



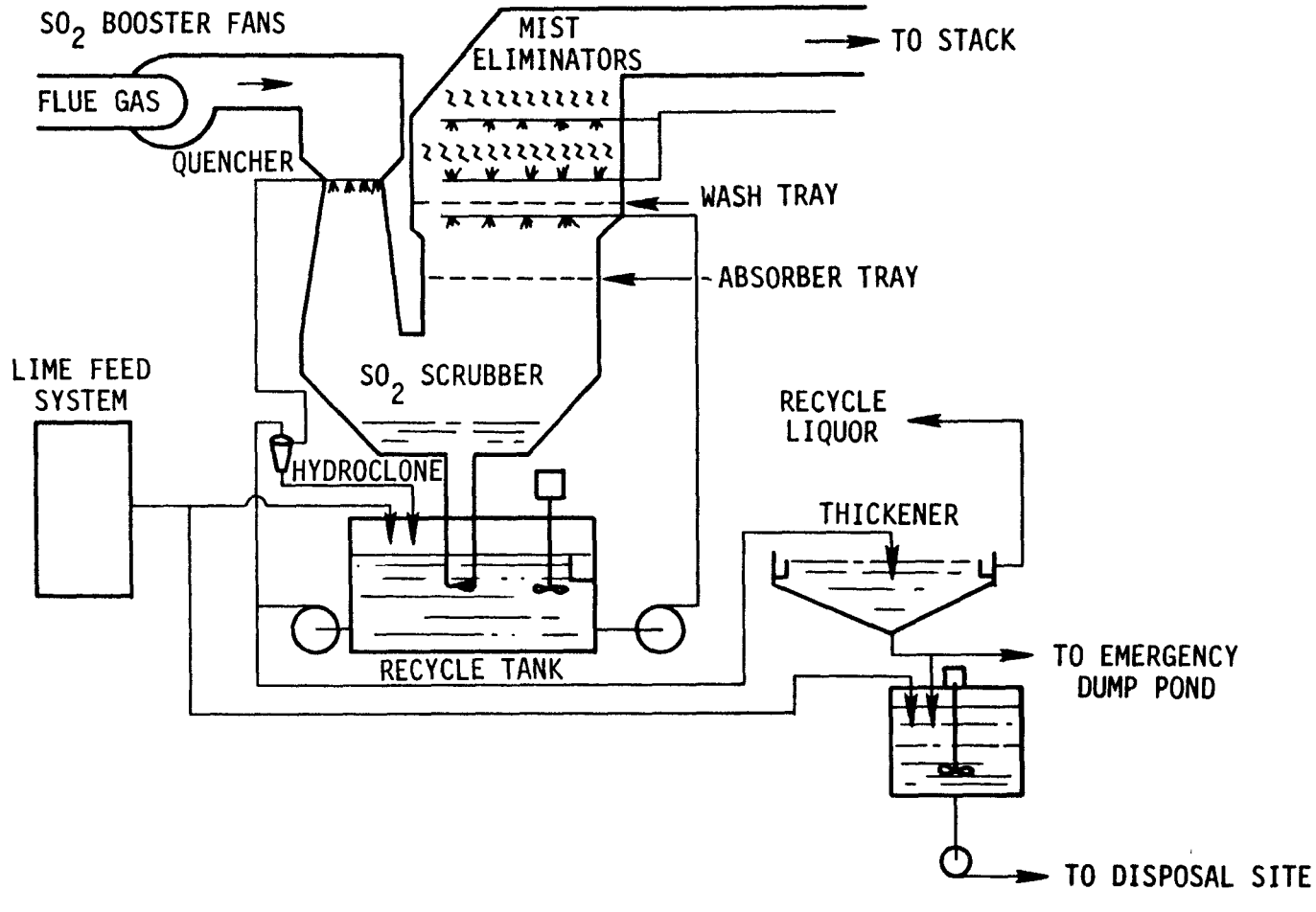
Louisville Gas and Electric,
Paddys Run 6 FGD System:
Simplified Process Flow Diagram



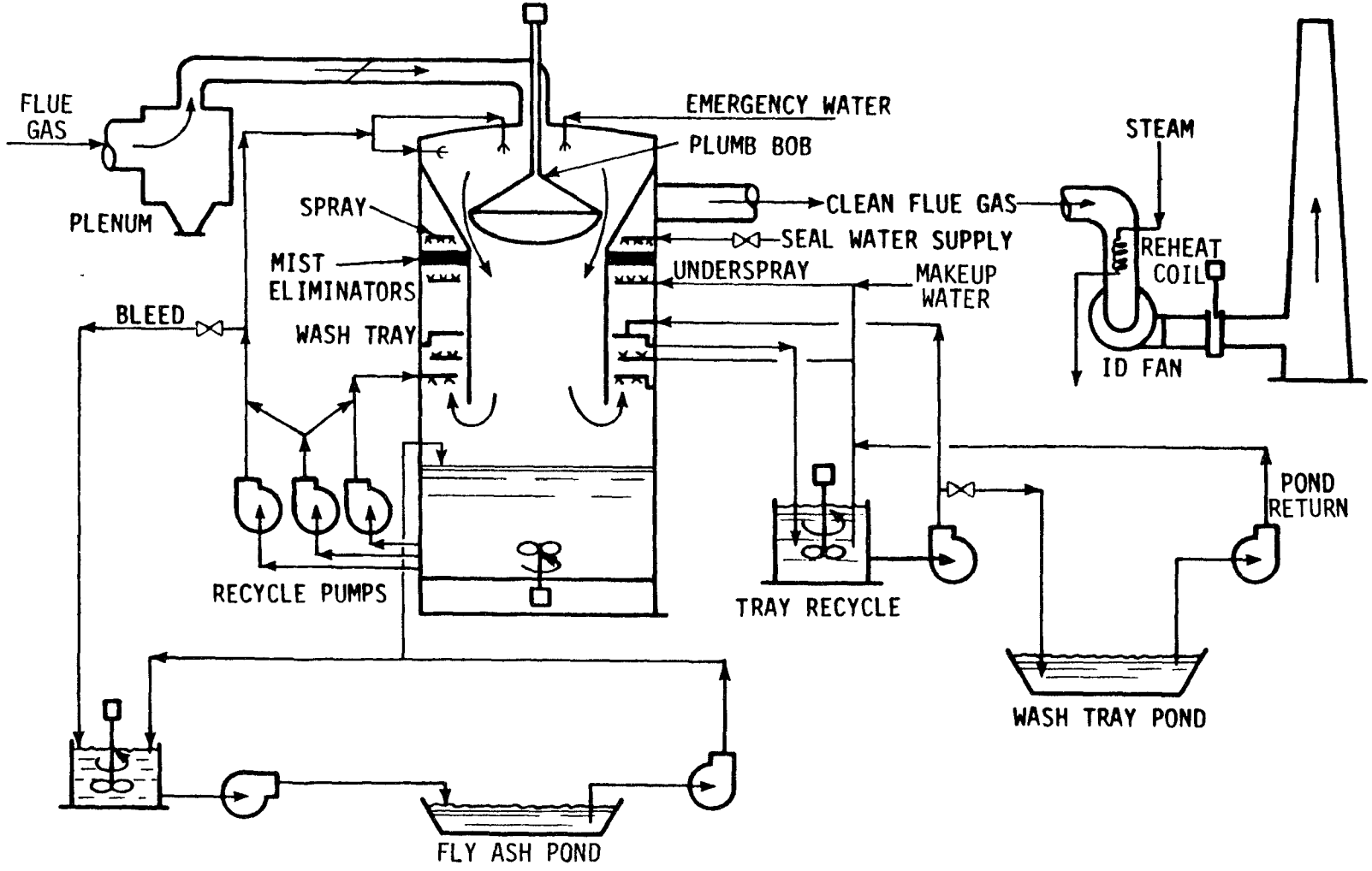
Minnesota Power and Light, Clay Boswell 4:
General Diagram



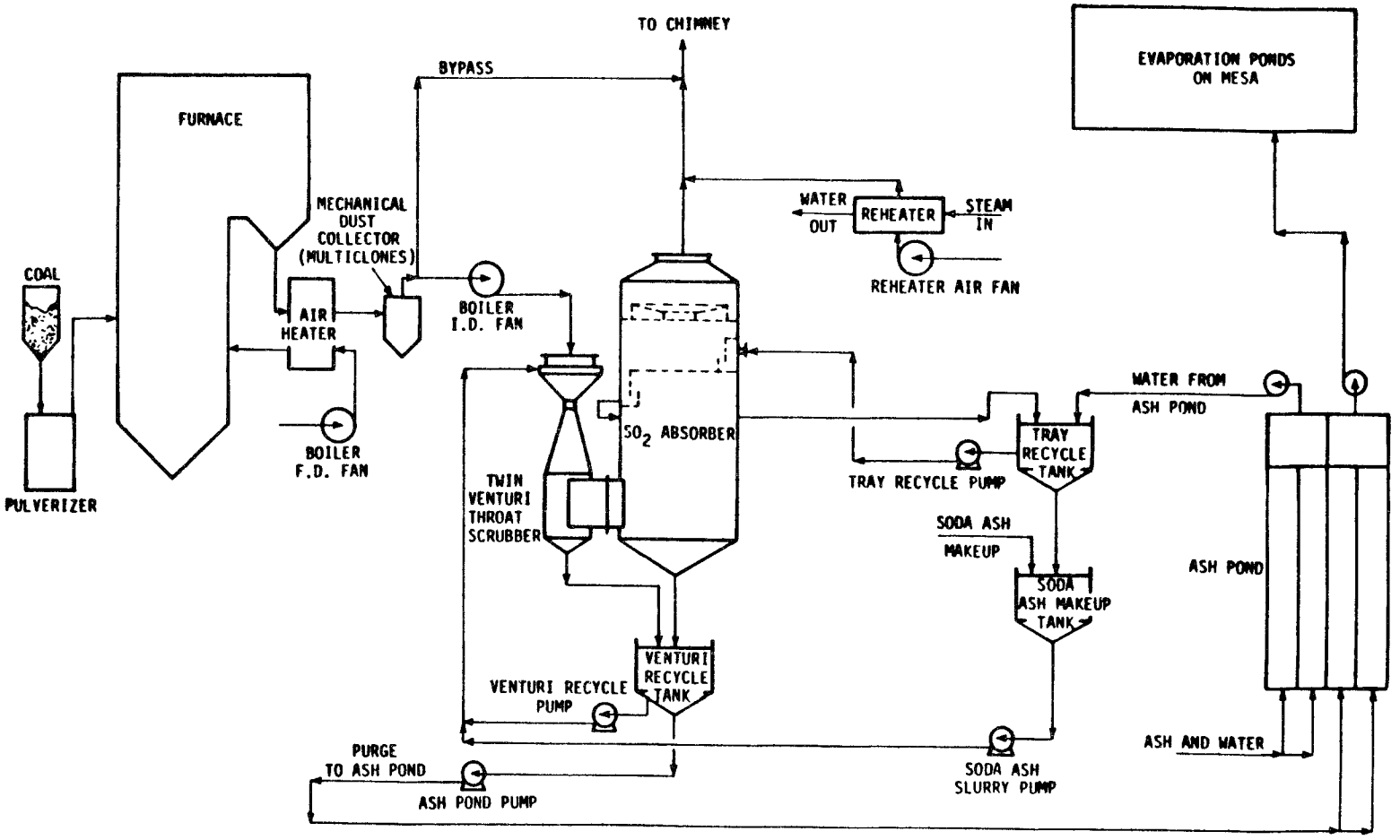
Minnkota Power Cooperative, Milton R. Young 2:
Simplified Process Flow Diagram for One of Two Absorbers



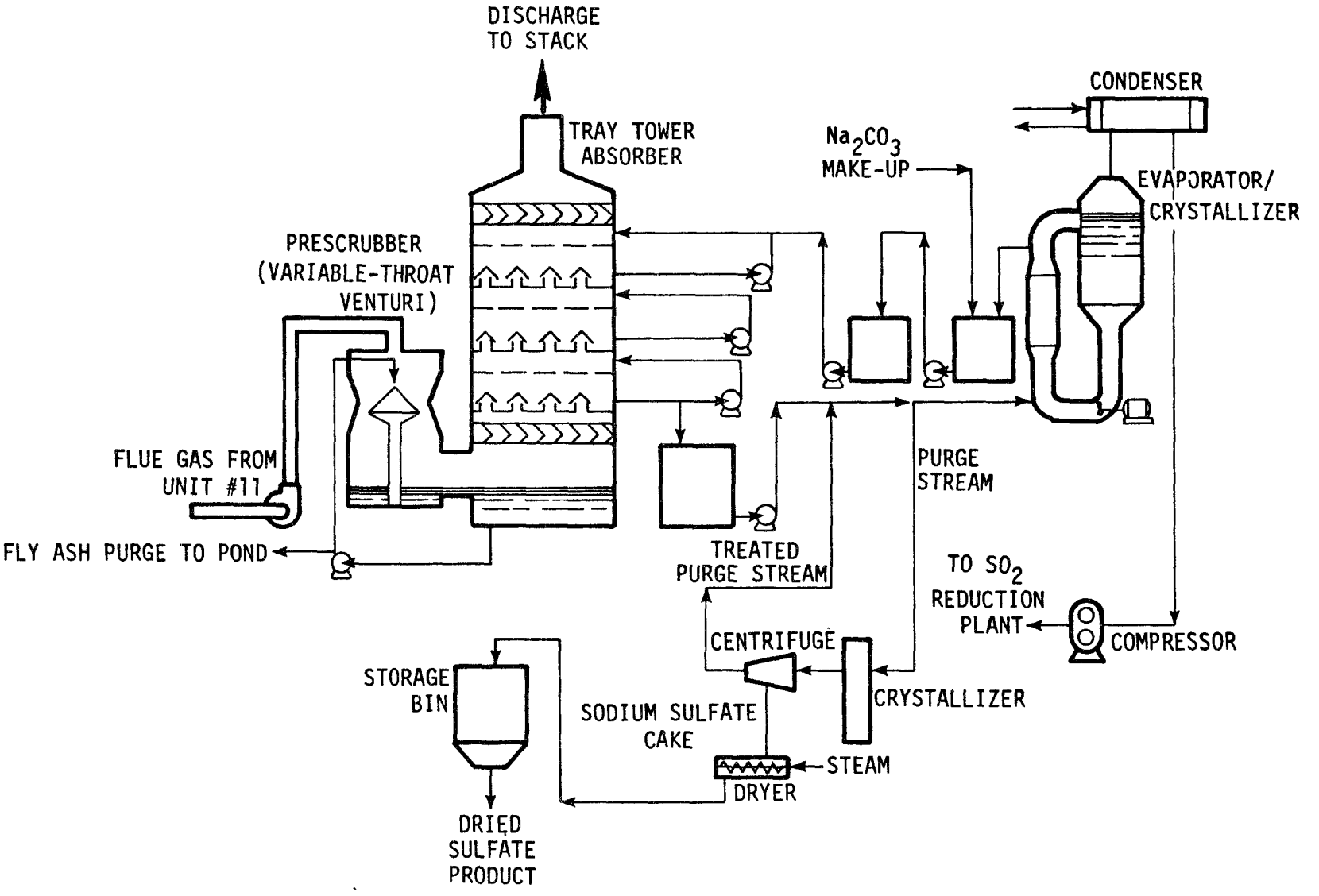
Monongahela Power, Pleasants 1 and 2:
Simplified Process Flow Diagram for One of Four Modules for Either Unit



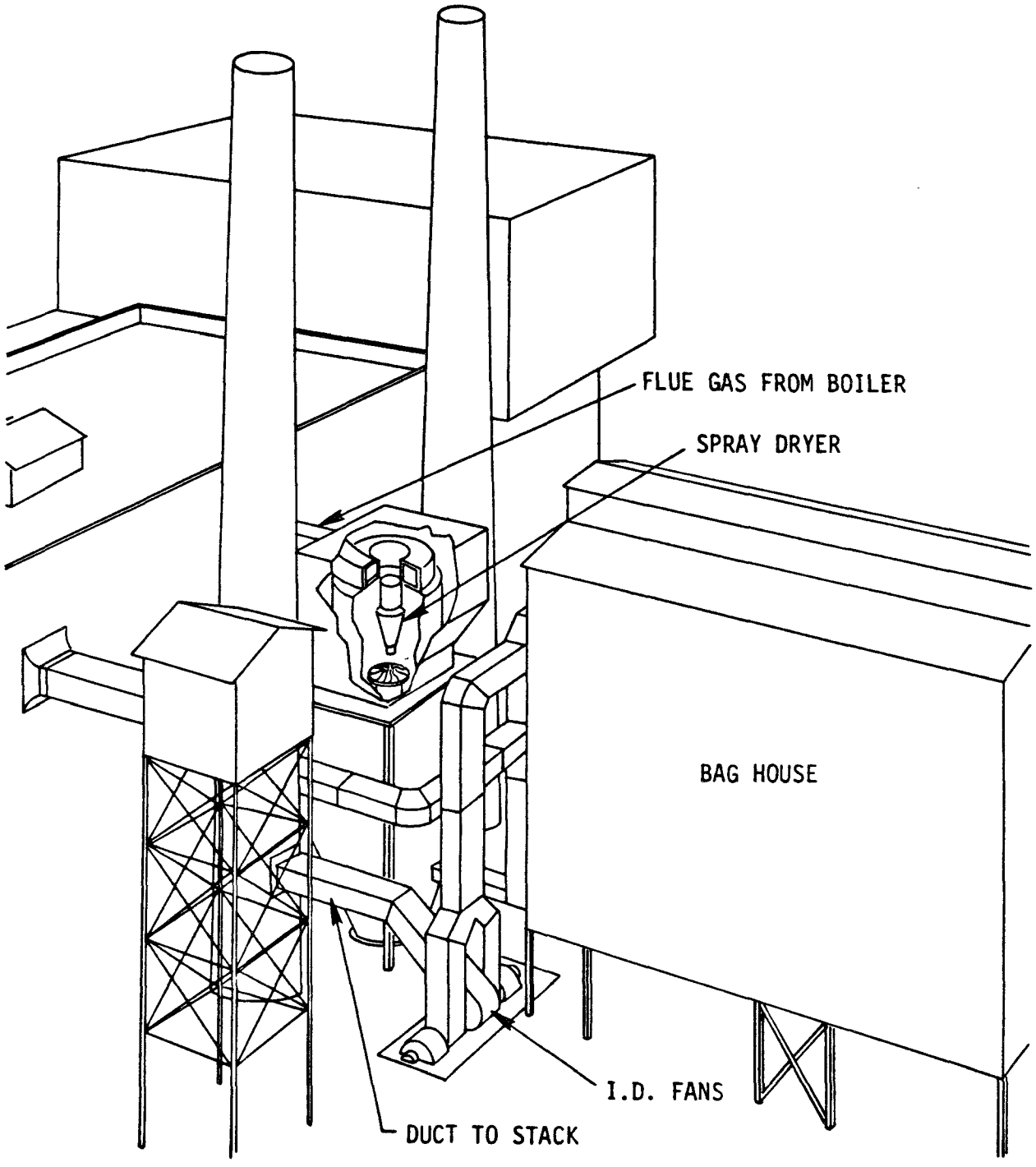
Montana Power, Colstrip 1 and 2:
Process diagram of a given FGD module.



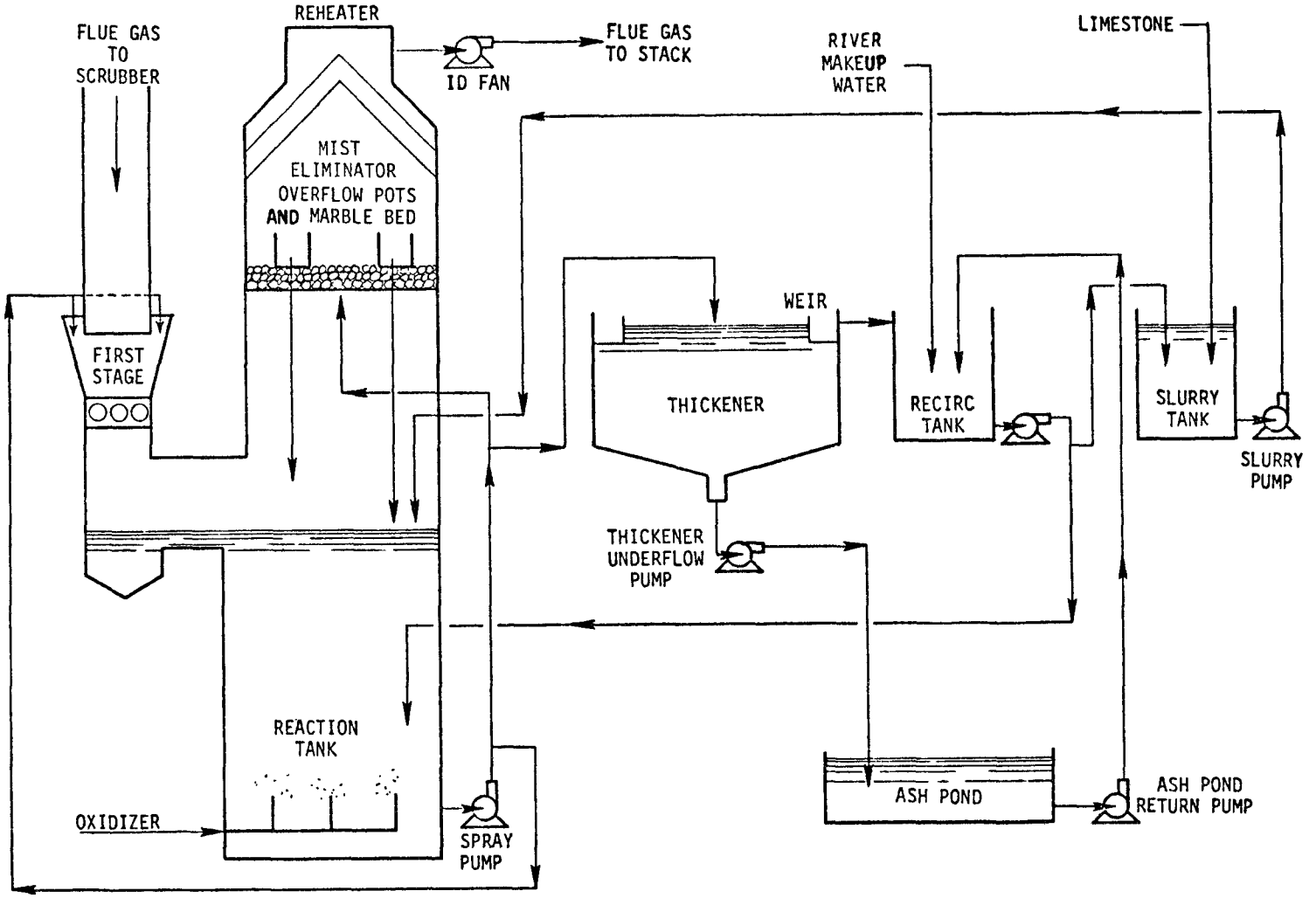
Nevada Power, Reid Gardner 1,2 and 3:
Process diagram of a given FGD system.



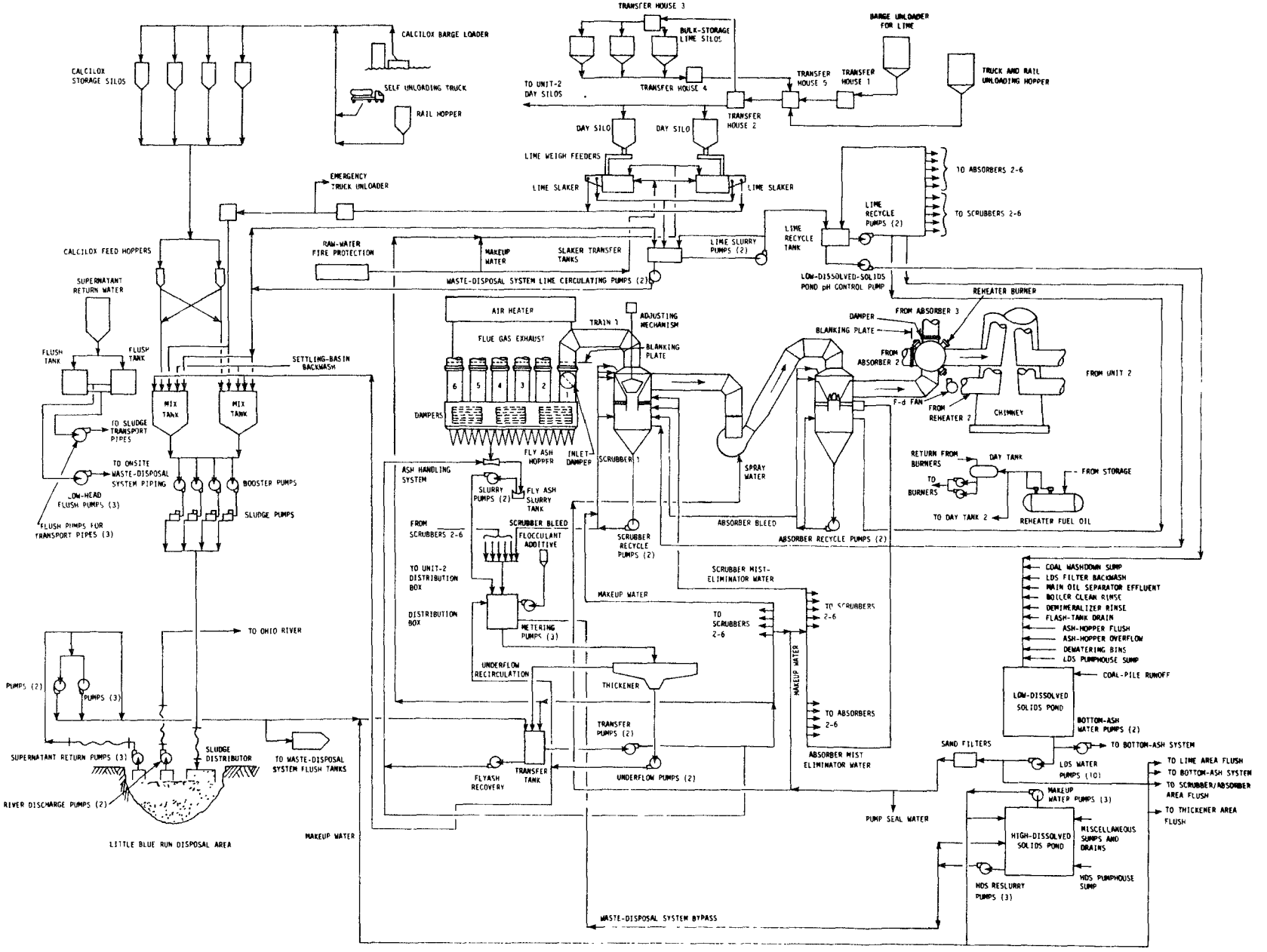
Northern Indiana Public Service,
D. H. Mitchell 11 Wellman Lord/Allied System:
General Process Diagram.



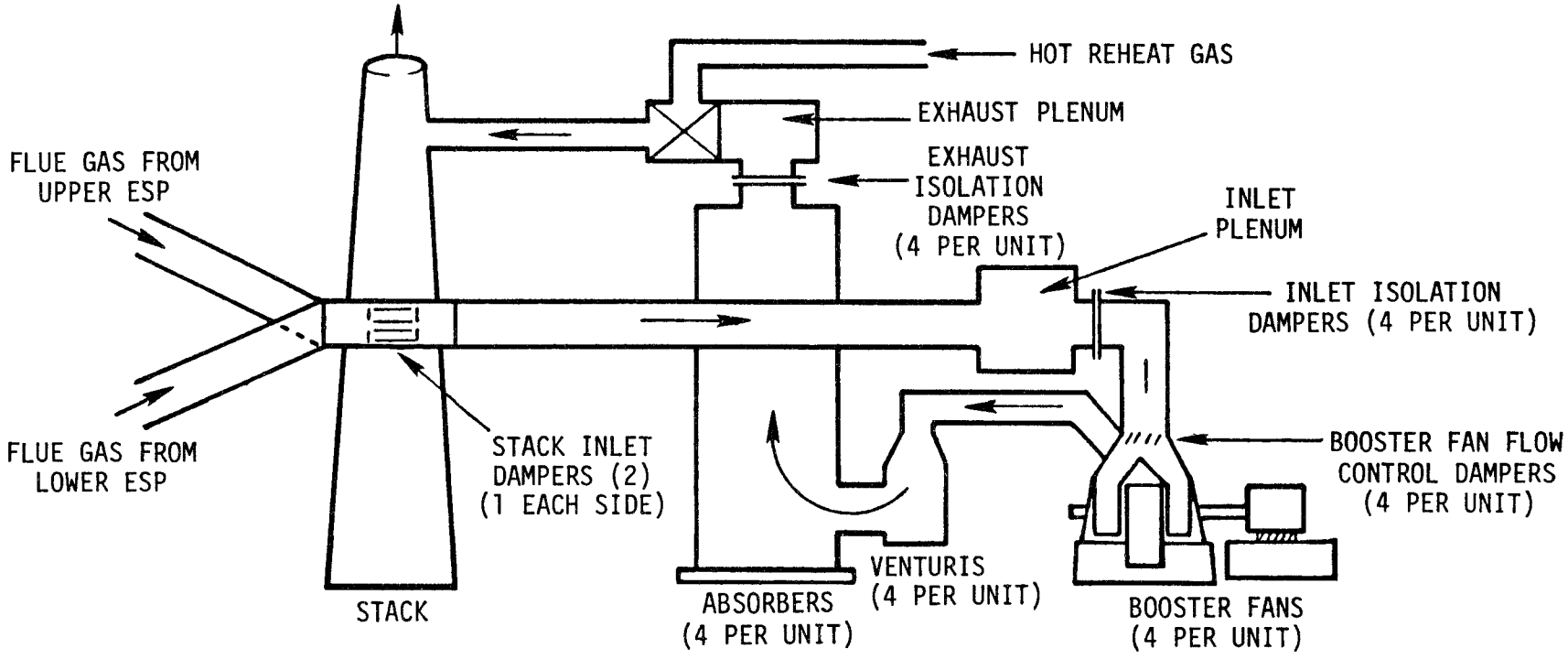
Northern States Power, Riverside 6 and 7:
General Diagram



Northern States Power, Sherburne 1 and 2 FGD System:
Simplified Process Flow Diagram

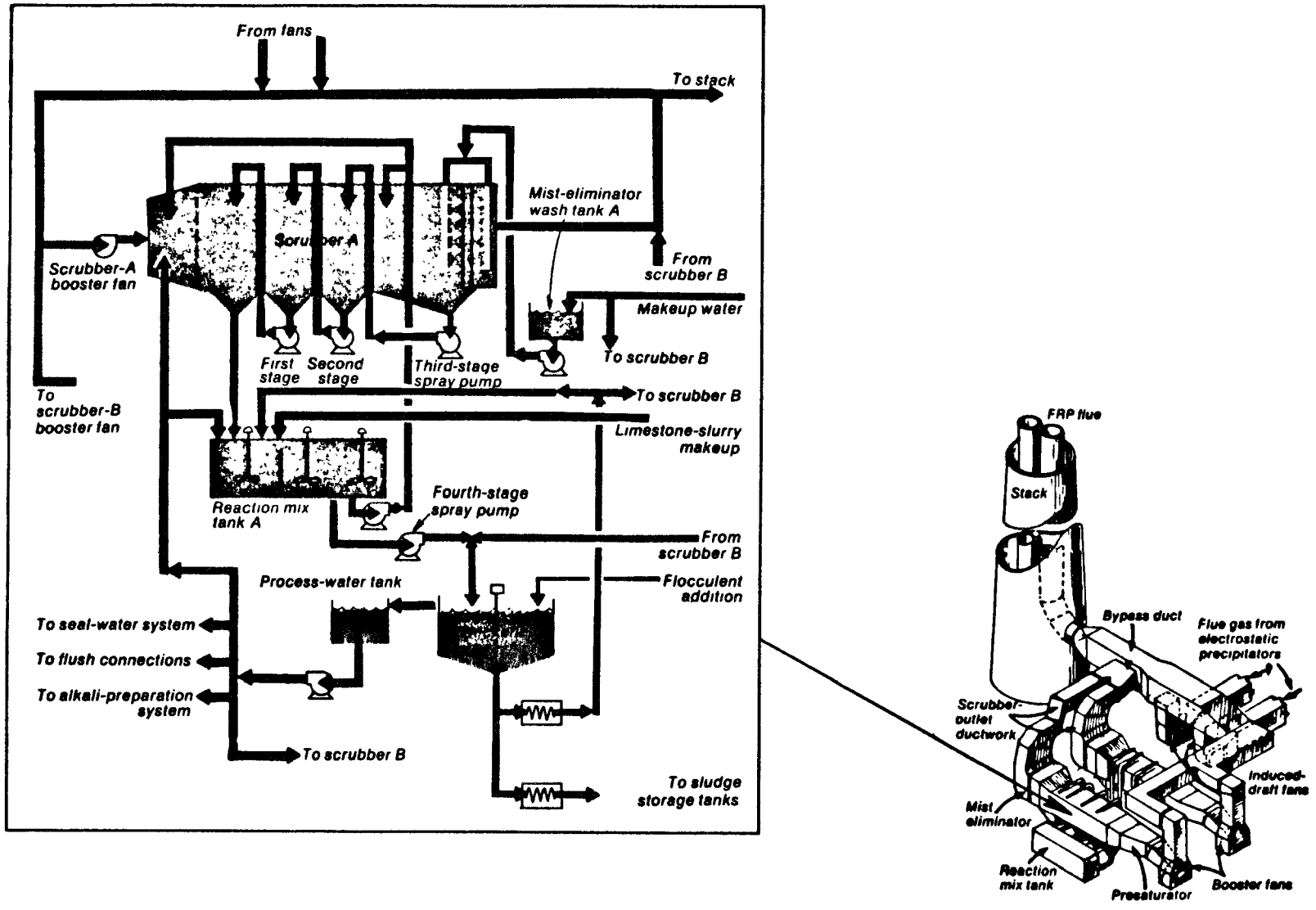


Pennsylvania Power, Bruce Mansfield FGD System:
Process Flow Diagram for Unit 1 or 2

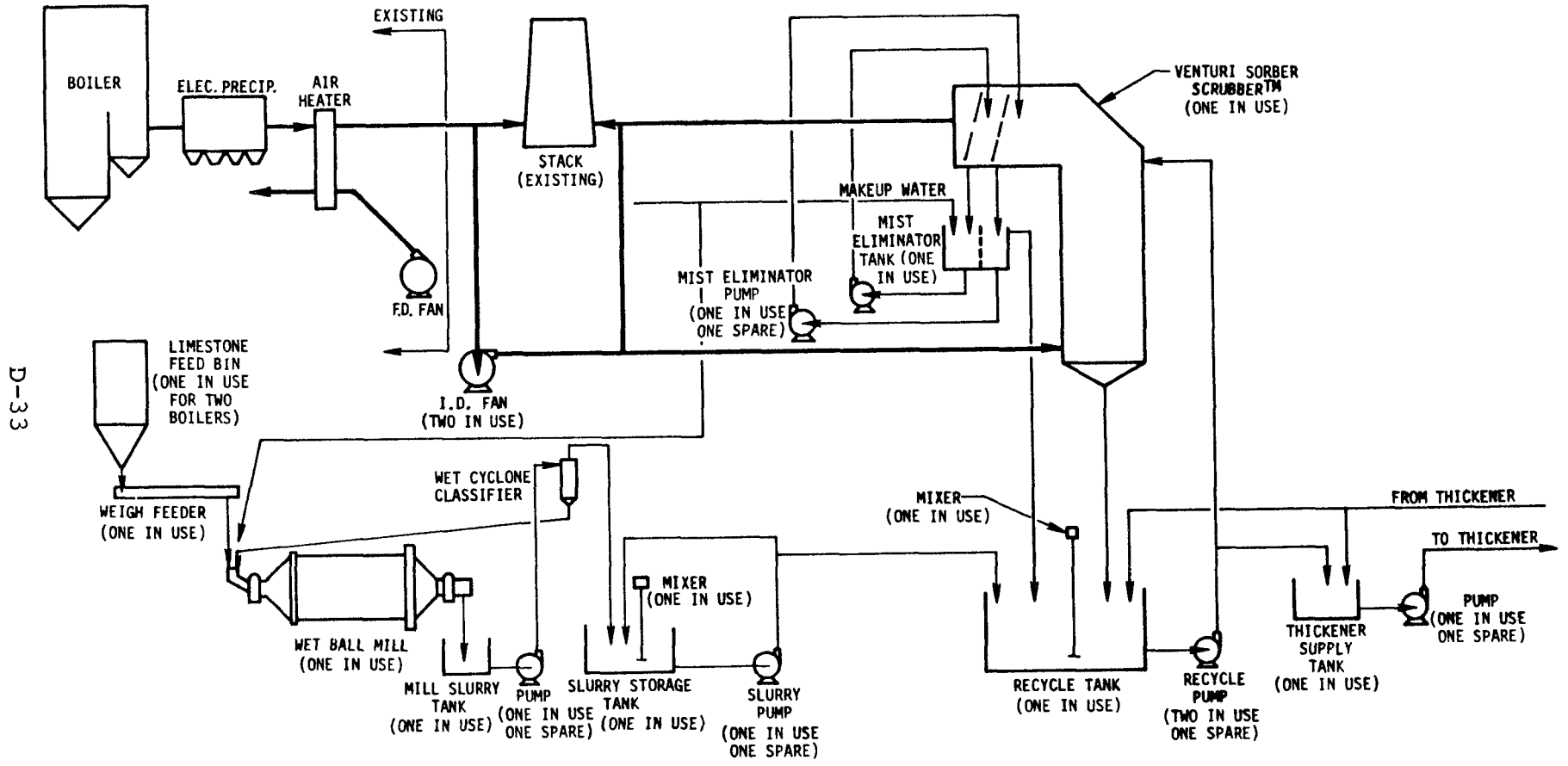


Public Service of New Mexico, San Juan 1, 2, and 3*
FGD System Flue Gas Flow Path

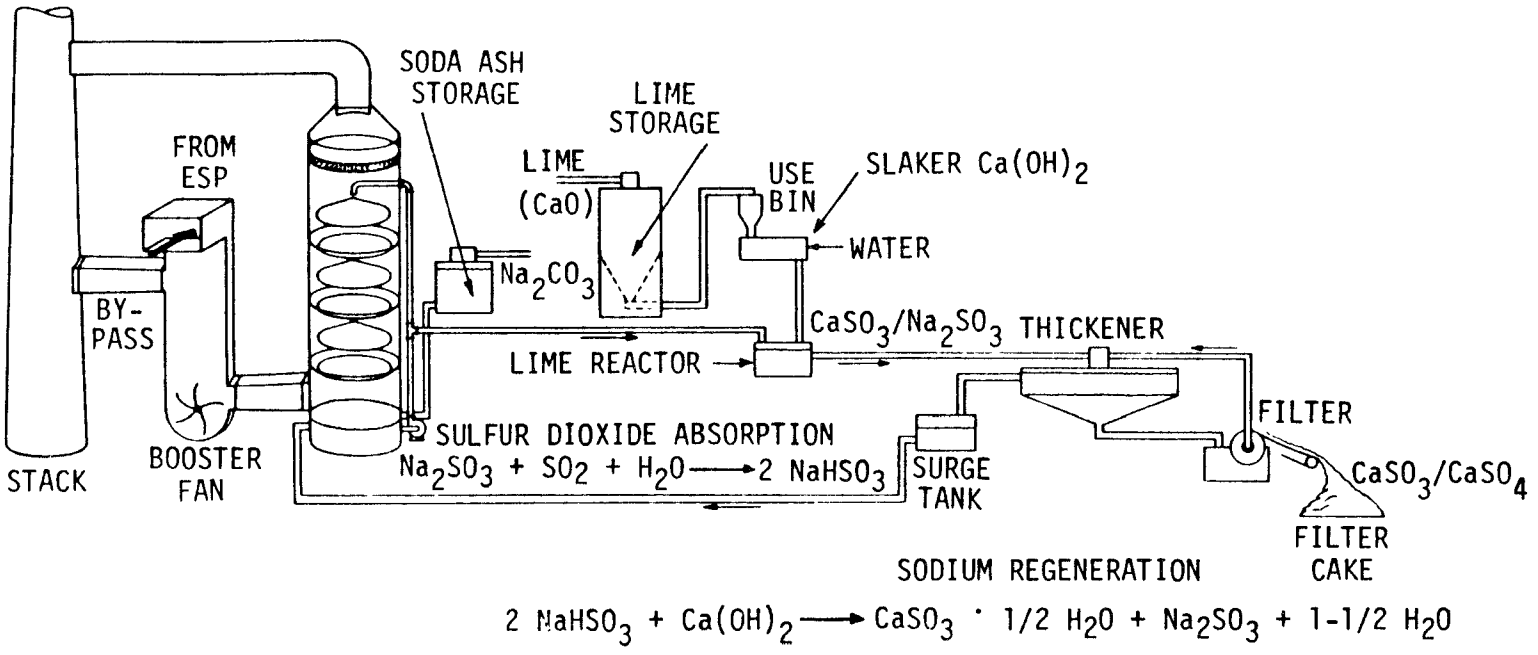
*San Juan 3 is identical except that only one scrubbing train is operational.



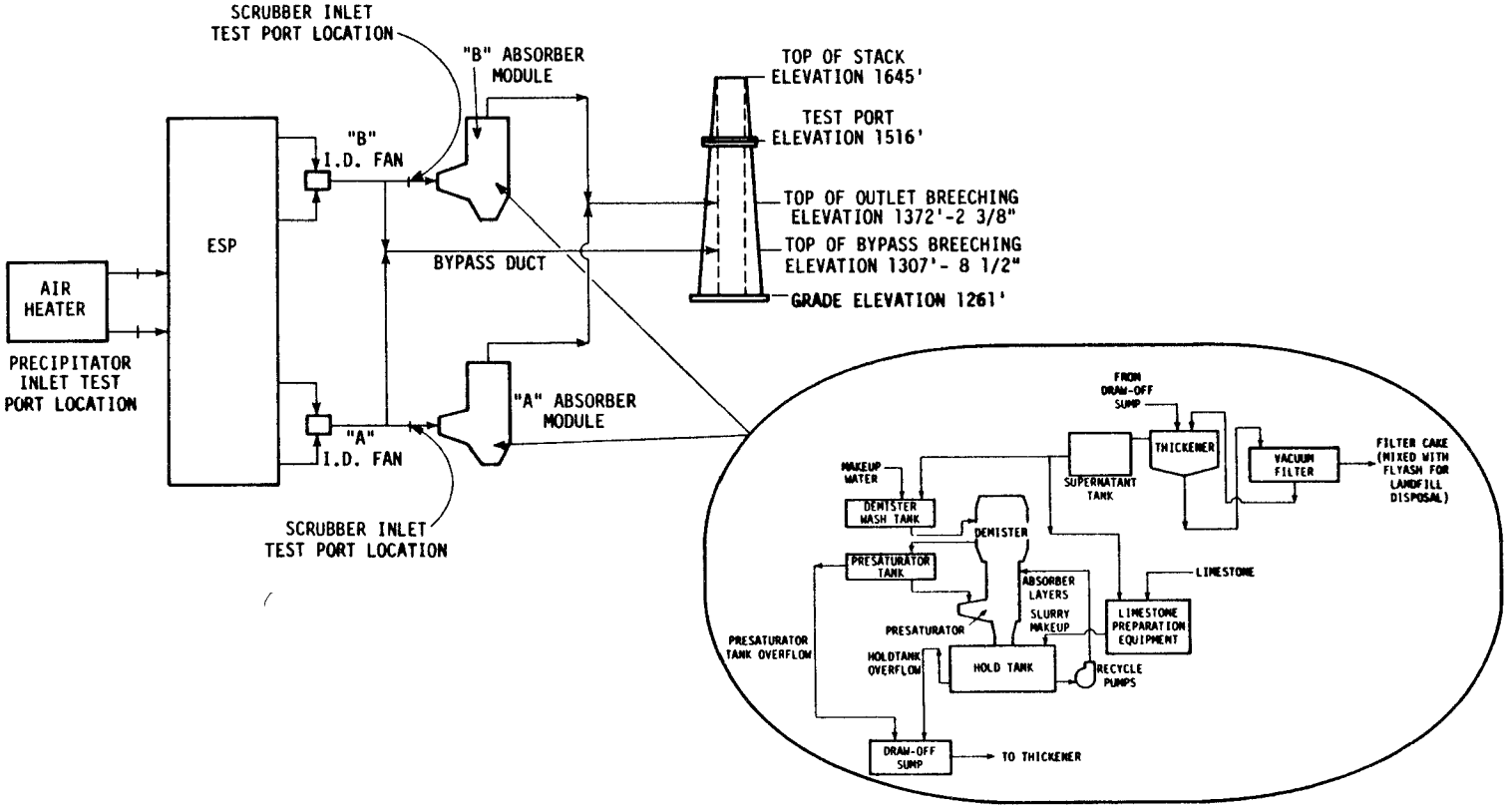
Salt River Project, Coronado 1 and 2:
Simplified Process Flow Diagram



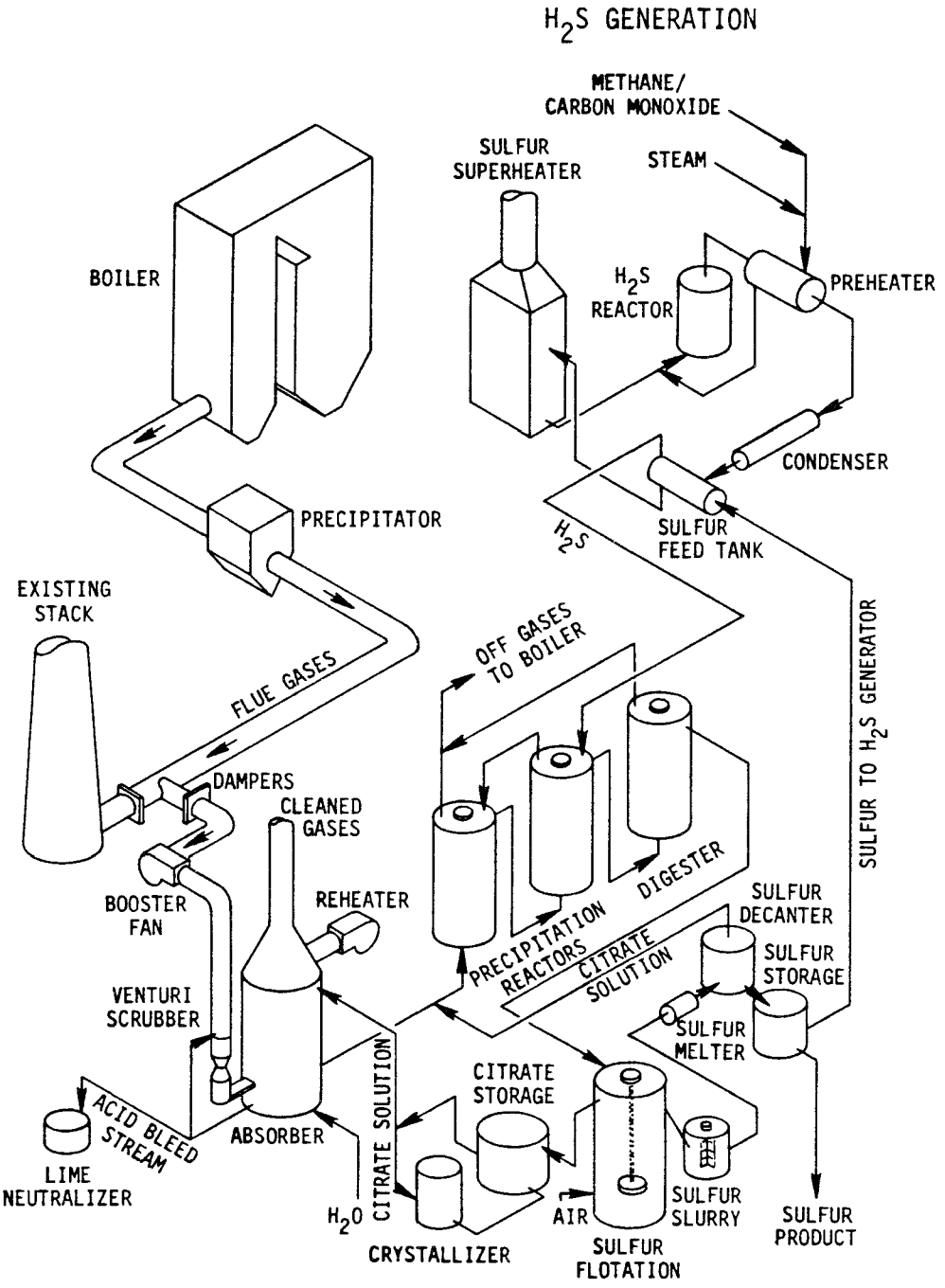
South Mississippi Electric, R.D. Morrow 1 and 2:
Simplified Process Flow Diagram



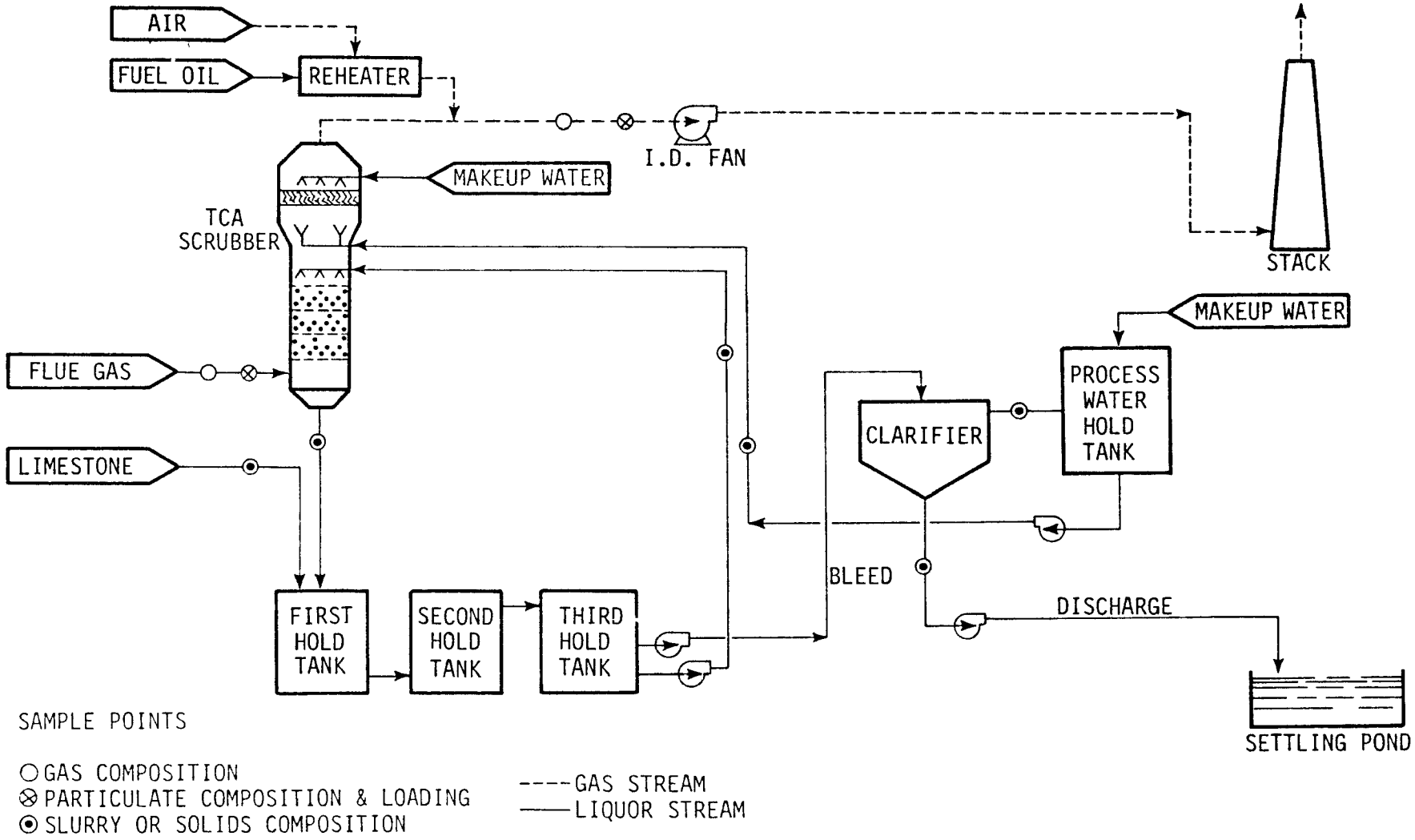
Southern Indiana Gas and Electric, A.B. Brown 1:
Dual Alkali FGD System Simplified Process Flow Diagram



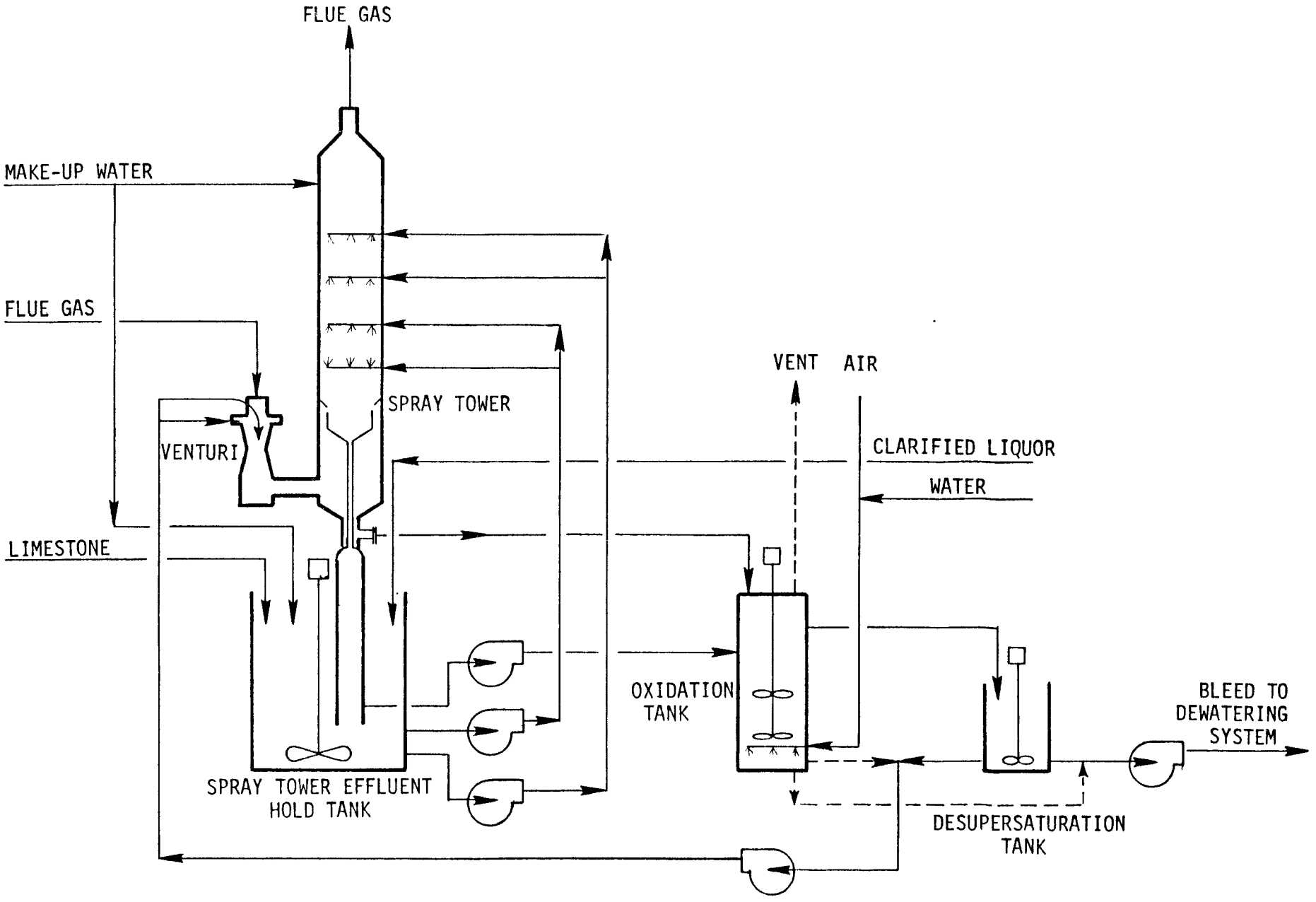
Springfield City Utilities, Southwest 1:
Simplified Process Diagram



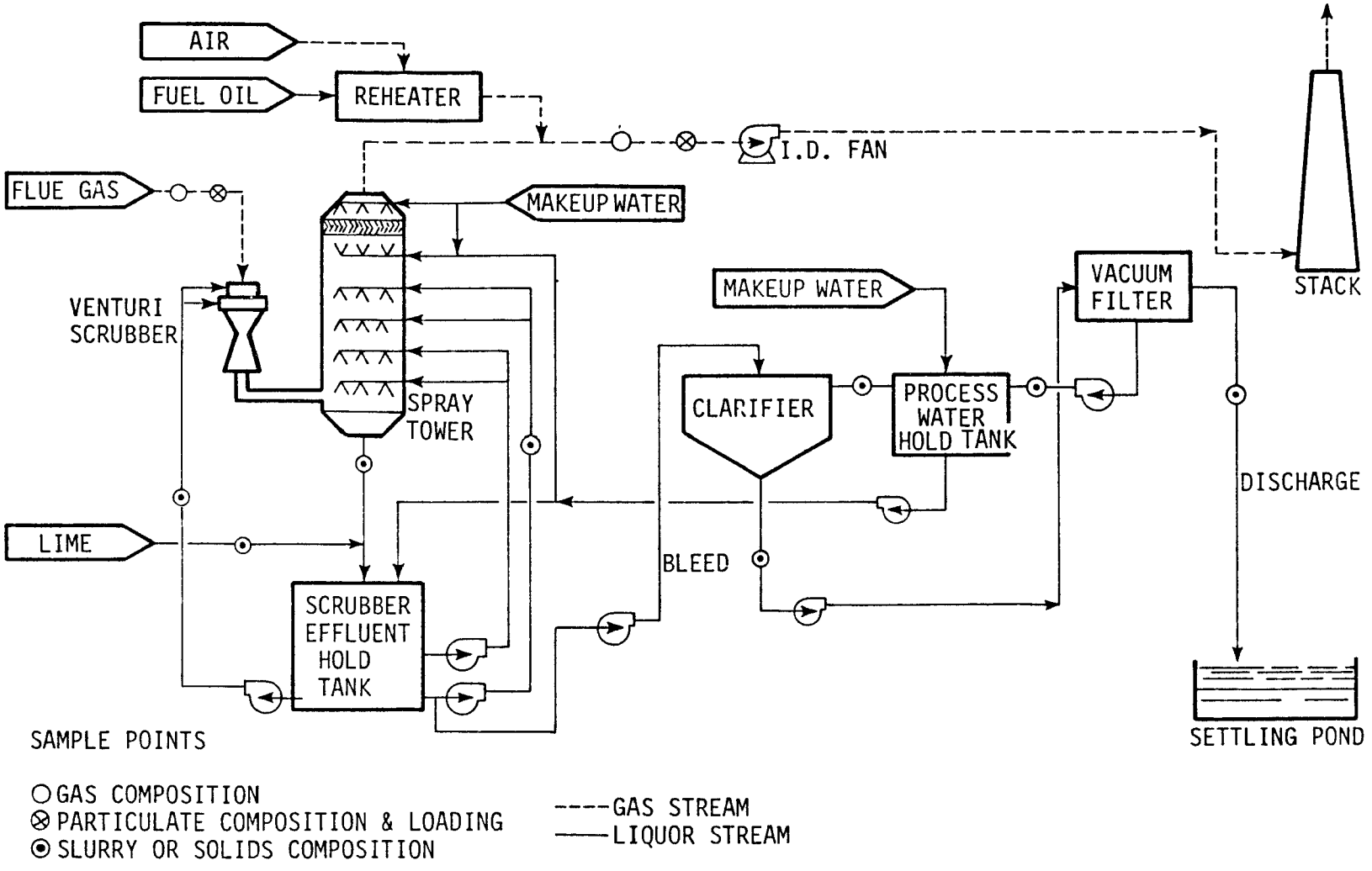
St. Joe Zinc, G.F. Weaton 1:
Citrate FGD System Simplified Process Flow Diagram



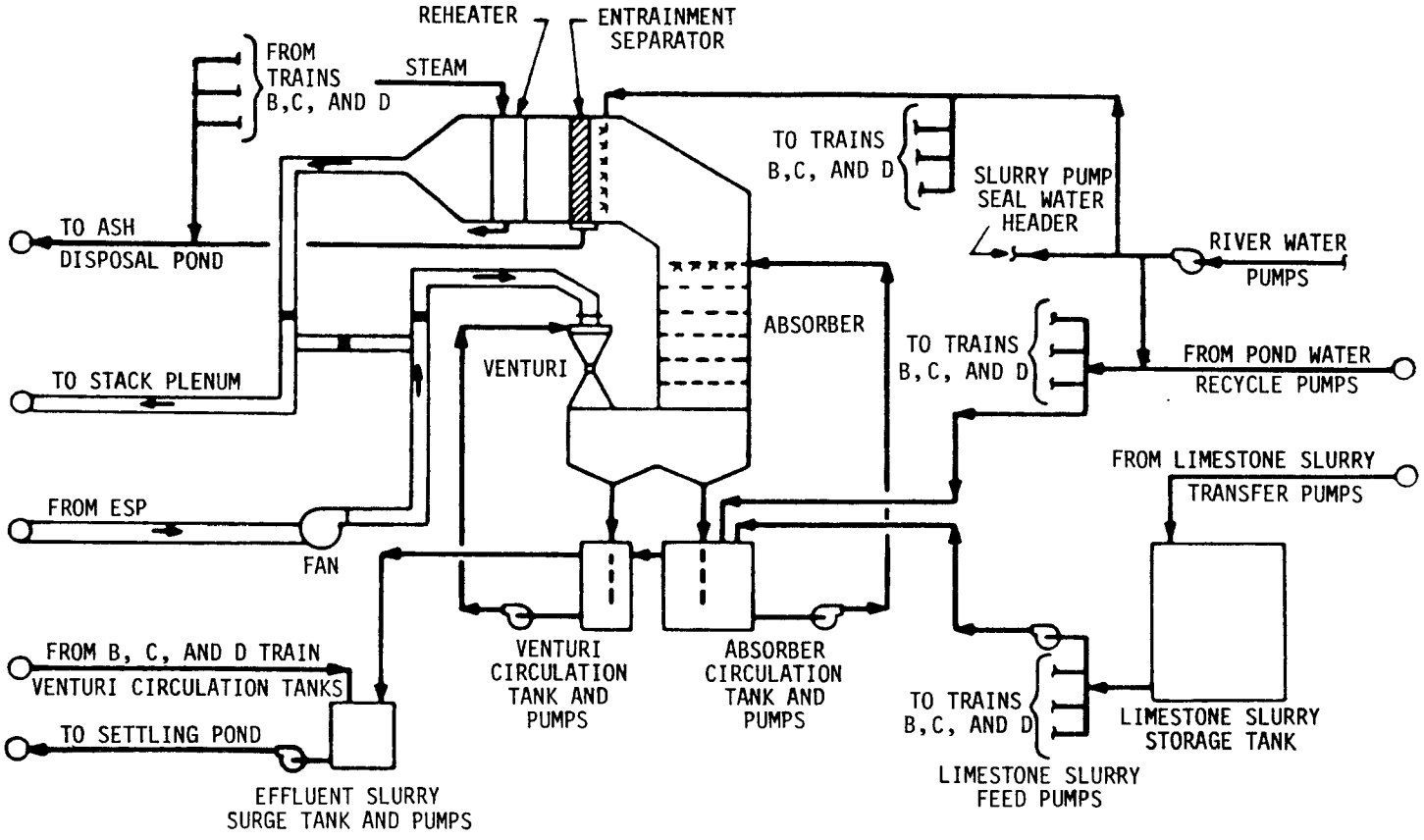
Tennessee Valley Authority,
Shawnee 10A Prototype Test Unit:
General Process Diagram.



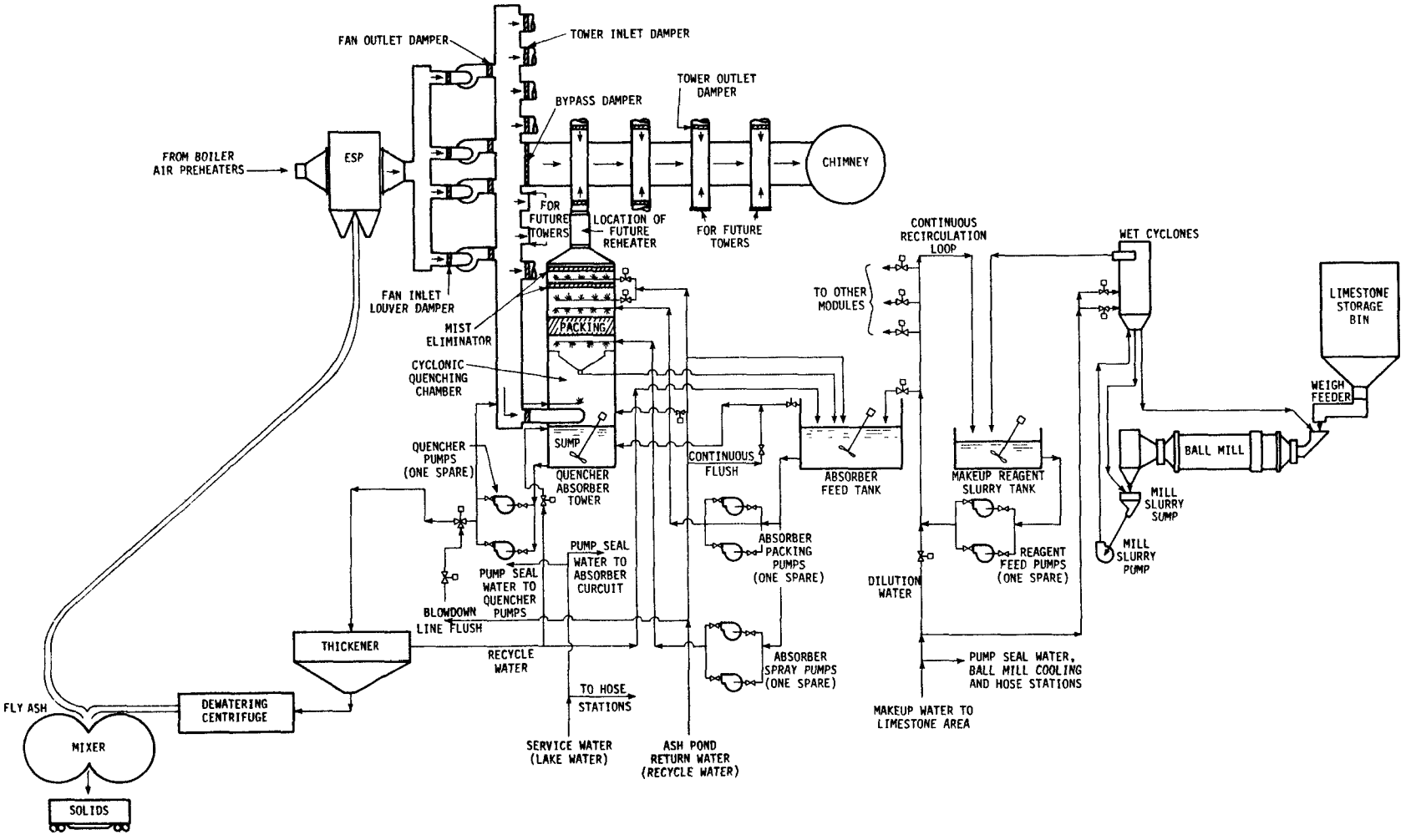
Tennessee Valley Authority, Shawnee 10B Prototype Test Unit:
Modified Venturi/Spray Tower System for 2-Stage Oxidation Testing.



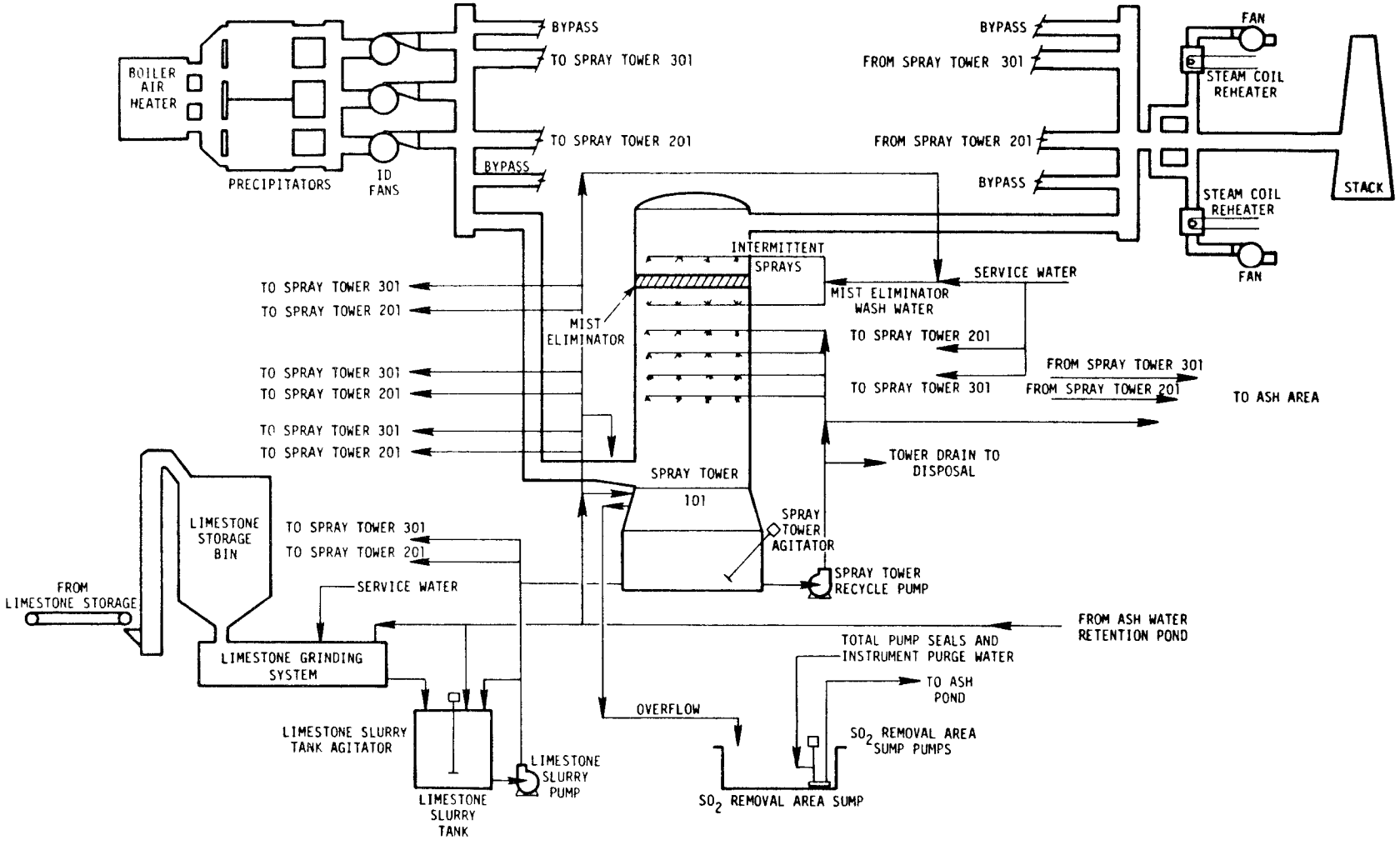
Tennessee Valley Authority, Shawnee 10B Prototype Unit:
General Process Diagram.



Tennessee Valley Authority, Widows Creek 8 FGD System:
Process Flow Diagram for One of the Four Scrubber Trains



Texas Utilities,
Simplified Process Flow Diagram for One of the Three Identical
Martin Lake FGD Systems



Texas Utilities,
Simplified Process Flow Diagram for Monticello 3

TECHNICAL REPORT DATA
(Please read Instructions on the reverse before completing)

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16. ABSTRACT

This report is the first full compilation (not a supplement) since the October-December 1979 report (EPA-600/7-80-029a). Because the next three reports are to be supplements, this issue should be retained for reference throughout the year. The report, which is generated by a computerized data base system, presents a survey of operational and planned domestic utility flue gas desulfurization (FGD) systems, terminated domestic utility FGD systems, operational domestic particle scrubbers, and Japanese coal-fired utility boiler FGD installations. It summarizes information contributed by the utility industry, process suppliers, regulatory agencies, and consulting engineering firms. Domestic FGD systems are tabulated alphabetically by development status (operational, under construction, or in planning stages), utility company, process supplier, process, and waste disposal practice. It presents data on boiler design, FGD system design, fuel characteristics, and actual performance. It includes unit by unit dependability parameters and discusses problems and solutions associated with the boilers and FGD systems. Process flow diagrams and FGD system economic data are appended. Because of its length, Section 3 of this report is published as a separate volume; the remainder of the report is in Volume I (EPA-600/7-81-021a). The report Front Matter and Appendices B, C, and D are repeated here to assist the reader.

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
Pollution	Pollution Control	13B
Flue Gases	Stationary Sources	21B
Desulfurization	Utility Boilers	07A, 07D
Electric Utilities		
Waste Disposal		15E
Boilers		13A
Maintenance		

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