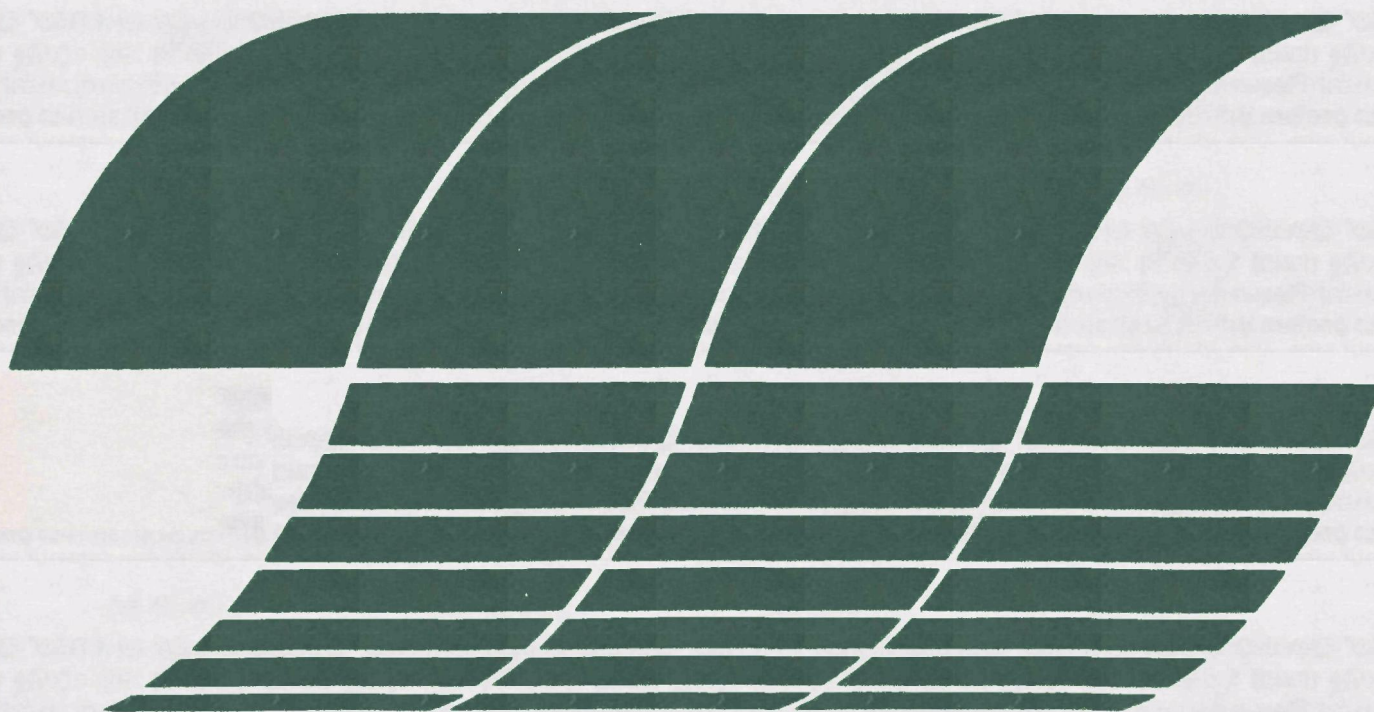




EPA Utility FGD Survey: **January-March 1980**

**Interagency
Energy/Environment
R&D Program Report**



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EPA-600/7-80-029b

May 1980

EPA Utility FGD Survey: January-March 1980

by

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NOTICE

This report (prepared by PEDCo Environmental, Inc., Cincinnati, Ohio under EPA Contract No. 68-01-4147, Task No. 143) 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 succeeding issues can be purchased from National Technical Information Service, Springfield, Virginia 22151.

USE OF THIS REPORT

This report is the first of three supplementary issues to the October-December 1979 report. Supplementary issues are cumulative, so that it is necessary to retain only the latest issue and the October-December 1979 report (EPA-600/7-80-029a).

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 March 1980, future projections (January 1990) of controlled and uncontrolled generating capacity, and unit by unit summaries of status changes and performance during the period.

Recent additions to this report include a section containing design and performance data for U.S. operational particle scrubbers (Section 14) and a section containing design and performance data for coal-fired operational Japanese FGD systems (Section 15). The regulatory classifications were recently modified to accommodate the revised New Source Performance Standards (6/79) and, as a result, the categories will differ slightly from those of previous issues.

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 and a glossary of units.

ABSTRACT

This report is the first of three supplements updating the October - December 1979 report (EPA-600/7-80-029a) and should be used in conjunction with it. 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, 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. 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 states), 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 operational domestic FGD systems show 65 systems in operation, 42 systems under construction, and 74 planned systems. Projected 1990 FGD controlled capacity in the U.S. is 85,671 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 Division of Stationary Source Enforcement 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 1 summarizes the status of FGD systems in the United States at the end of March 1980. Table II lists the units that have changed status during the first quarter 1980, and Table III shows the performance of operating units during this period.

TABLE 1. NUMBER AND TOTAL CAPACITY OF FGD SYSTEMS

Status	No. of units	Total Controlled Capacity, MW*	Equivalent Scrubbed Capacity, MW [†]
Operational	65	23,887	22,100
Under construction	42	19,583	18,454
Planned:			
Contract awarded	23	11,532	10,519
Letter of intent	2	842	842
Requesting/evaluating bids	15	10,255	10,221
Considering only FGD systems	34	19,572	19,432
TOTAL	181	85,671	81,568

* 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).

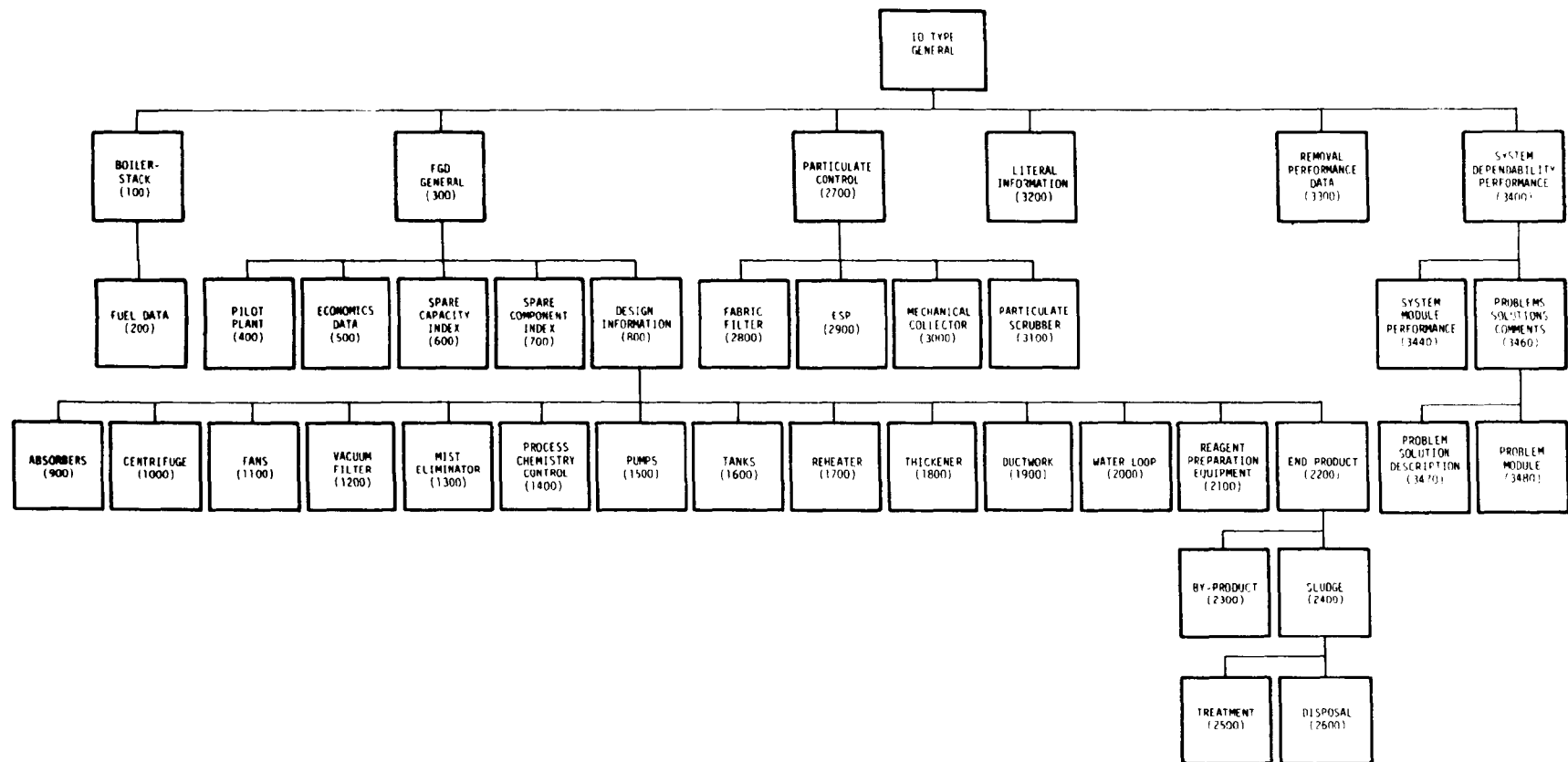


Figure 1. Computerized data base structure diagram.

TABLE II. SUMMARY OF CHANGES
JANUARY - MARCH 1980

FGD status report	Operational		Under construction		Contract awarded		Letter of intent		Requesting/ eval. bids		Considering FGD		Total	
	No.	MW*	No.	MW*	No.	MW*	No.	MW*	No.	MW*	No.	MW*	No.	MW*
12/31/79	62	21,521 ^a	39	16,051	23	11,631 ^a	2	842	15	10,281	35	19,902	176	80,228 ^a
Arizona Electric Power Coop														
Four Corners 1	+1	175	-1	175										
Four Corners 2	+1	175	-1	175										
Four Corners 3	+1	229	-1	229										
Basin Electric Power Coop														
Laramie River 3			+1	600	-1	600								
Cincinnati Gas & Electric														
East Bend 1											+1	650	+1	650
Deseret Generation & Trans. Coop														
Moon Lake 1									+1	410			+1	410
Moon Lake 2									+1	410			+1	410
Grand Haven Brd. of Light & Pwr.														
J.B. Sims 3					+1	81							+1	81
Michigan So. Central Pwr. Agency														
Project 1					+1	55							+1	55
Muscatine Power & Water														
Muscatine 9					+1	160			-1	160				
Nevada Power														
Reid Gardner 4									+1	250	-1	250		
New York State Elec. & Gas														
Somerset 1									+1	870	-1	870		
Philadelphia Electric														
Eddystone 1B			+1	240	-1	240								
Eddystone 2			+1	334	-1	334								
Seminole Electric														
Seminole 1					+1	620			-1	620				
Seminole 2					+1	620			-1	620				
Tennessee Valley Authority														
Johnsonville 1-10					+1	600			-1	600				
Paradise 1			+1	704	-1	704								
Paradise 2			+1	704	-1	704								
Texas Municipal Power Agency														
Gibbons Creek 1			+1	400	-1	400								
United Power Association														
Stanton 2					+1	50							+1	50
Wisconsin Power & Light														
Columbia 2					-1	316							-1	316
TOTAL	65	22,100	42	18,454	23	10,519	2	842	15	10,221	34	19,432	181	81,568

* Equivalent scrubbed capacity.

^a This value was modified slightly due to a MW correction.

TABLE III. PERFORMANCE OF OPERATIONAL UNITS
JANUARY - MARCH 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 through-out period, MW ^a	January 1980 Dependability % ^{c,e}				February 1980 Dependability % ^{c,e}				March 1980 Dependability % ^{c,e}			
						AVL	OPR	REL	UTL	AVL	OPR	REL	UTL	AVL	OPR	REL	UTL
Tombigbee 2	179	70	179	519		90	82		48	99	99		99	100	98		90
Tombigbee 3	179	70	179			100	98		43	100	100		3	100			0
Pleasants 1	519	83															
Apache 2	195	100	195			90	58	89	57	93	97	93	93	99	99	99	99
Apache 3	195	100	195			92	92	92	92	95	74	96	71	91	91	91	91
Cholla 1	119	100	119	350			97		97		100		100		96		96
Cholla 2	350	100															
Four Corners 1	175	100	175														
Four Corners 2	175	100	175														
Four Corners 3	229	100	229														
Green 1	242	100		242													
Duck Creek 1	378	90	378			32	35	38	32	49	49	52	49				
Newton 1	617	100	617			52	46	54	45	53	39	40	39	36	34	37	34
Craig 2	447	100	447														
Conesville 5	411	100	411			27	44	52	15	92	66	81	33	88	82	82	82
Conesville 6	411	100	411			89	76	76	76	90	78	82	72	94	73	73	16
Coal Creek 1	327	60	327				100		96		100		100		100		96
Elrama 1-4	510	100	510			100	100	100	98	100	100	100	92				
Phillips 1-6	410	100	410			73	89	74	72	71	79	71	70				
Petersburg 3	532	100	532														
Hawthorn 3	90	100	90	874	90	100	100		93	100	100		100	100	100		100
Hawthorn 4	90	100				100			0	100			0	100			0
La Cygne 1	874	100															
Jeffrey 1	540	75	540														
Lawrence 4	125	100	125				100		100		100		100		100		100
Lawrence 5	420	100	420		64		100		100		100		52		100		55
Green River 1-3	64	100				100			0	100			0	100			0
Cane Run 4	188	100	188				100		96		100		67		81		74
Cane Run 5	200	100	200				92		72		72		50		45		27
Cane Run 6	299	100	299				49		14		85		47		70		65
Mill Creek 3	442	100	442		72				0		36		27		37		31
Paddy's Run 6	72	100							0				0				0

(continued)

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 through-out period, MW ^a	January 1980 Dependability % ^{c,e}				February 1980 Dependability % ^{c,e}				March 1980 Dependability % ^{c,e}			
						AVL	OPR	REL	UTL	AVL	OPR	REL	UTL	AVL	OPR	REL	UTL
Milton R. Young 2	405	92	405			7	11	11	7	0	0		0	29	29	29	29
Colstrip 1	360	100		360													
Colstrip 2	360	100		360													
Reid Gardner 1	125	100	125			100	100	100	100	100	100	100	100	66	84	85	34
Reid Gardner 2	125	100	125			97	97	97	82	97	97	97	97	98	98	98	98
Reid Gardner 3	125	100	125			100	100	100	91	78	98	78	78	60	100	100	60
Dean H. Mitchell 11	115	100		115													
Sherburne 1	740	100	740			97				97				98			
Sherburne 2	740	100	740			97				96				98			
Jim Bridger 4	550	100	550														
Bruce Mansfield 1	917	100	917			98	100		90	98	100		94	98	100		84
Bruce Mansfield 2	917	100	917			97	100		91	94	100		100	98	100		84
Eddystone 1A	120	N/A ^d			120												
San Juan 1	361	100	361			87	57		47	67	65		59	93	73		26
San Juan 2	350	100	350			31	21		21	40	23		26	57	31		20
San Juan 3	534	100	534														
Coronado 1	280	80	280														
Winyah 2	140	50	140														
R.D. Morrow 1	124	62	124			0		0	0								
R.D. Morrow 2	124	62	124			0		0	0								
Marion 4	184	100	184				100		10		100		31		100		48
A.B. Brown 1	265	100	265			99	98	98	98	99	70	70	69	45	65	68	27
Southwest 1	194	100	194			61	56	62	52	55	50	50	50	43	35	35	35
G. F. Weaton 1	60	N/A ^d	60														
Shawnee 10A	10	N/A ^d	10														
Shawnee 10B	10	N/A ^d	10														
Widows Creek 8	550	100	550			70	90		45	85	94		77	87	79		77
Martin Lake 1	595	75	595														
Martin Lake 2	595	75	595														

(continued)

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 through-out period, MW ^a	January 1980 Dependability % ^{c,e}				February 1980 Dependability % ^{c,e}				March 1980 Dependability % ^{c,e}			
						AVL	OPR	REL	UTL	AVL	OPR	REL	UTL	AVL	OPR	REL	UTL
Martin Lake 3	595	75	595														
Monticello 3	800	100	800														
Hunter 1	360	90		360													
Huntington 1	366	85		366													
TOTAL			18,208	3,546	346												

^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 SO₂ emission standard.

^e Availability, operability, reliability, and utilization as defined in Appendix C of this report.

As indicated in Table 1, 65 power generating units (all coal-fired) are now equipped with operating FGD systems. These units represent a total controlled capacity of 23,887 MW. Current projections indicate that the total power generating capacity of the U.S. electric utility industry will be approximately 931 GW by 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 382 GW or 41 percent of the 1990 total will come from coal-fired units. The distribution of power generation sources, both present (April 1979) and future (January 1990) is as follows:^a

	Coal	Nuclear	Oil	Hydro	Gas	Other	GW (total)
April 1979	39%	9%	26%	12%	13%	1%	588
January 1990	41%	22%	18%	10%	8%	1%	931

Based on the known commitments to FGD by utilities as presented in Table 1, the percentage of electrical generating capacity controlled by FGD for both the present (March 1980) and the future (January 1990) is as follows:

	% of coal-fired generating capacity	% of total generating capacity
March 1980*	10.4	4.1
January 1990	22.4	9.2

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 55 to 60 systems representing approximately 36,000 to 41,000 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 (March 1980) and a projected (January 1990) breakdown of throwaway product systems versus saleable product systems as a percent of the total known commitments to FGD as of the end of the first quarter 1980:

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

	Throwaway product process % of total			Saleable product process % of total				Process undecided % of total	Total
	Lime	Limestone	Other	Sulfur	H ₂ SO ₄	Gypsum	N/A*		
March 1980	28.1	39.4	25.5	4.0	3.0				100
January 1990	16.4	36.4	20.5	1.1	2.4	0.2	3.0	20.0	100

* N/A - not available (these systems will utilize a saleable product process but the byproduct is unknown at this time).

HIGHLIGHTS: JANUARY - MARCH 1980

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

Tombigbee 2 of Alabama Electric Cooperative achieved availabilities of 90%, 99%, and 100% for the months of January, February, and March, respectively. The FGD system was unavailable only 69 hours in January due to a ruptured waste slurry line and an abraded expansion joint. No major FGD related problems were reported for February or March. The Tombigbee 3 FGD system had availabilities of 100% for both January and February; however, the Unit 3 boiler only operated for 24 hours in February. Unit 3 did not operate at all during March.

Arizona Electric Power Cooperative reported availabilities of 90%, 92%, and 99% for the Apache 2 FGD system during January, February, and March, respectively. The Apache 3 availabilities were 91%, 95%, and 91% for the same period. Most of the FGD system outage time reported was due to the malfunction of pumps.

The Cholla 1 FGD system of Arizona Public Service had operabilities of 97%, 100%, and 96% for the months of January, February, and March, respectively. No major FGD related problems were reported for the three month period although some outage time was required for repair of reheater ductwork.

Arizona Public Service announced during the period that modifications to the particle scrubbers at the Four Corners 1, 2, and 3 units were completed and the systems have begun operation in an SO₂ removal mode. Initially, the two Chemico venturi scrubbers designed for primary particle control at each unit were also removing approximately 30% of the SO₂ due to the alkalinity of the fly ash. These systems were modified to accommodate additional SO₂ removal (67.5%) by converting the scrubbers to lime/alkaline fly ash systems. Actual conversion of each system was completed in November 1979.

Basin Electric Power Coop announced that construction of the Laramie River 3 FGD system began during February 1980. Particle and SO₂ emissions at this 600 MW (gross) unit will be controlled by four lime/spray drying towers followed by a common ESP. The system is designed to remove 85 percent of the SO₂ before the flue gas exits through a 600 foot acid brick lined stack. Initial start up of the system is expected in July 1981.

Cincinnati Gas and Electric announced plans during the period for the installation of a second 650 MW (gross) generator at the East Bend power plant. The boiler will be identified as Unit 1 and will be required to meet an SO₂ emission standard of 0.84 lb/MMBtu. Currently, the utility is considering only FGD as a means of controlling the SO₂ emissions. The process type has not been selected and the projected start-up date of the unit has not been finalized.

No major FGD related problems were encountered during the first quarter, 1980 with the Conesville 6 FGD system of Columbus and Southern Ohio Electric. As a result, the unit had availabilities of 89%, 90%, and 94% for January, February, and March, respectively. The system utilization was only 16% in March due to an annual boiler/turbine inspection that began on March 9.

Cooperative Power Association reported FGD system utilization parameters of 96%, 100%, and 96% for January, February, and March, respectively. Some minor FGD outage time was reportedly caused by nozzle plugging and cracking which resulted in the unit operating at a reduced load for a short time in January. No major FGD related problems were reported for February or March.

Deseret Generation and Transmission Coop announced plans during the period for two new 410 MW (gross) units to be located in Vernal, Utah. The units will be designated as Moon Lake 1 and 2, and will burn coal with an average sulfur content of 0.5%. Currently, the utility is requesting/evaluating bids for limestone FGD systems to control SO₂ emissions from these two units. Baghouses will be used for primary particle removal. The FGD systems will operate in a closed water loop and the sludge generated will be disposed of in an on-site landfill. The expected start up of Unit 1 is December 1984. The start up date of Unit 2 is not finalized but is expected between 1987 and 1989.

Grand Haven Board of Light and Power announced that a contract has been awarded to Babcock and Wilcox for the installation of a lime FGD system at the new 81 MW (gross) J.B. Sims 3 unit. The boiler, which will be located in Grand Haven, Michigan, will fire coal with an average sulfur content of 2.75%. The FGD system will include two 100% capacity spray towers preceded by a cold side ESP for primary particle removal. Each spray tower will be

equipped with a chevron mist eliminator and an in-line hot water reheater to boost the temperature of the flue gas before it exits through a 360 foot stack. Initial start up of this unit is expected in June 1983.

Michigan South Central Power Agency reported during the period that a contract has been awarded to Babcock and Wilcox for a limestone wet scrubbing system to control SO₂ emissions from the new Project 1 unit. The 55 MW (gross) boiler, which will be located in Litchfield, Michigan, will burn coal with an average sulfur content of 2.25%. The SO₂ removal equipment will consist of a spray tower system preceded by a hot side ESP for primary particle removal. Initial start up of the system is expected in July 1982.

A contract was awarded during the first quarter, 1980, to Research Cottrell by Muscatine Power and Water for the installation of a limestone FGD system at the new 166 MW (gross) Muscatine 9 unit. The Combustion Engineering boiler will burn coal with an average sulfur content of 3.17%. The FGD system will consist of three double loop combination towers, each with a spray tower lower stage and a "wetted film contactor" grid type upper stage (Research Cottrell design). Upstream of the FGD system will be a cold side ESP for primary particle removal. The system will operate in a closed water loop and the sludge will be disposed of in a landfill. The expected start up date is September 1982.

Nevada Power reported that the Reid Gardner 2 FGD system had an availability of 98% for all three months of the first quarter, 1980. Minor outages were reportedly caused by problems with the emergency spray system and the malfunctioning of ID fan controls.

Nevada Power began requesting/evaluating bids during the period for a system to control SO₂ emissions from the new unit scheduled for installation at the Reid Gardner station. The boiler will be identified as Unit 4 and will burn coal with an average sulfur content of 0.75%. Construction of the unit is expected to begin sometime in 1980 and initial start up is scheduled for April 1983.

New York State Electric and Gas began requesting/evaluating bids in February, 1980 for a limestone FGD system to be installed at the new 870 MW (gross) Somerset 1 unit. The boiler will fire a bituminous coal with an average sulfur content of 2.4%. The limestone absorber will be designed for a 90% SO₂ removal efficiency and will be preceded by a cold side ESP for particle removal. The sludge generated will be dewatered and stabilized before being landfilled. Expected start up of the system is June 1984.

At Sherburne 1 of Northern States Power the FGD system had availabilities of 97%, 97%, and 98% for the months of January, February, and March, respectively. The Sherburne 2 FGD system had availabilities of 97%, 96%, and 98% for the same period. No major FGD related problems were reported for either unit during the first quarter and both boilers achieved the highest gross generation to date in January.

Pennsylvania Power reported that the Bruce Mansfield 1 FGD system had availabilities of 98% for all three months of the first quarter, 1980. The Bruce Mansfield 2 availabilities were 97%, 94%, and 98% for January, February, and March, respectively. No FGD related problems were reported for the three month period.

Philadelphia Electric announced during the period that construction has begun on the new magnesium oxide FGD system that is being installed at the Eddystone 1 unit. Operation of the prototype magnesium oxide system which treated one-third of the flue gas from the coal fired boiler has been terminated. The SO₂ removal equipment is being replaced with a similar magnesium oxide system designed to treat 100% of the boiler flue gas. The expected start up of the new system is December 1982. Current regulations do not require the utility to control SO₂ emissions from the Unit 1 boiler until the new FGD system is available for operation.

Construction is also underway on the FGD system being installed to control SO₂ emissions from the 334 MW (gross) Eddystone 2 boiler. This system will also be magnesium oxide and is being supplied by United Engineers. Expected start up is scheduled for December 1982.

Seminole Electric announced that contracts were awarded during February, 1980 to Peabody Process Systems for the installation of limestone FGD systems on the two new 620 MW (gross) Seminole 1 and Seminole 2 units located in Palatka, Florida. Each unit will be a pulverized coal boiler firing coal with an average sulfur content of 2.75%. Each FGD system will consist of five spray towers preceded by two ESP's for primary particle removal. One of the five modules for each system will be a spare. The expected start up dates for Units 1 and 2 are June 1983, and June 1985, respectively.

Tennessee Valley Authority announced that a contract has been awarded to Riley Stoker/Enviroengineering for the installation of a magnesium oxide FGD system at the 1450 MW (gross) Johnsonville power station located in New Johnsonville, Tennessee. The system will consist of four venturi scrubber/absorber trains (one spare) and sulfuric acid will be produced as a byproduct. The equivalent of 600 MW of flue gas will be treated by the FGD system, with the remaining 60% of the gas being bypassed for reheat. Expected start up of this system is December 1981.

Tennessee Valley Authority also announced during the period that construction has begun on the FGD systems being installed on the Paradise 1 and 2 boilers. Each FGD system will consist of six trains, each train consisting of two venturis in series, the first for primary particle control and the second for primary SO₂ removal. Inlet flue gas will be used to heat water, which in turn will be used to reheat the outlet flue gas. The systems are being supplied by Chemico and are expected to start up in March 1982, and June 1982, for Units 1 and 2, respectively.

Texas Municipal Power Agency announced that construction began during the first quarter, 1980 on the FGD system being stalled at the Gibbons Creek station. The system is being installed on Unit 1, a new 400 MW (gross) boiler that will fire lignite with an average sulfur content of 1.06%. The emission control system will consist of a cold side ESP followed by three 50% capacity limestone spray towers. Also included will be a chevron mist eliminator and a steam coil reheat system downstream of each spray tower. The unit is expected to begin operation in January 1982.

United Power Association announced during the period that a contract has been awarded to Komline and Sanderson for the installation of a lime/spray drying FGD system at the new Stanton 2 unit. The boiler, which will be located in Stanton, North Dakota, will fire lignite with an average sulfur content of 0.77%. The FGD system will consist of a spray dryer tower followed by a fabric filter for the removal of the spent reagent and particulate matter. The cleaned flue gas will exit to the atmosphere through a 254 foot concrete stack. Expected start up of this unit is January 1982.

Wisconsin Power and Light announced that plans for the installation of an FGD system at the Columbia 2 unit have been dropped. The utility will be utilizing a low sulfur coal at this unit in order to comply with the applicable SO₂ emission standard.

REFERENCE

- a. U.S. Department of Energy. Energy Information Administration. Office of Energy Data Interpretation. Division of Coal Power Statistics. Inventory of Power Plants in the United States, April 1979. Pub. No. DOE/EIA-0095.
- b. Rittenhouse, R.C. New Generating Capacity: When, Where, and By Whom. Power Engineering 82(4):57. April 1978.

EPA UTILITY FGD SURVEY: JULY - SEPTEMBER 1980

SECTION 1
SUMMARY LIST OF FGD SYSTEMS

COMPANY NAME/ UNIT NAME	UNIT NO.	UNIT LOCATION		START-UP DATE	STATUS	REG CLASS
ALABAMA ELECTRIC COOP						
TOMBIGBEE	2	LEROY	ALABAMA	9/78	1	B
TOMBIGBEE	3	LEROY	ALABAMA	6/79	1	B
ARIZONA ELECTRIC POWER COOP						
APACHE	2	COCHISE	ARIZONA	8/78	1	D
APACHE	3	COCHISE	ARIZONA	6/79	1	D
ARIZONA PUBLIC SERVICE						
CHOLLA	1	JOSEPH CITY	ARIZONA	10/73	1	C
CHOLLA	2	JOSEPH CITY	ARIZONA	4/78	1	C
CHOLLA	4	JOSEPH CITY	ARIZONA	6/81	2	C
FOUR CORNERS	1	FARMINGTON	NEW MEXICO	11/79	1	C
FOUR CORNERS	2	FARMINGTON	NEW MEXICO	11/79	1	C
FOUR CORNERS	3	FARMINGTON	NEW MEXICO	11/79	1	C
FOUR CORNERS	4	FARMINGTON	NEW MEXICO	0/82	3	C
FOUR CORNERS	5	FARMINGTON	NEW MEXICO	0/82	3	C
ASSOCIATED ELECTRIC COOP						
THOMAS HILL	3	MOBERLY	MISSOURI	1/82	2	A
ATLANTIC CITY ELECTRIC						
CUMBERLAND	1	MILLVILLE	NEW JERSEY	1/88	6	C
BASIN ELECTRIC POWER COOP						
ANTELOPE VALLEY	1	BEULAH	NORTH DAKOTA	4/83	2	D
ANTELOPE VALLEY	2	BEULAH	NORTH DAKOTA	10/85	5	C
LARAMIE RIVER	1	WHEATLAND	WYOMING	7/80	1	C
LARAMIE RIVER	2	WHEATLAND	WYOMING	6/81	2	C
LARAMIE RIVER	3	WHEATLAND	WYOMING	4/82	2	C
BIG RIVERS ELECTRIC						
D.B. WILSON	1			7/84	3	A
D.B. WILSON	2			1/86	3	A
GREEN	1	SEBREE	KENTUCKY	12/79	1	B
GREEN	2	SEBREE	KENTUCKY	11/80	2	B
CAJUN ELECTRIC POWER COOP						
BIG CAJUN III	1	DE SOTO PARISH	LOUISIANA	0/85	6	A
CENTRAL ILLINOIS LIGHT						
DUCK CREEK	1	CANTON	ILLINOIS	7/76	1	B
DUCK CREEK	2	CANTON	ILLINOIS	1/86	5	A
CENTRAL ILLINOIS PUBLIC SERV						
NEWTON	1	NEWTON	ILLINOIS	9/79	1	B
CENTRAL ILLINOIS PUBLIC SERVIC						
NEWTON	2	NEWTON	ILLINOIS	12/82	7	A
CENTRAL MAINE POWER						
SEARS ISLAND	1	PENOBSCOT BAY	MAINE	1/89	6	A
CENTRAL POWER & LIGHT						
COLETO CREEK	2	FANNIN	TEXAS	9/86	6	A
CINCINNATI GAS & ELECTRIC						
EAST BEND	1	RABBITHASH	KENTUCKY	10/87	6	
EAST BEND	2	RABBITHASH	KENTUCKY	12/80	2	B

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| | 7. PLANNED - CONSIDERING FGD SYSTEMS; ALSO ALTERNATIVE METHODS |

- A. FEDERAL NSPS(6/79)
 B. FEDERAL NSPS(12/71)
 C. STANDARD(S) MORE STRINGENT THAN NSPS(6/79)
 D. STANDARD(S) MORE STRINGENT THAN NSPS(12/71) BUT NOT MORE STRINGENT THAN NSPS(6/79)
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COMPANY NAME/ UNIT NAME	UNIT NO.	UNIT LOCATION		START-UP DATE	STATUS	REG CLASS
COLUMBUS & SOUTHERN OHIO ELEC.						
POSTON	5	NELSONVILLE	OHIO	8/86	6	D
POSTON	6	NELSONVILLE	OHIO	0/89	6	D
COMMONWEALTH EDISON						
POWERTON	51	PERKIN	ILLINOIS	4/80	2	E
COOPERATIVE POWER ASSOCIATION						
COAL CREEK	1	UNDERWOOD	NORTH DAKOTA	8/79	1	B
COAL CREEK	2	UNDERWOOD	NORTH DAKOTA	7/80	2	B
DELMARVA POWER & LIGHT						
DELAWARE CITY	1-3	DELAWARE CITY	DELAWARE	4/80	2	E
VIENNA	9	VIENNA	MARYLAND	6/87	6	A
DESERET GENERATION & TRANS COO						
MOON LAKE	1	VERNAL	UTAH	12/84	5	A
MOON LAKE	2	VERNAL	UTAH	0/88	5	A
DUQUESNE LIGHT						
ELRAMA	1-4	ELRAMA	PENNSYLVANIA	10/75	1	D
PHILLIPS	1-6	SOUTH HEIGHT	PENNSYLVANIA	7/73	1	D
EAST KENTUCKY POWER COOP						
J. K. SMITH	1			1/85	6	A
J. K. SMITH	2			1/87	6	A
SPURLOCK	2	MAYSVILLE	KENTUCKY	1/81	2	B
GENERAL PUBLIC UTILITIES						
COHO	1	GIRARD TWP.	PENNSYLVANIA	12/88	6	A
GILBERT	1	MILFORD	NEW JERSEY	0/90	6	A
SCOTTSVILLE	1	SCOTTSVILLE	PENNSYLVANIA	0/91	6	A
SEWARD	7	E. WHEATFIELD	PENNSYLVANIA	5/87	6	A
WEHRUM	1	WEHRUM	PENNSYLVANIA	0/95	6	A
GRAND HAVEN BRD OF LIGHT & PWR						
J. B. SIMS	3	GRAND HAVEN	MICHIGAN	6/83	3	A
HOOSIER ENERGY						
MEROM	1	SULLIVAN	INDIANA	5/82	3	B
MEROM	2	SULLIVAN	INDIANA	7/81	2	B
HOUSTON LIGHTING & POWER CO.						
W.A. PARISH	8	BOOTH	TEXAS	11/82	3	A
INDIANAPOLIS POWER & LIGHT						
PATRIOT	1	PATRIOT	INDIANA	0/87	6	C
PATRIOT	2	PATRIOT	INDIANA	0/87	6	C
PATRIOT	3	PATRIOT	INDIANA	0/87	6	C
PETERSBURG	3	PETERSBURG	INDIANA	12/77	1	B
PETERSBURG	4	PETERSBURG	INDIANA	10/84	2	B
KANSAS CITY POWER & LIGHT						
HAWTHORN	3	KANSAS CITY	MISSOURI	11/72	1	D
HAWTHORN	4	KANSAS CITY	MISSOURI	8/72	1	D
LA CYGNE	1	LA CYGNE	KANSAS	2/73	1	E
KANSAS POWER & LIGHT						
JEFFREY	1	WAMEGO	KANSAS	8/78	1	D
JEFFREY	2	WAMEGO	KANSAS	4/80	2	D
LAWRENCE	4	LAWRENCE	KANSAS	1/76	1	D

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KANSAS POWER & LIGHT LAWRENCE	5	LAWRENCE KANSAS	11/71	1	D
KENTUCKY UTILITIES GREEN RIVER	1-3	CENTRAL CITY KENTUCKY	9/75	1	E
LAKELAND UTILITIES MCINTOSH	3	LAKELAND FLORIDA	10/81	2	A
LOUISVILLE GAS & ELECTRIC					
CANE RUN	4	LOUISVILLE KENTUCKY	8/76	1	D
CANE RUN	5	LOUISVILLE KENTUCKY	12/77	1	D
CANE RUN	6	LOUISVILLE KENTUCKY	4/79	1	D
MILL CREEK	1	LOUISVILLE KENTUCKY	4/81	2	E
MILL CREEK	2	LOUISVILLE KENTUCKY	4/82	2	E
MILL CREEK	3	LOUISVILLE KENTUCKY	8/78	1	D
MILL CREEK	4	LOUISVILLE KENTUCKY	7/81	2	B
PADDY'S RUN	6	LOUISVILLE KENTUCKY	4/73	1	E
TRIMBLE COUNTY	1	BEDFORD KENTUCKY	7/84	6	A
TRIMBLE COUNTY	2	BEDFORD KENTUCKY	7/86	6	A
MICHIGAN SO. CENTRAL PWR AGENC PROJECT	1	LITCHFIELD MICHIGAN	7/82	3	
MIDDLE SOUTH UTILITIES					
ARKANSAS COAL	5	ARKANSAS	1/86	5	A
ARKANSAS COAL	6	ARKANSAS	1/89	5	A
LOUISIANA COAL	1	LOUISIANA	0/86	5	A
LOUISIANA COAL	2	LOUISIANA	0/88	5	A
MISSISSIPPI COAL	1	MISSISSIPPI	0/85	5	A
MISSISSIPPI COAL	2	MISSISSIPPI	0/87	5	A
MINNESOTA POWER & LIGHT CLAY BOSWELL	4	COHASSET MINNESOTA	4/80	2	B
MINNKOTA POWER COOPERATIVE MILTON R. YOUNG	2	CENTER NORTH DAKOTA	9/77	1	D
MONTANA POWER					
COLSTRIP	1	COLSTRIP MONTANA	9/75	1	B
COLSTRIP	2	COLSTRIP MONTANA	5/76	1	B
COLSTRIP	3	COLSTRIP MONTANA	1/84	2	C
COLSTRIP	4	COLSTRIP MONTANA	0/84	2	C
MUSCATINE POWER & WATER MUSCATINE	9	MUSCATINE IOWA	9/82	3	B
NEVADA POWER					
HARRY ALLEN	1	N.F. LAS VEGAS NEVADA	6/86	6	A
HARRY ALLEN	2	N.F. LAS VEGAS NEVADA	6/87	6	A
HARRY ALLEN	3	N.F. LAS VEGAS NEVADA	6/88	6	A
HARRY ALLEN	4	N.F. LAS VEGAS NEVADA	6/89	6	A
REID GARDNER	1	MOAPA NEVADA	4/74	1	B
REID GARDNER	2	MOAPA NEVADA	4/74	1	B
REID GARDNER	3	MOAPA NEVADA	6/76	1	B
REID GARDNER	4	MOAPA NEVADA	4/83	5	A
WARNER VALLEY	1	ST. GEORGE UTAH	6/85	6	A
WARNER VALLEY	2	ST. GEORGE UTAH	6/86	6	A

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NEW YORK STATE ELEC & GAS SOMERSET	1	SOMERSET	NEW YORK	6/84	5	E
NIAGARA MOHAWK POWER COOP CHARLES R. HUNTLEY	66	BUFFALO	NEW YORK	4/82	2	E
NORTHERN INDIANA PUB SERVICE DEAN H. MITCHELL	11	GARY	INDIANA	7/76	1	E
SCHAFER	17	WHEATFIELD	INDIANA	6/83	4	A
SCHAFER	18	WHEATFIELD	INDIANA	6/85	4	A
NORTHERN STATES POWER RIVERSIDE	6,7	MINNEAPOLIS	MINNESOTA	7/80	2	E
SHERBURNE	1	BECKER	MINNESOTA	3/76	1	D
SHERBURNE	2	BECKER	MINNESOTA	4/77	1	D
SHERBURNE	3	BECKER	MINNESOTA	5/84	5	C
OTTER TAIL POWER COYOTE	1	BEULAH	NORTH DAKOTA	3/81	2	E
PACIFIC GAS & ELECTRIC MONTEZUMA	1	COLLINSVILLE	CALIFORNIA	6/87	6	C
MONTEZUMA	2	COLLINSVILLE	CALIFORNIA	6/88	6	C
PACIFIC POWER & LIGHT JIM BRIDGER	4	ROCK SPRINGS	WYOMING	9/79	1	D
PENNSYLVANIA POWER BRUCE MANSFIELD	1	SHIPPINGPORT	PENNSYLVANIA	12/75	1	D
BRUCE MANSFIELD	2	SHIPPINGPORT	PENNSYLVANIA	7/77	1	D
BRUCE MANSFIELD	3	SHIPPINGPORT	PENNSYLVANIA	10/80	2	D
PHILADELPHIA ELECTRIC CROMBY		PHOENIXVILLE	PENNSYLVANIA	12/82	3	D
EDDYSTONE	1A	EDDYSTONE	PENNSYLVANIA	9/75	1	D
EDDYSTONE	1B	EDDYSTONE	PENNSYLVANIA	12/82	2	D
EDDYSTONE	2	EDDYSTONE	PENNSYLVANIA	12/82	2	D
POTOMAC ELECTRIC POWER DICKERSON	4	DICKERSON	MARYLAND	5/87	6	A
PUBLIC SERVICE INDIANA GIBSON	5	PRINCETON	INDIANA	0/82	3	B
PUBLIC SERVICE OF NEW MEXICO SAN JUAN	1	WATERFLOW	NEW MEXICO	4/78	1	C
SAN JUAN	2	WATERFLOW	NEW MEXICO	8/78	1	C
SAN JUAN	3	WATERFLOW	NEW MEXICO	12/79	1	C
SAN JUAN	4	WATERFLOW	NEW MEXICO	6/82	2	C
PWR AUTHORITY OF STATE OF NY FOSSIL		NEW YORK	NEW YORK	11/87	6	C
SALT RIVER PROJECT CORONADO	1	ST. JOHNS	ARIZONA	11/79	1	D
CORONADO	2	ST. JOHNS	ARIZONA	7/80	2	D
CORONADO	3	ST. JOHNS	ARIZONA	6/87	6	A
SAN MIGUEL ELECTRIC COOP SAN MIGUEL	1	SAN MIGUEL	TEXAS	9/80	2	B

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SEMINOLE ELECTRIC						
SEMINOLE	1	PALATKA	FLORIDA	3/83	3	A
SEMINOLE	2	PALATKA	FLORIDA	3/85	3	A
SIKESTON BOARD OF MUNIC. UTIL.						
SIKESTON	1	SIKESTON	MISSOURI	1/81	2	B
SOUTH CAROLINA PUBLIC SERVICE						
WINYAH	2	GEORGETOWN	SOUTH CAROLINA	7/77	1	B
WINYAH	3	GEORGETOWN	SOUTH CAROLINA	5/80	2	B
WINYAH	4	GEORGETOWN	SOUTH CAROLINA	7/81	3	A
SOUTH MISSISSIPPI ELEC PWR						
R.D. MORROW	1	HATTISBURG	MISSISSIPPI	8/78	1	B
R.D. MORROW	2	HATTISBURG	MISSISSIPPI	6/79	1	B
SOUTHERN ILLINOIS POWER COOP						
MARION	4	MARION	ILLINOIS	5/79	1	B
MARION	5	MARION	ILLINOIS	0/86	6	A
SOUTHERN INDIANA GAS & ELEC						
A.B. BROWN	1	WEST FRANKLIN	INDIANA	4/79	1	B
SOUTHWESTERN ELECTRIC POWER						
HENRY W. PIRKEY	1	HALLSVILLE	TEXAS	12/84	3	B
SPRINGFIELD CITY UTILITIES						
SOUTHWEST	1	SPRINGFIELD	MISSOURI	4/77	1	B
SPRINGFIELD WATER, LIGHT & PWR						
DALLMAN	3	SPRINGFIELD	ILLINOIS	11/80	2	B
ST. JOE ZINC						
G.F. WEATON	1	MONACA	PENNSYLVANIA	11/79	1	B
TAMPA ELECTRIC						
BIG BEND	4	TAMPA	FLORIDA	3/85	5	A
TENNESSEE VALLEY AUTHORITY						
JOHNSONVILLE	1-10	NEW JOHNSONVILLE	TENNESSEE	12/81	3	E
PARADISE	1	PARADISE	KENTUCKY	3/82	2	E
PARADISE	2	PARADISE	KENTUCKY	6/82	2	E
SHAWNEE	10A	PADUCAH	KENTUCKY	4/72	1	E
SHAWNEE	10B	PADUCAH	KENTUCKY	4/72	1	E
WIDOWS CREEK	7	BRIDGEPORT	ALABAMA	9/81	2	E
WIDOWS CREEK	8	BRIDGEPORT	ALABAMA	5/77	1	E
TEXAS MUNICIPAL POWER AGENCY						
GIBBONS CREEK	1	CARLOS	TEXAS	1/82	2	A
TEXAS POWER & LIGHT						
SANDOW	4	ROCKDALE	TEXAS	7/80	2	B
TWIN OAKS	1	BREMOND	TEXAS	8/84	3	A
TWIN OAKS	2	BREMOND	TEXAS	8/85	3	A
TEXAS UTILITIES						
FOREST GROVE	1	ATHENS	TEXAS	0/81	5	A
MARTIN LAKE	1	TATUM	TEXAS	4/77	1	B
MARTIN LAKE	2	TATUM	TEXAS	5/78	1	B
MARTIN LAKE	3	TATUM	TEXAS	2/79	1	B
MARTIN LAKE	4	TATUM	TEXAS	0/85	3	A
1. OPERATIONAL UNITS	4.	PLANNED - LETTER OF INTENT SIGNED				
2. UNITS UNDER CONSTRUCTION	5.	PLANNED - REQUESTING/EVALUATING BIDS				
3. PLANNED - CONTRACT AWARDED	6.	PLANNED - CONSIDERING ONLY FGD SYSTEMS				
	7.	PLANNED - CONSIDERING FGD SYSTEMS; ALSO ALTERNATIVE METHODS				
A. FEDERAL NSPS(6/79)						
B. FEDERAL NSPS(12/71)						
C. STANDARD(S) MORE STRINGENT THAN NSPS(6/79)						
D. STANDARD(S) MORE STRINGENT THAN NSPS(12/71) BUT NOT MORE STRINGENT THAN NSPS(6/79)						
E. STANDARD(S) EQUAL TO OR LESS STRINGENT THAN NSPS(12/71)						

SECTION 1
SUMMARY LIST OF FGD SYSTEMS

COMPANY NAME/ UNIT NAME	UNIT NO.	UNIT LOCATION	START-UP DATE	STATUS	REG CLASS
TEXAS UTILITIES					
MILL CREEK	1	HENDERSON TEXAS	0/85	6	A
MILL CREEK	2	HENDERSON TEXAS	0/86	6	A
MONTICELLO	3	MT. PLEASANT TEXAS	5/78	1	B
TUCSON ELECTRIC POWER					
SPRINGERVILLE	1	SPRINGERVILLE ARIZONA	6/85	3	B
SPRINGERVILLE	2	SPRINGERVILLE ARIZONA	1/87	3	B
UNITED POWER ASSOCIATION					
STANTON	2	STANTON NORTH DAKOTA	1/82	3	A
UTAH POWER & LIGHT					
HUNTER	1	CASTLE DALE UTAH	5/79	1	B
HUNTER	2	CASTLE DALE UTAH	6/80	2	B
HUNTER	3	CASTLE DALE UTAH	0/83	3	A
HUNTER	4	CASTLE DALE UTAH	0/85	3	A
HUNTINGTON	1	PRICE UTAH	5/78	1	B

- | | |
|---|--|
| 1. OPERATIONAL UNITS | 4. PLANNED - LETTER OF INTENT SIGNED |
| 2. UNITS UNDER CONSTRUCTION | 5. PLANNED - REQUESTING/EVALUATING BIDS |
| 3. PLANNED - CONTRACT AWARDED | 6. PLANNED - CONSIDERING ONLY FGD SYSTEMS |
| | 7. PLANNED - CONSIDERING FGD SYSTEMS; ALSO ALTERNATIVE METHODS |
| A. FEDERAL NSPS(6/79) | |
| B. FEDERAL NSPS(12/71) | |
| C. STANDARD(S) MORE STRINGENT THAN NSPS(6/79) | |
| D. STANDARD(S) MORE STRINGENT THAN NSPS(12/71) BUT NOT MORE STRINGENT THAN NSPS(6/79) | |
| E. STANDARD(S) EQUAL TO OR LESS STRINGENT THAN NSPS(12/71) | |

SECTION 2
STATUS OF FGD SYSTEMS

UNIT IDENTIFICATION	ABSTRACT
ALABAMA ELECTRIC COOP TOMBIGBEE 2 NEW 255.0 MW (GROSS) 179.0 MW (ESC) COAL 1.15 XS BITUMINOUS LIMESTONE PEABODY PROCESS SYSTEMS ENERGY CONSUMPTION: 3.1% STATUS 1 STARTUP 9/78	TOMBIGBEE 2 OF ALABAMA ELECTRIC COOP IS A PULVERIZED COAL BOILER LOCATED IN LEROY, ALABAMA. THE BOILER GENERATES A MAXIMUM FLUE GAS FLOW OF 953,000 ACFM AND BURNS BITUMINOUS COAL WITH AN AVERAGE SULFUR CONTENT OF 1.2% AND AN AVERAGE HEAT CONTENT OF 11,500 BTU/LB. THE UNIT SO ₂ EMISSION LIMITATION VALUE IS 1.2 LB/MMBTU. PRIMARY PARTICULATE MATTER CONTROL IS PROVIDED BY A HOT SIDE ESP. THE SO ₂ REMOVAL EQUIPMENT CONSISTS OF TWO SPRAY TOWERS SUPPLIED BY PEABODY PROCESS SYSTEMS WHICH UTILIZE A LIMESTONE REAGENT. A CHEVRON MIST ELIMINATOR IS INCLUDED FOR EACH TOWER AND THE FLUE GAS IS REHEATED WITH BYPASSED GAS BEFORE BEING VENTED TO A 400 FOOT ACID-BRICK LINED STACK. THE SYSTEM OPERATES IN AN OPEN WATER LOOP MODE AND SPENT ABSORBENT IS DISPOSED OF IN AN ON-SITE LINED POND.
ALABAMA ELECTRIC COOP TOMBIGBEE 3 NEW 255.0 MW (GROSS) 179.0 MW (ESC) COAL 1.15 XS BITUMINOUS LIMESTONE PEABODY PROCESS SYSTEMS ENERGY CONSUMPTION: 3.1% STATUS 1 STARTUP 6/79	TOMBIGBEE 3 OF ALABAMA ELECTRIC COOP IS A PULVERIZED COAL BOILER LOCATED IN LEROY, ALABAMA. THE BOILER GENERATES A MAXIMUM FLUE GAS FLOW OF 953,000 ACFM AND BURNS BITUMINOUS COAL WITH AN AVERAGE SULFUR CONTENT OF 1.2% AND AN AVERAGE HEAT CONTENT OF 11,500 BTU/LB. THE UNIT SO ₂ EMISSION LIMITATION VALUE IS 1.2 LB/MMBTU. PRIMARY PARTICULATE CONTROL IS PROVIDED BY A HOT SIDE ESP. THE SO ₂ REMOVAL EQUIPMENT CONSISTS OF TWO SPRAY TOWERS SUPPLIED BY PEABODY PROCESS SYSTEMS WHICH UTILIZE A LIMESTONE REAGENT. A CHEVRON MIST ELIMINATOR IS INCLUDED IN EACH TOWER, AND THE FLUE GAS IS REHEATED WITH BYPASSED GAS BEFORE BEING VENTED TO A 400 FOOT ACID BRICK LINED STACK. THE SYSTEM OPERATES IN AN OPEN WATER LOOP MODE, AND SPENT ABSORBENT IS DISPOSED IN AN ON-SITE LINED POND.
ALLEGHENY POWER SYSTEM MITCHELL 33 RETROFIT 300.0 MW (GROSS) 300.0 MW (ESC) COAL 2.80 XS BITUMINOUS LIME CHEMICO ENERGY CONSUMPTION: 1.1% STATUS 3 STARTUP 8/82	UNIT 33 AT ALLEGHENY POWER SYSTEM'S MITCHELL POWER STATION IN COURTNEY, PENNSYLVANIA IS A 2.8% SULFUR COAL FIRED BOILER. A CONTRACT WAS AWARDED TO CHEMICO FOR A LIME SCRUBBING PROCESS. SO ₂ REMOVAL EFFICIENCY WILL BE 95%. START UP IS PLANNED FOR AUGUST OF 1982.
ALLEGHENY POWER SYSTEM PLEASANTS 1 NEW 625.0 MW (GROSS) 519.0 MW (ESC) COAL 3.70 XS BITUMINOUS LIME BABCOCK & WILCOX ENERGY CONSUMPTION: ****% STATUS 1 STARTUP 3/79	ALLEGHENY POWER SYSTEM'S PLEASANTS 1 IS A BITUMINOUS COAL (3.70% S, 12,150 BTU/LB) FIRED BOILER IN BELMONT, WEST VIRGINIA. BABCOCK AND WILCOX SUPPLIED A LIME FGD SYSTEM DESIGNED TO REMOVE 90% OF THE FLUE GAS SO ₂ FROM THIS UNIT. THE EMISSION CONTROL SYSTEM INCLUDES AN ESP UPSTREAM OF FOUR SPRAY TOWER ABSORBERS. A FLUE GAS BYPASS SYSTEM PROVIDES REHEAT OF THE CLEANED GAS BEFORE IT IS DISCHARGED THROUGH A 1200 FOOT PLACITE LINED STACK. THE SYSTEM OPERATES IN AN OPEN WATER LOOP. THE FGD SYSTEM ON THIS UNIT HAS BEEN OPERATIONAL SINCE MARCH OF 1979.
ALLEGHENY POWER SYSTEM PLEASANTS 2 NEW 625.0 MW (GROSS) 519.0 MW (ESC) COAL 4.50 XS BITUMINOUS LIME BABCOCK & WILCOX ENERGY CONSUMPTION: ****% STATUS 2 STARTUP 9/80	ALLEGHENY POWER SYSTEM'S PLEASANTS 2 IS A BITUMINOUS COAL (3.7% S, 12,150 BTU/LB) FIRED BOILER UNDER CONSTRUCTION IN BELMONT, WEST VIRGINIA. BABCOCK AND WILCOX IS SUPPLYING A LIME FGD SYSTEM DESIGNED TO REMOVE 90% OF THE BOILER FLUE GAS SO ₂ . THE EMISSION CONTROL SYSTEM ON THIS UNIT WILL INCLUDE AN ESP UPSTREAM OF FOUR SPRAY TOWER ABSORBERS. A FLUE GAS BYPASS SYSTEM WILL PROVIDE REHEAT OF THE CLEANED GAS BEFORE IT IS DISCHARGED THROUGH A 1200 FOOT PLACITE LINED STACK. THE SYSTEM WILL OPERATE IN AN OPEN WATER LOOP. FGD SYSTEM START UP IS EXPECTED IN SEPTEMBER, 1980.
ARIZONA ELECTRIC POWER COOP APACHE 2 NEW 195.0 MW (GROSS) 195.0 MW (ESC) COAL .55 XS BITUMINOUS LIMESTONE RESEARCH COTTRELL ENERGY CONSUMPTION: 4.1% STATUS 1 STARTUP 8/78	APACHE 2 OF ARIZONA ELECTRIC POWER COOP IS LOCATED IN COCHISE, ARIZONA AND IS A DRY BOTTOM PULVERIZED COAL FIRED UNIT WITH A FLUE GAS FLOW OF 735,000 ACFM. BITUMINOUS COAL WITH A HEATING VALUE OF 10,000 BTU/LB, A SULFUR CONTENT OF 0.7% AND AN ASH CONTENT OF 15% IS THE FUEL USED FOR THIS UNIT. PARTICULATE CONTROL IS EFFECTED BY A HOT SIDE ESP. THE UNIT IS CURRENTLY IN OPERATION WITH STARTUP IN AUGUST 1978. TWO PACKED TOWERS EMPLOYING LIMESTONE ABSORBENT AND HAVING A DESIGN SO ₂ REMOVAL OF 85% WERE SUPPLIED BY RESEARCH COTTRELL. MIST ELIMINATION IS PROVIDED BY CHEVRON TYPE ELIMINATORS. NO REHEAT IS EMPLOYED. A 400 FT COLE BRAND CXL2000 LINED STACK IS IN USE. THE SYSTEM OPERATES IN AN OPEN WATER LOOP MODE AND WASTE MATERIAL IS DISPOSED OF IN OFF-SITE SLUDGE PONDS.

SECTION 2
STATUS OF FGD SYSTEMS

UNIT IDENTIFICATION	ABSTRACT
ARIZONA ELECTRIC POWER COOP APACHE 3 NEW 195.0 MW (GROSS) 195.0 MW (ESC) COAL .55 XS BITUMINOUS LIMESTONE RESEARCH COTTRELL ENERGY CONSUMPTION: 4.1% STATUS 1 STARTUP 6/79	APACHE 3 OF ARIZONA ELECTRIC POWER COOP IS A DRY BOTTOM, PULVERIZED COAL FIRED UNIT IN COCHISE, ARIZONA. LOW (0.7%) SULFUR BITUMINOUS COAL WITH AN AVERAGE HEATING VALUE OF 10,000 BTU/LB PRODUCES A MAXIMUM FLUE GAS FLOW OF 735,000 ACFM. THE FLUE GAS PASSES THROUGH A HOT SIDE ESP TO TWO RESEARCH COTTRELL PACKED TOWERS, WHERE LIMESTONE IS USED TO REMOVE 85% (DESIGN) OF THE SO ₂ . THE GAS EXITS A HORIZONTAL CHEVRON MIST ELIMINATOR INTO ITS OWN CEILCOTE LINED FLUE IN THE 400 FOOT STACK IT SHARES WITH UNIT 2. THE FGD, WHICH HAS BEEN OPERATIONAL SINCE JUNE OF 1979, USES NO REHEAT. THE SYSTEM OPERATES IN AN OPEN WATER LOOP AND SLUDGE IS DISPOSED OF IN TWO OFF SITE LINED PONDS WITH 20 YEARS' EXPECTED LIFESPAN. TWO ADDITIONAL PONDS ARE PLANNED, WHICH WOULD ADD ANOTHER 20 YEARS' CAPACITY.
ARIZONA PUBLIC SERVICE CHOLLA 1 RETROFIT 119.0 MW (GROSS) 119.0 MW (ESC) COAL .50 XS BITUMINOUS LIMESTONE RESEARCH COTTRELL ENERGY CONSUMPTION: 3.4% STATUS 1 STARTUP 10/73	ARIZONA PUBLIC SERVICE'S CHOLLA 1 IS LOCATED IN JOSEPH CITY, ARIZONA AND IS A TANGENTIALLY FIRED, WET BOTTOM PULVERIZED COAL UNIT. IT IS FUELED BY BITUMINOUS COAL THAT HAS A SULFUR CONTENT OF 0.5% AND A HEATING VALUE OF 10,150 BTU/LB. PARTICULATE MATTER IS CONTROLLED BY TWO FLOODED DISC SCRUBBERS. THE FGD SYSTEM BEGAN IN OCTOBER, 1973 AND IS NOW OPERATIONAL. SO ₂ IS CONTROLLED BY ONE TOWER WITH MUNTERS PACKING EMPLOYING A LIMESTONE ABSORBENT. THE UNIT WAS SUPPLIED BY RESEARCH COTTRELL AND HAS A DESIGN REMOVAL OF 92%. CHEVRON MIST ELIMINATORS ARE LOCATED PRIOR TO AN IN-LINE STEAM REHEAT SYSTEM. THE TREATED FLUE GAS IS VENTED TO A 256 FT ACID BRICK LINED STACK. THE FGD SYSTEM OPERATES IN AN OPEN WATER LOOP MODE AND THE UNTREATED WASTE IS DISPOSED OF IN AN ON-SITE UNLINED POND.
ARIZONA PUBLIC SERVICE CHOLLA 2 NEW 350.0 MW (GROSS) 350.0 MW (ESC) COAL .50 XS BITUMINOUS LIMESTONE RESEARCH COTTRELL ENERGY CONSUMPTION: ****% STATUS 1 STARTUP 4/78	CHOLLA 2 OF ARIZONA PUBLIC SERVICE IS LOCATED IN JOSEPH CITY, ARIZONA. THE BOILER BURNS PULVERIZED BITUMINOUS COAL (0.5% S, 10,150 BTU/LB). MECHANICAL COLLECTORS PROVIDE PRIMARY PARTICULATE CONTROL. FOUR PARALLEL FLOODED DISC AND PACKED TOWER SO ₂ ABSORBER TRAINS (THREE ARE REQUIRED FOR FULL LOAD) REMOVE THE FLUE GAS SO ₂ . THE DESIGN SO ₂ REMOVAL FOR THE SYSTEM, WHICH BEGAN OPERATIONS IN APRIL, 1978, IS 75%. THE CLEANED GAS PASSES THROUGH AN IN-LINE STEAM REHEATER INTO AN ACID BRICK LINED STACK. THE OPEN WATER LOOP SYSTEM DEPOSITS ITS SLUDGE INTO A FLY ASH POND.
ARIZONA PUBLIC SERVICE CHOLLA 4 NEW 350.0 MW (GROSS) 126.0 MW (ESC) COAL .50 XS LIMESTONE RESEARCH COTTRELL ENERGY CONSUMPTION: ****% STATUS 2 STARTUP 6/80	CHOLLA 4 OF ARIZONA PUBLIC SERVICE IS PRESENTLY UNDER CONSTRUCTION IN JOSEPH CITY, ARIZONA. START UP IS SCHEDULED FOR JUNE, 1980. THE PULVERIZED COAL (0.5% S, 10,150 BTU/LB) FIRED BOILER WILL EXHAUST FLUE GAS THROUGH AN ESP TO A PACKED TOWER WHICH WILL TREAT 36% OF THE GAS WITH LIMESTONE.
ARIZONA PUBLIC SERVICE FOUR CORNERS 1 RETROFIT 175.0 MW (GROSS) 175.0 MW (ESC) COAL .75 XS SUBBITUMINOUS LIME/ALKALINE FLYASH CHEMICO ENERGY CONSUMPTION: ****% STATUS 1 STARTUP 11/79	ARIZONA PUBLIC SERVICE HAS UPGRADED THE OPERATIONAL PARTICULATE SCRUBBERS AT FOUR CORNERS 1, 2, AND 3 IN FARMINGTON, NEW MEXICO TO HANDLE ADDITIONAL SO ₂ REMOVAL. INITIALLY, THE FRONT FIRED, DRY BOTTOM, PULVERIZED COAL (SUB-BITUMINOUS, 0.75% S, 8650 BTU/LB) UNITS 1 AND 2 SUPPLY 814,000 ACFM EACH INTO 2 CHEMICO VENTURI SCRUBBERS PER UNIT FOR PRIMARY PARTICULATE CONTROL AND APPROXIMATELY 30% SO ₂ REMOVAL USING ALKALINE FLY ASH. THE DESIGN SO ₂ REMOVAL EFFICIENCY SINCE THE CONVERSION TO LIME AND ALKALINE FLY ASH SCRUBBING IS 67.5%. OPERATIONS COMMENCED IN NOVEMBER, 1979.
ARIZONA PUBLIC SERVICE FOUR CORNERS 2 RETROFIT 175.0 MW (GROSS) 175.0 MW (ESC) COAL .75 XS SUBBITUMINOUS LIME/ALKALINE FLYASH CHEMICO ENERGY CONSUMPTION: ****% STATUS 1 STARTUP 11/79	ARIZONA PUBLIC SERVICE HAS UPGRADED THE OPERATIONAL PARTICULATE SCRUBBERS AT FOUR CORNERS 1,2, AND 3 IN FARMINGTON, NEW MEXICO TO HANDLE ADDITIONAL SO ₂ REMOVAL. INITIALLY, THE FRONT FIRED, DRY BOTTOM, PULVERIZED COAL (SUB-BITUMINOUS, 0.75% S, 8650 BTU/LB) UNITS 1 AND 2 SUPPLY 814,000 ACFM EACH INTO 2 CHEMICO VENTURI SCRUBBERS PER UNIT FOR PRIMARY PARTICULATE CONTROL AND APPROXIMATELY 30% SO ₂ REMOVAL USING ALKALINE FLY ASH. THE DESIGN SO ₂ REMOVAL EFFICIENCY SINCE THE CONVERSION TO LIME AND ALKALINE FLY ASH SCRUBBING IS 67.5%. OPERATIONS COMMENCED IN NOVEMBER, 1979.

SECTION 2
STATUS OF FGD SYSTEMS

UNIT IDENTIFICATION	ABSTRACT
ARIZONA PUBLIC SERVICE FOUR CORNERS 3 RETROFIT 229.0 MW (GROSS) 229.0 MW (ESC) COAL .75 %S SUBBITUMINOUS LIME/ALKALINE FLYASH CHEMICO ENERGY CONSUMPTION: ****X STATUS 1 STARTUP 11/79	ARIZONA PUBLIC SERVICE HAS UPGRADED THE OPERATIONAL PARTICULATE SCRUBBERS AT FOUR CORNERS 1, 2, AND 3 IN FARMINGTON, NEW MEXICO TO HANDLE ADDITIONAL SO ₂ REMOVAL. INITIALLY, THE FRONT FIRED, DRY BOTTOM, PULVERIZED COAL (SUB-BITUMINOUS, 0.75% S, 8650 BTU/LB) UNIT 3 SUPPLIES 1,030,000 ACFM INTO 2 CHEMICO VENTURI SCRUBBERS FOR PRIMARY PARTICULATE CONTROL AND APPROXIMATELY 30% SO ₂ REMOVAL USING ALKALINE FLY ASH. THE DESIGN SO ₂ REMOVAL EFFICIENCY SINCE THE CONVERSION TO LIME AND ALKALINE FLY ASH SCRUBBING IS 67.5%. OPERATIONS COMMENCED IN NOVEMBER, 1979.
ARIZONA PUBLIC SERVICE FOUR CORNERS 4 RETROFIT 755.0 MW (GROSS) 755.0 MW (ESC) COAL .75 %S LIME UNITED ENGINEERS ENERGY CONSUMPTION: ****X STATUS 3 STARTUP 0/82	ARIZONA PUBLIC SERVICE AWARDED A CONTRACT TO UNITED ENGINEERS FOR A LIME FGD SYSTEM TO BE RETROFITTED ONTO UNITS 4 AND 5 AT ITS FOUR CORNERS STATION IN FARMINGTON, NEW MEXICO. BASED ON THE PROTOTYPE HORIZONTAL SCRUBBING PROGRAM CONDUCTED BY THE UTILITY, A HORIZONTAL SYSTEM WAS CHOSEN TO CONTROL THE EMISSIONS FROM THESE COAL (0.75% S, 8650 BTU/LB) FIRED UNITS. THE PARTICULATE EMISSIONS ARE HANDLED BY AN ESP. START UP IS EXPECTED IN 1982.
ARIZONA PUBLIC SERVICE FOUR CORNERS 5 RETROFIT 755.0 MW (GROSS) 755.0 MW (ESC) COAL .75 %S LIME UNITED ENGINEERS ENERGY CONSUMPTION: ****X STATUS 3 STARTUP 0/82	ARIZONA PUBLIC SERVICE AWARDED A CONTRACT TO UNITED ENGINEERS FOR A LIME FGD SYSTEM TO BE RETROFITTED ONTO UNITS 4 AND 5 AT ITS FOUR CORNERS STATION IN FARMINGTON, NEW MEXICO. BASED ON THE PROTOTYPE HORIZONTAL SCRUBBING PROGRAM CONDUCTED BY THE UTILITY, A HORIZONTAL SYSTEM WAS CHOSEN TO CONTROL THE EMISSIONS FROM THESE COAL (0.75% S, 8650 BTU/LB) FIRED UNITS. THE PARTICULATE EMISSIONS ARE HANDLED BY AN ESP. START UP IS EXPECTED IN 1982.
ASSOCIATED ELECTRIC COOP THOMAS HILL 3 NEW 730.0 MW (GROSS) 670.0 MW (ESC) COAL 4.80 %S LIMESTONE PULLMAN KELLOGG ENERGY CONSUMPTION: ****X STATUS 2 STARTUP 1/82	THOMAS HILL 3 OF ASSOCIATED ELECTRIC COOP IS A PULVERIZED COAL (4.8% S, 9,700 BTU/LB) FIRED UNIT LOCATED IN MOBERLY, MISSOURI. TWO COLD SIDE ESP'S WILL PRECEDE THE FOUR 91.5% EFFICIENT PULLMAN KELLOGG HORIZONTAL WEIR FGD MODULES USING MAGNESIUM-PROMOTED LIMESTONE AS THE ABSORBENT. THE CLEANED GAS WILL PASS THROUGH A VERTICAL CHEVRON MIST ELIMINATOR TO A 620 FOOT BRICK LINED STACK. REHEAT WILL BE ACCOMPLISHED BY BYPASS. DRY FIXATED SLUDGE WILL BE TRUCKED TO AN ACTIVE STRIP MINE. THE SYSTEM WILL USE A CLOSED WATER LOOP. THE FGD SYSTEM IS UNDER CONSTRUCTION AND START UP IS EXPECTED IN JANUARY, 1982.
BASIN ELECTRIC POWER COOP ANTELOPE VALLEY 1 NEW 440.0 MW (GROSS) 440.0 MW (ESC) COAL .68 %S LIGNITE LIME/SPRAY DRYING JOY MFG/NIRO ATOMIZER ENERGY CONSUMPTION: .0X STATUS 2 STARTUP 4/82	UNIT 1 OF BASIN ELECTRIC POWER COOP'S ANTELOPE VALLEY PLANT IS PRESENTLY UNDER CONSTRUCTION IN BEULAH, NORTH DAKOTA. THIS UNIT WILL BURN PULVERIZED COAL (0.68% S, 6600 BTU/LB LIGNITE) AND SUPPLY 2,055,000 ACFM TO A DRY LIME FGD SYSTEM SUPPLIED BY WESTERN PRECIPITATION. THE 62% EFFICIENT SYSTEM WILL CONSIST OF 5 NIRO ATOMIZER SPRAY DRYERS AND TWO BAGHOUSES. THE CLEANED GAS, ALONG WITH A 4% BYPASS REHEAT, WILL EXIT A 600 FOOT PVC LINED STACK. THE SYSTEM WILL USE A CLOSED WATER LOOP AND THE DRY POWDER WILL BE USED FOR LANDFILL IN A COAL MINE. START UP IS EXPECTED IN APRIL, 1982.
BASIN ELECTRIC POWER COOP ANTELOPE VALLEY 2 NEW 440.0 MW (GROSS) 440.0 MW (ESC) COAL .68 %S LIGNITE LIME/SPRAY DRYING VENDOR NOT SELECTED ENERGY CONSUMPTION: .0X STATUS 5 STARTUP 4/84	ANTELOPE VALLEY 2 OF BASIN ELECTRIC POWER COOP WILL BE LOCATED IN BEULAH, NORTH DAKOTA. THE UTILITY IS PRESENTLY CONSIDERING VARIOUS FGD PROCESSES FOR THIS LIGNITE (0.68% S, 6600 BTU/LB) FIRED UNIT. THE UNIT WILL BE REQUIRED TO COMPLY WITH STATE EMISSIONS STANDARDS VIA BEST AVAILABLE CONTROL TECHNOLOGY. START UP IS SCHEDULED FOR APRIL, 1984.

SECTION 2
STATUS OF FGD SYSTEMS

UNIT IDENTIFICATION	ABSTRACT
<p>BASIN ELECTRIC POWER COOP LARAMIE RIVER 1 NEW 570.0 MW (GROSS) 600.0 MW (ESC) COAL .81 XS SUBBITUMINOUS LIMESTONE RESEARCH COTTRELL ENERGY CONSUMPTION: .0X STATUS 2 STARTUP 4/80</p>	<p>BASIN ELECTRIC POWER COOP'S LARAMIE RIVER 1 IS PRESENTLY UNDER CONSTRUCTION IN WHEATLAND, WYOMING. THE PULVERIZED COAL (0.81% S, 8139 BTU/LB) FIRED BOILER WILL FEED 2,300,000 ACFM OF FLUE GAS THROUGH A COLD SIDE ESP TO FIVE RESEARCH COTTRELL LIMESTONE PACKED TOWER MODULES, WHICH WILL REMOVE 90% OF THE SO₂. THE CLEANED GAS WILL EXIT FROM A VERTICAL CHEVRON DEMISTER INTO A 600 FOOT ACID BRICK LINED STACK. NO REHEAT WILL BE USED. THE FLYASH FIXATED SLUDGE WILL BE DEWATERED TO 83% SOLIDS BEFORE BEING LANDFILLED, AND THE SYSTEM WILL EMPLOY A CLOSED WATER LOOP. START UP IS SCHEDULED FOR APRIL, 1980.</p>
<p>BASIN ELECTRIC POWER COOP LARAMIE RIVER 2 NEW 570.0 MW (GROSS) 600.0 MW (ESC) COAL .81 XS SUBBITUMINOUS LIMESTONE RESEARCH COTTRELL ENERGY CONSUMPTION: .0X STATUS 2 STARTUP 11/80</p>	<p>BASIN ELECTRIC POWER COOP'S LARAMIE RIVER 2 IS PRESENTLY UNDER CONSTRUCTION IN WHEATLAND, WYOMING. THE PULVERIZED COAL (0.81% S, 8139 BTU/LB) FIRED BOILER WILL FEED 2,300,000 ACFM OF FLUE GAS THROUGH A OLD SIDE ESP TO FIVE RESEARCH COTTRELL LIMESTONE PACKED TOWER MODULES, WHICH WILL REMOVE 90% OF THE SO₂. THE CLEANED GAS WILL EXIT FROM A VERTICAL CHEVRON DEMISTER INTO A 600 FOOT ACID BRICK LINED STACK. NO REHEAT WILL BE USED. THE FLYASH FIXATED SLUDGE WILL BE DEWATERED TO 83% SOLIDS BEFORE BEING LANDFILLED, AND THE SYSTEM WILL EMPLOY A CLOSED WATER LOOP. START UP IS SCHEDULED FOR NOVEMBER, 1980.</p>
<p>BASIN ELECTRIC POWER COOP LARAMIE RIVER 3 NEW 570.0 MW (GROSS) 600.0 MW (ESC) COAL .54 XS SUBBITUMINOUS LIME/SPRAY DRYING BABCOCK & WILCOX ENERGY CONSUMPTION: .0X STATUS 2 STARTUP 4/82</p>	<p>LARAMIE RIVER 3 OF BASIN ELECTRIC POWER COOP IS UNDER CONSTRUCTION IN WHEATLAND, WYOMING, AND WILL UTILIZE FOUR DRY LIME INJECTION MODULES, AND A COLD SIDE ESP. THE BOILER WILL FIRE PULVERIZED COAL (0.54% S, 8100 BTU/LB) AND WILL SUPPLY 2,800,000 ACFM OF FLUE GAS TO THE FGD SYSTEM, WHICH WILL REMOVE 85% OF THE SO₂ BEFORE THE GAS EXITS THROUGH A 600 FOOT ACID BRICK LINED STACK. A 3% BYPASS WILL BE USED FOR REHEAT. THE SYSTEM WILL OPERATE IN A CLOSED WATER LOOP, AND WILL LANDFILL THE DRY POWDER WASTE. OPERATIONS ARE SCHEDULED TO COMMENCED IN APRIL, 1982.</p>
<p>BIG RIVERS ELECTRIC D. B. WILSON 1 NEW 440.0 MW (GROSS) 440.0 MW (ESC) COAL ***** XS BITUMINOUS LIME VENDOR NOT SELECTED ENERGY CONSUMPTION: ***** STATUS 6 STARTUP 0/84</p>	<p>BIG RIVERS ELECTRIC HAS PLANS FOR TWO NEW UNITS, D.B. WILSON 1 AND 2. THE PULVERIZED COAL FIRED BOILERS WILL HAVE A MW RATING OF 440 EACH. THE UNITS WILL UTILIZE EITHER A LIME, LIMESTONE OR DUAL ALKALI FGD SYSTEM. START UP OF UNIT 1 IS EXPECTED IN 1984.</p>
<p>BIG RIVERS ELECTRIC D. B. WILSON 2 NEW 440.0 MW (GROSS) 440.0 MW (ESC) COAL ***** XS BITUMINOUS LIME VENDOR NOT SELECTED ENERGY CONSUMPTION: ***** STATUS 6 STARTUP 0/85</p>	<p>BIG RIVERS ELECTRIC HAS PLANS FOR TWO NEW UNITS, D.B. WILSON 1 AND 2. THE PULVERIZED COAL FIRED BOILERS WILL HAVE A MW RATING OF 440 EACH. THE UNITS WILL UTILIZE EITHER A LIME, LIMESTONE OR DUAL ALKALI FGD SYSTEM. START UP OF UNIT 2 IS EXPECTED IN 1985.</p>
<p>BIG RIVERS ELECTRIC GREEN 1 NEW 242.0 MW (GROSS) 242.0 MW (ESC) COAL 3.75 XS BITUMINOUS LIME AMERICAN AIR FILTER ENERGY CONSUMPTION: ***** STATUS 1 STARTUP 12/79</p>	<p>UNIT 1 OF BIG RIVERS ELECTRIC'S GREEN STATION IS LOCATED IN SEBREE, KENTUCKY. THE DRY BOTTOM PULVERIZED COAL (3.75% S, 9750 BTU/LB) FIRED BOILER SUPPLIES 1,000,000 ACFM TO A COLD SIDE ESP FOLLOWED BY TWO AMERICAN AIR FILTER LIME SPRAY TOWERS WHICH WILL REMOVE 90% OF THE SO₂. THE CLEANED GAS PASSES THROUGH A CHEVRON MIST ELIMINATOR AND EXITS A SAUERISEN 72 LINED STACK AFTER IT IS HEATED BY STEAM COIL REHEATER. THE SLUDGE FROM THE CLOSED WATER LOOP SYSTEM IS POZ-O-TEC STABILIZED. OPERATIONS COMMENCED IN DECEMBER 1979.</p>

SECTION 2
STATUS OF FGD SYSTEMS

UNIT IDENTIFICATION	ABSTRACT
BIG RIVERS ELECTRIC GREEN 2 NEW 242.0 MW (GROSS) 242.0 MW (ESC) COAL 3.75 %S BITUMINOUS LIME AMERICAN AIR FILTER ENERGY CONSUMPTION: ****X STATUS 2 STARTUP 11/80	UNIT 2 OF BIG RIVERS ELECTRIC'S GREEN STATION IS BEING CONSTRUCTED IN SEBREE, KENTUCKY. THE DRY BOTTOM PULVERIZED COAL (3.75% S, 9750 BTU/LB) FIRED BOILER WILL SUPPLY 1,000,000 ACFM TO A COLD SIDE ESP FOLLOWED BY TWO AMERICAN AIR FILTER LIME SPRAY TOWERS WHICH WILL REMOVE 90% OF THE SO ₂ . THE CLEANED GAS WILL PASS THROUGH A CHEVRON MIST ELIMINATOR AND WILL EXIT A SAUERISEN 72 LINED STACK AFTER IT IS HEATED BY STEAM COIL REHEATER. THE SLUDGE FROM THE CLOSED WATER LOOP SYSTEM WILL BE POZ-O-TEC STABILIZED. START UP IS SCHEDULED FOR NOVEMBER, 1980.
CENTRAL ILLINOIS LIGHT DUCK CREEK 1 NEW 416.0 MW (GROSS) 378.0 MW (ESC) COAL 3.30 %S BITUMINOUS LIMESTONE RILEY STOKER/ENVIRONEERING ENERGY CONSUMPTION: 2.9% STATUS 1 STARTUP 7/76	DUCK CREEK 1 OF CENTRAL ILLINOIS LIGHT IS LOCATED IN CANTON, ILLINOIS. THE BALANCED DRAFT, FRONT FIRED, DRY BOTTOM UNIT BURNS PULVERIZED BITUMINOUS COAL (3.3% S, 10,500 BTU/LB) AND SUPPLIES 2,415,000 ACFM OF FLUE GAS TO TWO COLD SIDE ESP'S FOLLOWED BY FOUR RILEY STOKER/ENVIRONEERING ROD DECK SPRAY TOWER MODULES. THE FGD SYSTEM HAS BEEN OPERATIONAL (ONE MODULE) SINCE JULY, 1976, AND IS DESIGNED TO REMOVE 85% OF THE SO ₂ . HORIZONTAL CHEVRON MIST ELIMINATORS FOLLOW THE ABSORBERS, AND THE CLEANED GAS EXITS TO A 500 FOOT CEILCOTE LINED STACK WITHOUT REHEAT. THE SYSTEM OPERATES IN A CLOSED WATER LOOP, AND THE SLUDGE IS DISPOSED OF IN AN ON SITE CLAY LINED POND.
CENTRAL ILLINOIS LIGHT DUCK CREEK 2 NEW 450.0 MW (GROSS) 416.0 MW (ESC) COAL 3.30 %S BITUMINOUS LIMESTONE VENDOR NOT SELECTED ENERGY CONSUMPTION: ****X STATUS 5 STARTUP 1/86	CENTRAL ILLINOIS LIGHT IS CURRENTLY EVALUATING RIDS ON A LIMESTONE OR DUAL ALKALI FGD SYSTEM FOR UNIT 2 OF ITS DUCK CREEK STATION. THE BITUMINOUS COAL FIRED BOILER WILL FEED ITS FLUE GAS THROUGH A COLD SIDE ESP. THE SYSTEM WILL OPERATE IN A CLOSED WATER LOOP AND IS SCHEDULED TO BEGIN OPERATIONS IN JANUARY, 1986.
CENTRAL ILLINOIS PUBLIC SERV NEWTON 1 NEW 617.0 MW (GROSS) 617.0 MW (ESC) COAL 2.25 %S BITUMINOUS DUAL ALKALI BUELL/ENVIROTECH ENERGY CONSUMPTION: ****X STATUS 1 STARTUP 9/79	NEWTON 1 OF CENTRAL ILLINOIS PUBLIC SERVICE IS A TANGENTIALLY FIRED, DRY BOTTOM, PULVERIZED BITUMINOUS COAL (4% S, 10,900 BTU/LB) FIRED UNIT LOCATED IN NEWTON, ILLINOIS. A COLD SIDE ESP RECEIVES 2,163,480 ACFM OF FLUE GAS AND FEEDS IT TO FOUR BUELL ENVIROTECH POLYSPHERE PACKED TRAY TOWERS FOLLOWED BY TWO VERTICAL MIST ELIMINATORS PER MODULE. THE CLEANED GAS IS BOOSTED 25 DEG F BY A COMBINATION OF TWO DIFFERENT TYPES OF IN-LINE REHEATERS PLUS BYPASS REHEAT, AND THEN EXITS A 530 FOOT PRECRETE LINED STACK. THE WATER LOOP IS CLOSED, AND THE SLUDGE IS POZ-O-TEC TREATED.
CENTRAL MAINE POWER SEARS ISLAND 1 NEW 600.0 MW (GROSS) 600.0 MW (ESC) COAL ***** XS PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****X STATUS 6 STARTUP 1/89	SEARS ISLAND 1 IS A PLANNED UNIT TO BE BUILT ON PENOBSCOT BAY BY CENTRAL MAINE POWER. BECAUSE OF THE DISCOVERY OF A GEOLOGICAL FAULT ON SEARS ISLAND, PLANS FOR A 1150 MW NUCLEAR POWER PLANT HAVE BEEN REPLACED WITH PLANS FOR A 600 MW COAL FIRED PLANT. LIME AND LIMESTONE SCRUBBING ARE THE PRIMARY METHODS BEING CONSIDERED FOR COMPLIANCE WITH THE NSPS. IT WILL BE TWO YEARS BEFORE ALL PERMITS REQUIRED HAVE BEEN RECEIVED. START UP IS SCHEDULED FOR JANUARY, 1989.
CINCINNATI GAS & ELECTRIC EAST BEND 1 NEW 650.0 MW (GROSS) 650.0 MW (ESC) COAL ***** XS PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: 2.9% STATUS 6 STARTUP 0/0	CINCINNATI GAS AND ELECTRIC HAS PLANS FOR A NEW UNIT, EAST BEND 1, TO BE LOCATED ADJACENT TO EAST BEND 2 AT THE RABBITHASH, KENTUCKY SITE. THE COAL FIRED BOILER WILL HAVE A GENERATING CAPACITY OF 650MW. THE UNIT'S EXPECTED START UP HAS NOT BEEN DETERMINED.

SECTION 2
STATUS OF FGD SYSTEMS

UNIT IDENTIFICATION	ABSTRACT
<p>CINCINNATI GAS & ELECTRIC EAST BEND 2 NEW 650.0 MW (GROSS) 650.0 MW (ESC) COAL 5.00 %S LIME BABCOCK & WILCOX ENERGY CONSUMPTION: 2.9% STATUS 2 STARTUP 9/80</p>	<p>EAST BEND 2 OF CINCINNATI GAS AND ELECTRIC IS A PULVERIZED COAL (5% S) FIRED BOILER UNDER CONSTRUCTION IN RABBITHASH, KENTUCKY. THE EMISSION CONTROL SYSTEM CONSISTS OF A HOT SIDE ESP FOLLOWED BY THREE BABCOCK AND WILCOX LIME FGD MODULES. THE 87% CLEANED GAS WILL PASS THROUGH A CHEVRON MIST ELIMINATOR BEFORE BEING WARMED BY AN INDIRECT HOT AIR REHEATER AND EXITING THROUGH A BRICK LINED 650 FOOT STACK. THE SLUDGE FROM THIS CLOSED WATER LOOP SYSTEM WILL BE POZ-O-TEC STABILIZED BEFORE DISPOSAL IN AN ON SITE LANDFILL. START UP IS EXPECTED IN SEPTEMBER, 1980.</p>
<p>COLORADO UTE ELECTRIC ASSN. CRAIG 1 NEW 447.0 MW (GROSS) 447.0 MW (ESC) COAL .45 %S SUBBITUMINOUS LIMESTONE PEABODY PROCESS SYSTEMS ENERGY CONSUMPTION: 5.4% STATUS 2 STARTUP 4/80</p>	<p>THE COLORADO UTE ELECTRIC ASSN IS PRESENTLY CONSTRUCTING TWO IDENTICAL UNITS IN CRAIG, COLORADO, CRAIG 1 AND 2. BOTH UNITS WILL FIRE PULVERIZED SUBBITUMINOUS COAL (0.45% S, 10,000 BTU/LB). EACH UNIT'S HOT SIDE ESP AND FOUR MAGNESIUM PROMOTED LIMESTONE SPRAY TOWERS WILL REMOVE 85% OF THE SO₂. THE SCRUBBER EXHAUST WILL BE WARMED BY AN IN-LINE STEAM COIL REHEATER AND WILL PASS THROUGH A 600 FOOT TALL ACID BRICK LINED STACK. THE SYSTEM WILL OPERATE IN A CLOSED WATER LOOP, AND THE STABILIZED SLUDGE WILL BE DISPOSED OF IN AN OFF SITE MINEFILL. UNIT 1 START UP IS EXPECTED IN APRIL, 1980.</p>
<p>COLORADO UTE ELECTRIC ASSN. CRAIG 2 NEW 447.0 MW (GROSS) 447.0 MW (ESC) COAL .45 %S SUBBITUMINOUS LIMESTONE PEABODY PROCESS SYSTEMS ENERGY CONSUMPTION: 5.4% STATUS 1 STARTUP 8/79</p>	<p>THE CRAIG 2 UNIT OF THE COLORADO UTE ELECTRIC ASSN IS LOCATED IN CRAIG, COLORADO. THE CRAIG 2 UNIT FIRES PULVERIZED SUBBITUMINOUS COAL (0.45% S, 10,000 BTU/LP). THE UNIT'S HOT SIDE ESP AND FOUR MAGNESIUM PROMOTED LIMESTONE SPRAY TOWERS WILL REMOVE 85% OF THE SO₂. THE SCRUBBER EXHAUST IS WARMED BY AN IN-LINE STEAM COIL REHEATER AND PASSES THROUGH A 600 FOOT TALL ACID BRICK LINED STACK. THE SYSTEM OPERATES IN A CLOSED WATER LOOP, AND THE STABILIZED SLUDGE IS DISPOSED OF IN AN OFF SITE MINEFILL. START UP OF UNIT 2 WAS IN AUGUST, 1979.</p>
<p>COLORADO UTE ELECTRIC ASSN. CRAIG 3 NEW 447.0 MW (GROSS) 447.0 MW (ESC) COAL .45 %S SUBBITUMINOUS LIME/SPRAY DRYING VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 6 STARTUP 0/82</p>	<p>COLORADO UTE ELECTRIC ASSN. HAS PLANS FOR A NEW UNIT, CRAIG 3, TO BE LOCATED IN CRAIG, COLORADO ALONG WITH UNITS 1 AND 2. THE UNIT WILL FIRE PULVERIZED SUBBITUMINOUS COAL (0.45% S, 10,000 BTU/LB). THE SYSTEM WILL UTILIZE A DRY SCRUBBER WITH LIMESTONE INJECTION FOR EMISSION CONTROL. THE UNIT IS SCHEDULED TO COMMENCE OPERATIONS IN 1982.</p>
<p>COLUMBUS & SOUTHERN OHIO ELEC. CONESVILLE 5 NEW 411.0 MW (GROSS) 411.0 MW (ESC) COAL 4.67 %S BITUMINOUS LIME AIR CORRECTION DIVISION, UOP ENERGY CONSUMPTION: 3.9% STATUS 1 STARTUP 1/77</p>	<p>CONESVILLE 5 OF COLUMBUS AND SOUTHERN OHIO ELECTRIC IS A DRY BOTTOM, PULVERIZED BITUMINOUS COAL (4.67% S, 10,850 BTU/LB) FIRED UNIT LOCATED IN CONESVILLE, OHIO. A COLD SIDE ESP RECEIVES 1,393,893 ACFM OF FLUE GAS AND PASSES IT TO TWO THIOSORBIC LIME TCA MODULES SUPPLIED BY UOP. THE SO₂ REMOVAL EFFICIENCY OF THE TWO MODULES, WHICH BEGAN INITIAL OPERATION IN JANUARY, 1977, IS 89.5% (DESIGN). EACH MODULE HAS ONE BULK ENTRAINMENT SEPARATOR AND TWO CHEVRON MIST ELIMINATORS. THE CLEANED GAS EXITS THROUGH AN 800 FOOT TALL ACID BRICK LINED STACK. THE POZ-O-TEC STABILIZED SLUDGE IS PUMPED INTO AN ON SITE DIKED LANDFILL. THE SYSTEM OPERATES IN AN OPEN WATER LOOP.</p>
<p>COLUMBUS & SOUTHERN OHIO ELEC. CONESVILLE 6 NEW 411.0 MW (GROSS) 411.0 MW (ESC) COAL 4.67 %S BITUMINOUS LIME AIR CORRECTION DIVISION, UOP ENERGY CONSUMPTION: 3.9% STATUS 1 STARTUP 6/78</p>	<p>CONESVILLE 6 OF COLUMBUS AND SOUTHERN OHIO ELECTRIC IS A DRY BOTTOM, PULVERIZED BITUMINOUS COAL (4.67% S, 10,850 BTU/LB) FIRED UNIT LOCATED IN CONESVILLE, OHIO. A COLD SIDE ESP RECEIVES 1,393,893 ACFM OF FLUE GAS AND PASSES IT TO TWO THIOSORBIC LIME TCA MODULES SUPPLIED BY UOP. THE SO₂ REMOVAL EFFICIENCY OF THE TWO MODULES, WHICH BEGAN INITIAL OPERATION IN JUNE, 1978, IS 89.5% (DESIGN). EACH MODULE HAS ONE BULK ENTRAINMENT SEPARATOR AND TWO CHEVRON MIST ELIMINATORS. THE CLEANED GAS EXITS THROUGH AN 800 FOOT TALL ACID BRICK LINED STACK. THE POZ-O-TEC STABILIZED SLUDGE IS PUMPED INTO AN ON SITE DIKED LANDFILL. THE SYSTEM OPERATES IN AN OPEN WATER LOOP.</p>

SECTION 2
STATUS OF FGD SYSTEMS

UNIT IDENTIFICATION	ABSTRACT
COLUMBUS & SOUTHERN OHIO ELEC. POSTON 5 NEW 425.0 MW (GROSS) 375.0 MW (ESC) COAL ***** XS PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: 4.7% STATUS 6 STARTUP 8/86	COLUMBUS AND SOUTHERN OHIO ELECTRIC HAS PLANS FOR TWO NEW UNITS, POSTON 5 AND 6, TO BE LOCATED IN ATHENS, OHIO. THE COAL (2.5% S, 11,000 BTU/LB) FIRED UNITS WILL UTILIZE EITHER A LIME, LIMESTONE, OR DUAL ALKALI FGD SYSTEM. START UP OF UNIT 5 IS EXPECTED IN 1986.
COLUMBUS & SOUTHERN OHIO ELEC. POSTON 6 NEW 425.0 MW (GROSS) 375.0 MW (ESC) COAL 2.50 XS PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: 4.7% STATUS 6 STARTUP 0/89	COLUMBUS AND SOUTHERN OHIO ELECTRIC HAS PLANS FOR TWO NEW UNITS, POSTON 5 AND 6, TO BE LOCATED IN ATHENS, OHIO. THE COAL (2.5% S, 11,000 BTU/LB) FIRED UNITS WILL UTILIZE EITHER A LIME, LIMESTONE, OR DUAL ALKALI FGD SYSTEM. START UP OF UNIT 6 IS EXPECTED IN 1989.
COMMONWEALTH EDISON POWERTON 51 RETROFIT 450.0 MW (GROSS) 450.0 MW (ESC) COAL 3.53 XS LIMESTONE AIR CORRECTION DIVISION, UOP ENERGY CONSUMPTION: 5.6% STATUS 2 STARTUP 4/80	COMMONWEALTH EDISON IS PRESENTLY RETROFITTING BOILER NUMBER 51 AT ITS POWERTON STATION WITH A UOP LIMESTONE FGD SYSTEM. UNIT 51 IS ONE OF TWO IDENTICAL BOILERS SUPPLYING STEAM TO AN 850 MW TURBINE. THE PULVERIZED COAL (3.6% S, 10,500 BTU/LB) FIRED BOILER FEEDS FLUE GAS THROUGH AN ESP TO 3 TCA MODULES WHICH ARE DESIGNED TO REMOVE 74% OF THE SO ₂ . A STEAM INDIRECT HOT AIR REHEATER WILL BOOST THE TEMPERATURE BEFORE THE GAS EXITS AN ACID BRICK LINED STACK. THE SYSTEM WILL UTILIZE A CLOSED WATER LOOP, AND THE SLUDGE WILL BE POZ-O-TEC STABILIZED AND DISPOSED OF IN A LANDFILL. THE FGD SYSTEM IS UNDER CONSTRUCTION, AND THE START UP IS EXPECTED IN APRIL, 1980.
COOPERATIVE POWER ASSOCIATION COAL CREEK 1 NEW 545.0 MW (GROSS) 327.0 MW (ESC) COAL .63 XS LIGNITE LIME/ALKALINE FLYASH COMBUSTION ENGINEERING ENERGY CONSUMPTION: ***** STATUS 1 STARTUP 8/79	COAL CREEK 1 AND 2 ARE TWO PULVERIZED LIGNITE (0.63% S, 6258 BTU/LB) FIRED UNITS OWNED BY THE COOPERATIVE POWER ASSN AND UNITED POWER. A COLD SIDE ESP RECEIVES 2,200,000 ACFM OF FLUE GAS AND EXHAUSTS IT TO FOUR COUNTER-CURRENT SPRAY TOWERS. MIST ELIMINATION IS PROVIDED BY A BULK ENTRAINMENT SEPARATOR AND TWO CHEVRON MIST ELIMINATORS. A MINIMUM OF 40% BYPASS REHEAT WILL BE PROVIDED BEFORE THE CLEANED GAS EXITS THE 650 FOOT ACID BRICK LINED STACK. THE TOWER DESIGN SO ₂ REMOVAL EFFICIENCY IS 90%. THE SYSTEM WILL OPERATE IN AN OPEN WATER LOOP, AND THE FLYASH STABILIZED SLUDGE WILL BE DISPOSED IN A CLAY LINED POND. UNIT 1 OPERATIONS BEGAN IN AUGUST 1979.
COOPERATIVE POWER ASSOCIATION COAL CREEK 2 NEW 545.0 MW (GROSS) 327.0 MW (ESC) COAL .63 XS LIGNITE LIME/ALKALINE FLYASH COMBUSTION ENGINEERING ENERGY CONSUMPTION: ***** STATUS 2 STARTUP 7/80	COAL CREEK 1 AND 2 ARE TWO PULVERIZED LIGNITE (0.63% S, 6258 BTU/LB) FIRED UNITS OWNED BY THE COOPERATIVE POWER ASSN AND UNITED POWER. A COLD SIDE ESP RECEIVES 2,200,000 ACFM OF FLUE GAS AND EXHAUSTS IT TO FOUR COUNTER-CURRENT SPRAY TOWERS. MIST ELIMINATION IS PROVIDED BY A BULK ENTRAINMENT SEPARATOR AND TWO CHEVRON MIST ELIMINATORS. A MINIMUM OF 40% BYPASS REHEAT WILL BE PROVIDED BEFORE THE CLEANED GAS EXITS THE 650 FOOT ACID BRICK LINED STACK. THE TOWER DESIGN SO ₂ REMOVAL EFFICIENCY IS 90%. THE SYSTEM WILL OPERATE IN AN OPEN WATER LOOP, AND THE FLYASH STABILIZED SLUDGE WILL BE DISPOSED OF IN A CLAY LINED POND. UNIT 2 IS PRESENTLY UNDER CONSTRUCTION AND SHOULD INITIALLY START OPERATIONS IN JULY, 1980.
DELMARVA POWER & LIGHT DELAWARE CITY 1-3 RETROFIT 180.0 MW (GROSS) 180.0 MW (ESC) COKE 7.00 XS FLUID PETROLEUM COKE WELLMAN LORD DAVY MCKEE ENERGY CONSUMPTION: ***** STATUS 2 STARTUP 4/80	DELMARVA POWER & LIGHT'S DELAWARE CITY PLANT HAS FOUR BOILERS, THREE OF WHICH HAVE STEAM CAPACITIES OF 500K LB/HR EACH. THE BOILERS GENERATE STEAM AS WELL AS ELECTRICITY FOR GETTY REFINING AND MARKETING. LOW SULFUR CRUDE OIL WILL BE REPLACED WITH COKE (7-8% S) IN THE BOILER WHEN THE FGD SYSTEM IS COMPLETE, IN APRIL, 1980. A VENTURI PARTICULATE SCRUBBER AND A WELLMAN-LORD FGD SYSTEM (90% DESIGN EFFICIENCY) SUPPLIED BY DAVY POWERGAS ARE PRESENTLY UNDER CONSTRUCTION. AN INDIRECT GAS REHEATER WILL BE USED. THE SYSTEM WILL OPERATE IN AN OPEN WATER LOOP.

SECTION 2
STATUS OF FGD SYSTEMS

UNIT IDENTIFICATION	ABSTRACT
DELMARVA POWER & LIGHT VIENNA 9 NEW 550.0 MW (GROSS) 550.0 MW (ESC) COAL 2.70 XS PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****X STATUS 6 STARTUP 6/87	DELMARVA POWER AND LIGHT IS PLANNING A NEW UNIT, VIENNA 9, TO BE CONSTRUCTED IN VIENNA, MARYLAND. THE UTILITY IS PRESENTLY CONSIDERING A LIMESTONE FGD UNIT FOR EMISSION CONTROL. THE PULVERIZED COAL FIRED UNIT IS EXPECTED TO COMMENCE OPERATIONS IN JUNE 1987.
DESERET GENERATION & TRANS COO MOON LAKE 1 NEW 410.0 MW (GROSS) 410.0 MW (ESC) COAL .50 XS BITUMINOUS LIMESTONE VENDOR NOT SELECTED ENERGY CONSUMPTION: ****X STATUS 5 STARTUP 12/84	MOON LAKE 1 IS A PULVERIZED COAL (0.5% S, 10,500 BTU/LB) FIRED UNIT PLANNED BY DESERET GENERATION AND TRANSMISSION COOP. TO BE LOCATED IN VERNAL, UTAH. THE UTILITY IS PRESENTLY REQUESTING BIDS FOR A WET LIME-STONE SCRUBBING SYSTEM HAVING A SO2 REMOVAL EFFICIENCY OF 95%. THE SYSTEM WILL FEATURE A BAGHOUSE DESIGNED TO REMOVE 99.6% OF THE PARTICULATE. THE UNIT WILL OPERATE IN A CLOSED WATER LOOP WITH SLUDGE DISPOSAL ON SITE IN A LANDFILL. OPERATIONS ARE SCHEDULED TO COMMENCE IN 1984.
DESERET GENERATION & TRANS COO MOON LAKE 2 NEW 410.0 MW (GROSS) 410.0 MW (ESC) COAL .50 XS BITUMINOUS LIMESTONE VENDOR NOT SELECTED ENERGY CONSUMPTION: ****X STATUS 5 STARTUP 0/88	MOON LAKE 2 IS A PULVERIZED COAL (0.5% S, 10,500 BTU/LB) FIRED UNIT PLANNED BY DESERET GENERATION AND TRANSMISSION COOP. TO BE LOCATED IN VERNAL, UTAH. THE UTILITY IS PRESENTLY REQUESTING BIDS FOR A WET LIME-STONE SCRUBBING SYSTEM HAVING A SO2 REMOVAL EFFICIENCY OF 95%. THE SYSTEM WILL FEATURE A BAGHOUSE DESIGNED TO REMOVE 99.6% OF THE PARTICULATE. THE UNIT WILL OPERATE IN A CLOSED WATER LOOP WITH SLUDGE DISPOSAL ON SITE IN A LANDFILL. OPERATIONS ARE SCHEDULED TO COMMENCE IN 1988.
DUQUESNE LIGHT ELRAMA 1-4 RETROFIT 510.0 MW (GROSS) 510.0 MW (ESC) COAL 2.20 XS LIME CHEMICO ENERGY CONSUMPTION: 3.5X STATUS 1 STARTUP 10/75	ELRAMA 1-4 OF DUQUESNE LIGHT CONSISTS OF FOUR PULVERIZED COAL (2.2% S, 11,350 BTU/LB) FIRED UNITS LOCATED IN ELRAMA, PENNSYLVANIA. THE EMISSION CONTROL SYSTEM ON THIS SITE CONSISTS OF AN ESP FOLLOWED BY A MECHANICAL COLLECTOR AND FIVE VARIABLE THROAT VENTURI LIME ABSORBER MODULES SUPPLIED BY CHEMICO, WHICH ARE DESIGNED TO REMOVE 83% OF THE SO2 FROM THE FLUE GAS. THE CLEANED GAS PASSES THROUGH A DIRECT OIL FIRED REHEATER BEFORE EXITING A 400 FOOT ACID BRICK LINED STACK. THE SYSTEM OPERATES IN AN OPEN WATER LOOP, AND THE POZ-O-TEC STABILIZED SLUDGE IS HAULED TO AN OFF SITE LANDFILL. THE SYSTEM HAS BEEN OPERATIONAL SINCE OCTOBER, 1975.
DUQUESNE LIGHT PHILLIPS 1-6 RETROFIT 408.0 MW (GROSS) 410.0 MW (ESC) COAL 1.92 XS BITUMINOUS LIME CHEMICO ENERGY CONSUMPTION: 3.4X STATUS 1 STARTUP 7/73	THE PHILLIPS POWER STATION OF DUQUESNE LIGHT CONSISTS OF SIX DRY BOTTOM PULVERIZED COAL (2.2% S, 11,350 BTU/LB) FIRED UNITS LOCATED IN SOUTH HEIGHT, PENNSYLVANIA. PARTICULATE CONTROL IS ACCOMPLISHED BY SIX ESP/ MECHANICAL COLLECTOR COMBINATIONS (ONE/BOILER). ONE TWO STAGE AND THREE SINGLE STAGE VARIABLE THROAT VENTURI LIME FGD MODULES SUPPLIED BY CHEMICO ARE DESIGNED TO REMOVE 83% OF THE SO2 FROM THE FLUE GAS. TWO CHEVRON MIST ELIMINATORS/MODULE ARE FOLLOWED BY A DIRECT OIL FIRED REHEATER WHICH RAISES THE GAS TEMPERATURE BY 20 DEG F BEFORE IT LEAVES VIA A 340 FOOT TALL ACID BRICK LINED STACK. THE SYSTEM OPERATES IN AN OPEN WATER LOOP, AND THE POZ-O-TEC STABILIZED SLUDGE IS TRUCKED TO AN OFF SITE LANDFILL. THE SYSTEM HAS BEEN OPERATIONAL SINCE JULY, 1973.
EAST KENTUCKY POWER COOP J. K. SMITH 1 NEW 650.0 MW (GROSS) 650.0 MW (ESC) COAL ***** XS PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****X STATUS 6 STARTUP 1/85	THE EAST KENTUCKY POWER COOP HAS PLANS TO FIRE TWO NEW UNITS. THE J.K. SMITH 1 AND 2 WILL UTILIZE EITHER A DRY PROCESS OR A WET LINE PROCESS FOR EMISSION CONTROL. UNIT 1 IS EXPECTED TO START UP IN JANUARY, 1985.

SECTION 2
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UNIT IDENTIFICATION	ABSTRACT
EAST KENTUCKY POWER COOP J. K. SMITH 2 NEW 650.0 MW (GROSS) 650.0 MW (ESC) COAL ***** XS PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ***** STATUS 6 STARTUP 1/87	THE EAST KENTUCKY POWER COOP HAS PLANS TO FIRE TWO NEW UNITS. THE J.K. SMITH 1 AND 2 WILL UTILIZE EITHER A DRY PROCESS OR A WET LIME PROCESS FOR EMISSION CONTROL. UNIT 2 IS EXPECTED TO START UP IN JANUARY, 1987.
EAST KENTUCKY POWER COOP SPURLOCK 2 NEW 500.0 MW (GROSS) 500.0 MW (ESC) COAL 3.50 XS LIME ADL/COMBUSTION EQUIP ASSOCIATE ENERGY CONSUMPTION: ***** STATUS 2 STARTUP 1/81	SPURLOCK 2 OF EAST KENTUCKY POWER COOPERATIVE IS A BALANCED DRAFT PULVERIZED COAL (3.5% S, 11,000 BTU/LB) FIRED UNIT UNDER CONSTRUCTION IN MAYSVILLE, KENTUCKY. THE EMISSION CONTROL SYSTEM WILL CONSIST OF AN ESP FOLLOWED BY AN ADL/COMBUSTION EQUIPMENT ASSOCIATES LIME FGD SYSTEM (90% DESIGN SO2 REMOVAL EFFICIENCY). FLUE GAS FROM UNIT ONE WILL BE USED TO REHEAT THE CLEANED GAS. THE SYSTEM, SLATED FOR START UP IN JANUARY, 1981, WILL EMPLOY A CLOSED WATER LOOP AND POZ-O-TEC SLUDGE STABILIZATION.
GENERAL PUBLIC UTILITIES COHO 1 NEW 690.0 MW (GROSS) 800.0 MW (ESC) COAL 3.50 XS PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: 9.4% STATUS 6 STARTUP 12/88	COHO 1 IS A 3.5% S COAL FIRED UNIT PLANNED BY GENERAL PUBLIC UTILITIES TO BE LOCATED IN ERIE, PENNSYLVANIA. PRIMARY CONSIDERATION IS BEING GIVEN TO LIME AND LIMESTONE NON-SLURRY TYPE FGD SYSTEMS. THE UNIT AND FGD SYSTEM ARE SCHEDULED TO START UP IN DECEMBER, 1988.
GENERAL PUBLIC UTILITIES GILBERT 1 NEW 625.0 MW (GROSS) 625.0 MW (ESC) COAL 3.50 XS PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ***** STATUS 6 STARTUP 7/90	GENERAL PUBLIC UTILITIES HAS PLANS FOR A NEW UNIT, GILBERT 9, TO BE LOCATED IN MILFORD, NEW JERSEY. THE UTILITY IS CONSIDERING FGD AS AN EMISSION CONTROL STRATEGY. THE EXPECTED START UP DATE IS IN 1990.
GENERAL PUBLIC UTILITIES SCOTTSVILLE 1 NEW 625.0 MW (GROSS) 625.0 MW (ESC) COAL 3.50 XS PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ***** STATUS 6 STARTUP 7/91	GENERAL PUBLIC UTILITIES IS PLANNING A NEW UNIT TO BE LOCATED IN SCOTTSVILLE, PENNSYLVANIA. THE SCOTTSVILLE 1 UNIT IS EXPECTED TO START UP IN 1991. THE UTILITY IS PRESENTLY CONSIDERING ONLY FGD AS A EMISSION CONTROL STRATEGY.
GENERAL PUBLIC UTILITIES SEWARD 7 NEW 690.0 MW (GROSS) 800.0 MW (ESC) COAL ***** XS PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: 9.4% STATUS 6 STARTUP 5/87	GENERAL PUBLIC UTILITIES IS PLANNING A NEW UNIT, SEWARD 7, TO BE BUILT IN SEWARD, PENNSYLVANIA. THE UTILITY IS PRESENTLY CONSIDERING ONLY FGD AS THE EMISSION CONTROL STRATEGY, WITH NON-SLURRY TYPE LIME AND LIMESTONE SYSTEMS LOOKING THE MOST PROMISING. START UP IS EXPECTED IN MAY, 1987.

SECTION 2
STATUS OF FGD SYSTEMS

UNIT IDENTIFICATION	ABSTRACT
GENERAL PUBLIC UTILITIES WEHRUM 1 NEW 625.0 MW (GROSS) 625.0 MW (ESC) COAL 3.50 XS PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****X STATUS 6 STARTUP 0/95	THE WEHRUM 1 UNIT PLANNED BY GENERAL PUBLIC UTILITIES IS TO BE LOCATED IN WEHRUM, PENNSYLVANIA. THE UTILITY IS PRESENTLY CONSIDERING FGD AS AN EMISSION CONTROL STRATEGY. THE UNIT IS EXPECTED TO COMMENCE OPERATIONS IN 1995.
GRAND HAVEN BRD OF LIGHT & PWR J. B. SIMS 3 NEW 81.0 MW (GROSS) 81.0 MW (ESC) COAL 2.75 XS BITUMINOUS LIME BABCOCK & WILCOX ENERGY CONSUMPTION: ****X STATUS 3 STARTUP 6/83	THE GRAND HAVEN BOARD OF LIGHT AND POWER'S J.B. SIMS 3 IS A PLANNED BITUMINOUS COAL (2.75% S, 11,000 BTU/LB) FIRED UNIT TO BE LOCATED IN GRAND HAVEN, MICHIGAN. A CONTRACT HAS BEEN AWARDED TO BABCOCK AND WILCOX TO SUPPLY TWO SPRAY TOWERS TO CONTROL EMISSIONS. EACH SCRUBBER SYSTEM WILL UTILIZE A CHEVRON MIST ELIMINATOR AND AN IN-LINE REHEATER. THE SLUDGE IS TO BE DISPOSED IN AN OFF SITE LANDFILL. OPERATIONS ARE TO COMMENCE IN JUNE, 1983.
HOOSIER ENERGY MEROM 1 NEW 490.0 MW (GROSS) 441.0 MW (ESC) COAL 3.50 XS LIMESTONE MITSUBISHI HEAVY INDUSTRIES ENERGY CONSUMPTION: ****X STATUS 3 STARTUP 5/82	MEROM 1 AND 2 ARE TWO NEW UNITS BEING BUILT BY HOOSIER ENERGY IN SULLIVAN, INDIANA. THESE PULVERIZED COAL (3.5% S) FIRED UNITS WITH PRODUCE 1,732,000 ACFM OF FLUE GAS WHICH WILL BE CLEANED BY A COLD SIDE ESP UPSTREAM OF A MITSUBISHI LIMESTONE GRID TOWER ABSORBER (90% DESIGN SO2 REMOVAL). THE SYSTEM WILL UTILIZE BYPASS REHEAT AND A 700 FOOT STACK. THE SLUDGE WILL BE STABILIZED AND LANDFILLED, AND THE SYSTEM WILL OPERATE IN A CLOSED WATER LOOP MODE. START UP OF UNIT 1 IS SCHEDULED FOR MAY, 1982.
HOOSIER ENERGY MEROM 2 NEW 490.0 MW (GROSS) 441.0 MW (ESC) COAL 3.50 XS LIMESTONE MITSUBISHI HEAVY INDUSTRIES ENERGY CONSUMPTION: ****X STATUS 2 STARTUP 7/81	MEROM 1 AND 2 ARE TWO NEW UNITS BEING BUILT BY HOOSIER ENERGY IN SULLIVAN, INDIANA. THESE PULVERIZED COAL (3.5% S) FIRED UNITS WITH PRODUCE 1,732,000 ACFM OF FLUE GAS WHICH WILL BE CLEANED BY A COLD SIDE ESP UPSTREAM OF A MITSUBISHI LIMESTONE GRID TOWER ABSORBER (90% DESIGN SO2 REMOVAL). THE SYSTEM WILL UTILIZE BYPASS REHEAT AND A 700 FOOT STACK. THE SLUDGE WILL BE STABILIZED AND LANDFILLED, AND THE SYSTEM WILL OPERATE IN A CLOSED WATER LOOP MODE. START UP OF UNIT 2 IS SCHEDULED FOR JULY, 1981.
HOUSTON LIGHTING & POWER CO. W.A. PARISH 8 NEW 600.0 MW (GROSS) 492.0 MW (ESC) COAL .60 XS SUBBITUMINOUS LIMESTONE CHEMICO ENERGY CONSUMPTION: ****X STATUS 3 STARTUP 11/82	W.A. PARISH 8 IS A PULVERIZED COAL (0.6% S, 8700 BTU/LB) FIRED UNIT PLANNED BY HOUSTON LIGHTING AND POWER CO TO BE LOCATED IN THOMPSONS, TEXAS. THE UTILITY HAS AWARDED A CONTRACT TO CHEMICO FOR A LIMESTONE FGD SYSTEM WHICH WILL REMOVE 82% OF THE FLUE GAS SO2. REHEAT WILL BE PROVIDED BY BYPASSING 18% OF THE PARTICULATE CLEANED FLUE GAS. SLUDGE WILL BE DEWATERED, BLENDED WITH FLYASH, AND DISPOSED IN AN ON SITE LANDFILL. START UP IS EXPECTED IN NOVEMBER, 1982.
INDIANAPOLIS POWER & LIGHT PATRIOT 1 NEW 650.0 MW (GROSS) 650.0 MW (ESC) COAL 3.50 XS LIMESTONE VENDOR NOT SELECTED ENERGY CONSUMPTION: ****X STATUS 6 STARTUP 0/87	INDIANAPOLIS POWER AND LIGHT HAS PLANS FOR THREE NEW UNITS, PATRIOT 1, 2, AND 3, TO BE LOCATED IN PATRIOT, INDIANA. THE UTILITY PLANS ON UTILIZING A LIMESTONE FGD PROCESS FOR EMISSION CONTROL.

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UNIT IDENTIFICATION	ABSTRACT
INDIANAPOLIS POWER & LIGHT PATRIOT 2 NEW 650.0 MW (GROSS) 650.0 MW (ESC) COAL 3.50 XS LIMESTONE VENDOR NOT SELECTED ENERGY CONSUMPTION: ****X STATUS 6 STARTUP 0/87	INDIANAPOLIS POWER AND LIGHT HAS PLANS FOR THREE NEW UNITS, PATRIOT 1, 2, AND 3, TO BE LOCATED IN PATRIOT, INDIANA. THE UTILITY PLANS ON UTILIZING A LIMESTONE FGD PROCESS FOR EMISSION CONTROL.
INDIANAPOLIS POWER & LIGHT PATRIOT 3 NEW 650.0 MW (GROSS) 650.0 MW (ESC) COAL 3.50 XS LIMESTONE VENDOR NOT SELECTED ENERGY CONSUMPTION: ****X STATUS 6 STARTUP 0/87	INDIANAPOLIS POWER AND LIGHT HAS PLANS FOR THREE NEW UNITS, PATRIOT 1, 2, AND 3, TO BE LOCATED IN PATRIOT, INDIANA. THE UTILITY PLANS ON UTILIZING A LIMESTONE FGD PROCESS FOR EMISSION CONTROL.
INDIANAPOLIS POWER & LIGHT PETERSBURG 3 NEW 532.0 MW (GROSS) 532.0 MW (ESC) COAL 3.25 XS BITUMINOUS LIMESTONE AIR CORRECTION DIVISION, UOP ENERGY CONSUMPTION: 2.4X STATUS 1 STARTUP 12/77	PETERSBURG 3 OF INDIANAPOLIS POWER AND LIGHT IS LOCATED IN PETERSBURG, INDIANA, AND BURNS 4.5% S BITUMINOUS COAL (11,000 BTU/LB). TWO COLD SIDE ESP'S ARE LOCATED UPSTREAM OF 4 85% EFFICIENT UOP LIMESTONE TCA MODULES. A HORIZONTAL MIST ELIMINATOR PRECEDES AN INDIRECT HOT AIR REHEATER THAT BOOSTS THE GAS TEMPERATURE BY 30 DEG F BEFORE IT EXITS THE 616 FOOT RIGI-FLAKE 4850 LINED STACK. STABILIZED SLUDGE IS DISPOSED IN AN ON SITE POND, AND THE SYSTEM OPERATES IN A CLOSED WATER LOOP MODE. THIS UNIT HAS BEEN OPERATIONAL SINCE DECEMBER, 1977.
INDIANAPOLIS POWER & LIGHT PETERSBURG 4 NEW 530.0 MW (GROSS) 530.0 MW (ESC) COAL 3.50 XS BITUMINOUS LIMESTONE RESEARCH COTTRELL ENERGY CONSUMPTION: 2.1X STATUS 2 STARTUP 10/84	PETERSBURG 4 OF INDIANAPOLIS POWER AND LIGHT IS A BITUMINOUS COAL (3.5CX S 11,000 BTU/LB) FIRED BOILER UNDER CONSTRUCTION IN PETERSBURG, INDIANA. THE LIMESTONE FGD SYSTEM FOR THIS UNIT WILL BE SUPPLIED BY RESEARCH COTTRELL. THE SYSTEM WILL OPERATE IN A CLOSED WATER LOOP, AND SLUDGE WILL BE POZ-O-TEC STABILIZED BEFORE PONDING. START UP IS SLATED FOR OCTOBER OF 1984.
KANSAS CITY POWER & LIGHT HAWTHORN 3 RETROFIT 90.0 MW (GROSS) 90.0 MW (ESC) COAL .60 XS BITUMINOUS LIME COMBUSTION ENGINEERING ENERGY CONSUMPTION: 2.2X STATUS 1 STARTUP 11/72	HAWTHORN 3 OF KANSAS CITY POWER AND LIGHT IS A DRY BOTTOM PULVERIZED BITUMINOUS COAL (0.6X S, 9800 BTU/LB) FIRED UNIT LOCATED IN KANSAS CITY, MISSOURI, WHICH WAS CONVERTED FROM LIMESTONE FURNACE INJECTION AND TAIL END SCRUBBING TO A LIME SLURRY SYSTEM. TWO COMBUSTION ENGINEERING MARBLE BED ABSORBERS, WHICH WERE DESIGNED TO REMOVE 70% OF THE FLUE GAS SO2, BEGAN OPERATION IN JANUARY, 1977. ONE HORIZONTAL CHEVRON MIST ELIMINATOR PER MODULE IS UPSTREAM OF AN IN-LINE FINNED TUBE REHEATER, WHICH RAISES THE TEMPERATURE OF THE CLEANED GAS BEFORE IT EXITS THROUGH A GUNITE LINED 200 FOOT STACK. THE FLYASH STABILIZED SLUDGE IS DEPOSITED IN AN UNLINED SLUDGE POND. THE SYSTEM OPERATES IN A CLOSED WATER LOOP MODE.
KANSAS CITY POWER & LIGHT HAWTHORN 4 RETROFIT 90.0 MW (GROSS) 90.0 MW (ESC) COAL .60 XS BITUMINOUS LIME COMBUSTION ENGINEERING ENERGY CONSUMPTION: 2.2X STATUS 1 STARTUP 8/72	HAWTHORN 4 OF KANSAS CITY POWER AND LIGHT IS A DRY BOTTOM PULVERIZED BITUMINOUS COAL (0.6X S, 9800 BTU/LB) FIRED UNIT LOCATED IN KANSAS CITY, MISSOURI, WHICH WAS CONVERTED FROM LIMESTONE FURNACE INJECTION AND TAIL END SCRUBBING TO A LIME SLURRY SYSTEM. TWO COMBUSTION ENGINEERING MARBLE BED ABSORBERS, WHICH WERE DESIGNED TO REMOVE 70% OF THE FLUE GAS SO2, BEGAN OPERATION IN JANUARY, 1977. ONE HORIZONTAL CHEVRON MIST ELIMINATOR PER MODULE IS UPSTREAM OF AN IN-LINE FINNED TUBE REHEATER, WHICH RAISES THE TEMPERATURE OF THE CLEANED GAS BEFORE IT EXITS THROUGH A GUNITE LINED 200 FOOT STACK. THE FLYASH STABILIZED SLUDGE IS DEPOSITED IN AN UNLINED SLUDGE POND. THE SYSTEM OPERATES IN A CLOSED WATER LOOP MODE.

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UNIT IDENTIFICATION	ABSTRACT
KANSAS CITY POWER & LIGHT LA CYGNE 1 NEW 874.0 MW (GROSS) 874.0 MW (ESC) COAL 5.39 XS SUBBITUMINOUS LIMESTONE BABCOCK & WILCOX ENERGY CONSUMPTION: 2.7% STATUS 1 STARTUP 2/73	LA CYGNE 1 IS A WET BOTTOM, CYCLONE FIRED PULVERIZED SUBBITUMINOUS COAL (5.39% S, 9421 BTU/LB) FIRED UNIT OF KANSAS CITY POWER AND LIGHT, LOCATED IN LA CYGNE, KANSAS. THE EMISSION CONTROL SYSTEM CONSISTS OF EIGHT VARIABLE THROAT VENTURI/LIMESTONE SIEVE TRAY TOWER TRAINS SUPPLIED BY BABCOCK AND WILCOX. EACH 80% (SO ₂ REMOVAL, DESIGN) EFFICIENT TRAIN IS FOLLOWED BY A COMBINATION SIEVE TRAY AND CHEVRON MIST ELIMINATOR, FOLLOWED BY AN INDIRECT REHEATER. THE CLEANED GAS EXITS THROUGH A 700 FOOT STEEL LINED STACK. THE SYSTEM OPERATES IN A CLOSED WATER LOOP, AND THE SCRUBBER SLUDGE IS DISPOSED IN AN UNLINED POND. INITIAL OPERATIONS OF THE FGD SYSTEM BEGAN IN FEBRUARY, 1973.
KANSAS POWER & LIGHT JEFFREY 1 NEW 720.0 MW (GROSS) 540.0 MW (ESC) COAL .32 XS LIMESTONE COMBUSTION ENGINEERING ENERGY CONSUMPTION: ***** STATUS 1 STARTUP 8/78	KANSAS CITY POWER AND LIGHT'S JEFFREY 1 IS A TANGENTIAL FIRED PULVERIZED COAL (0.32% S, 8125 BTU/LB) UNIT IN WAMEGO, KANSAS. THE EMISSION CONTROL SYSTEM FOR THIS UNIT CONSISTS OF A COLD SIDE ESP FOLLOWED BY SIX (ONE SPARE) LIMESTONE SPRAY TOWER MODULES SUPPLIED BY COMBUSTION ENGINEERING. THE DESIGN SO ₂ REMOVAL EFFICIENCY IS 50% (INCLUDING A 30% BYPASS REHEAT). THE UNIT HAS BEEN OPERATIONAL SINCE AUGUST, 1978.
KANSAS POWER & LIGHT JEFFREY 2 NEW 700.0 MW (GROSS) 490.0 MW (ESC) COAL .30 XS LIMESTONE COMBUSTION ENGINEERING ENERGY CONSUMPTION: ***** STATUS 2 STARTUP 4/80	UNIT 2, PRESENTLY UNDER CONSTRUCTION AT KANSAS POWER AND LIGHT'S JEFFREY ENERGY CENTER IN JEFFREY, KANSAS, WILL BURN 0.3% S PULVERIZED COAL (8100 BTU/LB). THIS UNIT'S EMISSION CONTROL SYSTEM WILL CONSIST OF A COLD SIDE ESP AND COMBUSTION ENGINEERING LIMESTONE SPRAY TOWERS. A 30% FLUE GAS BYPASS WILL PROVIDE REHEAT OF THE CLEANED GAS BEFORE IT EXITS THROUGH A 600 FOOT STACK. THE SYSTEM WILL OPERATE IN A CLOSED WATER LOOP MODE, AND THE SLUDGE WILL BE STABILIZED WITH BOTTOM ASH AND PIPED TO AN ON-SITE CLAY LINED POND. SCHEDULED START UP OF THE SYSTEM IS APRIL, 1980.
KANSAS POWER & LIGHT LAWRENCE 4 RETROFIT 125.0 MW (GROSS) 125.0 MW (ESC) COAL .55 XS LIMESTONE COMBUSTION ENGINEERING ENERGY CONSUMPTION: ***** STATUS 1 STARTUP 1/76	LAWRENCE 4 OF KANSAS POWER AND LIGHT IS A BALANCED DRAFT, TANGENTIAL FIRED PULVERIZED COAL (0.55% S, 10,000 BTU/LB) UNIT LOCATED IN LAWRENCE, KANSAS. A NEW COMBUSTION ENGINEERING LIMESTONE ROD DECK/SPRAY TOWER SYSTEM REPLACED THE EXISTING MARBLE BED TAIL END SCRUBBER IN JANUARY, 1977. THE SYSTEM TREATS 403,000 ACFM OF FLUE GAS, WITH A DESIGN SO ₂ REMOVAL OF 73%. MIST ELIMINATION IS ACCOMPLISHED BY TWO CHEVRONS AND ONE BULK ENTRAINMENT SEPARATOR FOLLOWING EACH OF THE TWO MODULES. A FINNED TUBE REHEATER BOOSTS THE TEMPERATURE OF THE CLEANED GAS BY 20 DEG F BEFORE IT IS EXHAUSTED THROUGH A 120 FOOT STACK. THE SLUDGE IS DISPOSED IN AN UNLINED INTERIM POND, WHICH OVERFLOWS INTO A FINAL DISPOSAL POND. THE SYSTEM OPERATES IN A CLOSED WATER LOOP.
KANSAS POWER & LIGHT LAWRENCE 5 RETROFIT 420.0 MW (GROSS) 420.0 MW (ESC) COAL .55 XS LIMESTONE COMBUSTION ENGINEERING ENERGY CONSUMPTION: ***** STATUS 1 STARTUP 11/71	LAWRENCE 5 OF KANSAS POWER AND LIGHT IS A BALANCED DRAFT, TANGENTIAL FIRED PULVERIZED COAL (0.55% S, 10,000 BTU/LB) UNIT LOCATED IN LAWRENCE, KANSAS. A NEW COMBUSTION ENGINEERING LIMESTONE ROD DECK/SPRAY TOWER SYSTEM REPLACED THE EXISTING MARBLE BED TAIL END SCRUBBER IN APRIL, 1978. THE SYSTEM TREATS 403,000 ACFM OF FLUE GAS, WITH A DESIGN SO ₂ REMOVAL OF 73%. MIST ELIMINATION IS ACCOMPLISHED BY TWO CHEVRONS AND ONE BULK ENTRAINMENT SEPARATOR FOLLOWING EACH OF THE TWO MODULES. A FINNED TUBE REHEATER BOOSTS THE TEMPERATURE OF THE CLEANED GAS BY 20 DEG F BEFORE IT IS EXHAUSTED THROUGH A 120 FOOT STACK. THE SLUDGE IS DISPOSED IN AN UNLINED INTERIM POND, WHICH OVERFLOWS INTO A FINAL DISPOSAL POND. THE SYSTEM OPERATES IN A CLOSED WATER LOOP.
KENTUCKY UTILITIES GREEN RIVER 1-3 RETROFIT 64.0 MW (GROSS) 64.0 MW (ESC) COAL 4.00 XS BITUMINOUS LIME AMERICAN AIR FILTER ENERGY CONSUMPTION: 3.1% STATUS 1 STARTUP 9/75	GREEN RIVER 1-3 OF KENTUCKY UTILITIES ARE THREE DRY BOTTOM PULVERIZED BITUMINOUS COAL (4% S, 11,000 BTU/LB) FIRED UNITS LOCATED IN CENTRAL CITY, KENTUCKY. EACH BOILER SUPPLIES 360,000 ACFM OF FLUE GAS TO A VARIABLE THROAT VENTURI FOLLOWED BY AN AMERICAN AIR FILTER LIME MOBILE BED CONTACTOR (80% DESIGN SO ₂ REMOVAL EFFICIENCY). A RADIAL VANE MIST ELIMINATOR IS FOLLOWED BY A STEAM TUBE REHEATER AND A 165 FOOT STACK. SLUDGE IS DISPOSED IN AN ON-SITE UNLINED POND, AND THE SYSTEM OPERATES IN A CLOSED WATER LOOP. THE SYSTEM HAS BEEN OPERATIONAL SINCE SEPTEMBER, 1975.

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UNIT IDENTIFICATION	ABSTRACT
LAKELAND UTILITIES MCINTOSH 3 NEW 364.0 MW (GROSS) 364.0 MW (ESC) COAL 2.56 XS BITUMINOUS LIMESTONE BABCOCK & WILCOX ENERGY CONSUMPTION: ****X STATUS 2 STARTUP 10/81	MCINTOSH 3 OF LAKELAND UTILITIES IS BEING CONSTRUCTED IN LAKELAND, FLORIDA. BABCOCK AND WILCOX HAS BEEN AWARDED A CONTRACT TO SUPPLY AN 85% EFFICIENT (SO ₂) LIMESTONE FGD SYSTEM FOR THIS UNIT. THE EMISSION CONTROL SYSTEM WILL CONSIST OF A COLD SIDE ESP FOLLOWED BY TWO PARALLEL FGD MODULES AND A 250 FOOT ACID BRICK LINED STACK. THE SYSTEM WILL OPERATE IN A CLOSED WATER LOOP, AND THE POZ-O-TEC STABILIZED SLUDGE WILL BE USED AS A CONSTRUCTION BASE. CONSTRUCTION BEGAN IN NOVEMBER, 1979 AND START UP IS SCHEDULED TO BE IN OCTOBER, 1981.
LOUISVILLE GAS & ELECTRIC CANE RUN 4 RETROFIT 188.0 MW (GROSS) 188.0 MW (ESC) COAL 3.75 XS BITUMINOUS LIME AMERICAN AIR FILTER ENERGY CONSUMPTION: 1.6X STATUS 1 STARTUP 8/76	UNIT 4 AT LOUISVILLE GAS AND ELECTRIC'S CANE RUN STATION IS A PULVERIZED BITUMINOUS COAL (3.75% S, 11,500 BTU/LB) FIRED UNIT IN LOUISVILLE, KENTUCKY. AN ESP AND TWO AMERICAN AIR FILTER CARBIDE LIME MOBILE BED ABSORBER MODULES (85% DESIGN SO ₂ REMOVAL) TREAT 734,000 ACFM OF FLUE GAS FROM THE BOILER. TWO CHEVRON MIST ELIMINATORS/MODULE ARE FOLLOWED BY A DIRECT COMBUSTION REHEATER AND A 250 FOOT STACK. THE WATER LOOP IS OPEN, AND THE SLUDGE IS DISPOSED IN AN ON-SITE LINED POND. THIS RETROFIT SYSTEM HAS BEEN OPERATIONAL SINCE AUGUST, 1976.
LOUISVILLE GAS & ELECTRIC CANE RUN 5 RETROFIT 200.0 MW (GROSS) 200.0 MW (ESC) COAL 3.75 XS BITUMINOUS LIME COMBUSTION ENGINEERING ENERGY CONSUMPTION: 1.5X STATUS 1 STARTUP 12/77	CANE RUN 5 OF LOUISVILLE GAS AND ELECTRIC IS A PULVERIZED BITUMINOUS COAL (3.75% S, 11,500 BTU/LB) FIRED UNIT LOCATED IN LOUISVILLE, KENTUCKY. THE BOILER SUPPLIES 700,000 ACFM OF FLUE GAS TO AN EMISSION CONTROL SYSTEM CONSISTING OF AN ESP FOLLOWED AND TWO COMBUSTION ENGINEERING 85% EFFICIENT (DESIGN) CARBIDE LIME SPRAY TOWERS. A STEAM TUBE REHEATER RAISES THE GAS TEMPERATURE 40 DEG F. THE SYSTEM OPERATES IN AN OPEN WATER LOOP MODE, AND THE SLUDGE IS POZ-O-TEC STABILIZED. OPERATION OF THIS RETROFIT SYSTEM BEGAN IN DECEMBER, 1977.
LOUISVILLE GAS & ELECTRIC CANE RUN 6 RETROFIT 299.0 MW (GROSS) 299.0 MW (ESC) COAL 4.80 XS BITUMINOUS DUAL ALKALI ADL/COMBUSTION EQUIP ASSOCIATE ENERGY CONSUMPTION: 1.0X STATUS 1 STARTUP 4/79	LOUISVILLE GAS AND ELECTRIC'S CANE RUN 6 IS A PULVERIZED BITUMINOUS COAL (3.75% S, 11,500 BTU/LB) FIRED UNIT IN LOUISVILLE, KENTUCKY. ADL/COMBUSTION EQUIPMENT ASSOCIATES SUPPLIED A RETROFIT DUAL ALKALI DEMONSTRATION FGD SYSTEM FOR THIS UNIT. THE EMISSION CONTROL SYSTEM, DESIGNED TO REMOVE 95% OF THE FLUE GAS SO ₂ , CONSISTS OF A COLD SIDE ESP AND TWO TRAY TOWER MODULES. THE CLEANED GAS PASSES THROUGH A CHEVRON MIST ELIMINATOR AND TWO DIRECT COMBUSTION REHEATERS BEFORE EXITING A 518 FOOT STACK. THE WATER LOOP IS OPEN, AND THE SLUDGE IS DISPOSED IN AN ON-SITE CLAY LINED POND. FOR A ONE YEAR PERIOD FOLLOWING THE FIRST QUARTER OF OPERATION (WHICH BEGAN IN APRIL, 1979), THE U.S.EPA WILL SUBSIDIZE A MAX OF \$4.5 MM FOR OPERATION, R&D, AND REPORT WRITING (NOT APPLIED TO ANY CAPITAL EXPENDITURES).
LOUISVILLE GAS & ELECTRIC MILL CREEK 1 RETROFIT 358.0 MW (GROSS) 358.0 MW (ESC) COAL 3.75 XS LIME COMBUSTION ENGINEERING ENERGY CONSUMPTION: 1.4X STATUS 2 STARTUP 4/81	MILL CREEK 1 OF LOUISVILLE GAS AND ELECTRIC IS LOCATED IN LOUISVILLE, KENTUCKY. A RETROFIT LIME/LIMESTONE FGD SYSTEM IS PRESENTLY UNDER CONSTRUCTION ON THIS PULVERIZED COAL (3.75% S, 11,500 BTU/LB) FIRED UNIT. COMBUSTION ENGINEERING IS SUPPLYING THE LIME/LIMESTONE FGD SYSTEM WHICH WILL COMPLY WITH LOCAL EMISSION STANDARDS BY APRIL OF 1981.
LOUISVILLE GAS & ELECTRIC MILL CREEK 2 RETROFIT 350.0 MW (GROSS) 350.0 MW (ESC) COAL 3.75 XS LIME COMBUSTION ENGINEERING ENERGY CONSUMPTION: 1.4X STATUS 2 STARTUP 4/82	MILL CREEK 2 OF LOUISVILLE GAS AND ELECTRIC IS LOCATED IN LOUISVILLE, KENTUCKY. A RETROFIT LIME/LIMESTONE FGD SYSTEM IS PRESENTLY UNDER CONSTRUCTION ON THIS PULVERIZED COAL (3.75% S, 11,500 BTU/LB) FIRED UNIT. COMBUSTION ENGINEERING IS SUPPLYING THE LIME/LIMESTONE FGD SYSTEM WHICH WILL COMPLY WITH LOCAL EMISSION STANDARDS BY APRIL OF 1982.

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UNIT IDENTIFICATION	ABSTRACT
LOUISVILLE GAS & ELECTRIC MILL CREEK 3 NEW 442.0 MW (GROSS) 442.0 MW (ESC) COAL 3.75 XS BITUMINOUS LIME AMERICAN AIR FILTER ENERGY CONSUMPTION: 1.6% STATUS 1 STARTUP 8/78	LOUISVILLE GAS AND ELECTRIC'S MILL CREEK 3 IS A 3.75% S COAL (11,500 BTU/LB) FIRED UNIT LOCATED IN LOUISVILLE, KENTUCKY. AMERICAN AIR FILTER SUPPLIED A CARBIDE LIME FGD SYSTEM FOR THIS UNIT WHICH WAS DESIGNED TO REMOVE 85% OF THE SO ₂ FROM THE FLUE GAS. AN ESP IS FOLLOWED BY FOUR MOBILE BED SPRAY TOWERS AND A STEAM TUBE REHEATER. THE WATER LOOP IS OPEN, AND THE FLYASH AND LIME STABILIZED SLUDGE IS PONDED. THIS UNIT HAS BEEN OPERATIONAL SINCE AUGUST, 1978.
LOUISVILLE GAS & ELECTRIC MILL CREEK 4 NEW 495.0 MW (GROSS) 495.0 MW (ESC) COAL 3.75 XS LIME AMERICAN AIR FILTER ENERGY CONSUMPTION: ****% STATUS 2 STARTUP 7/81	MILL CREEK 4 OF LOUISVILLE GAS AND ELECTRIC IS A PULVERIZED BITUMINOUS COAL (3.75% S, 11,500 BTU/LB) FIRED UNIT UNDER CONSTRUCTION IN LOUISVILLE, KENTUCKY. THE EMISSION CONTROL SYSTEM WILL CONSIST OF AN ESP AND FOUR MOBILE BED SPRAY TOWERS. THE SYSTEM'S WATER LOOP WILL BE CLOSED, AND THE SLUDGE WILL BE STABILIZED WITH LIME AND FLYASH. STEAM TUBES WILL PROVIDE REHEAT OF THE CLEANED GASES. THE SYSTEM IS SCHEDULED TO START UP IN JULY OF 1981.
LOUISVILLE GAS & ELECTRIC PADDY'S RUN 5 RETROFIT 72.0 MW (GROSS) 72.0 MW (ESC) COAL 2.50 XS BITUMINOUS LIME COMBUSTION ENGINEERING ENERGY CONSUMPTION: 2.8% STATUS 1 STARTUP 4/73	UNIT 6 AT LOUISVILLE GAS AND ELECTRIC'S PADDY'S RUN STATION IS A DRY BOTTOM PULVERIZED COAL (2.5% S, 11,500 BTU/LB) FIRED UNIT IN LOUISVILLE, KENTUCKY. A RETROFIT CARBIDE LIME FGD SYSTEM BY COMBUSTION ENGINEERING TREATS 400,000 ACFM OF FLUE GAS FROM THE BOILER. AN ESP IS FOLLOWED BY TWO MARBLE BED ABSORBERS, A DIRECT COMBUSTION REHEATER, AND A 250 FOOT STACK. MIST ELIMINATION IS PROVIDED BY ONE CHEVRON/MODULE. THE LIME FIXATED SLUDGE IS TRUCKED TO AN UNLINED POND, AND THE WATER LOOP IS CLOSED. THE FGD SYSTEM BEGAN INITIAL OPERATIONS IN APRIL, 1973.
LOUISVILLE GAS & ELECTRIC TRIMBLE COUNTY 1 NEW 575.0 MW (GROSS) 575.0 MW (ESC) COAL 4.00 XS BITUMINOUS PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 6 STARTUP 7/84	LOUISVILLE GAS AND ELECTRIC WILL BE INSTALLING FGD SYSTEMS ON TWO OF THE FOUR BOILERS AT THE UTILITY'S PLANNED TRIMBLE COUNTY STATION IN BEDFORD, KENTUCKY. THE PULVERIZED 4% S (IF NO COAL WASH IS INCLUDED) COAL FIRED UNITS' FLUE GAS WILL BE CLEANED BY ESP'S AND WET SCRUBBING (90% REMOVAL EFFICIENCY). SLUDGE DISPOSAL STRATEGY IS UNDECIDED. UNIT 1 IS SCHEDULED FOR START UP IN JULY OF 1984.
LOUISVILLE GAS & ELECTRIC TRIMBLE COUNTY 2 NEW 575.0 MW (GROSS) 575.0 MW (ESC) COAL 4.00 XS BITUMINOUS PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 6 STARTUP 7/86	LOUISVILLE GAS AND ELECTRIC WILL BE INSTALLING FGD SYSTEMS ON TWO OF THE FOUR BOILERS AT THE UTILITY'S PLANNED TRIMBLE COUNTY STATION IN BEDFORD, KENTUCKY. THE PULVERIZED 4% S (IF NO COAL WASH IS INCLUDED) COAL FIRED UNITS' FLUE GAS WILL BE CLEANED BY ESP'S AND WET SCRUBBING (90% REMOVAL EFFICIENCY). SLUDGE DISPOSAL STRATEGY IS UNDECIDED. UNIT 2 IS SCHEDULED FOR START UP IN 1986.
MICHIGAN SO. CENTRAL PWR AGENC PROJECT 1 NEW 55.0 MW (GROSS) 55.0 MW (ESC) COAL 2.25 XS LIMESTONE BABCOCK & WILCOX ENERGY CONSUMPTION: ****% STATUS 3 STARTUP 7/82	THE PROJECT 1 UNIT OF MICHIGAN SOUTH CENTRAL POWER AGENCY IS TO BE CONSTRUCTED IN LITCHFIELD, MICHIGAN, AND WILL UTILIZE A WET LIMESTONE FGD PROCESS. THE PULVERIZED COAL FIRED BOILER WILL FEED ITS FLUE GAS THROUGH A HOT SIDE ESP FOLLOWED BY A BABCOCK AND WILCOX LIMESTONE SPRAY TOWER. THE CLEANED GAS WILL PASS THROUGH A MIST ELIMINATOR BEFORE BEING WARMED BY AN IN-LINE REHEATER AND EXITING A 250 FOOT STACK. THE SLUDGE IS TO BE DISPOSED OFF SITE. START UP IS SCHEDULED FOR JULY, 1982.

SECTION 2
STATUS OF FGD SYSTEMS

UNIT IDENTIFICATION	ABSTRACT
MIDDLE SOUTH UTILITIES ARKANSAS COAL 5 NEW 890.0 MW (GROSS) 890.0 MW (ESC) COAL .50 XS PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****X STATUS 5 STARTUP 1/86	MIDDLE SOUTH UTILITIES HAS AWARDED CONTRACTS ON SIX NEW LOW SULFUR (0.5%) COAL FIRED UNITS. THE UTILITY IS CURRENTLY REQUESTING/EVALUATING BIDS FOR THE FGD SYSTEMS, ALTHOUGH THE TYPE OF SYSTEM HAS NOT BEEN DECIDED. ARKANSAS COAL 5 IS SCHEDULED TO BEGIN OPERATIONS IN JANUARY, 1986.
MIDDLE SOUTH UTILITIES ARKANSAS COAL 6 NEW 890.0 MW (GROSS) 890.0 MW (ESC) COAL .50 XS PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****X STATUS 5 STARTUP 1/88	MIDDLE SOUTH UTILITIES HAS AWARDED CONTRACTS ON SIX NEW LOW SULFUR (0.5%) COAL FIRED UNITS. THE UTILITY IS CURRENTLY REQUESTING/EVALUATING BIDS FOR THE FGD SYSTEMS, ALTHOUGH THE TYPE OF SYSTEM HAS NOT BEEN DECIDED. ARKANSAS COAL 6 IS SCHEDULED TO BEGIN OPERATIONS IN JANUARY, 1988.
MIDDLE SOUTH UTILITIES LOUISIANA COAL 1 NEW 890.0 MW (GROSS) 890.0 MW (ESC) COAL .50 XS PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****X STATUS 5 STARTUP 0/86	MIDDLE SOUTH UTILITIES HAS AWARDED CONTRACTS ON SIX NEW LOW SULFUR (0.5%) COAL FIRED UNITS. THE UTILITY IS CURRENTLY REQUESTING/EVALUATING BIDS FOR THE FGD SYSTEMS, ALTHOUGH THE TYPE OF SYSTEM HAS NOT BEEN DECIDED. LOUISIANA COAL 1 WILL START UP IN 1986.
MIDDLE SOUTH UTILITIES LOUISIANA COAL 2 NEW 890.0 MW (GROSS) 890.0 MW (ESC) COAL .50 XS PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****X STATUS 5 STARTUP 0/88	MIDDLE SOUTH UTILITIES HAS AWARDED CONTRACTS ON SIX NEW LOW SULFUR (0.5%) COAL FIRED UNITS. THE UTILITY IS CURRENTLY REQUESTING/EVALUATING BIDS FOR THE FGD SYSTEMS, ALTHOUGH THE TYPE OF SYSTEM HAS NOT BEEN DECIDED. LOUISIANA COAL 2 WILL START UP IN 1988.
MIDDLE SOUTH UTILITIES MISSISSIPPI COAL 1 NEW 890.0 MW (GROSS) 890.0 MW (ESC) COAL .50 XS PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****X STATUS 5 STARTUP 0/85	MIDDLE SOUTH UTILITIES HAS AWARDED CONTRACTS ON SIX NEW LOW SULFUR (0.5%) COAL FIRED UNITS. THE UTILITY IS CURRENTLY REQUESTING/EVALUATING BIDS FOR THE FGD SYSTEMS, ALTHOUGH THE TYPE OF SYSTEM HAS NOT BEEN DECIDED. MISSISSIPPI COAL 1 WILL START UP IN 1985.
MIDDLE SOUTH UTILITIES MISSISSIPPI COAL 2 NEW 890.0 MW (GROSS) 890.0 MW (ESC) COAL .50 XS PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****X STATUS 5 STARTUP 0/87	MIDDLE SOUTH UTILITIES HAS AWARDED CONTRACTS ON SIX NEW LOW SULFUR (0.5%) COAL FIRED UNITS. THE UTILITY IS CURRENTLY REQUESTING/EVALUATING BIDS FOR THE FGD SYSTEMS, ALTHOUGH THE TYPE OF SYSTEM HAS NOT BEEN DECIDED. MISSISSIPPI COAL 2 WILL START UP IN 1987.

SECTION 2
STATUS OF FGD SYSTEMS

UNIT IDENTIFICATION	ABSTRACT
MINNESOTA POWER & LIGHT CLAY BOSWELL 4 NEW 554.0 MW (GROSS) 475.0 MW (ESC) COAL .94 XS SUBBITUMINOUS LIME/ALKALINE FLYASH PEABODY PROCESS SYSTEMS ENERGY CONSUMPTION: 1.3% STATUS 2 STARTUP 4/80	CLAY BOSWELL 4 OF MINNESOTA POWER AND LIGHT IS A SUBBITUMINOUS COAL (0.54% S, 8896 BTU/LB) FIRED UNIT UNDER CONSTRUCTION IN COHASSET, MINNESOTA. PEABODY PROCESS SYSTEMS WILL SUPPLY A LIME/ALKALINE FLYASH SYSTEM WHICH IS DESIGNED TO REMOVE 89% OF THE SO ₂ IN THE FLUE GAS. TWO HOT SIDE ESP'S WILL BE FOLLOWED BY VENTURI/SPRAY TOWER TRAINS. MIST ELIMINATION WILL BE PROVIDED BY A STEVE TRAY FOLLOWED BY A SPIN VANE CHEVRON, AND REHEAT WILL BE PROVIDED BY BYPASSING 5% OF THE FLUE GAS. THE SYSTEM WILL OPERATE IN A CLOSED WATER LOOP MODE, AND THE SLUDGE WILL BE DISPOSED IN A LINED POND. OPERATIONS ARE SCHEDULED TO COMMENCE IN APRIL, 1980.
MINNKOTA POWER COOPERATIVE MILTON R. YOUNG 2 NEW 440.0 MW (GROSS) 405.0 MW (ESC) COAL .70 XS LIGNITE LIME/ALKALINE FLYASH ADL/COMBUSTION EQUIP ASSOCIATE ENERGY CONSUMPTION: 1.6% STATUS 1 STARTUP 9/77	MINNKOTA POWER COOPERATIVE'S MILTON R. YOUNG 2 IS A CYCLONE FIRED LIGNITE (0.70% S, 6500 BTU/LB) BOILER LOCATED IN CENTER, NORTH DAKOTA. THE BOILER PRODUCES 2,021,400 ACFM OF FLUE GAS, WHICH IS CLEANED BY TWO ESP'S AND TWO ADL/COMBUSTION EQUIPMENT ASSOCIATES LIME/ALKALINE FLYASH SPRAY TOWERS (75% DESIGN SO ₂ REMOVAL EFFICIENCY). THE CLEANED GAS PASSES THROUGH A CHEVRON MIST ELIMINATOR BEFORE IT JOINS A 15% BYPASS REHEAT AND EXITS A 550 FOOT STACK. THE WATER LOOP IS OPEN, AND THE SLUDGE IS TRUCKED TO AN OFF-SITE MINEFILL. THIS SYSTEM HAS BEEN OPERATIONAL SINCE SEPTEMBER, 1977.
MONTANA POWER COLSTRIP 1 NEW 360.0 MW (GROSS) 360.0 MW (ESC) COAL .77 XS SUBBITUMINOUS LIME/ALKALINE FLYASH ADL/COMBUSTION EQUIP ASSOCIATE ENERGY CONSUMPTION: 3.3% STATUS 1 STARTUP 9/75	COLSTRIP 1 OF MONTANA POWER IS A SUBBITUMINOUS COAL (0.77% S, 8843 BTU/LB) FIRED UNIT LOCATED IN COLSTRIP, MONTANA. ADL/COMBUSTION EQUIPMENT ASSOCIATES SUPPLIED A LIME/ALKALINE FLYASH FGD SYSTEM CONSISTING OF THREE VENTURI SCRUBBER/SPRAY TOWER ABSORBER TRAINS. THE ABSORBERS ARE FOLLOWED BY HORIZONTAL CHEVRON MIST ELIMINATORS, A STEAM TUBE REHEATER, AND A 500 FOOT STACK. THE UNSTABILIZED SLUDGE IS DISPOSED IN AN ON-SITE LINED POND. THE WATER LOOP IS CLOSED. OPERATIONS INITIALLY BEGAN IN SEPTEMBER OF 1975.
MONTANA POWER COLSTRIP 2 NEW 360.0 MW (GROSS) 360.0 MW (ESC) COAL .77 XS SUBBITUMINOUS LIME/ALKALINE FLYASH ADL/COMBUSTION EQUIP ASSOCIATE ENERGY CONSUMPTION: 3.3% STATUS 1 STARTUP 5/76	COLSTRIP 2 OF MONTANA POWER IS A SUBBITUMINOUS COAL (0.77% S, 8843 BTU/LB) FIRED UNIT LOCATED IN COLSTRIP, MONTANA. ADL/COMBUSTION EQUIPMENT ASSOCIATES SUPPLIED A LIME/ALKALINE FLYASH FGD SYSTEM CONSISTING OF THREE VENTURI SCRUBBER/SPRAY TOWER ABSORBER TRAINS. THE ABSORBERS ARE FOLLOWED BY HORIZONTAL CHEVRON MIST ELIMINATORS, A STEAM TUBE REHEATER, AND A 500 FOOT STACK. THE UNSTABILIZED SLUDGE IS DISPOSED IN AN ON-SITE LINED POND. THE WATER LOOP IS CLOSED. OPERATIONS INITIALLY BEGAN IN MAY OF 1976.
MONTANA POWER COLSTRIP 3 NEW 700.0 MW (GROSS) 700.0 MW (ESC) COAL .70 XS LIME/ALKALINE FLYASH ADL/COMBUSTION EQUIP ASSOCIATE ENERGY CONSUMPTION: ****% STATUS 2 STARTUP 1/84	MONTANA POWER'S COLSTRIP 3 IS A LOW SULFUR COAL (0.7% S, 8800 BTU/LB) FIRED UNIT UNDER CONSTRUCTION IN COLSTRIP, MONTANA. A CONTRACT HAS BEEN AWARDED TO ADL/COMBUSTION EQUIPMENT ASSOCIATES FOR A LIME/ALKALINE FLYASH FGD SYSTEM ON THIS UNIT. START UP IS SCHEDULED FOR JANUARY, 1984.
MONTANA POWER COLSTRIP 4 NEW 700.0 MW (GROSS) 700.0 MW (ESC) COAL .70 XS LIME/ALKALINE FLYASH ADL/COMBUSTION EQUIP ASSOCIATE ENERGY CONSUMPTION: ****% STATUS 2 STARTUP 0/84	MONTANA POWER'S COLSTRIP 4 IS A LOW SULFUR COAL (0.7% S, 8800 BTU/LB) FIRED UNIT UNDER CONSTRUCTION IN COLSTRIP, MONTANA. A CONTRACT HAS BEEN AWARDED TO ADL/COMBUSTION EQUIPMENT ASSOCIATES FOR A LIME/ALKALINE FLYASH FGD SYSTEM ON THIS UNIT. START UP IS SCHEDULED FOR 1984.

SECTION 2
STATUS OF FGD SYSTEMS

UNIT IDENTIFICATION	ABSTRACT
<p>MUSCATINE POWER & WATER MUSCATINE 9 NEW 166.0 MW (GROSS) 160.0 MW (ESC) COAL 3.17 %S BITUMINOUS LIMESTONE RESEARCH COTTRELL ENERGY CONSUMPTION: 4.8% STATUS 3 STARTUP 9/82</p>	<p>MUSCATINE 9 IS A PULVERIZED BITUMINOUS COAL (3% S, 11,200 BTU/LB) FIRED UNIT PLANNED BY MUSCATINE POWER AND WATER TO BE LOCATED IN MUSCATINE, IOWA. A CONTRACT WAS AWARDED TO RESEARCH COTTRELL FOR A LIMESTONE UNIT FOR EMISSION CONTROL. THE FGD SYSTEM WILL FEATURE AN ESP, TWO 100% CAPACITY TOWERS, STEAM COIL REHEAT, A CLOSED WATER LOOP, AND FORCED OXIDATION OF THE SLUDGE BEFORE LANDFILL. THE DESIGN SO₂ REMOVAL WILL BE 94%. START UP WILL TAKE PLACE IN 1982.</p>
<p>NEVADA POWER HARRY ALLEN 1 NEW 500.0 MW (GROSS) 500.0 MW (ESC) COAL ***** %S PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ***** STATUS 6 STARTUP 6/86</p>	<p>NEVADA POWER'S HARRY ALLEN 1 IS A PLANNED COAL FIRED UNIT TO BE LOCATED IN LAS VEGAS, NEVADA. THE UTILITY IS CONSIDERING A HOT SIDE ESP IN CONJUNCTION WITH AN FGD SYSTEM. SPECIFICATIONS HAVE NOT YET BEEN PREPARED. START UP IS SCHEDULED FOR JUNE, 1986.</p>
<p>NEVADA POWER HARRY ALLEN 2 NEW 500.0 MW (GROSS) 500.0 MW (ESC) COAL ***** %S PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ***** STATUS 6 STARTUP 6/87</p>	<p>NEVADA POWER'S HARRY ALLEN 2 IS A PLANNED COAL FIRED UNIT TO BE LOCATED IN LAS VEGAS, NEVADA. THE UTILITY IS CONSIDERING A HOT SIDE ESP IN CONJUNCTION WITH AN FGD SYSTEM. SPECIFICATIONS HAVE NOT YET BEEN PREPARED. START UP IS SCHEDULED FOR JUNE, 1987.</p>
<p>NEVADA POWER HARRY ALLEN 3 NEW 500.0 MW (GROSS) 500.0 MW (ESC) COAL ***** %S PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ***** STATUS 6 STARTUP 6/88</p>	<p>NEVADA POWER'S HARRY ALLEN 3 IS A PLANNED COAL FIRED UNIT TO BE LOCATED IN LAS VEGAS, NEVADA. THE UTILITY IS CONSIDERING A HOT SIDE ESP IN CONJUNCTION WITH AN FGD SYSTEM. SPECIFICATIONS HAVE NOT YET BEEN PREPARED. START UP IS SCHEDULED FOR JUNE, 1988.</p>
<p>NEVADA POWER HARRY ALLEN 4 NEW 500.0 MW (GROSS) 500.0 MW (ESC) COAL ***** %S PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ***** STATUS 6 STARTUP 6/89</p>	<p>NEVADA POWER'S HARRY ALLEN 4 IS A PLANNED COAL FIRED UNIT TO BE LOCATED IN LAS VEGAS, NEVADA. THE UTILITY IS CONSIDERING A HOT SIDE ESP IN CONJUNCTION WITH AN FGD SYSTEM. SPECIFICATIONS HAVE NOT YET BEEN PREPARED. START UP IS SCHEDULED FOR JUNE, 1989.</p>
<p>NEVADA POWER REID GARDNER 1 RETROFIT 125.0 MW (GROSS) 125.0 MW (ESC) COAL .50 %S BITUMINOUS SODIUM CARBONATE ADL/COMBUSTION EQUIP ASSOCIATE ENERGY CONSUMPTION: ***** STATUS 1 STARTUP 4/74</p>	<p>REID GARDNER 1 IS A WET BOTTOM LOW SULFUR COAL (0.5% S, 12,450 BTU/LB) FIRED UNIT OWNED BY NEVADA POWER, LOCATED IN MOAPA, NEVADA. A SODIUM CARBONATE-BASED (TRONA) SCRUBBING SYSTEM BY ADL/COMBUSTION EQUIPMENT ASSOCIATES CONSISTS OF ONE MODULE CONTAINING TWIN VARIABLE THROAT VENTURIS FOLLOWED BY A SEPARATOR IN SERIES WITH A SINGLE STAGE PERFORATED PLATE WASH TOWER. PRIMARY PARTICULATE CONTROL IS PROVIDED BY UPSTREAM MULTICLONES. A RADIAL VANE MIST ELIMINATOR PRECEDES AN INDIRECT STEAM HOT AIR REHEATER AND A 200 FOOT STACK. THE SYSTEM OPERATES IN AN OPEN WATER LOOP, AND THE SLUDGE IS DISPOSED IN AN ON-SITE CLAY LINED SOLAR EVAPORATION POND. THE DESIGN SO₂ REMOVAL EFFICIENCY IS 90%. THE SYSTEM HAS BEEN OPERATIONAL SINCE APRIL, 1974.</p>

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STATUS OF FGD SYSTEMS

UNIT IDENTIFICATION	ABSTRACT
NEVADA POWER REID GARDNER 2 RETROFIT 125.0 MW (GROSS) 125.0 MW (ESC) COAL .50 XS BITUMINOUS SODIUM CARBONATE ADL/COMBUSTION EQUIP ASSOCIATE ENERGY CONSUMPTION: ****X STATUS 1 STARTUP 4/74	REID GARDNER 2 IS A WET BOTTOM LOW SULFUR COAL (0.5% S, 12,450 BTU/LB) FIRED UNIT OWNED BY NEVADA POWER, LOCATED IN MOAPA, NEVADA. A SODIUM CARBONATE-BASED (TRONA) SCRUBBING SYSTEM BY ADL/COMBUSTION EQUIPMENT ASSOCIATES CONSISTS OF ONE MODULE CONTAINING TWIN VARIABLE THROAT VENTURIS FOLLOWED BY A SEPARATOR IN SERIES WITH A SINGLE STAGE PERFORATED PLATE WASH TOWER. PRIMARY PARTICULATE CONTROL IS PROVIDED BY UPSTREAM MULTICLONES. A RADIAL VANE MIST ELIMINATOR PRECEDES AN INDIRECT STEAM HOT AIR HEATER AND A 200 FOOT STACK. THE SYSTEM OPERATES IN AN OPEN WATER LOOP, AND THE SLUDGE IS DISPOSED IN AN ON-SITE CLAY LINED SOLAR EVAPORATION POND. THE DESIGN SO ₂ REMOVAL EFFICIENCY IS 90%. THE SYSTEM HAS BEEN OPERATIONAL SINCE APRIL, 1974.
NEVADA POWER REID GARDNER 3 NEW 125.0 MW (GROSS) 125.0 MW (ESC) COAL .50 XS BITUMINOUS SODIUM CARBONATE ADL/COMBUSTION EQUIP ASSOCIATE ENERGY CONSUMPTION: ****X STATUS 1 STARTUP 6/76	REID GARDNER 3 IS A WET BOTTOM LOW SULFUR COAL (0.5% S, 12,450 BTU/LB) FIRED UNIT OWNED BY NEVADA POWER, LOCATED IN MOAPA, NEVADA. A SODIUM CARBONATE-BASED (TRONA) SCRUBBING SYSTEM BY ADL/COMBUSTION EQUIPMENT ASSOCIATES CONSISTS OF ONE MODULE CONTAINING TWIN VARIABLE THROAT VENTURIS FOLLOWED BY A SEPARATOR IN SERIES WITH A SINGLE STAGE PERFORATED PLATE WASH TOWER. PRIMARY PARTICULATE CONTROL IS PROVIDED BY UPSTREAM MULTICLONES. A RADIAL VANE MIST ELIMINATOR PRECEDES AN INDIRECT STEAM HOT AIR HEATER AND A 200 FOOT STACK. THE SYSTEM OPERATES IN AN OPEN WATER LOOP, AND THE SLUDGE IS DISPOSED IN AN ON-SITE CLAY LINED SOLAR EVAPORATION POND. THE DESIGN SO ₂ REMOVAL EFFICIENCY IS 90%. THE SYSTEM HAS BEEN OPERATIONAL SINCE JUNE, 1976.
NEVADA POWER REID GARDNER 4 NEW 250.0 MW (GROSS) 250.0 MW (ESC) COAL .75 XS SODIUM CARBONATE VENDOR NOT SELECTED ENERGY CONSUMPTION: ****X STATUS 5 STARTUP 4/83	REID GARDNER 4 OF NEVADA POWER IS A COAL (0.75% S, 12,450 BTU/LB) FIRED UNIT PLANNED FOR LOCATION IN MOAPA, NEVADA. THE UTILITY IS PRESENTLY EVALUATING BIDS FOR AN FGD SYSTEM AT THIS TIME. CONSTRUCTION IS EXPECTED TO BEGIN IN 1980, AND START UP IS EXPECTED IN 1983.
NEVADA POWER WARNER VALLEY 1 NEW 295.0 MW (GROSS) 250.0 MW (ESC) COAL 1.15 XS SUBBITUMINOUS LIME VENDOR NOT SELECTED ENERGY CONSUMPTION: ****X STATUS 6 STARTUP 6/85	NEVADA POWER'S WARNER VALLEY 1 IS A PLANNED COAL FIRED UNIT TO BE LOCATED IN ST. GEORGE, UTAH. THE UTILITY IS PRESENTLY PREPARING SPECIFICATIONS FOR A SCRUBBING SYSTEM. NO ANNOUNCEMENTS HAVE YET BEEN MADE CONCERNING THE EMISSION CONTROL STRATEGY FOR THIS UNIT. START UP IS EXPECTED IN JUNE OF 1985.
NEVADA POWER WARNER VALLEY 2 NEW 295.0 MW (GROSS) 250.0 MW (ESC) COAL 1.15 XS SUBBITUMINOUS LIME VENDOR NOT SELECTED ENERGY CONSUMPTION: ****X STATUS 6 STARTUP 6/86	NEVADA POWER'S WARNER VALLEY 2 IS A PLANNED COAL FIRED UNIT TO BE LOCATED IN ST. GEORGE, UTAH. THE UTILITY IS PRESENTLY PREPARING SPECIFICATIONS FOR A SCRUBBING SYSTEM. NO ANNOUNCEMENTS HAVE YET BEEN MADE CONCERNING THE EMISSION CONTROL STRATEGY FOR THIS UNIT. START UP IS EXPECTED IN JUNE OF 1986.
NEW YORK STATE ELEC & GAS SOMERSET 1 NEW 870.0 MW (GROSS) 870.0 MW (ESC) COAL 2.20 XS BITUMINOUS LIMESTONE VENDOR NOT SELECTED ENERGY CONSUMPTION: ****X STATUS 5 STARTUP 6/84	THE SOMERSET 1 UNIT OF THE NEW YORK STATE ELECTRIC & GAS CORP. IS A PULVERIZED COAL BOILER LOCATED IN SOMERSET, NEW YORK. THE BOILER GENERATES A FLUE GAS FLOW OF 3,100,000 ACFM AND FIRES A BITUMINOUS COAL WITH AN AVERAGE SULFUR CONTENT OF 2.4% AND AN AVERAGE HEAT CONTENT OF 12,400 BTU/LB. A COLD SIDE ESP WITH A DESIGN EFFICIENCY OF 99.77% WILL PROVIDE THE PRIMARY PARTICULATE REMOVAL. A LIMESTONE ABSORBER WITH A DESIGN REMOVAL EFFICIENCY OF 90% WILL BE USED FOR SO ₂ REMOVAL. THE SYSTEM WILL OPERATE IN A CLOSED LOOP MODE. THE SLUDGE IS TO BE DEWATERED AND STABILIZED BEFORE BEING LANDFILLED.

SECTION 2
STATUS OF FGD SYSTEMS

UNIT IDENTIFICATION	ABSTRACT
NIAGARA MOHAWK POWER COOP CHARLES R. HUNTLEY 66 RETROFIT 100.0 MW (GROSS) 100.0 MW (ESC) COAL 1.80 XS AQUEOUS CARBONATE ROCKWELL INTERNATIONAL ENERGY CONSUMPTION: ****% STATUS 2 STARTUP 4/82	CHARLES R. HUNTLEY 66 OF NIAGARA POWER COOP IS A PULVERIZED COAL (1.8% S, 12,500 BTU/LB) FIRED UNIT LOCATED IN BUFFALO, NEW YORK. A CONTRACT WAS AWARDED TO ATOMICS INTERNATIONAL FOR THE DESIGN AND INSTALLATION OF A 90% EFFICIENT RETROFIT AQUEOUS CARBONATE FGD SYSTEM WHICH WILL PRODUCE ELEMENTAL SULFUR AS AN END PRODUCT. FUNDS ARE BEING PROVIDED BY THE U.S.EPA AND THE EMPIRE STATE ELECTRIC ENERGY RESEARCH CORP. A SPRAY DRYER WILL BE FOLLOWED BY TWO BANKS OF EIGHT CYCLONES AN ESP, AND A 200 FOOT STEEL LINED STACK. THE WATER LOOP WILL BE OPEN. START UP OF THE FGD SYSTEM WILL BE IN 1982.
NORTHERN INDIANA PUB SERVICE DEAN H. MITCHELL 11 RETROFIT 115.0 MW (GROSS) 115.0 MW (ESC) COAL 3.50 XS WELLMAN LORD DAVY POWERGAS ENERGY CONSUMPTION: 27.8% STATUS 1 STARTUP 7/76	NORTHERN INDIANA PUBLIC SERVICE'S DEAN H. MITCHELL 11 IS A COAL (3.5% S, 11,000 BTU/LB) FIRED UNIT LOCATED IN GARY, INDIANA. A RETROFIT WELLMAN LORD FGD SYSTEM BY DAVY POWERGAS HAS BEEN OPERATING ON THIS UNIT SINCE JULY, 1976. AN ESP IS FOLLOWED BY A VARIABLE THROAT VENTURI SCRUBBER AND A TRAY TOWER ABSORBER (90% DESIGN SO2 REMOVAL EFFICIENCY). A DIRECT COMBUSTION RAISES THE CLEANED GAS TEMPERATURE 50 DEG F BEFORE THE GAS IS DISCHARGED THROUGH A 168 FOOT STAINLESS STEEL AND FRP LINED STACK. ELEMENTAL SULFUR AND SULFATE IS PRODUCED BY THE PROCESS DEVELOPED BY ALLIED CHEMICAL. THE SYSTEM OPERATES IN A CLOSED WATER LOOP MODE.
NORTHERN INDIANA PUB SERVICE SCHAFER 17 NEW 421.0 MW (GROSS) 421.0 MW (ESC) COAL 3.20 XS BITUMINOUS DUAL ALKALI FMC ENERGY CONSUMPTION: ****% STATUS 4 STARTUP 6/83	SCHAFER 17 OF NORTHERN INDIANA PUBLIC SERVICE IS A 3.2% SULFUR COAL FIRED UNIT PLANNED FOR CONSTRUCTION IN WHEATFIELD, INDIANA. THE UTILITY HAS SIGNED A LETTER OF INTENT WITH FMC FOR THE INSTALLATION OF A DUAL ALKALI FGD SYSTEM AT THIS UNIT. PARTICULATE MATTER WILL BE COLLECTED BY AN ESP AND THE SYSTEM WILL INCLUDE A REHEATER. START UP OF THIS UNIT IS SCHEDULED FOR JUNE OF 1983.
NORTHERN INDIANA PUB SERVICE SCHAFER 18 NEW 421.0 MW (GROSS) 421.0 MW (ESC) COAL 3.20 XS BITUMINOUS DUAL ALKALI FMC ENERGY CONSUMPTION: ****% STATUS 4 STARTUP 6/85	SCHAFER 18 OF NORTHERN INDIANA PUBLIC SERVICE IS A 3.2% SULFUR COAL FIRED UNIT PLANNED FOR CONSTRUCTION IN WHEATFIELD, INDIANA. THE UTILITY HAS SIGNED A LETTER OF INTENT WITH FMC FOR THE INSTALLATION OF A DUAL ALKALI FGD SYSTEM AT THIS UNIT. PARTICULATE MATTER WILL BE COLLECTED BY AN ESP AND THE SYSTEM WILL INCLUDE A REHEATER. START UP OF THIS UNIT IS SCHEDULED FOR JUNE OF 1985.
NORTHERN STATES POWER RIVERSIDE 6,7 RETROFIT 110.0 MW (GROSS) 110.0 MW (ESC) COAL 1.50 XS LIME/SPRAY DRYING JOY MFG/NIRO ATOMIZER ENERGY CONSUMPTION: ****% STATUS 2 STARTUP 7/80	RIVERSIDE 6 AND 7 ARE TWO COAL FIRED BOILERS OWNED BY NORTHERN STATES POWER AND LOCATED IN MINNEAPOLIS, MINNESOTA. EACH BOILER GENERATES A FLUE GAS FLOW OF 320,000 ACFM AT 350 F. CURRENTLY, A DEMONSTRATION LIME/SPRAY DRYING FGD SYSTEM IS UNDER CONSTRUCTION THAT WILL BE CAPABLE OF TREATING THE FLUE GAS FROM BOTH BOILERS. THE SYSTEM IS BEING SUPPLIED BY NIRO ATOMIZER/JOY MANUFACTURING AND WILL CONSIST OF A SPRAY DRYER FOLLOWED BY A BAGHOUSE. THE CLEAN FLUE GAS WILL BE VENTED TO TWO 300 FT CONCRETE STACKS WITH FIRE BRICK LINERS. SPENT ABSORBENT WILL BE DISPOSED OF IN ON AND OFF SITE LANDFILLS. OPERATIONS ARE EXPECTED TO BEGIN IN JULY, 1980.
NORTHERN STATES POWER SHERBURNE 1 NEW 740.0 MW (GROSS) 740.0 MW (ESC) COAL .80 XS SUBBITUMINOUS LIMESTONE/ALKALINE FLYASH COMBUSTION ENGINEERING ENERGY CONSUMPTION: 2.7% STATUS 1 STARTUP 3/76	NORTHERN STATES POWER'S SHERBURNE 1 IS A BALANCED DRAFT PULVERIZED SUBBITUMINOUS COAL (0.80% S, 8500 BTU/LB) FIRED BOILER IN BECKER, MINNESOTA. A 50% EFFICIENT (DESIGN) LIMESTONE/ALKALINE FLYASH FGD SYSTEM SUPPLIED BY COMBUSTION ENGINEERING HAS BEEN OPERATIONAL ON THIS UNIT SINCE MARCH OF 1976. TWELVE VARIABLE THROAT ROD DECK VENTURI/MARBLE BED ABSORBER TRAINS ARE FOLLOWED BY ONE CHEVRON MIST ELIMINATORS/TRAIN, AN IN-LINE HOT WATER REHEATER, AND A 650 FOOT CORTEN LINED STACK. THE SLUDGE IS FORCIBLY OXIDIZED AND DISPOSED IN A CLAY LINED SETTLING POND. THE WATER LOOP IS OPEN.

SECTION 2
STATUS OF FGD SYSTEMS

UNIT IDENTIFICATION	ABSTRACT
<p>NORTHERN STATES POWER SHERBURNE 2 NEW 740.0 MW (GROSS) 740.0 MW (ESC) COAL .80 %S SUBBITUMINOUS LIMESTONE/ALKALINE FLYASH COMBUSTION ENGINEERING ENERGY CONSUMPTION: 2.7% STATUS 1 STARTUP 4/77</p>	<p>NORTHERN STATES POWER'S SHERBURNE 2 IS A BALANCED DRAFT PULVERIZED SUBBITUMINOUS COAL (0.80% S, 8500 BTU/LB) FIRED BOILER IN BECKER, MINNESOTA. A 50% EFFICIENT (DESIGN) LIMESTONE/ALKALINE FLYASH FGD SYSTEM SUPPLIED BY COMBUSTION ENGINEERING HAS BEEN OPERATIONAL ON THIS UNIT SINCE APRIL OF 1977. TWELVE VARIABLE THROAT ROD DECK VENTURI/MARBLE BED ABSORBER TRAINS ARE FOLLOWED BY ONE CHEVRON MIST ELIMINATORS/TRAIN, AN IN-LINE HOT WATER REHEATER, AND A 650 FOOT CORTEN LINED STACK. THE SLUDGE IS FORCIBLY OXIDIZED AND DISPOSED IN A CLAY LINED SETTLING POND. THE WATER LOOP IS OPEN.</p>
<p>NORTHERN STATES POWER SHERBURNE 3 NEW 860.0 MW (GROSS) 860.0 MW (ESC) COAL .80 %S LIMESTONE COMBUSTION ENGINEERING ENERGY CONSUMPTION: ****% STATUS 5 STARTUP 5/84</p>	<p>NORTHERN STATES POWER'S SHERBURNE 3 IS A PLANNED TANGENTIAL FIRED PULVERIZED SUBBITUMINOUS COAL (0.80% S, 8500 BTU/LB) FIRED UNIT TO BE CONSTRUCTED IN BECKER, MINNESOTA. DUE TO THE LATEST TECHNOLOGY THAT HAS BEEN DEVELOPED BIDS HAVE AGAIN BEEN OPENED. THE UTILITY IS PRESENTLY EVALUATING THREE DIFFERENT TYPES OF FGD SYSTEMS. MAY, 1984 IS EXPECTED START UP.</p>
<p>OTTER TAIL POWER COYOTE 1 NEW 440.0 MW (GROSS) 440.0 MW (ESC) COAL .87 %S LIGNITE AQUEOUS CARBONATE/SPRAY DRYING WHEELABRATOR-FRYE/R-1. ENERGY CONSUMPTION: 1.1% STATUS 2 STARTUP 3/81</p>	<p>COYOTE 1 IS A CYCLONE FIRED PULVERIZED LIGNITE (0.875% S, 7050 BTU/LB) BOILER UNDER CONSTRUCTION IN BEULAH, NORTH DAKOTA. THIS UNIT IS JOINTLY OWNED BY FIVE UTILITIES, WITH OTTER TAIL POWER BEING THE MAJOR OWNER AND CONSTRUCTOR. AN AQUEOUS CARBONATE DRY FGD SYSTEM DESIGNED TO REMOVE 70% OF THE SO₂ IS BEING SUPPLIED BY WHEELABRATOR-FRYE AND ATOMICS INTERNATIONAL. THE SPRAY DRYER/BAGHOUSE SYSTEM IS SCHEDULED TO START UP IN 1981.</p>
<p>PACIFIC GAS & ELECTRIC MONTEZUMA 1 NEW 800.0 MW (GROSS) 800.0 MW (ESC) COAL .80 %S SUBBITUMINOUS LIMESTONE VENDOR NOT SELECTED ENERGY CONSUMPTION: 3.5% STATUS 6 STARTUP 6/87</p>	<p>MONTEZUMA 1 OF PACIFIC GAS AND ELECTRIC IS A COAL (0.8% S, 12,000 BTU/LB) FIRED BOILER PLANNED FOR COLLINSVILLE, CALIFORNIA. THE EMISSION CONTROL SYSTEM WILL CONSIST OF A BAGHOUSE AND A LIMESTONE FGD SYSTEM. SLUDGE WILL BE DISPOSED OF IN A LANDFILL. START UP DATE IS JUNE, 1987.</p>
<p>PACIFIC GAS & ELECTRIC MONTEZUMA 2 NEW 800.0 MW (GROSS) 800.0 MW (ESC) COAL .80 %S SUBBITUMINOUS LIMESTONE VENDOR NOT SELECTED ENERGY CONSUMPTION: 3.5% STATUS 6 STARTUP 6/88</p>	<p>MONTEZUMA 2 OF PACIFIC GAS AND ELECTRIC IS A COAL (0.8% S, 12,000 BTU/LB) FIRED BOILER PLANNED FOR COLLINSVILLE, CALIFORNIA. THE EMISSION CONTROL SYSTEM WILL CONSIST OF A BAGHOUSE AND A LIMESTONE FGD SYSTEM. SLUDGE WILL BE DISPOSED OF IN A LANDFILL. START UP DATE IS JUNE, 1988.</p>
<p>PACIFIC POWER & LIGHT JIM BRIDGER 4 NEW 550.0 MW (GROSS) 550.0 MW (ESC) COAL .56 %S SUBBITUMINOUS SODIUM CARBONATE AIR CORRECTION DIVISION, UOP ENERGY CONSUMPTION: .2% STATUS 1 STARTUP 9/79</p>	<p>PACIFIC POWER AND LIGHT'S JIM BRIDGER 4 IS A DRY BOTTOM PULVERIZED SUBBITUMINOUS COAL (0.56% S, 9300 BTU/LB) FIRED BOILER LOCATED IN ROCK SPRINGS, WYOMING. A 91% EFFICIENT SODIUM CARBONATE FGD SYSTEM FOR THIS UNIT WAS SUPPLIED BY THE AIR CORRECTION DIVISION OF UOP. A COLD SIDE ESP TREATS 2,720,000 ACFM OF FLUE GAS, FOLLOWED BY THREE SIEVE TRAY ABSORBERS. THE SYSTEM OPERATES IN A CLOSED WATER LOOP MODE. A SYSTEM CHECK OUT WAS CONDUCTED IN JULY OF 1979, AND OPERATIONS BEGAN IN SEPTEMBER, 1979.</p>

SECTION 2
STATUS OF FGD SYSTEMS

UNIT IDENTIFICATION	ABSTRACT
PENNSYLVANIA POWER BRUCE MANSFIELD 1 NEW 917.0 MW (GROSS) 917.0 MW (ESC) COAL 3.00 %S BITUMINOUS LIME CHEMICO ENERGY CONSUMPTION: 6.0% STATUS 1 STARTUP 12/75	BRUCE MANSFIELD 1 OF PENNSYLVANIA POWER IS A SUPERCRITICAL, BALANCED DRAFT BOILER FIRING PULVERIZED COAL (3.0% S, 11,500 BTU/LB) IN SHIPPINGPORT, PENNSYLVANIA. A CHEMICO THIOSORBIC LIME FGD SYSTEM WAS DESIGNED TO REMOVE FLYASH AND SO ₂ (92.1%) FROM 3,350,000 ACFM OF FLUE GAS. THE FGD SYSTEM CONSISTS OF SIX VARIABLE THROAT VENTURI SCRUBBERS FOLLOWED BY SIX FIXED THROAT VENTURI ABSORBERS, HORIZONTAL MIST ELIMINATORS, TWO DIRECT COMBUSTION REHEATERS, AND A 950 FOOT FLAKEGLASS STACK SHARED BY UNITS 1 AND 2. THE WATER LOOP IS OPEN, AND THE CALCILOX STABILIZED SLUDGE IS DISPOSED IN AN OFF SITE LANDFILL. THIS SYSTEM HAS BEEN OPERATIONAL SINCE DECEMBER, 1975.
PENNSYLVANIA POWER BRUCE MANSFIELD 2 NEW 917.0 MW (GROSS) 917.0 MW (ESC) COAL 3.00 %S BITUMINOUS LIME CHEMICO ENERGY CONSUMPTION: 6.0% STATUS 1 STARTUP 7/77	BRUCE MANSFIELD 2 OF PENNSYLVANIA POWER IS A SUPERCRITICAL, BALANCED DRAFT BOILER FIRING PULVERIZED COAL (3.0% S, 11,500 BTU/LB) IN SHIPPINGPORT, PENNSYLVANIA. A CHEMICO THIOSORBIC LIME FGD SYSTEM WAS DESIGNED TO REMOVE FLYASH AND SO ₂ (92.1%) FROM 3,350,000 ACFM OF FLUE GAS. THE FGD SYSTEM CONSISTS OF SIX VARIABLE THROAT VENTURI SCRUBBERS FOLLOWED BY SIX FIXED THROAT VENTURI ABSORBERS, HORIZONTAL MIST ELIMINATORS, TWO DIRECT COMBUSTION REHEATERS, AND A 950 FOOT FLAKEGLASS STACK SHARED BY UNITS 1 AND 2. THE WATER LOOP IS OPEN, AND THE CALCILOX STABILIZED SLUDGE IS DISPOSED IN AN OFF SITE LANDFILL. THIS SYSTEM HAS BEEN OPERATIONAL SINCE JULY, 1977.
PENNSYLVANIA POWER BRUCE MANSFIELD 3 NEW 917.0 MW (GROSS) 917.0 MW (ESC) COAL 3.00 %S LIME PULLMAN KELLOGG ENERGY CONSUMPTION: ****% STATUS 2 STARTUP 10/80	BRUCE MANSFIELD 3 OF PENNSYLVANIA POWER IS A SUPERCRITICAL PULVERIZED COAL (3.0% S, 11,500 BTU/LB) FIRED BOILER UNDER CONSTRUCTION IN SHIPPINGPORT, PENNSYLVANIA. FOUR ESP'S WILL TREAT 3,308,000 ACFM OF FLUE GAS, FOLLOWED BY FIVE (ONE SPARE) PULLMAN KELLOGG THIOSORBIC LIME ABSORBERS WHICH WILL REMOVE 92.2% OF THE SO ₂ . THE CLEANED GAS WILL PASS THROUGH CHEVRON MIST ELIMINATORS AND DIRECT COMBUSTION REHEATERS BEFORE DISCHARGE THROUGH A 600 FOOT INCONEL 625 LINED STACK. THE FLYASH STABILIZED SLUDGE WILL BE PIPED TO THE EXISTING OFF SITE LANDFILL PRESENTLY USED BY UNITS ONE AND TWO. START UP IS EXPECTED IN OCTOBER, 1980.
PHILADELPHIA ELECTRIC CROMBY RETROFIT 150.0 MW (GROSS) 150.0 MW (ESC) COAL 3.00 %S MAGNESIUM OXIDE UNITED ENGINEERS ENERGY CONSUMPTION: ****% STATUS 3 STARTUP 12/82	PHILADELPHIA ELECTRIC HAS PLANS FOR THE RETROFIT OF AN FGD SYSTEM ON ONE OF THE TWO 3.0% SULFUR COAL FIRED BOILERS AT CROMBY STATION IN PHOENIXVILLE, PENNSYLVANIA. A CONTRACT HAS BEEN AWARDED TO UNITED ENGINEERS FOR A MAGNESIUM OXIDE SYSTEM. THE START UP DATE IS SET FOR 1982.
PHILADELPHIA ELECTRIC EDDYSTONE 1A RETROFIT 120.0 MW (GROSS) 120.0 MW (ESC) COAL 2.60 %S BITUMINOUS MAGNESIUM OXIDE UNITED ENGINEERS ENERGY CONSUMPTION: ****% STATUS 1 STARTUP 9/75	UNIT 1 OF PHILADELPHIA ELECTRIC'S EDDYSTONE, PENNSYLVANIA STATION IS A BITUMINOUS COAL (2.6% S, 13,600 BTU/LB) FIRED UNIT WHICH USES ESP'S, MECHANICAL COLLECTORS, AND THREE PARTICULATE SCRUBBERS (TWO VENTURI ROD AND ONE VENTURI) PROVIDE PRIMARY PARTICULATE CONTROL. THE 1A FGD SYSTEM CONSISTS OF A MAG OX ROD DECK SPRAY TOWER FOLLOWING THE VENTURI SCRUBBER. THE 90% EFFICIENT (DESIGN) ABSORBER, A RETROFIT BY UNITED ENGINEERS, LEADS TO A LOUVER TYPE MIST ELIMINATOR, A DIRECT COMBUSTION REHEATER, AND A 249 FOOT STACK. THE SPENT SLURRY IS REGENERATED AT THE ESSEX SULFURIC ACID PLANT IN NEWARK, NEW JERSEY, AND THE MAG-OX IS RETURNED TO EDDYSTONE. THE SYSTEM OPERATES IN AN OPEN WATER LOOP, AND HAS BEEN OPERATIONAL SINCE SEPTEMBER, 1975.
PHILADELPHIA ELECTRIC EDDYSTONE 1B RETROFIT 240.0 MW (GROSS) 240.0 MW (ESC) COAL 2.60 %S MAGNESIUM OXIDE UNITED ENGINEERS ENERGY CONSUMPTION: ****% STATUS 2 STARTUP 12/82	UNIT 1 OF PHILADELPHIA ELECTRIC'S EDDYSTONE, PENNSYLVANIA STATION IS A BITUMINOUS COAL (2.6% S, 13,600 BTU/LB) FIRED UNIT WHICH USES ESP'S, MECHANICAL COLLECTORS, AND THREE PARTICULATE SCRUBBERS (TWO ROD DECK SPRAY TOWERS AND ONE VENTURI) FOR PRIMARY PARTICULATE CONTROL. THE 1B FGD WILL FOLLOW THE TWO ROD DECK SPRAY TOWERS. UNITED ENGINEERS WILL SUPPLY A MAGNESIUM OXIDE FGD SYSTEM FOR EMISSION CONTROL. THE START UP DATE IS SET FOR DECEMBER, 1982.

SECTION 2
STATUS OF FGD SYSTEMS

UNIT IDENTIFICATION	ABSTRACT
PHILADELPHIA ELECTRIC EDDYSTONE 2 RETROFIT 334.0 MW (GROSS) 334.0 MW (ESC) COAL 2.50 XS MAGNESIUM OXIDE UNITED ENGINEERS ENERGY CONSUMPTION: ****X STATUS 2 STARTUP 12/82	EDDYSTONE 2 OF PHILADELPHIA ELECTRIC IS A 2.5% SULFUR COAL FIRED BOILER LOCATED IN EDDYSTONE, PENNSYLVANIA. THE PLANT'S GENERATING CAPACITY IS 334 MW. UNITED ENGINEERS WILL SUPPLY A MAGNESIUM OXIDE FGD SYSTEM FOR EMISSION CONTROL. START UP IS SET FOR DECEMBER, 1982.
POTOMAC ELECTRIC POWER DICKERSON 4 NEW 850.0 MW (GROSS) 800.0 MW (ESC) COAL 1.90 XS BITUMINOUS PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****X STATUS 6 STARTUP 5/87	DICKERSON 4 OF POTOMAC ELECTRIC POWER IS A PULVERIZED COAL (2.0% S, 11,000 BTU/LB) FIRED UNIT PLANNED FOR LOCATION IN DICKERSON, MARYLAND. THE UTILITY IS CONSIDERING AN FGD SYSTEM FOR THIS UNIT, BUT THERE ARE NO FIRM PLANS FOR THE INSTALLATION OF AN FGD SYSTEM. START UP OF THE BOILER IS EXPECTED IN 1985. FGD SYSTEM START UP IS EXPECTED IN MAY, 1987.
PUBLIC SERVICE INDIANA GIBSON 5 NEW 650.0 MW (GROSS) 650.0 MW (ESC) COAL 3.30 XS LIMESTONE PULLMAN KELLOGG ENERGY CONSUMPTION: ****X STATUS 3 STARTUP 0/82	GIBSON 5 OF PUBLIC SERVICE OF INDIANA IS A 3.3% SULFUR COAL FIRED UNIT PLANNED FOR LOCATION IN PRINCETON, INDIANA. A CONTRACT WAS AWARDED TO PULLMAN KELLOGG FOR A LIMESTONE FGD SYSTEM CONSISTING OF FOUR KELLOGG-WEIR ABSORBER-REACTOR MODULES. SYSTEM START UP IS EXPECTED IN 1982. THE SYSTEM WILL USE KELLOGG'S PROPRIETARY MAGNESIUM-PROMOTED LIMESTONE.
PUBLIC SERVICE OF NEW MEXICO SAN JUAN 1 RETROFIT 361.0 MW (GROSS) 361.0 MW (ESC) COAL .80 XS SUBBITUMINOUS WELLMAN LORD DAVY POWERGAS ENERGY CONSUMPTION: 4.4% STATUS 1 STARTUP 4/78	SAN JUAN 1 OF PUBLIC SERVICE OF NEW MEXICO IN WATERFLOW, NEW MEXICO IS A COAL (0.8% S, 8100 BTU/LB) FIRED BOILER WHICH SUPPLIES 1,319,000 ACFM OF FLUE GAS TO A RETROFIT WELLMAN LORD FGD SYSTEM BY DAVY POWERGAS. THE EMISSION CONTROL SYSTEM, OPERATIONAL SINCE APRIL OF 1978, CONSISTS OF A HOT SIDE ESP FOLLOWED BY FOUR (ONE SPARE) VENTURI SCRUBBER/SPRAY TOWER ABSORBER TRAINS WHICH WERE DESIGNED TO REMOVE 85% OF THE FLUE GAS SO ₂ . AN INDIRECT HOT AIR REHEATER PRECEDES A BRICK LINED STACK. END PRODUCT ELEMENTAL SULFUR IS PRODUCED BY THE ALLIED CHEMICAL PROCESS. THE WATER LOOP IS CLOSED.
PUBLIC SERVICE OF NEW MEXICO SAN JUAN 2 RETROFIT 350.0 MW (GROSS) 350.0 MW (ESC) COAL .80 XS SUBBITUMINOUS WELLMAN LORD DAVY POWERGAS ENERGY CONSUMPTION: 4.6% STATUS 1 STARTUP 8/78	SAN JUAN 2 OF PUBLIC SERVICE OF NEW MEXICO IN WATERFLOW, NEW MEXICO IS A COAL (0.8% S, 8100 BTU/LB) FIRED BOILER WHICH SUPPLIES 1,319,000 ACFM OF FLUE GAS TO A RETROFIT WELLMAN LORD FGD SYSTEM BY DAVY POWERGAS. THE EMISSION CONTROL SYSTEM, OPERATIONAL SINCE AUGUST OF 1978, CONSISTS OF A HOT SIDE ESP FOLLOWED BY FOUR (ONE SPARE) VENTURI SCRUBBER/SPRAY TOWER ABSORBER TRAINS WHICH WERE DESIGNED TO REMOVE 85% OF THE FLUE GAS SO ₂ . AN INDIRECT HOT AIR REHEATER PRECEDES A BRICK LINED STACK. END PRODUCT ELEMENTAL SULFUR IS PRODUCED BY THE ALLIED CHEMICAL PROCESS. THE WATER LOOP IS CLOSED.
PUBLIC SERVICE OF NEW MEXICO SAN JUAN 3 NEW 534.0 MW (GROSS) 534.0 MW (ESC) COAL .80 XS SUBBITUMINOUS WELLMAN LORD DAVY POWERGAS ENERGY CONSUMPTION: 3.6% STATUS 1 STARTUP 12/79	SAN JUAN 3 IS A COAL (0.8% S, 8100 BTU/LB) FIRED UNIT OF THE PUBLIC SERVICE OF NEW MEXICO AND IS LOCATED IN WATERFLOW, NEW MEXICO. THE FGD SYSTEM, SUPPLIED BY DAVY POWERGAS IS AN INTEGRATION OF THE WELLMAN LORD SO ₂ RECOVERY PROCESS AND ALLIED CHEMICAL'S SO ₂ REDUCTION TO SULFUR PROCESS. FIVE (ONE SPARE) VENTURI SCRUBBER/SPRAY TOWER ABSORBER (90% DESIGN SO ₂ REMOVAL) TRAINS FOLLOW A HOT SIDE ESP. AN INDIRECT HOT AIR REHEATER BOOSTS THE GAS TEMPERATURE 50 DEG F. THE SYSTEM OPERATES IN A CLOSED WATER LOOP MODE. OPERATIONS COMMENCED IN DECEMBER, 1979.

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STATUS OF FGD SYSTEMS

UNIT IDENTIFICATION	ABSTRACT
PUBLIC SERVICE OF NEW MEXICO SAN JUAN 4 NEW 534.0 MW (GROSS) 534.0 MW (ESC) COAL .80 XS SUBBITUMINOUS WELLMAN LORD DAVY POWERGAS ENERGY CONSUMPTION: 3.6% STATUS 2 STARTUP 6/82	SAN JUAN 4 IS A COAL (0.8% S, 8100 BTU/LB) FIRED UNIT OF THE PUBLIC SERVICE OF NEW MEXICO UNDER CONSTRUCTION IN WATERFLOW, NEW MEXICO. THE FGD SYSTEM BEING SUPPLIED BY DAVY POWERGAS IS AN INTEGRATION OF THE WELLMAN LORD SO2 RECOVERY PROCESS AND ALLIED CHEMICAL'S SO2 REDUCTION TO SULFUR PROCESS. FIVE (ONE SPARE) VENTURI SCRUBBER/SPRAY TOWER ABSORBER (90% DESIGN SO2 REMOVAL) TRAINS WILL FOLLOW A HOT SIDE ESP. AN INDIRECT HOT AIR REHEATER WILL BOOST THE GAS TEMPERATURE 50 DEG F. THE SYSTEM WILL OPERATE IN A CLOSED WATER LOOP MODE. START UP IS EXPECTED IN JUNE, 1982.
PWR AUTHORITY OF STATE OF NY FOSSIL NEW 700.0 MW (GROSS) 700.0 MW (ESC) COAL 3.0% XS PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 6 STARTUP 11/87	THE POWER AUTHORITY OF NEW YORK PLANS A NEW 3.0% SULFUR COAL FIRED UNIT WHICH WILL BE LOCATED AT THE ARTHUR KILL FACILITY ON STATEN ISLAND. THE UTILITY IS PRESENTLY CONSIDERING FGD SYSTEMS FOR THIS UNIT. PUBLIC SERVICE COMMISSION HEARINGS ARE CURRENTLY IN PROGRESS. START UP IS EXPECTED IN NOVEMBER, 1987.
SALT RIVER PROJECT CORONADO 1 NEW 350.0 MW (GROSS) 280.0 MW (ESC) COAL 1.00 XS SUBBITUMINOUS LIMESTONE PULLMAN KELLOGG ENERGY CONSUMPTION: 4.3% STATUS 1 STARTUP 11/79	SALT RIVER PROJECT'S CORONADO 1 IS A DRY BOTTOM PULVERIZED SUBBITUMINOUS COAL (1.0% S, 8300 BTU/LB) FIRED BOILER LOCATED IN ST. JOHNS, ARIZONA. PULLMAN KELLOGG SUPPLIED THE TWO LIMESTONE HORIZONTAL WEIR SPRAY TOWERS WHICH WILL REMOVE 82.5% OF THE SO2 FROM THE FLUE GAS PASSED THROUGH THEM. VERTICAL HEIL MIST ELIMINATORS PRECEDE A 500 FOOT STACK. A MINIMUM OF 20% BYPASS PROVIDES REHEAT. THE WATER LOOP IS AN OPEN MODE, AND THE UNSTABILIZED SLUDGE IS DISPOSED IN AN UNLINED POND. START UP WAS IN NOVEMBER, 1979.
SALT RIVER PROJECT CORONADO 2 NEW 350.0 MW (GROSS) 280.0 MW (ESC) COAL 1.00 XS SUBBITUMINOUS LIMESTONE PULLMAN KELLOGG ENERGY CONSUMPTION: 4.3% STATUS 2 STARTUP 7/80	SALT RIVER PROJECT'S CORONADO 2 IS A DRY BOTTOM PULVERIZED SUBBITUMINOUS COAL (1.0% S, 8300 BTU/LB) FIRED BOILER UNDER CONSTRUCTION IN ST. JOHNS, ARIZONA. PULLMAN KELLOGG IS SUPPLYING TWO LIMESTONE HORIZONTAL WEIR SPRAY TOWERS WHICH WILL REMOVE 82.5% OF THE SO2 FROM THE FLUE GAS PASSED THROUGH THEM. VERTICAL HEIL MIST ELIMINATORS PRECEDE A 500 FOOT STACK. A MINIMUM OF 20% BYPASS WILL PROVIDE REHEAT. THE WATER LOOP WILL BE OPEN, AND THE UNSTABILIZED SLUDGE WILL BE DISPOSED IN AN UNLINED POND. START UP IS EXPECTED IN JULY, 1980.
SALT RIVER PROJECT CORONADO 3 NEW 400.0 MW (GROSS) 280.0 MW (ESC) COAL .60 XS SUBBITUMINOUS LIMESTONE VENDOR NOT SELECTED ENERGY CONSUMPTION: 3.8% STATUS 6 STARTUP 6/87	CORONADO 3 IS A DRY BOTTOM PULVERIZED SUBBITUMINOUS COAL (1.0% S, 8300 BTU/LB) FIRED UNIT PLANNED BY SALT RIVER PROJECT TO BE LOCATED IN ST. JOHN'S, ARIZONA. THE UTILITY IS PRESENTLY CONSIDERING THE INSTALLATION OF TWO HORIZONTAL SPRAY TOWERS UTILIZING LIMESTONE AS THE ABSORBENT. PLANS FOR AN EMISSION CONTROL SYSTEM HAVE NOT BEEN FINALIZED. THE SYSTEM WILL HAVE A 20% BYPASS REHEAT, AND THE SLUDGE WILL PROBABLY BE PONDED. SCHEDULED OPERATION DATE IS 1987.
SAN MIGUEL ELECTRIC COOP SAN MIGUEL 1 NEW 400.0 MW (GROSS) 400.0 MW (ESC) COAL 1.70 XS LIGNITE LIMESTONE BABCOCK & WILCOX ENERGY CONSUMPTION: 5.0% STATUS 2 STARTUP 9/80	SAN MIGUEL 1 OF THE SAN MIGUEL ELECTRIC COOP IS A LIGNITE (1.7% S, 5000 BTU/LB) FIRED RADIANT BOILER UNDER CONSTRUCTION IN SAN MIGUEL, TEXAS. THE EMISSION CONTROL SYSTEM ON THIS UNIT WILL CONSIST OF A COLD SIDE ESP FOLLOWED BY FOUR BABCOCK AND WILCOX 86% EFFICIENT LIMESTONE TCA MODULES. CHEVRON MIST ELIMINATORS WILL PRECEDE AN IN-LINE REHEATER AND AN ACID BRICK LINED STACK. THE WATER LOOP WILL BE CLOSED, AND THE DEWATERED SLURRY WILL BE MIXED WITH FLYASH BY RESEARCH COTTRELL AND DISPOSED IN AN OFF SITE LANDFILL.

SECTION 2
STATUS OF FGD SYSTEMS

UNIT IDENTIFICATION	ABSTRACT
SEMINOLE ELECTRIC SEMINOLE 1 NEW 620.0 MW (GROSS) 620.0 MW (ESC) COAL 2.75 %S SUBBITUMINOUS LIMESTONE PEABODY PROCESS SYSTEMS ENERGY CONSUMPTION: ****% STATUS 3 STARTUP 3/83	SEMINOLE 1 OF SEMINOLE ELECTRIC IS A COAL (2.75% S, 11,700 BTU/LB) FIRED UNIT PLANNED FOR LOCATION IN PALATKA, FLORIDA. THE EMISSION CONTROL SYSTEM WILL CONSIST OF ESP'S AND A LIMESTONE FGD SYSTEM. THE FGD SYSTEM WILL BE SUPPLIED BY PEABODY PROCESS SYSTEM. START UP IS EXPECTED IN MARCH OF 1983.
SEMINOLE ELECTRIC SEMINOLE 2 NEW 620.0 MW (GROSS) 620.0 MW (ESC) COAL 2.75 %S SUBBITUMINOUS LIMESTONE PEABODY PROCESS SYSTEMS ENERGY CONSUMPTION: ****% STATUS 3 STARTUP 3/85	SEMINOLE 2 OF SEMINOLE ELECTRIC IS A COAL (2.75% S, 11,700 BTU/LB) FIRED UNIT PLANNED FOR LOCATION IN PALATKA, FLORIDA. THE EMISSION CONTROL SYSTEM WILL CONSIST OF ESP'S AND A LIMESTONE FGD SYSTEM. THE FGD SYSTEM WILL BE SUPPLIED BY PEABODY SYSTEMS. START UP IS EXPECTED IN MARCH OF 1985.
SIKESTON BOARD OF MUNIC. UTIL. SIKESTON 1 NEW 235.0 MW (GROSS) 235.0 MW (ESC) COAL 2.80 %S LIMESTONE BABCOCK & WILCOX ENERGY CONSUMPTION: 1.6% STATUS 2 STARTUP 1/81	THE SIKESTON BOARD OF MUNICIPAL UTILITIES' SIKESTON 1 IS A PULVERIZED COAL (2.8% S, 11,340 BTU/LB) FIRED BOILER UNDER CONSTRUCTION IN SIKESTON, MISSOURI. BABCOCK AND WILCOX IS SUPPLYING AN EMISSION CONTROL SYSTEM CONSISTING OF TWO ESP'S AND THREE 50% CAPACITY LIMESTONE VENTURI FGD MODULES. THE CLEANED GAS WILL PASS THROUGH CHEVRON MIST ELIMINATORS BEFORE EXITING A 450 FOOT FRP LINED FLUE (A SECOND CARBON STEEL LINED FLUE, USED FOR EMERGENCY BYPASS, IS ALSO IN THE STACK). THE WATER LOOP WILL BE OPEN, AND THE SLUDGE WILL BE PONDED. START UP IS SLATED FOR JANUARY, 1981.
SOUTH CAROLINA PUBLIC SERVICE WINYAH 2 NEW 280.0 MW (GROSS) 140.0 MW (ESC) COAL 1.70 %S BITUMINOUS LIMESTONE BABCOCK & WILCOX ENERGY CONSUMPTION: 1.1% STATUS 1 STARTUP 7/77	WINYAH 2 OF SOUTH CAROLINA PUBLIC SERVICE IS A PULVERIZED BITUMINOUS COAL (1.70% S, 11,500 BTU/LB) FIRED UNIT LOCATED IN GEORGETOWN, SOUTH CAROLINA. A COLD SIDE ESP AND A BABCOCK AND WILCOX VENTURI SCRUBBER/LIMESTONE TRAY TOWER ABSORBER TRAIN DESIGNED TO REMOVE 69% OF THE SO2 FROM THE BOILER FLUE GAS MAKE UP THE EMISSION CONTROL SYSTEM ON THIS UNIT. THE SYSTEM OPERATES IN AN OPEN WATER LOOP, AND THE SLUDGE IS DISPOSED IN AN ON-SITE UNLINED POND. THIS SYSTEM HAS BEEN OPERATIONAL SINCE JULY OF 1977.
SOUTH CAROLINA PUBLIC SERVICE WINYAH 3 NEW 280.0 MW (GROSS) 280.0 MW (ESC) COAL 1.70 %S LIMESTONE BABCOCK & WILCOX ENERGY CONSUMPTION: 2.1% STATUS 2 STARTUP 5/80	WINYAH 3 IS A DRY BOTTOM BOILER UNDER CONSTRUCTION BY SOUTH CAROLINA PUBLIC SERVICE WHICH WILL BURN 1.7% SULFUR COAL (11,500 BTU/LB) IN GEORGETOWN, SOUTH CAROLINA. AN ESP WILL PRECEDE A BABCOCK AND WILCOX LIMESTONE FGD SYSTEM AND AN INDIRECT STEAM REHEATER. THE WATER LOOP WILL BE CLOSED. EXPECTED START UP DATE IS MAY, 1980.
SOUTH CAROLINA PUBLIC SERVICE WINYAH 4 NEW 280.0 MW (GROSS) 280.0 MW (ESC) COAL 1.70 %S BITUMINOUS LIMESTONE AMERICAN AIR FILTER ENERGY CONSUMPTION: 2.1% STATUS 3 STARTUP 7/81	SOUTH CAROLINA PUBLIC SERVICE'S WINYAH 4 IS A PLANNED BITUMINOUS COAL (1.7% S, 11,500 BTU/LB) FIRED UNIT TO BE LOCATED IN GEORGETOWN, SOUTH CAROLINA. TWO AMERICAN AIR FILTER LIMESTONE SLURRY SPRAY TOWERS WILL FOLLOW AN ESP. THE TEMPERATURE OF THE CLEANED GAS WILL BE RAISED BY AN INDIRECT STEAM REHEATER. THE SYSTEM WILL OPERATE IN A CLOSED WATER LOOP MODE. THE CONTRACT FOR THE FGD SYSTEM HAS BEEN AWARDED, AND START UP IS EXPECTED IN JULY, 1981.

SECTION 2
STATUS OF FGD SYSTEMS

UNIT IDENTIFICATION	ABSTRACT
SOUTH MISSISSIPPI ELEC PWR R.D. MORROW 1 NEW 200.0 MW (GROSS) 124.0 MW (ESC) COAL 1.30 XS BITUMINOUS LIMESTONE RILEY STOKER/ENVIRONEERING ENERGY CONSUMPTION: 5.5% STATUS 1 STARTUP 8/78	R.D. MORROW 1 OF SOUTHERN MISSISSIPPI ELECTRIC IS A PULVERIZED COAL (1.3% S, 12,000 BTU/LB) FIRED UNIT IN HATTISBURG, MISSISSIPPI. THE EMISSION CONTROL SYSTEM FOR THIS UNIT CONSISTS OF A HOT SIDE ESP FOLLOWED BY A LIME-STONE VENTRI-ROD ABSORBER SUPPLIED BY RILEY STOKER/ENVIRONEERING. AFTER THE CLEANED GAS PASSES THROUGH A VERTICAL CHEVRON MIST ELIMINATOR, IT IS JOINED BY A 3% BYPASS REHEAT BEFORE IT IS DISCHARGED THROUGH A 408 FOOT STACK SHARED BY UNITS 1 AND 2 (EACH UNIT HAS ITS OWN ACID BRICK LINED FLUE). THE WATER LOOP IS CLOSED, AND THE FLYASH STABILIZED SLUDGE IS HAULED BY TRUCK TO AN OFF SITE LANDFILL. THE SYSTEM HAS BEEN OPERATIONAL SINCE AUGUST OF 1978.
SOUTH MISSISSIPPI ELEC PWR R.D. MORROW 2 NEW 200.0 MW (GROSS) 124.0 MW (ESC) COAL 1.30 XS BITUMINOUS LIMESTONE RILEY STOKER/ENVIRONEERING ENERGY CONSUMPTION: 5.5% STATUS 1 STARTUP 6/79	R.D. MORROW 2 OF SOUTHERN MISSISSIPPI ELECTRIC IS A PULVERIZED COAL (1.3% S, 12,000 BTU/LB) FIRED UNIT IN HATTISBURG, MISSISSIPPI. THE EMISSION CONTROL SYSTEM FOR THIS UNIT CONSISTS OF A HOT SIDE ESP FOLLOWED BY A LIME-STONE VENTRI-ROD ABSORBER SUPPLIED BY RILEY STOKER/ENVIRONEERING. AFTER THE CLEANED GAS PASSES THROUGH A VERTICAL CHEVRON MIST ELIMINATOR, IT IS JOINED BY A 3% BYPASS REHEAT BEFORE IT IS DISCHARGED THROUGH A 408 FOOT STACK SHARED BY UNITS 1 AND 2 (EACH UNIT HAS ITS OWN ACID BRICK LINED FLUE). THE WATER LOOP IS CLOSED, AND THE FLYASH STABILIZED SLUDGE IS HAULED BY TRUCK TO AN OFF SITE LANDFILL. THE SYSTEM HAS BEEN OPERATIONAL SINCE JUNE OF 1979.
SOUTHERN ILLINOIS POWER COOP MARION 4 NEW 184.0 MW (GROSS) 184.0 MW (ESC) COAL/REFUS 3.50 XS LIMESTONE BABCOCK & WILCOX ENERGY CONSUMPTION: ****% STATUS 1 STARTUP 5/79	UNIT 4 AT SOUTHERN ILLINOIS POWER COOP'S MARION STATION IN MARION, ILLINOIS IS A CYCLONE FIRED COAL (3.0% S, 9000 BTU/LB) BOILER WHICH IS SERVED BY A 89.4% EFFICIENT (DESIGN) LIMESTONE FGD SYSTEM SUPPLIED BY BARCOCK AND WILCOX. TWO SPRAY TOWERS AND A BRICK LINED STACK ARE DOWNSTREAM OF AN ESP IN THIS SYSTEM. THE WATER LOOP IS OPEN, AND THE FLYASH STABILIZED SLUDGE IS DEWATERED AND LANDFILLED. THE SYSTEM BECAME OPERATIONAL DURING MAY OF 1979.
SOUTHERN ILLINOIS POWER COOP MARION 5 NEW 300.0 MW (GROSS) 300.0 MW (ESC) COAL 3.00 XS PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 6 STARTUP 0/86	MARION 5 IS A COAL (3.0% S, 9000 BTU/LB) FIRED UNIT PLANNED BY SOUTHERN ILLINOIS POWER COOP FOR LOCATION IN MARION, ILLINOIS. THE UTILITY HAS NOT YET DECIDED ON AN FGD PROCESS AS IT IS WAITING FOR THE FINALIZATION OF THE SO2 REGULATIONS THE UNIT WILL HAVE TO MEET. START UP IS EXPECTED IN 1986.
SOUTHERN INDIANA GAS & ELEC A.B. BROWN 1 NEW 265.0 MW (GROSS) 265.0 MW (ESC) COAL 3.35 XS BITUMINOUS DUAL ALKALI FMC ENERGY CONSUMPTION: .8% STATUS 1 STARTUP 4/79	SOUTHERN INDIANA GAS AND ELECTRIC'S A.B.BROWN 1 IS A DRY BOTTOM PULVERIZED COAL (4.5% S, 13,010 BTU/LB) FIRED UNIT IN WEST FRANKLIN, INDIANA. FMC SUPPLIED A DUAL ALKALI FGD SYSTEM DESIGNED TO REMOVE 85% OF THE FLUE GAS SO2. THE UNIT CONSISTS OF TWO THREE STAGE DISC CONTACTORS. A COLD SIDE ESP PROVIDES PRIMARY PARTICULATE CONTROL, AND ONE CHEVRON MIST ELIMINATOR/MODULE PRECEDES A 498 FOOT ACID BRICK LINED STACK. THE SYSTEM PRODUCES A FILTER CAKE WASTE PRODUCT WHICH IS DISPOSED IN AN ON SITE LANDFILL. THE WATER LOOP CAN BE EITHER OPEN OR CLOSED. THE SYSTEM HAS BEEN OPERATIONAL SINCE MARCH OF 1979.
SOUTHWESTERN ELECTRIC POWER HENRY W. PERKEY 1 NEW 720.0 MW (GROSS) 720.0 MW (ESC) COAL .80 XS LIGNITE LIMESTONE AIR CORRECTION DIVISION, UOP ENERGY CONSUMPTION: ****% STATUS 3 STARTUP 12/84	HENRY W. PERKEY 1 IS A WET BOTTOM LIGNITE (0.8% S, 6300 BTU/LB) FIRED UNIT PLANNED BY SOUTHWESTERN ELECTRIC POWER FOR LOCATION IN HALLSVILLE, TEXAS. A CONTRACT HAS BEEN AWARDED TO THE AIR CORRECTION DIVISION OF UOP FOR FOUR LIMESTONE SPRAY TOWERS (99% EFFICIENCY). MIST ELIMINATION WILL BE PROVIDED BY TWO STAGE CHEVRONS, AND THE STACK WILL BE ACID BRICK LINED. NO REHEAT IS PLANNED. THE WATER LOOP WILL BE CLOSED, AND THE SLUDGE WILL BE POZ-O-TEC STABILIZED. START UP IS EXPECTED BY DECEMBER, 1984.

SECTION 2
STATUS OF FGD SYSTEMS

UNIT IDENTIFICATION	ABSTRACT
SPRINGFIELD CITY UTILITIES SOUTHWEST 1 NEW 194.0 MW (GROSS) 194.0 MW (ESC) COAL 3.50 XS BITUMINOUS LIMESTONE AIR CORRECTION DIVISION, UOP ENERGY CONSUMPTION: 4.6% STATUS 1 STARTUP 4/77	SPRINGFIELD CITY UTILITIES' SOUTHWEST 1 IS A PULVERIZED BITUMINOUS COAL (3.5% S, 12,500 BTU/LB) FIRED BOILER LOCATED IN SPRINGFIELD, MISSOURI. THE EMISSION CONTROL SYSTEM FOR THIS UNIT CONSISTS OF A COLD SIDE ESP FOLLOWED BY TWO UOP LIMESTONE TCA MODULES WHICH WERE DESIGNED TO REMOVE 80% OF THE FLUE GAS SO ₂ . ONE CHEVRON/MODULE LEADS TO A 384 FOOT CEILCOTE LINED STACK. THE DRY FLYASH STABILIZED SLUDGE IS DEWATERED BY A ROTARY DRUM VACUUM AND TRUCKED TO A LANDFILL. THE SYSTEM HAS BEEN OPERATIONAL SINCE APRIL, 1977.
SPRINGFIELD WATER, LIGHT & PWR DALLMAN 3 NEW 205.0 MW (GROSS) 205.0 MW (ESC) COAL 3.30 XS LIMESTONE RESEARCH COTTRELL ENERGY CONSUMPTION: 5.9% STATUS 2 STARTUP 11/80	DALLMAN 3 OF SPRINGFIELD WATER, LIGHT, AND POWER IS A PULVERIZED COAL (3.3% S, 10,500 BTU/LB) FIRED BOILER UNDER CONSTRUCTION IN SPRINGFIELD, ILLINOIS. RESEARCH COTTRELL IS SUPPLYING A LIMESTONE FGD SYSTEM DESIGNED TO REMOVE 95% OF THE SO ₂ FROM 850,000 ACFM OF BOILER FLUE GAS. A HOT SIDE ESP WILL PRECEDE TWO PACKED TOWER ABSORBERS, ONE HORIZONTAL CHEVRON PER MODULE, AND A 500 FOOT ACID BRICK LINED STACK. NO REHEAT WILL BE PROVIDED. A SLUDGE DISPOSAL STRATEGY HAS NOT BEEN FINALIZED, BUT THE UTILITY IS CONSIDERING EITHER PONDING OR LANDFILL. FGD OPERATIONS SHOULD BEGIN IN NOVEMBER, 1980.
ST. JOE ZINC G.F. WEATON 1 RETROFIT 60.0 MW (GROSS) 60.0 MW (ESC) COAL 2.00 XS BITUMINOUS CITRATE BUREAU OF MINES ENERGY CONSUMPTION: ****X STATUS 1 STARTUP 11/79	G.F. WEATON 1, OWNED BY ST. JOE ZINC, IS A COAL (3.0% S, 12,500 BTU/LB) FIRED BOILER LOCATED IN MONACA, PENNSYLVANIA. THE BUREAU OF MINES RETROFITTED A PROTOTYPE CITRATE FGD SYSTEM ON THIS UNIT, WHICH PROVIDES POWER FOR THE LOCAL UTILITY GRID. ONE VENTURI SCRUBBER/ABSORBER TRAIN FOLLOWS A COLD SIDE ESP. TWO CHEVRON MIST ELIMINATORS ARE FOLLOWED BY A COMBINATION OF INDIRECT HOT AIR AND DIRECT COMBUSTION REHEATERS, AND A 102 FOOT FIBERGLASS LINED SCRUBBER STACK. THE SYSTEM SO ₂ REMOVAL EFFICIENCY WILL BE OVER 90%. THE WATER LOOP IS CLOSED LOOP MODE. THE FGD SYSTEM COMMENCED OPERATION IN NOVEMBER OF 1979.
TAMPA ELECTRIC BIG BEND 4 NEW 475.0 MW (GROSS) 475.0 MW (ESC) COAL 2.50 XS PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****X STATUS 5 STARTUP 3/85	UNIT 4 AT TAMPA ELECTRIC'S BIG BEND STATION IS A PLANNED DRY BOTTOM PULVERIZED COAL (2.5% S, 10,300 BTU/LB) FIRED UNIT TO BE LOCATED IN TAMPA, FLORIDA. THE FGD PROCESS HAS NOT YET BEEN CHOSEN. AN ESP WILL PROVIDE PRIMARY PARTICULATE CONTROL. THE FGD SYSTEM, WHICH WILL REMOVE 90% OF THE FLUE GAS SO ₂ , WILL INCLUDE AN INDIRECT HOT AIR REHEATER LEADING TO A 490 FOOT CONCRETE LINED STACK.
TENNESSEE VALLEY AUTHORITY JOHNSONVILLE 1-10 RETROFIT 1450.0 MW (GROSS) 600.0 MW (ESC) COAL 3.10 XS MAGNESIUM OXIDE RILEY ENVIRONMENTAL ENERGY CONSUMPTION: ****X STATUS 3 STARTUP 12/81	UNITS 1 THROUGH 10 AT JOHNSONVILLE STATION OF TVA ARE COAL (2.6% S, 10,750 BTU/LB) FIRED BOILERS LOCATED IN NEW JOHNSONVILLE, TENNESSEE. UNITED ENGINEERS HAS BEEN AWARDED A CONTRACT TO PROVIDE ENGINEERING ASSISTANCE TO TVA FOR A 90% EFFICIENT MAGNESIUM OXIDE FGD SYSTEM TO BE RETROFITTED ON THESE UNITS. SULFURIC ACID WILL BE PRODUCED AS A BYPRODUCT FROM THIS SYSTEM, WHICH WILL FEATURE FOUR VENTURI SCRUBBER/ABSORBER TRAINS (ONE SPARE), 60% BYPASS REHEAT, AND A 600 FOOT STACK. START UP IS EXPECTED IN 1981.
TENNESSEE VALLEY AUTHORITY PARADISE 1 RETROFIT 704.0 MW (GROSS) 704.0 MW (ESC) COAL 4.20 XS LIMESTONE CHEMICO ENERGY CONSUMPTION: ****X STATUS 2 STARTUP 3/82	PARADISE 1 OF TVA IS A 4.2% SULFUR COAL FIRED UNIT LOCATED IN PARADISE, KENTUCKY. A CONTRACT HAS BEEN AWARDED TO CHEMICO FOR AN 84.2% EFFICIENT LIMESTONE FGD SYSTEM TO BE RETROFITTED ON THIS BOILER. SIX VENTURI SCRUBBERS AND VENTURI ABSORBER TRAINS WILL FOLLOW AN ESP. INLET FLUE GAS WILL BE USED TO HEAT WATER, WHICH IN TURN WILL BE USED TO REHEAT THE OUTLET FLUE GAS. FORCED OXIDATION WILL BE USED IN ONE MODULE TO CONTROL SCALING THROUGHOUT THE SYSTEM. THE UTILITY EXPECTS TO GET AN 80% SOLIDS LANDFILL-ABLE GRADE SLUDGE. OPERATIONS SHOULD START IN MARCH, 1982.

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UNIT IDENTIFICATION	ABSTRACT
TENNESSEE VALLEY AUTHORITY PARADISE 2 RETROFIT 704.0 MW (GROSS) 704.0 MW (ESC) COAL 4.20 XS LIMESTONE CHEMICO ENERGY CONSUMPTION: ****X STATUS 2 STARTUP 6/82	PARADISE 2 OF TVA IS A 4.2% SULFUR COAL FIRED UNIT LOCATED IN PARADISE, KENTUCKY. A CONTRACT HAS BEEN AWARDED TO CHEMICO FOR AN 84.2% EFFICIENT LIMESTONE FGD SYSTEM TO BE RETROFITTED ON THIS BOILER. SIX VENTURI SCRUBBERS AND VENTURI ABSORBER TRAINS WILL FOLLOW AN ESP. INLET FLUE GAS WILL BE USED TO HEAT WATER, WHICH IN TURN WILL BE USED TO REHEAT THE OUTLET FLUE GAS. FORCED OXIDATION WILL BE USED IN ONE MODULE TO CONTROL SCALING THROUGHOUT THE SYSTEM. THE UTILITY EXPECTS TO GET AN 80% SOLIDS LANDFILL-ABLE GRADE SLUDGE. OPERATIONS SHOULD START IN JUNE, 1982.
TENNESSEE VALLEY AUTHORITY SHAWNEE 10A RETROFIT 10.0 MW (GROSS) 10.0 MW (ESC) COAL 2.90 XS BITUMINOUS LIME/LIMESTONE AIR CORRECTION DIVISION, UOP ENERGY CONSUMPTION: ****X STATUS 1 STARTUP 4/72	SHAWNEE 10 OF TVA IS A 2.9% SULFUR BITUMINOUS COAL FIRED BOILER LOCATED IN PADUCAH, KENTUCKY. MODULE 10A IS A RETROFIT PROTOTYPE LIME/LIMESTONE TCA SYSTEM SUPPLIED BY THE AIR CORRECTION DIVISION, UOP. THE SYSTEM UTILIZES A CHEVRON MIST ELIMINATOR AND A DIRECT COMBUSTION REHEATER, AND OPERATES IN A CLOSED WATER LOOP. THIS TEST PROGRAM IS FUNDED BY THE EPA WITH TVA AS THE CONSTRUCTOR AND FACILITY OPERATOR. THE BECHTEL CORP. OF SAN FRANCISCO IS THE MAJOR CONTRACTOR, TEST DIRECTOR, AND REPORT WRITER. THE SYSTEM HAS BEEN OPERATIONAL SINCE APRIL, 1972.
TENNESSEE VALLEY AUTHORITY SHAWNEE 10B RETROFIT 10.0 MW (GROSS) 10.0 MW (ESC) COAL 2.90 XS BITUMINOUS LIME/LIMESTONE CHEMICO ENERGY CONSUMPTION: ****X STATUS 1 STARTUP 4/72	SHAWNEE 10 OF TVA IS A 2.9% SULFUR BITUMINOUS COAL FIRED BOILER LOCATED IN PADUCAH, KENTUCKY. MODULE 10B IS A RETROFIT PROTOTYPE LIME/LIMESTONE VENTURI SCRUBBER/SPRAY TOWER ABSORBER SUPPLIED BY CHEMICO. THE SYSTEM, OPERATIONAL SINCE APRIL, 1972, INCLUDES A CHEVRON MIST ELIMINATOR AND A DIRECT COMBUSTION REHEATER, AND OPERATES IN A CLOSED WATER LOOP. THIS TEST PROGRAM IS FUNDED BY THE EPA WITH TVA AS THE CONSTRUCTOR AND FACILITY OPERATOR. THE BECHTEL CORP. OF SAN FRANCISCO IS THE MAJOR CONTRACTOR, TEST DIRECTOR, AND REPORT WRITER.
TENNESSEE VALLEY AUTHORITY WIDOWS CREEK 7 RETROFIT 575.0 MW (GROSS) 575.0 MW (ESC) COAL 3.70 XS BITUMINOUS LIMESTONE COMBUSTION ENGINEERING ENERGY CONSUMPTION: ****X STATUS 2 STARTUP 9/81	WIDOWS CREEK 7 IS A PULVERIZED BITUMINOUS COAL (3.7% S, 11,100 BTU/LB) FIRED BOILER OF TVA LOCATED IN BRIDGEPORT, ALABAMA. COMBUSTION ENGINEERING IS PRESENTLY RETROFITTING A LIMESTONE VENTURI SCRUBBER/SPRAY TOWER ABSORBER FGD SYSTEM ON THIS UNIT. AN ESP WILL PRECEDE THE SCRUBBING TRAIN, AND A COMBINATION OF A BULK ENTRAINMENT SEPARATOR, TWO CHEVRON MIST ELIMINATORS AND A FINNED TUBE REHEATER FOLLOW THE SYSTEM. THE SCRUBBER SLUDGE WILL BE DISPOSED IN A SLUDGE POND. CONSTRUCTION BEGAN IN SEPTEMBER, 1978, AND START UP IS EXPECTED IN SEPTEMBER, 1981.
TENNESSEE VALLEY AUTHORITY WIDOWS CREEK 8 RETROFIT 550.0 MW (GROSS) 550.0 MW (ESC) COAL 3.70 XS LIMESTONE TENNESSEE VALLEY AUTHORITY ENERGY CONSUMPTION: 4.7% STATUS 1 STARTUP 5/77	WIDOWS CREEK 8 OF TVA IS A BALANCED DRAFT, TANGENTIALLY FIRED COAL (4.3% S, 10,000 BTU/LB) BOILER IN BRIDGEPORT, ALABAMA. TVA RETROFITTED THIS UNIT WITH A LIMESTONE FGD SYSTEM (80% DESIGN SO2 REMOVAL EFFICIENCY) WHICH BEGAN OPERATIONS IN MAY, 1977. AN ESP PRECEDES FOUR VARIABLE THROAT VENTURI SCRUBBER/MULTIGRID TOWER ABSORBER TRAINS (ONE OF THE TOWERS IS PACKED). ONE VERTICAL CHEVRON/TRAIN AND AN INDIRECT HOT AIR REHEATER ARE INCLUDED IN THE SYSTEM. SLUDGE FROM THE FGD SYSTEM IS PONDED.
TEXAS MUNICIPAL POWER AGENCY GIBBONS CREEK 1 NEW 400.0 MW (GROSS) 400.0 MW (ESC) COAL 1.06 XS LIGNITE LIMESTONE COMBUSTION ENGINEERING ENERGY CONSUMPTION: ****X STATUS 2 STARTUP 1/82	GIBBONS CREEK 1 OF THE TEXAS MUNICIPAL POWER AGENCY IS A DRY BOTTOM PULVERIZED LIGNITE (1.06% S, 4860 BTU/LB) FIRED UNIT PLANNED FOR LOCATION IN CARLOS, TEXAS. THE EMISSION CONTROL SYSTEM WILL CONSIST OF A COLD SIDE ESP FOLLOWED BY THREE 50% CAPACITY LIMESTONE SPRAY TOWERS. A CONTRACT HAS BEEN AWARDED TO COMBUSTION ENGINEERING FOR THE FGD SYSTEM, WHICH INCLUDES A CHEVRON MIST ELIMINATOR AND A STEAM COIL REHEATER. CLEANED FLUE GAS WILL BE DISCHARGED THROUGH A 465 FOOT ACID BRICK LINED STACK. THE POZ-O-TEC STABILIZED SLUDGE WILL BE USED AS STRIP MINE LANDFILL. START UP IS EXPECTED IN JANUARY, 1982.

SECTION 2
STATUS OF FGD SYSTEMS

UNIT IDENTIFICATION	ABSTRACT
<p>TEXAS POWER & LIGHT SANDOW 4 NEW 545.0 MW (GROSS) 382.0 MW (ESC) COAL 1.60 XS LIGNITE LIMESTONE COMBUSTION ENGINEERING ENERGY CONSUMPTION: ****X STATUS 2 STARTUP 7/80</p>	<p>SANDOW 4 IS A PULVERIZED 1.6% SULFUR LIGNITE FIRED BOILER OF TEXAS POWER AND LIGHT UNDER CONSTRUCTION IN ROCKDALE, TEXAS. COMBUSTION ENGINEERING IS SUPPLYING THREE LIMESTONE SPRAY TOWERS FOR THIS UNIT. A COLD SIDE ESP WILL PROVIDE PRIMARY PARTICULATE CONTROL. A 30% BYPASS REHEAT WILL BE USED, AND THE OVERALL SO₂ REMOVAL EFFICIENCY WILL BE 75%. THE SYSTEM WILL OPERATE IN A CLOSED WATER LOOP, AND THE SLUDGE WILL BE PONDED. START UP IS EXPECTED IN JULY, 1980.</p>
<p>TEXAS POWER & LIGHT TWIN OAKS 1 NEW 750.0 MW (GROSS) 750.0 MW (ESC) COAL .70 XS LIGNITE LIMESTONE CHEMICO ENERGY CONSUMPTION: ****X STATUS 3 STARTUP 8/84</p>	<p>TWIN OAKS 1 IS A 0.75% SULFUR LIGNITE FIRED BOILER PLANNED BY TEXAS POWER AND LIGHT AND ALCOA FOR LOCATION IN BREMOND, TEXAS. A CONTRACT HAS BEEN AWARDED TO CHEMICO FOR A LIMESTONE FGD SYSTEM ON THIS UNIT. START UP IS EXPECTED IN AUGUST OF 1984.</p>
<p>TEXAS POWER & LIGHT TWIN OAKS 2 NEW 750.0 MW (GROSS) 750.0 MW (ESC) COAL .70 XS LIGNITE LIMESTONE CHEMICO ENERGY CONSUMPTION: ****X STATUS 3 STARTUP 8/85</p>	<p>TWIN OAKS 2 IS A 0.75% SULFUR LIGNITE FIRED BOILER PLANNED BY TEXAS POWER AND LIGHT AND ALCOA FOR LOCATION IN BREMOND, TEXAS. A CONTRACT HAS BEEN AWARDED TO CHEMICO FOR A LIMESTONE FGD SYSTEM ON THIS UNIT. START UP IS EXPECTED IN AUGUST OF 1985.</p>
<p>TEXAS UTILITIES FOREST GROVE 1 NEW 750.0 MW (GROSS) 750.0 MW (ESC) COAL .80 XS LIGNITE PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****X STATUS 5 STARTUP 0/81</p>	<p>TEXAS UTILITIES IS PLANNING A LIGNITE (0.8% S, 7000 BTU/LB) FIRED BOILER, FOREST GROVE 1, WHICH WILL BE LOCATED IN ATHENS, TEXAS. THE UTILITY IS PRESENTLY REQUESTING BIDS ON AN FGD SYSTEM FOR THIS UNIT. TWO ESP'S WILL PROVIDE PRIMARY PARTICULATE CONTROL, AND NO STACK GAS REHEAT IS PLANNED. START UP IS EXPECTED IN LATE 1981.</p>
<p>TEXAS UTILITIES MARTIN LAKE 1 NEW 793.0 MW (GROSS) 595.0 MW (ESC) COAL .90 XS LIGNITE LIMESTONE RESEARCH COTTRELL ENERGY CONSUMPTION: 1.3X STATUS 1 STARTUP 4/77</p>	<p>TEXAS UTILITIES' MARTIN LAKE 1 IS A LIGNITE (0.9% S, 7380 BTU/LB) FIRED BOILER IN TATUM, TEXAS. THIS UNIT IS EQUIPPED WITH AN EMISSION CONTROL SYSTEM WHICH INCLUDES A COLD SIDE ESP AND A LIMESTONE FGD SYSTEM, BOTH SUPPLIED BY RESEARCH COTTRELL. THE FGD SYSTEM CONSISTS OF SIX PACKED SPRAY TOWER ABSORBERS WHICH TREAT 75% OF THE TOTAL BOILER FLUE GAS. THE REMAINING FLUE GAS IS BYPASSED FOR REHEAT. THE TOTAL DESIGN SO₂ REMOVAL EFFICIENCY IS 70.5%. TWO CHEVRONS/MODULE PROVIDE MIST ELIMINATION. THE FLUE GAS CLEANING WASTES ARE FLYASH STABILIZED AND DISPOSED IN AN ON-SITE LANDFILL. THE SYSTEM OPERATES IN A CLOSED WATER LOOP. INITIAL SYSTEM OPERATIONS TOOK PLACE IN APRIL, 1977.</p>
<p>TEXAS UTILITIES MARTIN LAKE 2 NEW 793.0 MW (GROSS) 595.0 MW (ESC) COAL .90 XS LIGNITE LIMESTONE RESEARCH COTTRELL ENERGY CONSUMPTION: 1.3X STATUS 1 STARTUP 5/78</p>	<p>TEXAS UTILITIES' MARTIN LAKE 2 IS A LIGNITE (0.9% S, 7380 BTU/LB) FIRED BOILER IN TATUM, TEXAS. THIS UNIT IS EQUIPPED WITH AN EMISSION CONTROL SYSTEM WHICH INCLUDES A COLD SIDE ESP AND A LIMESTONE FGD SYSTEM, BOTH SUPPLIED BY RESEARCH COTTRELL. THE FGD SYSTEM CONSISTS OF SIX PACKED SPRAY TOWER ABSORBERS WHICH TREAT 75% OF THE TOTAL BOILER FLUE GAS. THE REMAINING FLUE GAS IS BYPASSED FOR REHEAT. THE TOTAL DESIGN SO₂ REMOVAL EFFICIENCY IS 70.5%. TWO CHEVRONS/MODULE PROVIDE MIST ELIMINATION. THE FLUE GAS CLEANING WASTES ARE FLYASH STABILIZED AND DISPOSED IN AN ON-SITE LANDFILL. THE SYSTEM OPERATES IN A CLOSED WATER LOOP. INITIAL SYSTEM OPERATIONS TOOK PLACE IN MAY, 1978.</p>

SECTION 2
STATUS OF FGD SYSTEMS

UNIT IDENTIFICATION	ABSTRACT
<p>TEXAS UTILITIES MARTIN LAKE 3 NEW 793.0 MW (GROSS) 595.0 MW (ESC) COAL .90 %S LIGNITE LIMESTONE RESEARCH COTTRELL ENERGY CONSUMPTION: 1.3% STATUS 1 STARTUP 2/79</p>	<p>TEXAS UTILITIES' MARTIN LAKE 3 IS A LIGNITE (0.9% S, 7380 BTU/LB) FIRED BOILER IN TATUM, TEXAS. THIS UNIT IS EQUIPPED WITH AN EMISSION CONTROL SYSTEM WHICH INCLUDES A COLD SIDE ESP AND A LIMESTONE FGD SYSTEM, BOTH SUPPLIED BY RESEARCH COTTRELL. THE FGD SYSTEM CONSISTS OF SIX PACKED SPRAY TOWER ABSORBERS WHICH TREAT 75% OF THE TOTAL BOILER FLUE GAS. THE REMAINING FLUE GAS IS BYPASSED FOR REHEAT. THE TOTAL DESIGN SO₂ REMOVAL EFFICIENCY IS 70.5%. TWO CHEVRONS/MODULE PROVIDE MIST ELIMINATION. THE FLUE GAS CLEANING WASTES ARE FLYASH STABILIZED AND DISPOSED IN AN ON-SITE LANDFILL. THE SYSTEM OPERATES IN A CLOSED WATER LOOP. INITIAL SYSTEM OPERATIONS TOOK PLACE IN FEBRUARY, 1979.</p>
<p>TEXAS UTILITIES MARTIN LAKE 4 NEW 750.0 MW (GROSS) 750.0 MW (ESC) COAL .90 %S LIGNITE LIMESTONE RESEARCH COTTRELL ENERGY CONSUMPTION: ****% STATUS 3 STARTUP 0/85</p>	<p>MARTIN LAKE 4 OF TEXAS UTILITIES IS A LIGNITE (0.9% S, 7380 BTU/LB) FIRED BOILER UNDER CONSTRUCTION IN TATUM, TEXAS. A CONTRACT FOR A LIMESTONE FGD SYSTEM FOR THIS UNIT HAS BEEN AWARDED TO RESEARCH COTTRELL. CONSTRUCTION HAS NOT YET BEGUN ON THE FGD SYSTEM. FGD START UP IS EXPECTED IN 1985 OR 1986.</p>
<p>TEXAS UTILITIES MILL CREEK 1 NEW 750.0 MW (GROSS) 750.0 MW (ESC) COAL ***** %S LIGNITE PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 6 STARTUP 0/85</p>	<p>MILL CREEK 1 OF TEXAS UTILITIES IS A PLANNED LIGNITE FIRED UNIT TO BE LOCATED IN HENDERSON, TEXAS. THE UTILITY WILL INCLUDE AN FGD SYSTEM ON THIS UNIT, BUT NO DECISIONS HAVE BEEN MADE AS TO THE PROCESS TYPE OR VENDOR. ESP'S WILL PROVIDE PRIMARY PARTICULATE CONTROL. START UP IS EXPECTED IN 1985.</p>
<p>TEXAS UTILITIES MILL CREEK 2 NEW 750.0 MW (GROSS) 750.0 MW (ESC) COAL ***** %S LIGNITE PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 6 STARTUP 0/86</p>	<p>MILL CREEK 2 OF TEXAS UTILITIES IS A PLANNED LIGNITE FIRED UNIT TO BE LOCATED IN HENDERSON, TEXAS. THE UTILITY WILL INCLUDE AN FGD SYSTEM ON THIS UNIT, BUT NO DECISIONS HAVE BEEN MADE AS TO THE PROCESS TYPE OR VENDOR. ESP'S WILL PROVIDE PRIMARY PARTICULATE CONTROL. START UP IS EXPECTED IN 1986.</p>
<p>TEXAS UTILITIES MONTICELLO 3 NEW 800.0 MW (GROSS) 800.0 MW (ESC) COAL 1.50 %S LIGNITE LIMESTONE CHEMICO ENERGY CONSUMPTION: ****% STATUS 1 STARTUP 5/78</p>	<p>MONTICELLO 3 OF TEXAS UTILITIES IS A LIGNITE (1.5% S, 7000 BTU/LB) FIRED UNIT IN MT. PLEASANT, TEXAS. THIS UNIT'S EMISSION CONTROL SYSTEM CONSISTS OF TWO COLD SIDE ESP'S FOLLOWED BY THREE CHEMICO LIMESTONE SPRAY TOWERS (74% DESIGN SO₂ REMOVAL EFFICIENCY), ONE HORIZONTAL CHEVRON MIST ELIMINATOR/MODULE, AND AN INDIRECT HOT AIR REHEATER. THE WATER LOOP IS CLOSED, AND THE FLYASH STABILIZED SLUDGE IS DISPOSED IN AN ON SITE LANDFILL. THIS SYSTEM HAS BEEN OPERATIONAL SINCE MAY OF 1978.</p>
<p>TUCSON ELECTRIC POWER SPRINGERVILLE 1 NEW 370.0 MW (GROSS) 370.0 MW (ESC) COAL ***** %S SUBBITUMINOUS LIME/SPRAY DRYING JOY MFG/NIRO ATOMIZER ENERGY CONSUMPTION: ****% STATUS 3 STARTUP 6/85</p>	<p>TUCSON GAS AND ELECTRIC WILL BE BUILDING TWO NEW UNITS IN SPRINGERVILLE, COLORADO, SPRINGERVILLE 1 AND 2. THE UNITS WILL FIRE PULVERIZED SUBBITUMINOUS COAL (0.53-0.69% S AND 8500-8900 BTU/LB). A CONTRACT HAS BEEN AWARDED TO JOY MANUFACTURING/NIRO ATOMIZER FOR A LIME/SPRAY DRYING FGD SYSTEM TO CONTROL PARTICULATE MATTER AND SO₂ EMISSIONS. THE SYSTEM WILL BE DESIGNED TO ACCOMMODATE A REHEATER (SHOULD ONE BE REQUIRED) AND WILL OPERATE IN A CLOSED WATER LOOP. CLEANED FLUE GAS WILL EXIT THE SYSTEM VIA A 500 FOOT CONCRETE STACK. OPERATIONS ARE SCHEDULED TO BEGIN IN 1985.</p>

SECTION 2
STATUS OF FGD SYSTEMS

UNIT IDENTIFICATION	ABSTRACT
<p>TUCSON ELECTRIC POWER SPRINGERVILLE 2 NEW 370.0 MW (GROSS) 370.0 MW (ESC) COAL ***** XS SUBBITUMINOUS LIME/SPRAY DRYING JOY MFG/NIRO ATOMIZER ENERGY CONSUMPTION: ***** STATUS 3 STARTUP 1/87</p>	<p>TUCSON GAS AND ELECTRIC WILL BE BUILDING TWO NEW UNITS IN SPRINGERVILLE, COLORADO, SPRINGERVILLE 1 AND 2. THE UNITS WILL FIRE PULVERIZED SUBBITUMINOUS COAL (0.53-0.69% S AND 8500-8900 BTU/LB). A CONTRACT HAS BEEN AWARDED TO JOY MANUFACTURING/NIRO ATOMIZER FOR A LIME/SPRAY DRYING FGD SYSTEM TO CONTROL PARTICULATE MATTER AND SO₂ EMISSIONS. THE SYSTEM WILL BE DESIGNED TO ACCOMMODATE A REHEATER (SHOULD ONE BE REQUIRED) AND WILL OPERATE IN A CLOSED WATER LOOP. CLEANED FLUE GAS WILL EXIT THE SYSTEM VIA A 500 FOOT CONCRETE STACK. OPERATIONS ARE SCHEDULED TO BEGIN IN 1987.</p>
<p>UNITED POWER ASSOCIATION STANTON 2 NEW 50.0 MW (GROSS) 50.0 MW (ESC) COAL .77 XS LIGNITE LIME/SPRAY DRYING KOMLINE & SANDERSON ENERGY CONSUMPTION: ***** STATUS 3 STARTUP 1/82</p>	<p>THE UNITED POWER ASSOCIATION HAS PLANS FOR A PULVERIZED COAL (0.77% S, 7000 BTU/LB) FIRED UNIT, STANTON 2, TO BE LOCATED IN STANTON, NORTH DAKOTA. A CONTRACT HAS BEEN AWARDED TO KOMLINE AND SANDERSON FOR A LIME SPRAY TOWER. A FABRIC FILTER SUPPLIED BY RESEARCH COTTRELL WILL BE DESIGNED TO REMOVE 99% OF THE PARTICULATE. THE SYSTEM WILL OPERATE IN AN OPEN LOOP MODE WITH SLUDGE DISPOSAL TO BE IN A CLAY LINED SETTLING POND. OPERATIONS ARE SCHEDULED TO COMMENCE IN JANUARY, 1982.</p>
<p>UTAH POWER & LIGHT HUNTER 1 NEW 400.0 MW (GROSS) 360.0 MW (ESC) COAL .55 XS BITUMINOUS LIME CHEMICO ENERGY CONSUMPTION: ***** STATUS 1 STARTUP 5/79</p>	<p>HUNTER 1 OF UTAH POWER AND LIGHT IS A COAL (0.55% S, 12,500 BTU/LB) FIRED UNIT IN CASTLEDALE, UTAH. CHEMICO SUPPLIED A PEBBLE LIME WET SCRUBBING SYSTEM WHICH BECAME OPERATIONAL IN MAY, 1979. THE SCRUBBING SYSTEM IS DESIGNED TO OPERATE IN AN OPEN WATER LOOP WITH AN SO₂ REMOVAL EFFICIENCY OF 80%. PRIMARY PARTICULATE CONTROL IS PROVIDED BY AN UPSTREAM ESP, AND STACK GAS REHEAT IS PROVIDED BY BYPASS. THE SLUDGE IS FLYASH STABILIZED AND DISPOSED ON-SITE.</p>
<p>UTAH POWER & LIGHT HUNTER 2 NEW 400.0 MW (GROSS) 360.0 MW (ESC) COAL .55 XS LIME CHEMICO ENERGY CONSUMPTION: ***** STATUS 2 STARTUP 6/80</p>	<p>UTAH POWER AND LIGHT'S HUNTER 2 IS A COAL (0.55% S, 12,500 BTU/LB) FIRED UNIT UNDER CONSTRUCTION IN CASTLEDALE, UTAH. CHEMICO IS SUPPLYING A PEBBLE LIME WET SCRUBBING SYSTEM DESIGNED TO OPERATE IN AN OPEN WATER LOOP WITH AN SO₂ REMOVAL EFFICIENCY OF 80%. AN UPSTREAM ESP PROVIDES PRIMARY PARTICULATE CONTROL, AND A BYPASS SYSTEM PROVIDES STACK GAS REHEAT. THE SLUDGE WILL BE FLYASH STABILIZED AND DISPOSED ON-SITE. START UP OF BOTH THE BOILER AND FGD SYSTEM IS EXPECTED IN JUNE, 1980.</p>
<p>UTAH POWER & LIGHT HUNTER 3 NEW 400.0 MW (GROSS) 400.0 MW (ESC) COAL .55 XS BITUMINOUS LIMESTONE CHEMICO ENERGY CONSUMPTION: ***** STATUS 3 STARTUP 0/83</p>	<p>UTAH POWER AND LIGHT HAS PLANS FOR TWO NEW UNITS, HUNTER 3 AND 4, TO BE CONSTRUCTED IN CASTLEDALE, UTAH. A CONTRACT HAS BEEN AWARDED TO CHEMICO FOR A LIME, NONREGENERABLE FGD UNIT FOR EMISSION CONTROL. THE PULVERIZED COAL FIRED UNITS (0.55% S, 12,500 BTU/LB) ARE TO BEGIN OPERATIONS IN 1983 AND 1985, RESPECTIVELY.</p>
<p>UTAH POWER & LIGHT HUNTER 4 NEW 400.0 MW (GROSS) 400.0 MW (ESC) COAL .55 XS BITUMINOUS LIMESTONE CHEMICO ENERGY CONSUMPTION: ***** STATUS 3 STARTUP 0/85</p>	<p>UTAH POWER AND LIGHT HAS PLANS FOR TWO NEW UNITS, HUNTER 3 AND 4, TO BE CONSTRUCTED IN CASTLEDALE, UTAH. A CONTRACT HAS BEEN AWARDED TO CHEMICO FOR A LIME, NONREGENERABLE FGD UNIT FOR EMISSION CONTROL. THE PULVERIZED COAL FIRED UNITS (0.55% S, 12,500 BTU/LB) ARE TO BEGIN OPERATIONS IN 1983 AND 1985, RESPECTIVELY.</p>

SECTION 2
STATUS OF FGD SYSTEMS

UNIT IDENTIFICATION

ABSTRACT

UTAH POWER & LIGHT
HUNTINGTON
1
NEW 432.0 MW (GROSS)
366.0 MW (ESC)
COAL
.55 %S BITUMINOUS
LIME
CHEMICO
ENERGY CONSUMPTION: 1.6%
STATUS 1 STARTUP 5/78

HUNTINGTON 1 OF UTAH POWER IS A TANGENTIALLY FIRED PULVERIZED COAL (0.55% S, 12,500 BTU/LB) BOILER IN PRICE, UTAH. A COLD SIDE ESP TREATS 1,742,000 ACFM OF FLUE GAS AND IS FOLLOWED BY A CHEMICO LIME FGD SYSTEM CONSISTING OF FOUR SPRAY TOWERS (80% DESIGN EFFICIENCY). ONE FOUR PASS CHEVRON/MODULE PROVIDES MIST ELIMINATION, AND A COMBINATION OF A STEAM TUBE AND 10-20% BYPASS REHEATERS BOOST THE GAS TEMPERATURE 45-50 DEG F. THE SYSTEM OPERATES IN A CLOSED WATER LOOP, AND THE FLYASH STABILIZED SLUDGE IS TRUCKED TO AN ON-SITE LANDFILL. THE SYSTEM INCLUDES A 600 FOOT ACID BRICK LINED STACK, AND HAS BEEN OPERATIONAL SINCE MAY OF 1978.

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	ALABAMA ELECTRIC COOP
PLANT NAME	TOMBIGBEE
UNIT NUMBER	2
CITY	LEROU
STATE	ALABAMA
GROSS UNIT GENERATING CAPACITY - MW	255.0
NET UNIT GENERATING CAPACITY W/FGD - MW	235.0
EQUIVALENT SCRUBBED CAPACITY - MW	179.0
** FUEL DATA	
FUEL TYPE	COAL
FUEL GRADE	BITUMINOUS
AVERAGE HEAT CONTENT - Btu/lb	26749. (11500 Btu/lb)
AVERAGE ASH CONTENT - %	14.00
AVERAGE MOISTURE CONTENT - %	7.00
AVERAGE SULFUR CONTENT - %	1.15
AVERAGE CHLORIDE CONTENT - %	.04
** FGD SYSTEM	
GENERAL PROCESS TYPE	WET SCRUBBING
PROCESS TYPE	LIMESTONE
SYSTEM SUPPLIER	PEABODY PROCESS SYSTEMS
NEW/RETROFIT	NEW
ENERGY CONSUMPTION - %	3.1
INITIAL START-UP DATE	9/79
COMMERCIAL START-UP DATE	9/78
SO2 DESIGN REMOVAL EFFICIENCY - %	85.00
PARTICULATE DESIGN REMOVAL EFFICIENCY - %	99.30
ABSORBER SPARE CAPACITY INDEX - %	.0
ABSORBER SPARE COMPONENTS INDEX	.0
** WATER LOOP	
TYPE	CLOSED
FRESH MAKE-UP WATER - LITER/S	8.8 (140 GPM)
** DISPOSAL	
TYPE	LINED POND

-----PERFORMANCE DATA-----

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

1/80	A		35.8		21.1					
	B		56.7		33.5					
	SYSTEM	90.7	81.5		48.1		744	439	357	

** 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	99.3		99.3		696	696	691	

** 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	97.8		89.9		744	684	669	

ALABAMA ELECTRIC COOP: TOMBIGBEE 2 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

DURING MARCH THE FGD SYSTEM WAS AVAILABLE 100% OF THE TIME.

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	ALABAMA ELECTRIC COOP
PLANT NAME	TOMBIGBEE
UNIT NUMBER	3
CITY	LERCY
STATE	ALABAMA
GROSS UNIT GENERATING CAPACITY - MW	255.0
NET UNIT GENERATING CAPACITY W/FGD - MW	235.0
EQUIVALENT SCRUBBED CAPACITY - MW	179.0

** FUEL DATA	
FUEL TYPE	COAL
FUEL GRADE	BITUMINOUS
AVERAGE HEAT CONTENT - Btu/lb	26749. (11500 BTU/LB)
AVERAGE ASH CONTENT - %	14.00
AVERAGE MOISTURE CONTENT - %	7.00
AVERAGE SULFUR CONTENT - %	1.15
AVERAGE CHLORIDE CONTENT - %	.04

** FGD SYSTEM	
GENERAL PROCESS TYPE	WET SCRUBBING
PROCESS TYPE	LIMESTONE
SYSTEM SUPPLIER	PEABODY PROCESS SYSTEMS
NEW/RETROFIT	NEW
ENERGY CONSUMPTION - %	7.1
INITIAL START-UP DATE	6/79
COMMERCIAL START-UP DATE	6/79
SO2 DESIGN REMOVAL EFFICIENCY - %	85.70
PARTICULATE DESIGN REMOVAL EFFICIENCY - %	99.30
ABSORBER SPARE CAPACITY INDEX - %	.0
ABSORBER SPARE COMPONENTS INDEX	.0

** WATER LOOP	
TYPE	CLOSED
FRESH MAKE-UP WATER - LITER/S	9.8 (140 GPM)

** DISPOSAL	
TYPE	LINED POND

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

1/80	A		69.2		30.5					
	B		45.4		20.0					
	SYSTEM	100.0	97.9		43.1		744	328	321	

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JANUARY UNIT 3 WAS AVAILABLE THE ENTIRE MONTH.

2/80	A		33.3		1.1					
	B		100.0		3.4					
	SYSTEM	100.0	100.0		3.4		696	24	24	

** PROBLEMS/SOLUTIONS/COMMENTS

DURING FEBRUARY THE UNIT 3 BOILER AND FGD SYSTEM OPERATED ONLY 24 HOURS.

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

** PROBLEMS/SOLUTIONS/COMMENTS

DURING MARCH THE UNIT 3 GENERATOR WAS KEPT OUT OF SERVICE.

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	ALLEGHENY POWER SYSTEM	
PLANT NAME	PLEASANTS	
UNIT NUMBER	1	
CITY	BELMONT	
STATE	WEST VIRGINIA	
GROSS UNIT GENERATING CAPACITY - MW	625.0	
NET UNIT GENERATING CAPACITY W/FGD - MW	625.0	
EQUIVALENT SCRUBBED CAPACITY - MW	519.0	
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	BITUMINOUS	
AVERAGE HEAT CONTENT - B/G	27912.	(12000 BTU/LP)
AVERAGE ASH CONTENT - %	*****	
AVERAGE MOISTURE CONTENT - %	15.00	
AVERAGE SULFUR CONTENT - %	3.70	
AVERAGE CHLORIDE CONTENT - %	*****	
** FGD SYSTEM		
GENERAL PROCESS TYPE	WET SCRUBBING	
PROCESS TYPE	LIME	
SYSTEM SUPPLIER	BABCOCK & WILCOX	
NEW/RETROFIT	NEW	
ENERGY CONSUMPTION - %	*****	
INITIAL START-UP DATE	3/79	
COMMERCIAL START-UP DATE	**/**	
SO2 DESIGN REMOVAL EFFICIENCY - %	90.00	
PARTICULATE DESIGN REMOVAL EFFICIENCY - %	99.55	
ABSORBER SPARE COMPONENTS INDEX	.0	
** WATER LOOP		
TYPE	CLOSED	
FRESH MAKE-UP WATER - LITER/S	*****	(***** GPM)

-----PERFORMANCE DATA-----									
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL	PER BOILER	FGD	CAP.
						SO2 PART.	HOURS	HOURS	HOURS FACTOR
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 1980.

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
GROSS UNIT GENERATING CAPACITY - MW	195.0
NET UNIT GENERATING CAPACITY W/FGD - MW	175.0
EQUIVALENT SCRUBBED CAPACITY - MW	195.0

** FUEL DATA	
FUEL TYPE	COAL
FUEL GRADE	BITUMINOUS
AVERAGE HEAT CONTENT - J/G	23260. (17000 BTU/LB)
AVERAGE ASH CONTENT - %	15.00
AVERAGE MOISTURE CONTENT - %	9.00
AVERAGE SULFUR CONTENT - %	.55
AVERAGE CHLORIDE CONTENT - %	*****

** FGD SYSTEM	
GENERAL PROCESS TYPE	WET SCRUBBING
PROCESS TYPE	LIMESTONE
SYSTEM SUPPLIER	RESEARCH COTTRELL
NEW/RETROFIT	NEW
ENERGY CONSUMPTION - %	4.1
INITIAL START-UP DATE	8/78
COMMERCIAL START-UP DATE	1/79
SO2 DESIGN REMOVAL EFFICIENCY - %	85.00
PARTICULATE DESIGN REMOVAL EFFICIENCY - %	99.50
ABSORBER SPARE CAPACITY INDEX - %	.0
ABSORBER SPARE COMPONENTS INDEX	.0

** WATER LOOP	
TYPE	OPEN
FRESH MAKE-UP WATER - LITER/S	115.9 (1840 GPM)

** DISPOSAL	
TYPE	POND

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

1/80	SYSTEM	90.9	58.3	88.8	57.3	97.40	744	731	426	
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** 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	
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** PROBLEMS/SOLUTIONS/COMMENTS

DURING FEBRUARY OUTAGE TIME WAS DUE TO A PRECIPITATOR FAILURE.

FORCED OUTAGE TIME WAS ALSO CAUSED BY A PUMP MALFUNCTION.

3/80	SYSTEM	99.0	99.0	99.0	99.0		744	744	738	
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** PROBLEMS/SOLUTIONS/COMMENTS

SOME OF THE OUTAGE TIME DURING MARCH OCCURRED BECAUSE OF PUMP FAILURE.

OTHER OUTAGE TIME WAS CAUSED BY STICKING VALVES AND LIMESTONE FEED-BELT PROBLEMS.

SECTION 3

DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

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-----
COMPANY NAME                ARIZONA ELECTRIC POWER COOP
PLANT NAME                  APACHE
UNIT NUMBER                 3
CITY                        COCHISE
STATE                       ARIZONA
GROSS UNIT GENERATING CAPACITY - MW      195.0
NET UNIT GENERATING CAPACITY W/FGD - MW   175.0
EQUIVALENT SCRUBBED CAPACITY - MW        195.0

** FUEL DATA
  FUEL TYPE                  COAL
  FUEL GRADE                 BITUMINOUS
  AVERAGE HEAT CONTENT - Btu/lb      23260.    ( 10000 Btu/lb)
  AVERAGE ASH CONTENT - %            15.00
  AVERAGE MOISTURE CONTENT - %        9.00
  AVERAGE SULFUR CONTENT - %          .55
  AVERAGE CHLORIDE CONTENT - %        *****

** FGD SYSTEM
  GENERAL PROCESS TYPE        WET SCRUBBING
  PROCESS TYPE                LIMESTONE
  SYSTEM SUPPLIER             RESEARCH COTTRELL
  NEW/RETROFIT                NEW
  ENERGY CONSUMPTION - %       4.1
  INITIAL START-UP DATE        6/79
  COMMERCIAL START-UP DATE      4/79
  SO2 DESIGN REMOVAL EFFICIENCY - %    85.00
  PARTICULATE DESIGN REMOVAL EFFICIENCY - %  99.50
  ABSORBER SPARE CAPACITY INDEX - %    .0
  ABSORBER SPARE COMPONENTS INDEX      .0

** WATER LOOP
  TYPE                        OPEN
  FRESH MAKE-UP WATER - LITER/S      340.2    ( 5400 GPM)

** DISPOSAL
  TYPE                        POND
  
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-----PERFORMANCE DATA-----
PERIOD  MODULE  AVAILABILITY  OPERABILITY  RELIABILITY  UTILIZATION  % REMOVAL  PER BOILER  FGD  CAP.
          SO2    PART.    HOURS    HOURS    HOURS    HOURS    HOURS    HOURS  FACTOR
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1/80  SYSTEM      91.7      91.7      91.7      91.7      97.40      744    744    682

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** 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.

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2/80  SYSTEM      95.6      74.1      96.0      71.4      97.40      696    671    497

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** PROBLEMS/SOLUTIONS/COMMENTS

DURING FEBRUARY OUTAGE TIME WAS DUE TO A PRECIPITATOR FAILURE.

FORCED OUTAGE TIME WAS ALSO CAUSED BY A PUMP MALFUNCTION.

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3/80  SYSTEM      91.0      91.0      91.0      91.0      744    744    677

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** PROBLEMS/SOLUTIONS/COMMENTS

SOME OF THE OUTAGE TIME DURING MARCH OCCURRED BECAUSE OF PUMP FAILURE.

OTHER OUTAGE TIME WAS CAUSED BY STICKING VALVES AND LIMESTONE FEED-BELT PROBLEMS.

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
GROSS UNIT GENERATING CAPACITY - MW	119.0
NET UNIT GENERATING CAPACITY W/FGD - MW	115.0
EQUIVALENT SCRUBBED CAPACITY - MW	119.0
 ** FUEL DATA	
FUEL TYPE	COAL
FUEL GRADE	BITUMINOUS
AVERAGE HEAT CONTENT - J/G	23609. (10150 BTU/Lb)
AVERAGE ASH CONTENT - %	13.50
AVERAGE MOISTURE CONTENT - %	15.00
AVERAGE SULFUR CONTENT - %	.50
AVERAGE CHLORIDE CONTENT - %	.02
 ** FGD SYSTEM	
GENERAL PROCESS TYPE	WET SCRUBBING
PROCESS TYPE	LIMESTONE
SYSTEM SUPPLIER	RESEARCH COTTRELL
NEW/RETROFIT	RETROFIT
ENERGY CONSUMPTION - %	3.4
INITIAL START-UP DATE	10/73
COMMERCIAL START-UP DATE	12/73
SO ₂ DESIGN REMOVAL EFFICIENCY - %	92.00
PARTICULATE DESIGN REMOVAL EFFICIENCY - %	80.00
ABSORBER SPARE CAPACITY INDEX - %	.0
ABSORBER SPARE COMPONENTS INDEX	.0
 ** WATER LOOP	
TYPE	OPEN
FRESH MAKE-UP WATER - LITER/S	7.6 (120 GPM)
 ** DISPOSAL	
TYPE	POND

-----PERFORMANCE DATA-----									
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO ₂	PART. HOURS	PER BOILER HOURS	FGD CAP. HOURS FACTOR
11/79	A	77.0			77.0				
	B	98.0			98.0				
	SYSTEM	87.5			87.5		720	720	632
12/79	A	94.0			94.0				
	B	87.0			87.0				
	SYSTEM	90.5			90.5		744	744	672
1/80	A	95.0			95.0				
	B	99.0			99.0				
	SYSTEM	97.0			97.0		744	744	724
2/80	A	100.0			100.0				
	B	99.0			99.0				
	SYSTEM	99.5			99.5		696	696	694
3/80	A	99.0			99.0				
	B	93.0			93.0				
	SYSTEM	96.0			96.0		744	744	715

** PROBLEMS/SOLUTIONS/COMMENTS

NO FORCED OUTAGES WERE REPORTED BY THE UTILITY FOR THE FIVE MONTH PERIOD.
SOME SCHEDULED OUTAGE TIME WAS REQUIRED FOR REPAIR OF THE REHEATER DUCT-
WORK.

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
GROSS UNIT GENERATING CAPACITY - MW	350.0
NET UNIT GENERATING CAPACITY W/FGD - MW	250.0
EQUIVALENT SCRUBBED CAPACITY - MW	350.0
** FUEL DATA	
FUEL TYPE	COAL
FUEL GRADE	PITUMINOUS
AVERAGE HEAT CONTENT - J/G	23609. (10150 BTU/LB)
AVERAGE ASH CONTENT - %	13.50
AVERAGE MOISTURE CONTENT - %	15.00
AVERAGE SULFUR CONTENT - %	.50
AVERAGE CHLORIDE CONTENT - %	.02
** FGD SYSTEM	
GENERAL PROCESS TYPE	WET SCRUBBING
PROCESS TYPE	LYMESTONE
SYSTEM SUPPLIER	RESEARCH COTTRELL
NEW/RETROFIT	NEW
ENERGY CONSUMPTION - %	*****
INITIAL START-UP DATE	4/78
COMMERCIAL START-UP DATE	**/**
SO2 DESIGN REMOVAL EFFICIENCY - %	75.00
PARTICULATE DESIGN REMOVAL EFFICIENCY - %	99.70
ABSORBER SPARE CAPACITY INDEX - %	33.0
ABSORBER SPARE COMPONENTS INDEX	1.0
** WATER LOOP	
TYPE	OPEN
FRESH MAKE-UP WATER - LITER/S	7.6 (120 GPM)
** DISPOSAL	
TYPE	POND

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

SECTION 3

DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

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-----
COMPANY NAME                ARIZONA PUBLIC SERVICE
PLANT NAME                  FOUR CORNERS
UNIT NUMBER                 1
CITY                        FARMINGTON
STATE                       NEW MEXICO
GROSS UNIT GENERATING CAPACITY - MW      175.0
NET UNIT GENERATING CAPACITY W/FGD - MW   175.0
EQUIVALENT SCRUBBED CAPACITY - MW        175.0

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

** FGD SYSTEM
GENERAL PROCESS TYPE        WET SCRUBBING
PROCESS TYPE                LIME/ALKALINE FLYASH
SYSTEM SUPPLIER             CHEMICO
NEW/RETROFIT               RETROFIT
ENERGY CONSUMPTION - %      *****
INITIAL START-UP DATE       11/79
COMMERCIAL START-UP DATE    **/**
SO2 DESIGN REMOVAL EFFICIENCY - % *****
PARTICULATE DESIGN REMOVAL EFFICIENCY - % 99.00
ABSORBER SPARE COMPONENTS INDEX      1.0

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

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12/79  SYSTEM                                744

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** PROBLEMS/SOLUTIONS/COMMENTS

INITIAL OPERATIONS STARTED IN NOVEMBER 1979.

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1/80  SYSTEM                                744

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2/80  SYSTEM                                696

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3/80  SYSTEM                                744

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** PROBLEMS/SOLUTIONS/COMMENTS

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

SECTION 3

DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

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-----
COMPANY NAME                ARIZONA PUBLIC SERVICE
PLANT NAME                  FOUR CORNERS
UNIT NUMBER                 2
CITY                        FARMINGTON
STATE                       NEW MEXICO
GROSS UNIT GENERATING CAPACITY - MW      175.0
NET UNIT GENERATING CAPACITY W/FGD - MW   175.0
EQUIVALENT SCRUBBED CAPACITY - MW        175.0

** FUEL DATA
FUEL TYPE                   COAL
FUEL GRADE                  SUBBITUMINOUS
AVERAGE HEAT CONTENT - J/G    23004.      ( 8600 BTU/Lb)
AVERAGE ASH CONTENT - %      22.00
AVERAGE MOISTURE CONTENT - %  12.30
AVERAGE SULFUR CONTENT - %    .75
AVERAGE CHLORIDE CONTENT - %  .07

** FGD SYSTEM
GENERAL PROCESS TYPE        WET SCRUBBING
PROCESS TYPE                LIME/ALKALINE FLYASH
SYSTEM SUPPLIER             CHEMICO
NEW/RETROFIT                RETROFIT
ENERGY CONSUMPTION - %      *****
INITIAL START-UP DATE       11/79
COMMERCIAL START-UP DATE    **/**
SO2 DESIGN REMOVAL EFFICIENCY - % *****
PARTICULATE DESIGN REMOVAL EFFICIENCY - % 99.00
ABSORBER SPARE COMPONENTS INDEX      1.0

```

```

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

```

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11/79  SYSTEM                                720

```

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12/79  SYSTEM                                744

```

** PROBLEMS/SOLUTIONS/COMMENTS

INITIAL OPERATIONS STARTED IN NOVEMBER 1979.

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1/80  SYSTEM                                744

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2/80  SYSTEM                                696

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3/80  SYSTEM                                744

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** PROBLEMS/SOLUTIONS/COMMENTS

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

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
GROSS UNIT GENERATING CAPACITY - MW	229.0
NET UNIT GENERATING CAPACITY W/FGD - MW	229.0
EQUIVALENT SCRUBBED CAPACITY - MW	229.0
** FUEL DATA	
FUEL TYPE	COAL
FUEL GRADE	SUBBITUMINOUS
AVERAGE HEAT CONTENT - J/G	20004. (2600 BTU/LB)
AVERAGE ASH CONTENT - %	22.70
AVERAGE MOISTURE CONTENT - %	12.30
AVERAGE SULFUR CONTENT - %	.75
AVERAGE CHLORIDE CONTENT - %	.07
** FGD SYSTEM	
GENERAL PROCESS TYPE	WET SCRUBBING
PROCESS TYPE	LIME/ALKALINE FLYASH
SYSTEM SUPPLIER	CHEMICO
NEW/RETROFIT	RETROFIT
ENERGY CONSUMPTION - %	*****
INITIAL START-UP DATE	11/79
COMMERCIAL START-UP DATE	**/**
SO2 DESIGN REMOVAL EFFICIENCY - %	*****
PARTICULATE DESIGN REMOVAL EFFICIENCY - %	99.00
ABSORBER SPARE COMPONENTS INDEX	1.0

-----PERFORMANCE DATA-----

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	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.

SECTION 3

DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

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-----
COMPANY NAME          BIG RIVERS ELECTRIC
PLANT NAME            GREEN
UNIT NUMBER          1
CITY                  SEBREE
STATE                 KENTUCKY
GROSS UNIT GENERATING CAPACITY - MW      242.0
NET UNIT GENERATING CAPACITY W/FGD - MW   200.0
EQUIVALENT SCRUBBED CAPACITY - MW        242.0

** FUEL DATA
  FUEL TYPE           COAL
  FUEL GRADE          BITUMINOUS
  AVERAGE HEAT CONTENT - B/G             22678.      ( 9750 BTU/LB)
  AVERAGE ASH CONTENT - %                20.00
  AVERAGE MOISTURE CONTENT - %            11.00
  AVERAGE SULFUR CONTENT - %              3.75
  AVERAGE CHLORIDE CONTENT - %            *****

** FGD SYSTEM
  GENERAL PROCESS TYPE  WET SCRUBBING
  PROCESS TYPE          LIME
  SYSTEM SUPPLIER       AMERICAN AIR FILTER
  NEW/RETROFIT          NEW
  ENERGY CONSUMPTION - % *****
  INITIAL START-UP DATE 12/79
  COMMERCIAL START-UP DATE 12/79
  SO2 DESIGN REMOVAL EFFICIENCY - %       90.00
  PARTICULATE DESIGN REMOVAL EFFICIENCY - % 99.00
  ABSORBER SPARE COMPONENTS INDEX         1.0

** WATER LOOP
  TYPE                  CLOSED
  FRESH MAKE-UP WATER - LITER/S           *****      (***** GPM)

** TREATMENT
  TYPE                  POZ-O-TEC

```

```

-----PERFORMANCE DATA-----
PERIOD  MODULE  AVAILABILITY  OPERABILITY  RELIABILITY  UTILIZATION  % REMOVAL  PER BOILER  FGD  CAP.
          502  PART.  HOURS  HOURS  HOURS  HOURS  HOURS  HOURS  FACTOR
-----
1/80  SYSTEM                                744
2/80  SYSTEM                                696
3/80  SYSTEM                                744

```

** PROBLEMS/SOLUTIONS/COMMENTS

NO INFORMATION WAS AVAILABLE FOR THE FIRST QUARTER, 1980.

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
GROSS UNIT GENERATING CAPACITY - MW	416.0
NET UNIT GENERATING CAPACITY W/FGD - MW	378.0
EQUIVALENT SCRUBBED CAPACITY - MW	378.0

** FUEL DATA

FUEL TYPE	COAL
FUEL GRADE	BITUMINOUS
AVERAGE HEAT CONTENT - J/G	24423. (10500 BTU/LB)
AVERAGE ASH CONTENT - %	9.12
AVERAGE MOISTURE CONTENT - %	18.00
AVERAGE SULFUR CONTENT - %	3.30
AVERAGE CHLORIDE CONTENT - %	.03

** FGD SYSTEM

GENERAL PROCESS TYPE	WET SCRUBBING
PROCESS TYPE	LIMESTONE
SYSTEM SUPPLIER	RILEY STOKER/ENVIRONMENTAL
NEW/RETROFIT	NEW
ENERGY CONSUMPTION - %	2.9
INITIAL START-UP DATE	7/76
COMMERCIAL START-UP DATE	8/78
SO2 DESIGN REMOVAL EFFICIENCY - %	85.00
PARTICULATE DESIGN REMOVAL EFFICIENCY - %	*****
ABSORBER SPARE COMPONENTS INDEX	1.0

** WATER LOOP

TYPE	CLOSED
FRESH MAKE-UP WATER - LITER/S	27.8 (600 GPM)

** DISPOSAL

TYPE	LINED POND
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-----PERFORMANCE DATA-----

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PER BOILER PART. HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
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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	31.9	35.4	29.3					
	SYSTEM	32.4	35.2	38.3	32.4		744	684	241	

** PROBLEMS/SOLUTIONS/COMMENTS

OUTAGE TIME WAS REQUIRED DURING JANUARY 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	70.2	41.2	47.8	41.2					
	SYSTEM	49.7	49.1	51.9	49.1		696	696	342	

CENTRAL ILLINOIS LIGHT: DUCK CREEK 1 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

DURING FEBRUARY SOME OUTAGE TIME WAS DUE TO MODULE CLEANING AND THE CLEANING OF THE 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 RECYCLE DISCHARGE VALVE WAS REPLACED CAUSING SOME DOWN TIME.

3/80 SYSTEM

744

** PROBLEMS/SOLUTIONS/COMMENTS

NO INFORMATION WAS AVAILABLE FOR THE MONTH OF MARCH.

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
GROSS UNIT GENERATING CAPACITY - MW	617.0
NET UNIT GENERATING CAPACITY W/FGD - MW	575.0
EQUIVALENT SCRUBBED CAPACITY - MW	617.0

** FUEL DATA

FUEL TYPE	COAL
FUEL GRADE	BITUMINOUS
AVERAGE HEAT CONTENT - J/G	25353. (10900 BTU/LB)
AVERAGE ASH CONTENT - %	4.00
AVERAGE MOISTURE CONTENT - %	*****
AVERAGE SULFUR CONTENT - %	2.25
AVERAGE CHLORIDE CONTENT - %	.20

** FGD SYSTEM

GENERAL PROCESS TYPE	WET SCRUBBING
PROCESS TYPE	DUAL ALKALI
SYSTEM SUPPLIER	BUELL/ENVIROTECH
NEW/RETROFIT	NEW
ENERGY CONSUMPTION - %	*****
INITIAL START-UP DATE	9/79
COMMERCIAL START-UP DATE	12/79
SO2 DESIGN REMOVAL EFFICIENCY - %	95.00
PARTICULATE DESIGN REMOVAL EFFICIENCY - %	99.50
ABSORBER SPARE COMPONENTS INDEX	1.0

** WATER LOOP

TYPE	CLOSED
FRESH MAKE-UP WATER - LITER/S	***** (***** GPM)

** TREATMENT

TYPE	POZ-O-TEC
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-----PERFORMANCE DATA-----

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

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.

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						

CENTRAL ILLINOIS PUBLIC SERV: NEWTON 1 (CONT.)

-----PERFORMANCE DATA-----									
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO ₂	PART. HOURS	PER BOILER HOURS	FGD CAP. HOURS FACTOR
D	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.
 FOR THE QUARTER, THE TOTAL SYSTEM WAS AVAILABLE 47.2% AND WAS UTILIZED 39.4% OF THE TIME.

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	
GROSS UNIT GENERATING CAPACITY - MW	447.0	
NET UNIT GENERATING CAPACITY W/FGD - MW	447.0	
EQUIVALENT SCRUBBED CAPACITY - MW	447.0	
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	SUBBITUMINOUS	
AVERAGE HEAT CONTENT - Btu/lb	23260.	(10000 Btu/lb)
AVERAGE ASH CONTENT - %	8.00	
AVERAGE MOISTURE CONTENT - %	16.00	
AVERAGE SULFUR CONTENT - %	.45	
AVERAGE CHLORIDE CONTENT - %	.00	
** FGD SYSTEM		
GENERAL PROCESS TYPE	WET SCRUBBING	
PROCESS TYPE	LIMESTONE	
SYSTEM SUPPLIER	PEABODY PROCESS SYSTEMS	
NEW/RETROFIT	NEW	
ENERGY CONSUMPTION - %	5.4	
INITIAL START-UP DATE	8/79	
COMMERCIAL START-UP DATE	6/80	
SO ₂ DESIGN REMOVAL EFFICIENCY - %	85.00	
PARTICULATE DESIGN REMOVAL EFFICIENCY - %	99.80	
ABSORBER SPARE COMPONENTS INDEX	1.0	
** WATER LOOP		
TYPE	CLOSED	
FRESH MAKE-UP WATER - LITER/S	19.9	(316 GPM)
** DISPOSAL		
TYPE	MINEFILL	

-----PERFORMANCE DATA-----									
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL	PER BOILER	FGD	CAP.
						SO ₂ PART.	HOURS	HOURS	FACTOR
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 LOOKED AT TO SOLVE THE PROBLEM.

SECTION 2
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
GROSS UNIT GENERATING CAPACITY - MW	411.0
NET UNIT GENERATING CAPACITY W/FGD - MW	375.0
EQUIVALENT SCRUBBED CAPACITY - MW	411.0

** FUEL DATA

FUEL TYPE	COAL
FUEL GRADE	BITUMINOUS
AVERAGE HEAT CONTENT - J/G	25237. (10850 BTU/LB)
AVERAGE ASH CONTENT - %	15.10
AVERAGE MOISTURE CONTENT - %	7.50
AVERAGE SULFUR CONTENT - %	4.67
AVERAGE CHLORIDE CONTENT - %	.01

** FGD SYSTEM

GENERAL PROCESS TYPE	WET SCRUBBING
PROCESS TYPE	LIME
SYSTEM SUPPLIER	AIR CORRECTION DIVISION, UOP
NEW/RETROFIT	NEW
ENERGY CONSUMPTION - %	3.9
INITIAL START-UP DATE	1/77
COMMERCIAL START-UP DATE	2/77
SO2 DESIGN REMOVAL EFFICIENCY - %	89.50
PARTICULATE DESIGN REMOVAL EFFICIENCY - %	.00
ABSORBER SPARE CAPACITY INDEX - %	.0
ABSORBER SPARE COMPONENTS INDEX	.0

** WATER LOOP

TYPE	OPEN
FRESH MAKE-UP WATER - LITER/S	31.5 (500 GPM)

** TREATMENT

TYPE	PO2-O-TEC
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** DISPOSAL

TYPE	POND
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-----PERFORMANCE DATA-----

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

1/80	A	25.0	38.0	45.0	13.0					
	B	29.0	50.0	59.0	17.0					
	SYSTEM	27.0	44.0	52.0	15.0		744	255	112	

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JANUARY A BOILER OUTAGE OCCURRED FROM THE FIRST OF THE MONTH TO THE TWENTIETH, 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	348	230	

** PROBLEMS/SOLUTIONS/COMMENTS

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

3/80	A	88.0	82.0	82.0	82.0					
	B	88.0	81.0	81.0	81.0					
	SYSTEM	88.0	82.0	82.0	82.0		744	744	610	

-----PERFORMANCE DATA-----										
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PER PART.	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.

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
 GROSS UNIT GENERATING CAPACITY - MW 411.0
 NET UNIT GENERATING CAPACITY W/FGD - MW 375.0
 EQUIVALENT SCRUBBED CAPACITY - MW 411.0

** FUEL DATA
 FUEL TYPE COAL
 FUEL GRADE BITUMINOUS
 AVERAGE HEAT CONTENT - J/G 25237. (10850 BTU/LB)
 AVERAGE ASH CONTENT - % 15.10
 AVERAGE MOISTURE CONTENT - % 7.50
 AVERAGE SULFUR CONTENT - % 4.67
 AVERAGE CHLORIDE CONTENT - % .01

** FGD SYSTEM
 GENERAL PROCESS TYPE WET SCRUBBING
 PROCESS TYPE LIME
 SYSTEM SUPPLIER AIR CORRECTION DIVISION, UOP
 NEW/RETROFIT NEW
 ENERGY CONSUMPTION - % 3.9
 INITIAL START-UP DATE 6/78
 COMMERCIAL START-UP DATE **/**
 SO₂ DESIGN REMOVAL EFFICIENCY - % 89.50
 PARTICULATE DESIGN REMOVAL EFFICIENCY - % .00
 ABSORBER SPARE CAPACITY INDEX - % .0
 ABSORBER SPARE COMPONENTS INDEX .0

** WATER LOOP
 TYPE OPEN
 FRESH MAKE-UP WATER - LITER/S 31.5 (500 GPM)

** TREATMENT
 TYPE POZ-O-TEC

** DISPOSAL
 TYPE POND

-----PERFORMANCE DATA-----									
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO ₂ PART.	PER BOILER HOURS	FGD HOURS	CAP. FACTOR
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	743	565

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD 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	642	501

** 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				
	B	94.0	76.0	76.0	16.0				
	SYSTEM	94.0	73.0	73.0	16.0		744	163	119

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

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER WENT DOWN ON MARCH 9TH FOR A BOILER/TURBINE INSPECTION AND
REMAINED DOWN THROUGH THE END OF THE MONTH.

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
GROSS UNIT GENERATING CAPACITY - MW	545.0
NET UNIT GENERATING CAPACITY W/FGD - MW	465.0
EQUIVALENT SCRUBBED CAPACITY - MW	327.0
** FUEL DATA	
FUEL TYPE	COAL
FUEL GRADE	LIGNITE
AVERAGE HEAT CONTENT - Btu/lb	14550 (6258 BTU/LB)
AVERAGE ASH CONTENT - %	7.14
AVERAGE MOISTURE CONTENT - %	39.83
AVERAGE SULFUR CONTENT - %	.63
AVERAGE CHLORIDE CONTENT - %	.02
** FGD SYSTEM	
GENERAL PROCESS TYPE	WET SCRUBBING
PROCESS TYPE	LIME/ALKALINE FLYASH
SYSTEM SUPPLIER	COMBUSTION ENGINEERING
NEW/RETROFIT	NEW
ENERGY CONSUMPTION - %	*****
INITIAL START-UP DATE	8/79
COMMERCIAL START-UP DATE	**/**
SO2 DESIGN REMOVAL EFFICIENCY - %	99.00
PARTICULATE DESIGN REMOVAL EFFICIENCY - %	99.50
ABSORBER SPARE COMPONENTS INDEX	.0
** WATER LOOP	
TYPE	OPEN
FRESH MAKE-UP WATER - LITER/S	***** (***** GPM)
** TREATMENT	
TYPE	FLYASH STABILIZATION
** DISPOSAL	
TYPE	LINED POND

-----PERFORMANCE DATA-----										
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER BOILER HOURS	FGD HOURS	CAP. HOURS	Factor
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 PLUGGAGE WERE FOUND DURING THE INSPECTION.										
SOME OUTAGE TIME DURING THE MONTH WAS CAUSED BY BOILER RELATED PROBLEMS. A BOILER TRIP WAS CAUSED BY THE TURBINE.										
AN HOUR OUTAGE TIME WAS NECESSARY DUE TO A LOSS OF POWER TO THE CONTROL SYSTEM. ABNORMAL DRUM LEVEL WAS ALSO ENCOUNTERED.										
A THREE TO FOUR HOUR OUTAGE WAS SCHEDULED TO MAKE REPAIRS ON THE EQUIPMENT.										
2/80	SYSTEM	100.0			99.9		696	695	695	
** PROBLEMS/SOLUTIONS/COMMENTS										
WHILE THE BOILER WAS OFF-LINE DUE TO ID FAN TROUBLE CAUSED BY ELECTRICAL GROUNDING, TWO MODULES WERE TAKEN OFF LINE SO CALIBRATIONS COULD BE DONE.										
3/80	SYSTEM	100.0			96.1		744	715	715	

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

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER TRIPPED THREE TIMES DURING THE MONTH. ONE TRIP WAS DUE TO THE CUT DOWN OF TRANSMISSION POWER.

THE UNIT WAS DOWN WITH THE BOILER FOR FOUR HOURS TO CLEAN THE FILTER ON THE STATOR COOLING PUMPS.

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

SECTION 2
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME DUQUESNE LIGHT
PLANT NAME ELRAMA
UNIT NUMBER 1-4
CITY ELRAMA
STATE PENNSYLVANIA
GROSS UNIT GENERATING CAPACITY - MW 510.0
NET UNIT GENERATING CAPACITY W/FGD - MW 475.0
EQUIVALENT SCRUBBED CAPACITY - MW 510.0

** FUEL DATA

FUEL TYPE COAL
FUEL GRADE *****
AVERAGE HEAT CONTENT - J/G 26400. (11350 BTU/LB)
AVERAGE ASH CONTENT - % 21.00
AVERAGE MOISTURE CONTENT - % *****
AVERAGE SULFUR CONTENT - % 2.20
AVERAGE CHLORIDE CONTENT - % *****

** FGD SYSTEM

GENERAL PROCESS TYPE WET SCRUBBING
PROCESS TYPE LIME
SYSTEM SUPPLIER CHEMICO
NEW/RETROFIT RETROFIT
ENERGY CONSUMPTION - % 3.5
INITIAL START-UP DATE 10/75
COMMERCIAL START-UP DATE 10/75
SO₂ DESIGN REMOVAL EFFICIENCY - % 83.00
PARTICULATE DESIGN REMOVAL EFFICIENCY - % 99.00
ABSORBER SPARE CAPACITY INDEX - % 35.0
ABSORBER SPARE COMPONENTS INDEX 1.3

** WATER LOOP

TYPE OPEN
FRESH MAKE-UP WATER - LITER/S ***** (***** GPM)

** TREATMENT

TYPE POZ-O-TEC

** DISPOSAL

TYPE LANDFILL

-----PERFORMANCE DATA-----									
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO ₂ PART.	PER BOILER HOURS	FGD HOURS	CAP. FACTOR
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	587

** PROBLEMS/SOLUTIONS/COMMENTS

THERE HAVE BEEN NO SCRUBBER-RELATED OUTAGES OVER THE SEPTEMBER THRU DECEMBER PERIOD.

THE SLUDGE IS NOW BEING TRUCKED TO A REMOTE SITE 10 MILES AWAY CAUSING OPERATING COSTS TO INCREASE.

THE NEW SO₂ MONITOR HAS PLUGGED ONLY ONCE SINCE OCTOBER AND WAS REQUIRED ONLY 4 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

-----PERFORMANCE DATA-----										
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART. HOURS	PER BOILER HOURS	FGD HOURS	CAP. FACTOR
	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 SO2 MONITOR IS STILL OPERATING WELL AND HAS LOGGED SIX MONTHS OF OPERATION. THE TWO RUBBER LINED WORMEN RECYCLE PUMPS HAVE NOW LOGGED 14,000 HOURS AS OF FEBRUARY 1980 AND ARE STILL OPERATING WITHOUT ANY MAJOR PROBLEMS. THE HIGH AVAILABILITIES ARE DUE TO THE 5TH MODULE BEING A TRUE SPARE.

THE SO2 MONITOR IS STILL OPERATING WELL AND HAS LOGGED SIX MONTHS OF

3/80 SYSTEM

744

** PROBLEMS/SOLUTIONS/COMMENTS

NO INFORMATION WAS AVAILABLE FOR THE MONTH OF MARCH.

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
GROSS UNIT GENERATING CAPACITY - MW	418.0
NET UNIT GENERATING CAPACITY W/FGD - MW	373.0
EQUIVALENT SCRUBBED CAPACITY - MW	410.0
** FUEL DATA	
FUEL TYPE	COAL
FUEL GRADE	BITUMINOUS
AVERAGE HEAT CONTENT - Btu/lb	26830. (11535 BTU/Lb)
AVERAGE ASH CONTENT - %	16.27
AVERAGE MOISTURE CONTENT - %	5.02
AVERAGE SULFUR CONTENT - %	1.92
AVERAGE CHLORIDE CONTENT - %	*****
** FGD SYSTEM	
GENERAL PROCESS TYPE	WET SCRUBBING
PROCESS TYPE	LIME
SYSTEM SUPPLIER	CHEMICO
NEW/RETROFIT	RETROFIT
ENERGY CONSUMPTION - %	3.4
INITIAL START-UP DATE	7/73
COMMERCIAL START-UP DATE	**/**
SO2 DESIGN REMOVAL EFFICIENCY - %	83.00
PARTICULATE DESIGN REMOVAL EFFICIENCY - %	99.00
ABSORBER SPARE CAPACITY INDEX - %	18.0
ABSORBER SPARE COMPONENTS INDEX	.6
** WATER LOOP	
TYPE	OPEN
FRESH MAKE-UP WATER - LITER/S	***** (***** GPM)
** TREATMENT	
TYPE	POZ-O-TEC
** DISPOSAL	
TYPE	LANDFILL

-----PERFORMANCE DATA-----									
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PER BOILER HOURS	FGD CAP. HOURS	FACOR
12/79	101	.0	.0	.0	.0				
	201	99.9	100.0	100.0	100.0				
	301	90.7	100.0	90.6	90.0				
	401	77.7	100.0	81.2	77.0				
	SYSTEM	67.1	75.0	68.0	67.0		744	567	494

** 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				
	201	98.1	100.0	98.0	93.3				
	301	100.0	100.0	100.0	99.0				
	401	97.6	100.0	97.5	96.0				
	SYSTEM	73.9	89.0	73.9	72.0		744	604	536

-----PERFORMANCE DATA-----										
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO ₂	PER PART. HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
2/80	101	13.7	17.3	13.7	13.7					
	201	91.6	100.0	91.7	91.7					
	301	86.2	100.0	86.0	84.6					
	401	94.2	100.0	94.0	90.5					
	SYSTEM	71.4	79.3	71.4	70.1		696	551	488	

** PROBLEMS/SOLUTIONS/COMMENTS

SODIUM THIOSULFATE ADDITION CONTINUED THROUGH THE FIRST QUARTER AND THE MIST ELIMINATOR SCALING HAS BEEN SIGNIFICANTLY REDUCED. 2000-5000 HOURS OF OPERATION HAVE BEEN LOGGED WITHOUT MIST ELIMINATOR SCALE UP. THE UTILITY REPORTS THAT SO₂ REMOVAL EFFICIENCY HAS IMPROVED 3% DUE TO THIS AS WELL. THE UTILITY IS LOOKING INTO THE ADDITION OF SODIUM THIOSULFATE AT ELRAMA.

THE FAN RUBBER LINERS HAVE BEEN A CONTINUAL PROBLEM. TWO 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 SYSTEM

744

** PROBLEMS/SOLUTIONS/COMMENTS

NO INFORMATION WAS AVAILABLE FOR THE MONTH OF MARCH.

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
GROSS UNIT GENERATING CAPACITY - MW      532.0
NET UNIT GENERATING CAPACITY W/FGD - MW   515.0
EQUIVALENT SCRUBBED CAPACITY - MW        532.0

** FUEL DATA
FUEL TYPE                   COAL
FUEL GRADE                  BITUMINOUS
AVERAGE HEAT CONTENT - B/G      25004.      ( 10750 BTU/LB)
AVERAGE ASH CONTENT - %        *****
AVERAGE MOISTURE CONTENT - %    *****
AVERAGE SULFUR CONTENT - %      3.25
AVERAGE CHLORIDE CONTENT - %    *****

** FGD SYSTEM
GENERAL PROCESS TYPE        WET SCRUBBING
PROCESS TYPE                LIMESTONE
SYSTEM SUPPLIER             AIR CORRECTION DIVISION, UOP
NEW/RETROFIT                NEW
ENERGY CONSUMPTION - %       2.4
INITIAL START-UP DATE       12/77
COMMERCIAL START-UP DATE    12/77
SO2 DESIGN REMOVAL EFFICIENCY - %      85.30
PARTICULATE DESIGN REMOVAL EFFICIENCY - %  99.30
ABSORBER SPARE COMPONENTS INDEX        .6

** WATER LOOP
TYPE                         CLOSED
FRESH MAKE-UP WATER - LITER/S      55.6      ( 882 GPM)

** TREATMENT
TYPE                         POZ-O-TEC

** DISPOSAL
TYPE                         LANDFILL

```

```

-----PERFORMANCE DATA-----
PERIOD  MODULE  AVAILABILITY  OPERABILITY  RELIABILITY  UTILIZATION  % REMOVAL  PER  BOILER  FGD  CAP.
              SO2  PART.  HOURS  HOURS  HOURS  HOURS  HOURS  HOURS  FACTOR
-----
1/80  SYSTEM                                744
2/80  SYSTEM                                696
3/80  SYSTEM                                744

```

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE FIRST QUARTER 1980, THE ENTIRE SCRUBBER PACKING BED WAS LOST DUE TO EXCESSIVE WEAR OF THE NEOPRENE FOAM PACKING BALLS. THESE ARE TO BE REPLACED IN APRIL, AT WHICH TIME THE UNIT WILL BE TAKEN OFF LINE TO ACCOMMODATE THE REPAIR.

BYPASS DAMPER FAILURES ALSO OCCURRED AND ARE REPORTED TO BE A CONTINUAL PROBLEM. MODIFICATIONS WERE MADE TO THE GULLOTINE TYPE DAMPERS DURING THE PERIOD.

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
GROSS UNIT GENERATING CAPACITY - MW      90.0
NET UNIT GENERATING CAPACITY W/FGD - MW   85.0
EQUIVALENT SCRUBBED CAPACITY - MW        90.0

** FUEL DATA
FUEL TYPE                  COAL
FUEL GRADE                 BITUMINOUS
AVERAGE HEAT CONTENT - Btu/lb      22795.    ( 9800 Btu/lb)
AVERAGE ASH CONTENT - %           11.00
AVERAGE MOISTURE CONTENT - %      *****
AVERAGE SULFUR CONTENT - %        .60
AVERAGE CHLORIDE CONTENT - %      *****

** FGD SYSTEM
GENERAL PROCESS TYPE       WET SCRUBBING
PROCESS TYPE               LIME
SYSTEM SUPPLIER            COMBUSTION ENGINEERING
NEW/RETROFIT               RETROFIT
ENERGY CONSUMPTION - %      2.2
INITIAL START-UP DATE      11/72
COMMERCIAL START-UP DATE   **/**
SO2 DESIGN REMOVAL EFFICIENCY - %    70.00
PARTICULATE DESIGN REMOVAL EFFICIENCY - %  99.00
ABSORBER SPARE COMPONENTS INDEX      .6

** WATER LOOP
TYPE                       CLOSED
FRESH MAKE-UP WATER - LITER/S      *****    (***** GPM)

** TREATMENT
TYPE                       FLYASH STABILIZATION

** DISPOSAL
TYPE                       POND
  
```

```

-----PERFORMANCE DATA-----
PERIOD  MODULE  AVAILABILITY  OPERABILITY  RELIABILITY  UTILIZATION  % REMOVAL  PER BOILER  FGD  CAP.
          SO2  PART.  HOURS  HOURS  HOURS  HOURS  HOURS  HOURS  FACTOR
-----
10/79  SYSTEM    100.0    100.0          91.0          744    677    677
11/79  SYSTEM    100.0    100.0          38.0          720    274    274
12/79  SYSTEM    100.0    100.0          92.0          744    684    684
  
```

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS AVAILABLE VIRTUALLY 100% OF THE TIME THE BOILER OPERATED. THE LOW NOVEMBER FIGURES ARE DUE TO A 406 HOUR BOILER OUTAGE CAUSED BY SUPERHEAT TUBE LEAKS AND A 42 HOUR OUTAGE CAUSED BY ECONOMIZER LEAKS.

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1/80  SYSTEM    100.0    100.0          93.0          744    692    692
2/80  SYSTEM    100.0    100.0          100.0          696    696    696
3/80  SYSTEM    100.0    100.0          100.0          744    744    744
  
```

KANSAS CITY POWER & LIGHT: HAWTHORN 3 (CONT.)

-----PERFORMANCE DATA-----										
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO ₂	PER PART. HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS AVAILABLE 100% OF THE TIME THE BOILER OPERATED. NO PROBLEMS WERE ENCOUNTERED.

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
GROSS UNIT GENERATING CAPACITY - MW	90.0
NET UNIT GENERATING CAPACITY W/FGD - MW	85.0
EQUIVALENT SCRUBBED CAPACITY - MW	90.0

** FUEL DATA	
FUEL TYPE	COAL
FUEL GRADE	BITUMINOUS
AVERAGE HEAT CONTENT - J/G	22795. (9800 BTU/LB)
AVERAGE ASH CONTENT - %	11.00
AVERAGE MOISTURE CONTENT - %	*****
AVERAGE SULFUR CONTENT - %	.60
AVERAGE CHLORIDE CONTENT - %	*****

** FGD SYSTEM	
GENERAL PROCESS TYPE	WET SCRUBBING
PROCESS TYPE	LIME
SYSTEM SUPPLIER	COMBUSTION ENGINEERING
NEW/RETROFIT	RETROFIT
ENERGY CONSUMPTION - %	2.2
INITIAL START-UP DATE	8/72
COMMERCIAL START-UP DATE	**/**
SO2 DESIGN REMOVAL EFFICIENCY - %	70.00
PARTICULATE DESIGN REMOVAL EFFICIENCY - %	99.00
ABSORBER SPARE COMPONENTS INDEX	.6

** WATER LOOP	
TYPE	CLOSED
FRESH MAKE-UP WATER - LITER/S	***** (***** GPM)

** TREATMENT	
TYPE	FLYASH STABILIZATION

** DISPOSAL	
TYPE	POND

-----PERFORMANCE DATA-----

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

10/79	SYSTEM	100.0	100.0		89.0		744	662	662	
11/79	SYSTEM	100.0	100.0		40.0		720	288	288	
12/79	SYSTEM	100.0			.0		744	0	0	

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WENT DOWN ON NOVEMBER 26TH FOR A TURBINE GENERATOR OVERHAUL.

1/80	SYSTEM	100.0			.0		744	0	0	
2/80	SYSTEM	100.0			.0		696	0	0	
3/80	SYSTEM	100.0			.0		744	0	0	

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT REMAINED OFF LINE THROUGH THE FIRST QUARTER 1980 BECAUSE OF THE TURBINE GENERATOR OVERHAUL.

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
GROSS UNIT GENERATING CAPACITY - MW	874.0
NET UNIT GENERATING CAPACITY W/FGD - MW	820.0
EQUIVALENT SCRUBBED CAPACITY - MW	874.0
** FUEL DATA	
FUEL TYPE	COAL
FUEL GRADE	SUBBITUMINOUS
AVERAGE HEAT CONTENT - J/G	21913. (9421 BTU/LB)
AVERAGE ASH CONTENT - %	24.36
AVERAGE MOISTURE CONTENT - %	8.60
AVERAGE SULFUR CONTENT - %	5.39
AVERAGE CHLORIDE CONTENT - %	.03
** FGD SYSTEM	
GENERAL PROCESS TYPE	WET SCRUBBING
PROCESS TYPE	LIMESTONE
SYSTEM SUPPLIER	BABCOCK & WILCOX
NEW/RETROFIT	NEW
ENERGY CONSUMPTION - %	2.7
INITIAL START-UP DATE	2/73
COMMERCIAL START-UP DATE	6/73
SO2 DESIGN REMOVAL EFFICIENCY - %	80.00
PARTICULATE DESIGN REMOVAL EFFICIENCY - %	99.50
ABSORBER SPARE COMPONENTS INDEX	.6
** WATER LOOP	
TYPE	CLOSED
FRESH MAKE-UP WATER - LITER/S	72.3 (1148 GPM)
** DISPOSAL	
TYPE	UNLINED POND

-----PERFORMANCE DATA-----									
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL	PER BOILER	FGD	CAP.
						SO2 PART.	HOURS	HOURS	HOURS FACTOR
1/80	SYSTEM							744	
2/80	SYSTEM							696	
3/80	SYSTEM							744	

** PROBLEMS/SOLUTIONS/COMMENTS

NO INFORMATION WAS AVAILABLE FOR THE FIRST QUARTER 1980.

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
GROSS UNIT GENERATING CAPACITY - MW	720.0
NET UNIT GENERATING CAPACITY W/FGD - MW	680.0
EQUIVALENT SCRUBBED CAPACITY - MW	540.0

** FUEL DATA

FUEL TYPE	COAL
FUEL GRADE	*****
AVERAGE HEAT CONTENT - Btu/lb	18899. (9125 Btu/lb)
AVERAGE ASH CONTENT - %	5.80
AVERAGE MOISTURE CONTENT - %	28.00
AVERAGE SULFUR CONTENT - %	.32
AVERAGE CHLORIDE CONTENT - %	.01

** FGD SYSTEM

GENERAL PROCESS TYPE	WET SCRUBBING
PROCESS TYPE	LIMESTONE
SYSTEM SUPPLIER	COMBUSTION ENGINEERING
NEW/RETROFIT	NEW
ENERGY CONSUMPTION - %	*****
INITIAL START-UP DATE	8/78
COMMERCIAL START-UP DATE	**/**
SO ₂ DESIGN REMOVAL EFFICIENCY - %	80.00
PARTICULATE DESIGN REMOVAL EFFICIENCY - %	99.00
ABSORBER SPARE CAPACITY INDEX - %	20.0
ABSORBER SPARE COMPONENTS INDEX	1.0

** WATER LOOP

TYPE	CLOSED
FRESH MAKE-UP WATER - LITER/S	35.1 (557 GPM)

** DISPOSAL

TYPE	POND
------	------

-----PERFORMANCE DATA-----

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO ₂ PART.	PER BOILER HOURS	FGD HOURS	CAP. HOURS	Factor
--------	--------	--------------	-------------	-------------	-------------	------------------------------------	---------------------	--------------	---------------	--------

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

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR PROBLEMS WERE ENCOUNTERED DURING THE FIRST QUARTER 1980. SOME
INTAKE MIXER MODIFICATIONS WERE PERFORMED.

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
GROSS UNIT GENERATING CAPACITY - MW      125.0
NET UNIT GENERATING CAPACITY W/FGD - MW   115.0
EQUIVALENT SCRUBBED CAPACITY - MW        125.0

** FUEL DATA
FUEL TYPE                   COAL
FUEL GRADE                  *****
AVERAGE HEAT CONTENT - Btu/lb      23260.      ( 10000 Btu/lb)
AVERAGE ASH CONTENT - %           9.80
AVERAGE MOISTURE CONTENT - %       12.00
AVERAGE SULFUR CONTENT - %         .55
AVERAGE CHLORIDE CONTENT - %       .03

** FGD SYSTEM
GENERAL PROCESS TYPE        WET SCRUBBING
PROCESS TYPE                LIMESTONE
SYSTEM SUPPLIER              COMBUSTION ENGINEERING
NEW/RETROFIT                RETROFIT
ENERGY CONSUMPTION - %       *****
INITIAL START-UP DATE       1/76
COMMERCIAL START-UP DATE    **/**
SO2 DESIGN REMOVAL EFFICIENCY - %      73.00
PARTICULATE DESIGN REMOVAL EFFICIENCY - %  98.90
ABSORBER SPARE CAPACITY INDEX - %       .0
ABSORBER SPARE COMPONENTS INDEX        .0

** WATER LOOP
TYPE                        CLOSED
FRESH MAKE-UP WATER - LITER/S          *****      (***** GPM)

** TREATMENT
TYPE                          FORCED OXIDATION

** DISPOSAL
TYPE                          POND
  
```

```

-----PERFORMANCE DATA-----
PERIOD  MODULE  AVAILABILITY  OPERABILITY  RELIABILITY  UTILIZATION  % REMOVAL  PER  BOILER  FGD  CAP.
              100.0          100.0          100.0          100.0          SO2  PART.  HOURS  HOURS  HOURS  FACTOR
-----
1/80  SYSTEM          100.0          100.0          100.0          100.0          744    744    744
2/80  SYSTEM          100.0          100.0          100.0          100.0          696    696    696
3/80  SYSTEM          100.0          100.0          100.0          100.0          744    744    744
  
```

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR PROBLEMS WERE REPORTED TO HAVE BEEN EXPERIENCED WITH THE
LAWRENCE 4 SCRUBBER DURING THE FIRST QUARTER 1980.

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
GROSS UNIT GENERATING CAPACITY - MW	420.0
NET UNIT GENERATING CAPACITY W/FGD - MW	400.0
EQUIVALENT SCRUBBED CAPACITY - MW	420.0

** FUEL DATA

FUEL TYPE	COAL
FUEL GRADE	*****
AVERAGE HEAT CONTENT - J/G	23260. (10000 BTU/LB)
AVERAGE ASH CONTENT - %	9.80
AVERAGE MOISTURE CONTENT - %	12.00
AVERAGE SULFUR CONTENT - %	.55
AVERAGE CHLORIDE CONTENT - %	.03

** FGD SYSTEM

GENERAL PROCESS TYPE	WET SCRUBBING
PROCESS TYPE	LIMESTONE
SYSTEM SUPPLIER	COMBUSTION ENGINEERING
NEW/RETROFIT	RETROFIT
ENERGY CONSUMPTION - %	*****
INITIAL START-UP DATE	11/71
COMMERCIAL START-UP DATE	**/**
SO2 DESIGN REMOVAL EFFICIENCY - %	52.00
PARTICULATE DESIGN REMOVAL EFFICIENCY - %	98.90
ABSORBER SPARE CAPACITY INDEX - %	.0
ABSORBER SPARE COMPONENTS INDEX	.0

** WATER LOOP

TYPE	CLOSED
FRESH MAKE-UP WATER - LITER/S	***** (***** GPM)

** TREATMENT

TYPE	FORCED OXIDATION
------	------------------

** DISPOSAL

TYPE	POND
------	------

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

** PROBLEMS/SOLUTIONS/COMMENTS

THE LAWRENCE 5 SCRUBBER OPERATED WITHOUT ANY MAJOR PROBLEMS DURING THE FIRST QUARTER 1980. THE BOILER WAS DOWN FROM THE MIDDLE OF FEBRUARY TO THE MIDDLE OF MARCH FOR TURBINE REPAIRS, DURING WHICH TIME SCRUBBER MAINTENANCE WAS PERFORMED.

SECTION 3

DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

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-----
COMPANY NAME                KENTUCKY UTILITIES
PLANT NAME                 GREEN RIVER
UNIT NUMBER               1-3
CITY                     CENTRAL CITY
STATE                   KENTUCKY
GROSS UNIT GENERATING CAPACITY - MW      64.0
NET UNIT GENERATING CAPACITY W/FGD - MW   60.0
EQUIVALENT SCRUBBED CAPACITY - MW        64.0

** FUEL DATA
FUEL TYPE                 COAL
FUEL GRADE               BITUMINOUS
AVERAGE HEAT CONTENT - J/G      25596.      ( 11000 BTU/LB)
AVERAGE ASH CONTENT - %        13.40
AVERAGE MOISTURE CONTENT - %    12.10
AVERAGE SULFUR CONTENT - %      4.00
AVERAGE CHLORIDE CONTENT - %    *****

** FGD SYSTEM
GENERAL PROCESS TYPE       WET SCRUBBING
PROCESS TYPE              LIME
SYSTEM SUPPLIER            AMERICAN AIR FILTER
NEW/RETROFIT              RETROFIT
ENERGY CONSUMPTION - %      3.1
INITIAL START-UP DATE      9/75
COMMERCIAL START-UP DATE    6/76
SO2 DESIGN REMOVAL EFFICIENCY - %      80.00
PARTICULATE DESIGN REMOVAL EFFICIENCY - %  99.50
ABSORBER SPARE CAPACITY INDEX - %      .0
ABSORBER SPARE COMPONENTS INDEX        .0

** WATER LOOP
TYPE                     CLOSED
FRESH MAKE-UP WATER - LITER/S      4.7      ( 75 GPM)

** DISPOSAL
TYPE                     LINED POND
  
```

```

-----PERFORMANCE DATA-----
PERIOD  MODULE  AVAILABILITY  OPERABILITY  RELIABILITY  UTILIZATION  % REMOVAL  PER BOILER  FGD  CAP.
              100.0              100.0              100.0              100.0      SO2  PART.  HOURS  HOURS  HOURS  FACTOR
-----
1/80  SYSTEM    100.0              100.0              100.0              100.0      744    C
2/80  SYSTEM    100.0              100.0              100.0              100.0      696    C
3/80  SYSTEM    100.0              100.0              100.0              100.0      744    C
  
```

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER REMAINED OUT OF SERVICE DUE TO BOILER REPAIRS. THE UNIT IS EXPECTED TO BE OPERATING IN ANOTHER MONTH.

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
GROSS UNIT GENERATING CAPACITY - MW	188.0
NET UNIT GENERATING CAPACITY W/FGD - MW	175.0
EQUIVALENT SCRUBBED CAPACITY - MW	188.0

** FUEL DATA	
FUEL TYPE	COAL
FUEL GRADE	BITUMINOUS
AVERAGE HEAT CONTENT - J/G	26749. (11500 BTU/LB)
AVERAGE ASH CONTENT - %	17.10
AVERAGE MOISTURE CONTENT - %	9.00
AVERAGE SULFUR CONTENT - %	3.75
AVERAGE CHLORIDE CONTENT - %	.04

** FGD SYSTEM	
GENERAL PROCESS TYPE	WET SCRUBBING
PROCESS TYPE	LIME
SYSTEM SUPPLIER	AMERICAN AIR FILTER
NEW/RETROFIT	RETROFIT
ENERGY CONSUMPTION - %	1.6
INITIAL START-UP DATE	8/76
COMMERCIAL START-UP DATE	9/77
SO2 DESIGN REMOVAL EFFICIENCY - %	85.00
PARTICULATE DESIGN REMOVAL EFFICIENCY - %	99.00
ABSORBER SPARE CAPACITY INDEX - %	.0
ABSORBER SPARE COMPONENTS INDEX	.0

** WATER LOOP	
TYPE	OPEN
FRESH MAKE-UP WATER - LITER/S	6.3 (100 GPM)

** DISPOSAL	
TYPE	LINED POND

-----PERFORMANCE DATA-----									
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER BOILER HOURS	FGD HOURS	CAP. FACTOR
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 1980
WITH EITHER THE BOILER OR THE FGD SYSTEM.

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
GROSS UNIT GENERATING CAPACITY - MW      200.0
NET UNIT GENERATING CAPACITY W/FGD - MW   192.0
EQUIVALENT SCRUBBED CAPACITY - MW        200.0

** FUEL DATA
FUEL TYPE                   COAL
FUEL GRADE                  BITUMINOUS
AVERAGE HEAT CONTENT - J/G    26749.      ( 11500 BTU/LB)
AVERAGE ASH CONTENT - %      17.10
AVERAGE MOISTURE CONTENT - %  9.00
AVERAGE SULFUR CONTENT - %    3.75
AVERAGE CHLORIDE CONTENT - %  .04

** FGD SYSTEM
GENERAL PROCESS TYPE        WET SCRUBBING
PROCESS TYPE                LIME
SYSTEM SUPPLIER              COMBUSTION ENGINEERING
NEW/RETROFIT                RETROFIT
ENERGY CONSUMPTION - %       1.5
INITIAL START-UP DATE       12/77
COMMERCIAL START-UP DATE    7/78
SO2 DESIGN REMOVAL EFFICIENCY - %      85.00
PARTICULATE DESIGN REMOVAL EFFICIENCY - %  99.00
ABSORBER SPARE CAPACITY INDEX - %       .2
ABSORBER SPARE COMPONENTS INDEX         .0

** WATER LOOP
TYPE                         OPEN
FRESH MAKE-UP WATER - LITER/S    *****      (***** GPM)

** TREATMENT
TYPE                         POZ-O-TEC

** DISPOSAL
TYPE                         LINED POND

```

```

-----PERFORMANCE DATA-----
PERIOD  MODULE  AVAILABILITY  OPERABILITY  RELIABILITY  UTILIZATION  % REMOVAL  PER  BOILER  FGD  CAP.
              502  PART.  HOURS  HOURS  HOURS  HOURS  HOURS  HOURS  FACTOR
-----
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
3/80  SYSTEM                44.5                27.2                744    454    202

** 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.

REHEATER TUBE PROBLEMS WERE ALSO ENCOUNTERED IN FEBRUARY AND CONTINUED THROUGH MARCH. THE UTILITY HOPES TO REPLACE THE TUBE BUNDLES IN THE SUMMER.

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
GROSS UNIT GENERATING CAPACITY - MW	299.0
NET UNIT GENERATING CAPACITY W/FGD - MW	277.0
EQUIVALENT SCRUBBED CAPACITY - MW	299.0
** FUEL DATA	
FUEL TYPE	COAL
FUEL GRADE	BITUMINOUS
AVERAGE HEAT CONTENT - J/G	25586. (11000 BTU/LB)
AVERAGE ASH CONTENT - %	17.10
AVERAGE MOISTURE CONTENT - %	9.00
AVERAGE SULFUR CONTENT - %	4.80
AVERAGE CHLORIDE CONTENT - %	.04
** FGD SYSTEM	
GENERAL PROCESS TYPE	WET SCRUBBING
PROCESS TYPE	DUAL ALKALI
SYSTEM SUPPLIER	ADL/COMBUSTION EQUIP ASSOCIATE
NEW/RETROFIT	RETROFIT
ENERGY CONSUMPTION - %	1.0
INITIAL START-UP DATE	4/79
COMMERCIAL START-UP DATE	**/**
SO2 DESIGN REMOVAL EFFICIENCY - %	95.00
PARTICULATE DESIGN REMOVAL EFFICIENCY - %	99.00
ABSORBER SPARE CAPACITY INDEX - %	20.0
ABSORBER SPARE COMPONENTS INDEX	.3
** WATER LOOP	
TYPE	CLOSED
FRESH MAKE-UP WATER - LITER/S	***** (***** GPM)
** DISPOSAL	
TYPE	LANDFILL

-----PERFORMANCE DATA-----

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

1/80	SYSTEM	49.0			13.8		744	210	103	
------	--------	------	--	--	------	--	-----	-----	-----	--

** PROBLEMS/SOLUTIONS/COMMENTS

FGD SYSTEM OUTAGE TIME IN JANUARY WAS CAUSED BY THE LOSS OF THE THICKENER. THE RAKE WOULDN'T TURN 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	

** PROBLEMS/SOLUTIONS/COMMENTS

IN FEBRUARY AND MARCH OUTAGE TIME WAS CAUSED BY PROBLEMS WITH THE RECYCLE PUMPS.

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
GROSS UNIT GENERATING CAPACITY - MW      442.0
NET UNIT GENERATING CAPACITY W/FGD - MW   420.0
EQUIVALENT SCRUBBED CAPACITY - MW         442.0

```

```

** FUEL DATA
FUEL TYPE          COAL
FUEL GRADE         BITUMINOUS
AVERAGE HEAT CONTENT - J/G      26749.      ( 11500 BTU/LB)
AVERAGE ASH CONTENT - %         11.50
AVERAGE MOISTURE CONTENT - %     *****
AVERAGE SULFUR CONTENT - %       3.75
AVERAGE CHLORIDE CONTENT - %     .04

```

```

** FGD SYSTEM
GENERAL PROCESS TYPE  WET SCRUBBING
PROCESS TYPE         LIME
SYSTEM SUPPLIER       AMERICAN AIR FILTER
NEW/RETROFIT          NEW
ENERGY CONSUMPTION - %      1.6
INITIAL START-UP DATE    8/78
COMMERCIAL START-UP DATE  3/79
SO2 DESIGN REMOVAL EFFICIENCY - %  85.00
PARTICULATE DESIGN REMOVAL EFFICIENCY - %  99.00
ABSORBER SPARE COMPONENTS INDEX    .3

```

```

** WATER LOOP
TYPE                 OPEN
FRESH MAKE-UP WATER - LITER/S      9.4      ( 150 GPM)

```

```

** TREATMENT
TYPE                 FLYASH/LIME STABILIZATION

```

```

** DISPOSAL
TYPE                 POND

```

```

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

```

```

1/80  SYSTEM                .0                744      0
2/80  SYSTEM                36.1             696      512      185
3/80  SYSTEM                36.9             744      618      229

```

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT CAME BACK ON LINE ON FEBRUARY 10TH AFTER THE TURBINE OVERHAUL WORK WAS COMPLETED.

PROBLEMS ENCOUNTERED DURING FEBRUARY AND MARCH WITH THE FGD SYSTEM OPERATION INCLUDED FROZEN WATER LINES AND WORN GASKETS BLOWING IN THE REHEATER FLANGES.

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
GROSS UNIT GENERATING CAPACITY - MW      72.0
NET UNIT GENERATING CAPACITY W/FGD - MW   67.0
EQUIVALENT SCRUBBED CAPACITY - MW         72.0

** FUEL DATA
FUEL TYPE              COAL
FUEL GRADE             BITUMINOUS
AVERAGE HEAT CONTENT - Btu/lb            26749. ( 11500 Btu/lb)
AVERAGE ASH CONTENT - %                  11.50
AVERAGE MOISTURE CONTENT - %             *****
AVERAGE SULFUR CONTENT - %               2.50
AVERAGE CHLORIDE CONTENT - %             *****

** FGD SYSTEM
GENERAL PROCESS TYPE   WET SCRUBBING
PROCESS TYPE           LIME
SYSTEM SUPPLIER        COMBUSTION ENGINEERING
NEW/RETROFIT           RETROFIT
ENERGY CONSUMPTION - %  2.8
INITIAL START-UP DATE  4/73
COMMERCIAL START-UP DATE **/**
SO2 DESIGN REMOVAL EFFICIENCY - %         90.00
PARTICULATE DESIGN REMOVAL EFFICIENCY - % 99.10
ABSORBER SPARE CAPACITY INDEX - %         .0
ABSORBER SPARE COMPONENTS INDEX          .0

** WATER LOOP
TYPE                   CLOSED
FRESH MAKE-UP WATER - LITER/S             3.1 ( 50 GPM)

** TREATMENT
TYPE                   LIME STABILIZATION

** DISPOSAL
TYPE                   POND
  
```

```

-----PERFORMANCE DATA-----
PERIOD  MODULE  AVAILABILITY  OPERABILITY  RELIABILITY  UTILIZATION  % REMOVAL  PER BOILER  FGD  CAP.
          1/80  2/80  3/80  1/80  2/80  3/80  SO2  PART.  HOURS  HOURS  HOURS  FACTOR
-----
1/80  SYSTEM                .0                744      0      0
2/80  SYSTEM                .0                696      0      0
3/80  SYSTEM                .0                744      0      0
  
```

** PROBLEMS/SOLUTIONS/COMMENTS

THIS UNIT DID NOT OPERATE DURING THE FIRST QUARTER 1980 DUE TO A LACK OF DEMAND. THIS UNIT IS USED AS A PEAKING UNIT AND WILL BE RETIRED SOMETIME IN 1987.

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
GROSS UNIT GENERATING CAPACITY - MW      440.0
NET UNIT GENERATING CAPACITY W/FGD - MW   402.0
EQUIVALENT SCRUBBED CAPACITY - MW        405.0

** FUEL DATA
FUEL TYPE                   COAL
FUEL GRADE                  LIGNITE
AVERAGE HEAT CONTENT - Btu/lb      15119.      ( 6500 Btu/lb)
AVERAGE ASH CONTENT - %           6.50
AVERAGE MOISTURE CONTENT - %       38.00
AVERAGE SULFUR CONTENT - %         .70
AVERAGE CHLORIDE CONTENT - %       .01

** FGD SYSTEM
GENERAL PROCESS TYPE        WET SCRUBBING
PROCESS TYPE                LIME/ALKALINE FLYASH
SYSTEM SUPPLIER             ADL/COMBUSTION EQUIP ASSOCIATE
NEW/RETROFIT               NEW
ENERGY CONSUMPTION - %       1.6
INITIAL START-UP DATE       9/77
COMMERCIAL START-UP DATE    6/78
SO2 DESIGN REMOVAL EFFICIENCY - %    85.00
PARTICULATE DESIGN REMOVAL EFFICIENCY - % 99.60
ABSORBER SPARE CAPACITY INDEX - %     .0
ABSORBER SPARE COMPONENTS INDEX      .0

** WATER LOOP
TYPE                        CLOSED
FRESH MAKE-UP WATER - LITER/S      44.1      ( 700 GPM)

** DISPOSAL
TYPE                         MINEFILL
  
```

```

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

```

1/80  A          67.7          10.5          7.1
      B          67.7           .0           .0
      SYSTEM     7.1          10.5          10.5          7.1          744      504      27
  
```

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JANUARY THE COLD WEATHER CAUSED SOME FROZEN LINES AND THE BOOSTER FAN TO FREEZE.

A HIGH PERCENTAGE OF COARSE SOLIDS IN THE THICKENER CAUSED SOME OUTAGE TIME. THE WARM GEAR ON THE THICKENER ALSO BROKE CAUSING PROBLEMS.

```

2/80  A          .0           .0           .0
      B          .0           .0           .0
      SYSTEM     .0           .0           .0          696      696      0
  
```

** PROBLEMS/SOLUTIONS/COMMENTS

THE PROBLEMS RELATED TO THE COLD WEATHER CONTINUED THROUGH FEBRUARY. THE ICE ON THE BOOSTER FAN HAD TO BE MELTED.

THE SHAFT SLEEVES ON SEVERAL SPRAY RECYCLE PUMPS WERE REPLACED.

THE GEAR REDUCER FAILED ON THE B-SIDE ABSORBER AGITATOR CAUSING PROBLEMS.

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

THE ISOLATION DAMPER CHAINS BROKE DURING THE MONTH.

3/80	A	28.9	22.6		22.6				
	B	28.9	6.2		6.2				
	SYSTEM	28.9	28.8	28.8	28.8	744	743	107	

•• 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.

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 EXPERIENCED A PROBLEM WITH THE ANCHOR BOLTS SHEARING.

THE SHAFT SLEEVES ON THE SPRAY RECYCLE PUMPS WOULD NOT HOLD THE PACKING SO THEY HAD TO BE REPLACED IN MARCH.

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
GROSS UNIT GENERATING CAPACITY - MW      360.0
NET UNIT GENERATING CAPACITY W/FGD - MW   332.0
EQUIVALENT SCRUBBED CAPACITY - MW        360.0

** FUEL DATA
FUEL TYPE                   COAL
FUEL GRADE                  SUBBITUMINOUS
AVERAGE HEAT CONTENT - J/G      20569.      ( 9843 BTU/LB)
AVERAGE ASH CONTENT - %        8.60
AVERAGE MOISTURE CONTENT - %    23.90
AVERAGE SULFUR CONTENT - %      .77
AVERAGE CHLORIDE CONTENT - %    .01

** FGD SYSTEM
GENERAL PROCESS TYPE         WET SCRUBBING
PROCESS TYPE                 LIME/ALKALINE FLYASH
SYSTEM SUPPLIER              ADL/COMBUSTION EQUIP ASSOCIATE
NEW/RETROFIT                 NEW
ENERGY CONSUMPTION - %        3.3
INITIAL START-UP DATE        9/75
COMMERCIAL START-UP DATE     11/75
SO2 DESIGN REMOVAL EFFICIENCY - %    60.00
PARTICULATE DESIGN REMOVAL EFFICIENCY - %  99.50
ABSORBER SPARE CAPACITY INDEX - %    20.0
ABSORBER SPARE COMPONENTS INDEX      .5

** WATER LOOP
TYPE                         CLOSED
FRESH MAKE-UP WATER - LITER/S      23.3      ( 370 GPM)

** DISPOSAL
TYPE                         POND

```

```

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

12/79  SYSTEM                                744
1/80   SYSTEM                                744
2/80   SYSTEM                                696
3/80   SYSTEM                                744

```

** PROBLEMS/SOLUTIONS/COMMENTS

NO INFORMATION WAS AVAILABLE FOR THE PERIOD OF DECEMBER 1979 THROUGH MARCH 1980.

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
GROSS UNIT GENERATING CAPACITY - MW	360.0
NET UNIT GENERATING CAPACITY w/FGD - MW	332.0
EQUIVALENT SCRUBBED CAPACITY - MW	360.0
** FUEL DATA	
FUEL TYPE	COAL
FUEL GRADE	SUBBITUMINOUS
AVERAGE HEAT CONTENT - J/G	20549. (8843 BTU/LB)
AVERAGE ASH CONTENT - %	8.60
AVERAGE MOISTURE CONTENT - %	23.90
AVERAGE SULFUR CONTENT - %	.77
AVERAGE CHLORIDE CONTENT - %	.01
** FGD SYSTEM	
GENERAL PROCESS TYPE	WET SCRUBBING
PROCESS TYPE	LIME/ALKALINE FLYASH
SYSTEM SUPPLIER	ADL/COMBUSTION EQUIP ASSOCIATE
NEW/RETROFIT	NEW
ENERGY CONSUMPTION - %	3.3
INITIAL START-UP DATE	5/76
COMMERCIAL START-UP DATE	10/76
SO2 DESIGN REMOVAL EFFICIENCY - %	60.00
PARTICULATE DESIGN REMOVAL EFFICIENCY - %	99.50
ABSORBER SPARE CAPACITY INDEX - %	20.0
ABSORBER SPARE COMPONENTS INDEX	.5
** WATER LOOP	
TYPE	CLOSED
FRESH MAKE-UP WATER - LITER/S	23.3 (370 GPM)
** DISPOSAL	
TYPE	POND

-----PERFORMANCE DATA-----									
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER BOILER HOURS HOURS	FGD HOURS	CAP. FACTOR
12/79	SYSTEM						744		
1/80	SYSTEM						744		
2/80	SYSTEM						696		
3/80	SYSTEM						744		

** PROBLEMS/SOLUTIONS/COMMENTS

NO INFORMATION WAS AVAILABLE FOR THE PERIOD FROM DECEMBER 1979 THROUGH
MARCH 1980.

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
GROSS UNIT GENERATING CAPACITY - MW      125.0
NET UNIT GENERATING CAPACITY W/FGD - MW   110.0
EQUIVALENT SCRUBBED CAPACITY - MW        125.0

** FUEL DATA
FUEL TYPE             COAL
FUEL GRADE            BITUMINOUS
AVERAGE HEAT CONTENT - J/G      28959.      ( 12450 BTU/LB)
AVERAGE ASH CONTENT - %         9.00
AVERAGE MOISTURE CONTENT - %    5.50
AVERAGE SULFUR CONTENT - %      .50
AVERAGE CHLORIDE CONTENT - %    .05

** FGD SYSTEM
GENERAL PROCESS TYPE  WET SCRUBBING
PROCESS TYPE          SODIUM CARBONATE
SYSTEM SUPPLIER       ADL/COMBUSTION EQUIP ASSOCIATE
NEW/RETROFIT          RETROFIT
ENERGY CONSUMPTION - % *****
INITIAL START-UP DATE  4/74
COMMERCIAL START-UP DATE **/
SO2 DESIGN REMOVAL EFFICIENCY - %      90.00
PARTICULATE DESIGN REMOVAL EFFICIENCY - % 97.00
ABSORBER SPARE CAPACITY INDEX - %      .3
ABSORBER SPARE COMPONENTS INDEX        .0

** WATER LOOP
TYPE                  CLOSED
FRESH MAKE-UP WATER - LITER/S          9.8      ( 155 GPM)

** DISPOSAL
TYPE                  LINED POND

```

```

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

```

```

1/80 SYSTEM      100.0      100.0      100.0      100.0      744      744      744

```

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER AND FGD SYSTEM OPERATED THE ENTIRE MONTH WITH NO OUTAGES.

```

2/80 SYSTEM      100.0      100.0      100.0      100.0      696      696      696

```

** PROBLEMS/SOLUTIONS/COMMENTS

DURING FEBRUARY, NO OUTAGES OCCURRED.

```

3/80 SYSTEM      66.2       83.7       84.7       33.8       744      300      251

```

** 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 THE VENTURI PUMP AND SIX OTHER TIMES DUE TO LOW VENTURI FLOW.

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
GROSS UNIT GENERATING CAPACITY - MW	125.0
NET UNIT GENERATING CAPACITY W/FGD - MW	110.0
EQUIVALENT SCRUBBED CAPACITY - MW	125.0
** FUEL DATA	
FUEL TYPE	COAL
FUEL GRADE	BITUMINOUS
AVERAGE HEAT CONTENT - J/G	28959. (12450 BTU/LB)
AVERAGE ASH CONTENT - %	8.00
AVERAGE MOISTURE CONTENT - %	5.50
AVERAGE SULFUR CONTENT - %	.50
AVERAGE CHLORIDE CONTENT - %	.05
** FGD SYSTEM	
GENERAL PROCESS TYPE	WET SCRUBBING
PROCESS TYPE	SODIUM CARBONATE
SYSTEM SUPPLIER	ADL/COMBUSTION EQUIP ASSOCIATE
NEW/RETROFIT	RETROFIT
ENERGY CONSUMPTION - %	*****
INITIAL START-UP DATE	4/74
COMMERCIAL START-UP DATE	**/**
SO2 DESIGN REMOVAL EFFICIENCY - %	92.00
PARTICULATE DESIGN REMOVAL EFFICIENCY - %	97.00
ABSORBER SPARE CAPACITY INDEX - %	.0
ABSORBER SPARE COMPONENTS INDEX	.0
** WATER LOOP	
TYPE	CLOSED
FRESH MAKE-UP WATER - LITER/S	9.8 (155 GPM)
** DISPOSAL	
TYPE	LINED POND

-----PERFORMANCE DATA-----

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PER BOILER PART. HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
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1/80	SYSTEM	97.3	96.9	96.9	81.6		744	627	607	
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** PROBLEMS/SOLUTIONS/COMMENTS

DURING JANUARY THE SCRUBBER WENT OFF LINE WITH THE BOILER TO REPLACE THE REBUILT NO. 2 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 COME OFF LINE WITH THE BOILER.

THE CLEANING OF THE VENTURI RACE TRACK NOZZLES CAUSED TWO SCRUBBER OUTAGES.

THE SCRUBBER WENT OFF LINE SO MAINTENANCE COULD BE DONE ON THE ID FAN DAMPER CONTROLS.

2/80	SYSTEM	97.0	97.0	97.0	97.0		696	696	675	
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** 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 ALSO CLEANED DURING THE OUTAGE.

THE SCRUBBER RACE TRACK NOZZLES HAD TO BE CLEANED TWICE, CAUSING APPROX-

NEVADA POWER: REID GARDNER 2 (CONT.)

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

IMATELY 4 HOURS OUTAGE TIME.

THE DISCHARGE VALVE ON THE VENTURI RECYCLE PUMP WAS REPLACED DURING FEBRUARY.

REPAIRS WERE MADE ON THE SCRUBBER EMERGENCY SPRAY LINE CAUSING ABOUT 4 HOURS OUTAGE TIME.

THE SCRUBBER HAD TO BE SHUT DOWN SO REPAIRS ON THE ID FAN DAMPER CONTROLS COULD BE MADE.

3/80	SYSTEM	97.5	97.5	97.5	97.5	744	744	725
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** PROBLEMS/SOLUTIONS/COMMENTS

DURING MARCH THE SCRUBBER WAS TAKEN OFF LINE DUE TO NO EMERGENCY SPRAY. 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.

LOW VENTURI FLOW ALSO WAS A PROBLEM DURING MARCH.

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
GROSS UNIT GENERATING CAPACITY - MW	125.0
NET UNIT GENERATING CAPACITY W/FGD - MW	110.0
EQUIVALENT SCRUBBED CAPACITY - MW	125.0

** FUEL DATA	
FUEL TYPE	COAL
FUEL GRADE	BITUMINOUS
AVERAGE HEAT CONTENT - J/G	28959. (12450 BTU/LB)
AVERAGE ASH CONTENT - %	8.00
AVERAGE MOISTURE CONTENT - %	9.00
AVERAGE SULFUR CONTENT - %	.50
AVERAGE CHLORIDE CONTENT - %	.05

** FGD SYSTEM	
GENERAL PROCESS TYPE	WET SCRUBBING
PROCESS TYPE	SODIUM CARBONATE
SYSTEM SUPPLIER	ADL/COMBUSTION EQUIP ASSOCIATE
NEW/RETROFIT	NEW
ENERGY CONSUMPTION - %	*****
INITIAL START-UP DATE	6/76
COMMERCIAL START-UP DATE	7/76
SO2 DESIGN REMOVAL EFFICIENCY - %	85.00
PARTICULATE DESIGN REMOVAL EFFICIENCY - %	99.00
ABSORBER SPARE CAPACITY INDEX - %	.0
ABSORBER SPARE COMPONENTS INDEX	.0

** WATER LOOP	
TYPE	CLOSED
FRESH MAKE-UP WATER - LITER/S	9.8 (155 GPM)

** DISPOSAL	
TYPE	LINED POND

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

1/80	SYSTEM	100.0	99.7	100.0	91.3		744	681	679	
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** PROBLEMS/SOLUTIONS/COMMENTS

DURING JANUARY THE SCRUBBER AND BOILER WERE OFF LINE FOR APPROXIMATELY 64 HOURS TO REPAIR AND BALANCE THE BOILER ID FAN.

2/80	SYSTEM	78.8	98.2	77.9	77.9		696	552	542	
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** PROBLEMS/SOLUTIONS/COMMENTS

DURING FEBRUARY TWO OUTAGES WERE NECESSARY SO THE ID FAN COULD BE BALANCED.

THE SCRUBBER AND BOILER WENT OFF LINE SO THAT THE COAL LEAKS ON THE BURNER LINES COULD BE REPAIRED.

HIGH FURNACE PRESSURE CAUSED THE SCRUBBER AND BOILER TO TRIP OFF.

3/80	SYSTEM	60.3	99.7	99.7	60.2		744	450	448	
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** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT AND SCRUBBER WENT DOWN TWICE DURING MARCH. THE FIRST OUTAGE WAS TO BALANCE THE ID FAN. LATER IN THE MONTH THE ID FANS AND THE PRECIPITATORS HAD TO BE REPAIRED.

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	
GROSS UNIT GENERATING CAPACITY - MW	115.0	
NET UNIT GENERATING CAPACITY W/FGD - MW	78.0	
EQUIVALENT SCRUBBED CAPACITY - MW	115.0	
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	*****	
AVERAGE HEAT CONTENT - Btu/lb	25586.	(11000 BTU/LB)
AVERAGE ASH CONTENT - %	*****	
AVERAGE MOISTURE CONTENT - %	11.00	
AVERAGE SULFUR CONTENT - %	3.50	
AVERAGE CHLORIDE CONTENT - %	*****	
** FGD SYSTEM		
GENERAL PROCESS TYPE	WET SCRUBBING	
PROCESS TYPE	WELLMAN LORD	
SYSTEM SUPPLIER	DAVY POWERGAS	
NEW/RETROFIT	RETROFIT	
ENERGY CONSUMPTION - %	27.8	
INITIAL START-UP DATE	7/76	
COMMERCIAL START-UP DATE	6/77	
SO2 DESIGN REMOVAL EFFICIENCY - %	90.00	
PARTICULATE DESIGN REMOVAL EFFICIENCY - %	98.50	
ABSORBER SPARE CAPACITY INDEX - %	.0	
ABSORBER SPARE COMPONENTS INDEX	.0	
** WATER LOOP		
TYPE	CLOSED	
FRESH MAKE-UP WATER - LITER/S	*****	(***** GPM)
** BYPRODUCT		
BYPRODUCT NATURE	ELEMENTAL SULFUR	
DISPOSITION		

-----PERFORMANCE DATA-----										
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PER PART. HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
12/79	SYSTEM							744		
1/80	SYSTEM							744		
2/80	SYSTEM							696		
3/80	SYSTEM							744		

** PROBLEMS/SOLUTIONS/COMMENTS

NO INFORMATION WAS AVAILABLE FROM DECEMBER 1979 THROUGH MARCH 1980.

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
GROSS UNIT GENERATING CAPACITY - MW	740.0
NET UNIT GENERATING CAPACITY W/FGD - MW	700.0
EQUIVALENT SCRUBBED CAPACITY - MW	740.0
** FUEL DATA	
FUEL TYPE	COAL
FUEL GRADE	SUBBITUMINOUS
AVERAGE HEAT CONTENT - J/G	19771. (8500 BTU/LB)
AVERAGE ASH CONTENT - %	9.00
AVERAGE MOISTURE CONTENT - %	25.00
AVERAGE SULFUR CONTENT - %	.80
AVERAGE CHLORIDE CONTENT - %	.03
** FGD SYSTEM	
GENERAL PROCESS TYPE	WET SCRUBBING
PROCESS TYPE	LIMESTONE/ALKALINE FLYASH
SYSTEM SUPPLIER	COMBUSTION ENGINEERING
NEW/RETROFIT	NEW
ENERGY CONSUMPTION - %	2.7
INITIAL START-UP DATE	3/76
COMMERCIAL START-UP DATE	5/76
SO2 DESIGN REMOVAL EFFICIENCY - %	50.00
PARTICULATE DESIGN REMOVAL EFFICIENCY - %	99.00
ABSORBER SPARE CAPACITY INDEX - %	8.0
ABSORBER SPARE COMPONENTS INDEX	.9
** WATER LOOP	
TYPE	CLOSED
FRESH MAKE-UP WATER - LITER/S	***** (***** GPM)
** TREATMENT	
TYPE	FORCED OXIDATION
** DISPOSAL	
TYPE	LINED POND

PERFORMANCE DATA									
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PER BOILER HOURS	FGD HOURS	CAP. FACTOR
1/80	SYSTEM	97.0					744	793	
2/80	SYSTEM	97.0					696	687	
3/80	SYSTEM	98.0					744	688	

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE FIRST QUARTER, 1980 NO MAJOR PROBLEMS WERE ENCOUNTERED WITH THE FGD UNIT.

FROM MID-SEPTEMBER TO MID-OCTOBER THE UTILITY HAS SCHEDULED A BOILER OUTAGE IN WHICH TIME THE MARBLE BEDS WILL BE INSPECTED.

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
GROSS UNIT GENERATING CAPACITY - MW	740.0
NET UNIT GENERATING CAPACITY W/FGD - MW	700.0
EQUIVALENT SCRUBBED CAPACITY - MW	740.0
** FUEL DATA	
FUEL TYPE	COAL
FUEL GRADE	SUBBITUMINOUS
AVERAGE HEAT CONTENT - J/G	19771. (8500 BTU/Lb)
AVERAGE ASH CONTENT - %	9.00
AVERAGE MOISTURE CONTENT - %	25.00
AVERAGE SULFUR CONTENT - %	.80
AVERAGE CHLORIDE CONTENT - %	.03
** FGD SYSTEM	
GENERAL PROCESS TYPE	WET SCRUBBING
PROCESS TYPE	LYMESTONE/ALKALINE FLYASH
SYSTEM SUPPLIER	COMBUSTION ENGINEERING
NEW/RETROFIT	NEW
ENERGY CONSUMPTION - %	2.7
INITIAL START-UP DATE	4/77
COMMERCIAL START-UP DATE	4/77
SO2 DESIGN REMOVAL EFFICIENCY - %	50.00
PARTICULATE DESIGN REMOVAL EFFICIENCY - %	99.00
ABSORBER SPARE CAPACITY INDEX - %	8.0
ABSORBER SPARE COMPONENTS INDEX	.9
** WATER LOOP	
TYPE	OPEN
FRESH MAKE-UP WATER - LITER/S	***** (***** GPM)
** TREATMENT	
TYPE	FORCED OXIDATION
** DISPOSAL	
TYPE	LINED POND

-----PERFORMANCE DATA-----										
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
1/80	SYSTEM	97.0					744	744		
2/80	SYSTEM	96.0					696	696		
3/80	SYSTEM	98.0					744	744		

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE FIRST QUARTER, 1980 THE FGD SYSTEM EXPERIENCED NO MAJOR PROBLEMS.

A FOUR WEEK BOILER OUTAGE IS SCHEDULED FOR MAY IN WHICH TIME THE MARBLE BEDS WILL BE REMOVED FROM THE FGD UNIT.

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
GROSS UNIT GENERATING CAPACITY - MW	550.0
NET UNIT GENERATING CAPACITY W/FGD - MW	507.8
EQUIVALENT SCRUBBED CAPACITY - MW	550.0
** FUEL DATA	
FUEL TYPE	COAL
FUEL GRADE	SUBBITUMINOUS
AVERAGE HEAT CONTENT - J/G	21632. (9300 BTU/LB)
AVERAGE ASH CONTENT - %	9.00
AVERAGE MOISTURE CONTENT - %	18.00
AVERAGE SULFUR CONTENT - %	.56
AVERAGE CHLORIDE CONTENT - %	.01
** FGD SYSTEM	
GENERAL PROCESS TYPE	WET SCRUBBING
PROCESS TYPE	SODIUM CARBONATE
SYSTEM SUPPLIER	AIR CORRECTION DIVISION, UOP
NEW/RETROFIT	NEW
ENERGY CONSUMPTION - %	.2
INITIAL START-UP DATE	9/79
COMMERCIAL START-UP DATE	2/80
SO2 DESIGN REMOVAL EFFICIENCY - %	91.00
PARTICULATE DESIGN REMOVAL EFFICIENCY - %	99.00
ABSORBER SPARE COMPONENTS INDEX	.9
** WATER LOOP	
TYPE	CLOSED
FRESH MAKE-UP WATER - LITER/S	***** (***** GPM)
** DISPOSAL	
TYPE	POND

-----PERFORMANCE DATA-----									
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL	PER BOILER	FGD	CAP.
						SO2 PART.	HOURS	HOURS	FACTOR
1/80	SYSTEM							744	
2/80	SYSTEM							696	
3/80	SYSTEM							744	

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT IS STILL IN THE SHAKEDOWN PHASE. A NUMBER OF MECHANICAL PROBLEMS
AND SOME CONTROL PROBLEMS HAVE BEEN ENCOUNTERED.

SECTION 3

DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

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-----
COMPANY NAME                PENNSYLVANIA POWER
PLANT NAME                  BRUCE MANSFIELD
UNIT NUMBER                 1
CITY                        SHIPPINGPORT
STATE                       PENNSYLVANIA
GROSS UNIT GENERATING CAPACITY - MW      917.0
NET UNIT GENERATING CAPACITY W/FGD - MW   825.0
EQUIVALENT SCRUBBED CAPACITY - MW        917.0

** FUEL DATA
FUEL TYPE                   COAL
FUEL GRADE                  BITUMINOUS
AVERAGE HEAT CONTENT - J/G      26749.      ( 11500 BTU/LB)
AVERAGE ASH CONTENT - %        12.90
AVERAGE MOISTURE CONTENT - %    7.00
AVERAGE SULFUR CONTENT - %      3.00
AVERAGE CHLORIDE CONTENT - %    *****

** FGD SYSTEM
GENERAL PROCESS TYPE        WET SCRUBBING
PROCESS TYPE                LIME
SYSTEM SUPPLIER             CHEMICO
NEW/RETROFIT                NEW
ENERGY CONSUMPTION - %       6.0
INITIAL START-UP DATE       12/75
COMMERCIAL START-UP DATE    6/76
SO2 DESIGN REMOVAL EFFICIENCY - %      92.10
PARTICULATE DESIGN REMOVAL EFFICIENCY - % 99.80
ABSORBER SPARE CAPACITY INDEX - %      .0
ABSORBER SPARE COMPONENTS INDEX      .0

** WATER LOOP
TYPE                        OPEN
FRESH MAKE-UP WATER - LITER/S    *****      (***** GPM)

** TREATMENT
TYPE                        CALCILOX

** DISPOSAL
TYPE                        LANDFILL

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-----PERFORMANCE DATA-----
PERIOD  MODULE  AVAILABILITY  OPERABILITY  RELIABILITY  UTILIZATION  % REMOVAL  PER  BOILER  FGD  CAP.
          1/80    2/80    3/80    1/80    2/80    3/80    SO2  PART.  HOURS  HOURS  HOURS  FACTOR
-----
1/80  SYSTEM    98.6    100.0    90.4    90.4    744    672    672
2/80  SYSTEM    98.1    100.0    93.7    696    652    652

** PROBLEMS/SOLUTIONS/COMMENTS
      NO MAJOR FGD RELATED PROBLEMS OCCURRED DURING JANUARY AND FEBRUARY.

3/80  SYSTEM    98.8    100.0    83.7    744    623    623

** PROBLEMS/SOLUTIONS/COMMENTS

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THE BOILER WAS OUT ONE WEEK IN MARCH DUE TO A PLUGGED AIR PREHEATER. NO MAJOR FGD RELATED PROBLEMS WERE REPORTED FOR MARCH.

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
GROSS UNIT GENERATING CAPACITY - MW	917.0
NET UNIT GENERATING CAPACITY W/FGD - MW	825.0
EQUIVALENT SCRUBBED CAPACITY - MW	917.0
** FUEL DATA	
FUEL TYPE	COAL
FUEL GRADE	BITUMINOUS
AVERAGE HEAT CONTENT - J/G	26749. (11500 BTU/LB)
AVERAGE ASH CONTENT - %	12.90
AVERAGE MOISTURE CONTENT - %	7.00
AVERAGE SULFUR CONTENT - %	3.00
AVERAGE CHLORIDE CONTENT - %	*****
** FGD SYSTEM	
GENERAL PROCESS TYPE	WET SCRUBBING
PROCESS TYPE	LIME
SYSTEM SUPPLIER	CHEMICO
NEW/RETROFIT	NEW
ENERGY CONSUMPTION - %	6.0
INITIAL START-UP DATE	7/77
COMMERCIAL START-UP DATE	**/**
SO2 DESIGN REMOVAL EFFICIENCY - %	92.10
PARTICULATE DESIGN REMOVAL EFFICIENCY - %	99.80
ABSORBER SPARE CAPACITY INDEX - %	.0
ABSORBER SPARE COMPONENTS INDEX	.0
** WATER LOOP	
TYPE	OPEN
FRESH MAKE-UP WATER - LITER/S	***** (***** GPM)
** TREATMENT	
TYPE	CALCILOX
** DISPOSAL	
TYPE	LANDFILL

-----PERFORMANCE DATA-----										
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PER BOILER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
1/80	SYSTEM	97.1	100.0		90.6		744	674	674	
2/80	SYSTEM	94.7	100.0		99.8		696	694	694	

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM EXPERIENCED NO MAJOR PROBLEMS DURING JANUARY AND FEBRUARY.

3/80	SYSTEM	98.4	100.0		83.7		744	380	380	
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** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER WAS OUT 16 DAYS IN MARCH FOR A SCHEDULED BOILER INSPECTION.
NO MAJOR FGD RELATED PROBLEMS WERE REPORTED.

SECTION 3

DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

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-----
COMPANY NAME                PHILADELPHIA ELECTRIC
PLANT NAME                  EDDYSTONE
UNIT NUMBER                 1A
CITY                        EDDYSTONE
STATE                       PENNSYLVANIA
GROSS UNIT GENERATING CAPACITY - MW      120.0
NET UNIT GENERATING CAPACITY W/FGD - MW   120.0
EQUIVALENT SCRUBBED CAPACITY - MW        120.0

** FUEL DATA
FUEL TYPE                   COAL
FUEL GRADE                  BITUMINOUS
AVERAGE HEAT CONTENT - J/G    31634.      ( 13600 BTU/LB)
AVERAGE ASH CONTENT - %      9.40
AVERAGE MOISTURE CONTENT - %  5.90
AVERAGE SULFUR CONTENT - %    2.60
AVERAGE CHLORIDE CONTENT - %  *****

** FGD SYSTEM
GENERAL PROCESS TYPE        WET SCRUBBING
PROCESS TYPE                MAGNESIUM OXIDE
SYSTEM SUPPLIER             UNITED ENGINEERS
NEW/RETROFIT               RETROFIT
ENERGY CONSUMPTION - %      *****
INITIAL START-UP DATE       9/75
COMMERCIAL START-UP DATE    9/75
SO2 DESIGN REMOVAL EFFICIENCY - %    99.00
PARTICULATE DESIGN REMOVAL EFFICIENCY - %  99.00
ABSORBER SPARE CAPACITY INDEX - %      .0
ABSORBER SPARE COMPONENTS INDEX      .0

** WATER LOOP
TYPE                        OPEN
FRESH MAKE-UP WATER - LITER/S      8.3      ( 132 GPM)

** BYPRODUCT
BYPRODUCT NATURE            SULFURIC ACID
DISPOSITION

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-----PERFORMANCE DATA-----
PERIOD  MODULE  AVAILABILITY  OPERABILITY  RELIABILITY  UTILIZATION  % REMOVAL  PER  BOILER  FGD  CAP.
          SO2  PART.  HOURS  HOURS  HOURS  HOURS  HOURS  HOURS  HOURS  FACTOR
-----
1/80  SYSTEM                744      0
2/80  SYSTEM                696      0
3/80  SYSTEM                744      0

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** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER AND TURBINE WERE DOWN DURING THE FIRST QUARTER 1980 FOR TURBINE MAINTENANCE.

OPERATION OF THIS PROTOTYPE MAGNESIUM OXIDE SYSTEM, WHICH TREATED ONE THIRD OF THE FLUE GAS FROM THE EDDYSTONE 1 BOILER, HAS BEEN TERMINATED. THE SO2 REMOVAL EQUIPMENT IS PRESENTLY BEING REPLACED WITH A SIMILAR MAG-OX SYSTEM DESIGNED TO TREAT 100% OF THE BOILER FLUE GAS. THE EXPECTED START DATE OF THIS SYSTEM IS DECEMBER 1982. CURRENT REGULATIONS DO NOT REQUIRE CONTROL OF SO2 EMISSIONS UNTIL THE NEW SCRUBBER IS AVAILABLE FOR OPERATION.

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
GROSS UNIT GENERATING CAPACITY - MW	361.0
NET UNIT GENERATING CAPACITY W/FGD - MW	314.0
EQUIVALENT SCRUBBED CAPACITY - MW	361.0

** FUEL DATA

FUEL TYPE	COAL
FUEL GRADE	SUBBITUMINOUS
AVERAGE HEAT CONTENT - J/G	22795. (9800 BTU/LB)
AVERAGE ASH CONTENT - %	18.30
AVERAGE MOISTURE CONTENT - %	14.82
AVERAGE SULFUR CONTENT - %	.80
AVERAGE CHLORIDE CONTENT - %	.03

** FGD SYSTEM

GENERAL PROCESS TYPE	WET SCRUBBING
PROCESS TYPE	WELLMAN LORD
SYSTEM SUPPLIER	DAVY POWERGAS
NEW/RETROFIT	RETROFIT
ENERGY CONSUMPTION - %	4.4
INITIAL START-UP DATE	4/78
COMMERCIAL START-UP DATE	**/**
SO2 DESIGN REMOVAL EFFICIENCY - %	90.00
PARTICULATE DESIGN REMOVAL EFFICIENCY - %	99.80
ABSORBER SPARE CAPACITY INDEX - %	33.0
ABSORBER SPARE COMPONENTS INDEX	1.0

** WATER LOOP

TYPE	CLOSED
FRESH MAKE-UP WATER - LITER/S	30.2 (480 GPM)

** BYPRODUCT

BYPRODUCT NATURE	ELEMENTAL SULFUR
DISPOSITION	MARKETED

-----PERFORMANCE DATA-----

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
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1/80	A	81.0	51.0		42.0						
	B	96.0	42.0		35.0						
	C	.0	.0		.0						
	D	83.0	79.0		65.0						
	SYSTEM	87.0	57.0		47.0			744	610	351	
2/80	A	.0	.0		.0						
	B	99.0	94.0		86.0						
	C	3.0	3.0		2.0						
	D	99.0	98.0		89.0						
	SYSTEM	67.0	65.0		59.0			696	634	411	
3/80	A	.0	.0		.0						
	B	100.0	50.0		18.0						
	C	83.0	83.0		29.0						
	D	97.0	85.0		30.0						
	SYSTEM	93.0	73.0		26.0			744	262	191	

** PROBLEMS/SOLUTIONS/COMMENTS

SCRUBBER OPERATIONS AT UNIT ONE ARE STILL LIMITED TO TWO MODULES BECAUSE OF A LACK OF REHEAT.

SECTION 3

DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

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COMPANY NAME                PUBLIC SERVICE OF NEW MEXICO
PLANT NAME                  SAN JUAN
UNIT NUMBER                 2
CITY                        WATERFLOW
STATE                       NEW MEXICO
GROSS UNIT GENERATING CAPACITY - MW      357.0
NET UNIT GENERATING CAPACITY W/FGD - MW  306.0
EQUIVALENT SCRUBBED CAPACITY - MW        357.0

** FUEL DATA
FUEL TYPE                   COAL
FUEL GRADE                  SUBBITUMINOUS
AVERAGE HEAT CONTENT - J/G      22795.      ( 9800 BTU/Lb)
AVERAGE ASH CONTENT - %        18.00
AVERAGE MOISTURE CONTENT - %    14.82
AVERAGE SULFUR CONTENT - %      .80
AVERAGE CHLORIDE CONTENT - %    .03

** FGD SYSTEM
GENERAL PROCESS TYPE        WET SCRUBBING
PROCESS TYPE                WELLMAN LORD
SYSTEM SUPPLIER              DAVY POWERGAS
NEW/RETROFIT                RETROFIT
ENERGY CONSUMPTION - %        4.6
INITIAL START-UP DATE        8/78
COMMERCIAL START-UP DATE     **/**
SO2 DESIGN REMOVAL EFFICIENCY - %    97.00
PARTICULATE DESIGN REMOVAL EFFICIENCY - %  99.50
ABSORBER SPARE CAPACITY INDEX - %    33.0
ABSORBER SPARE COMPONENTS INDEX      1.0

** WATER LOOP
TYPE                         CLOSED
FRESH MAKE-UP WATER - LITER/S      30.2      ( 480 GPM)

** BYPRODUCT
BYPRODUCT NATURE             ELEMENTAL SULFUR
DISPOSITION                   MARKETED

```

```

-----PERFORMANCE DATA-----
PERIOD  MODULE  AVAILABILITY  OPERABILITY  RELIABILITY  UTILIZATION  % REMOVAL  PER BOILER  FGD  CAP.
              SO2  PART.  HOURS  HOURS  HOURS  HOURS  HOURS  HOURS  FACTOR
-----
1/80  E          92.0        63.0                62.0
      F           .0         .0                 .0
      G           .0         .0                 .0
      H           .0         .0                 .0
      SYSTEM    31.0        21.0                21.0              744    737    155

2/80  E          97.0        66.0                65.0
      F          22.0         2.0                12.0
      G           .0         .0                 .0
      H           .0         .0                 .0
      SYSTEM    40.0        23.0                26.0              696    683    178

3/80  E          87.0         .0                 .0
      F          85.0        94.0                59.0
      G           .0         .0                 .0
      H           .0         .0                 .0
      SYSTEM    57.0        31.0                20.0              744    472    147

```

** 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 REHEAT IS INSTALLED, WHICH IS EXPECTED TO BE COMPLETED IN APRIL.

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
 GROSS UNIT GENERATING CAPACITY - MW 534.0
 NET UNIT GENERATING CAPACITY W/FGD - MW 468.0
 EQUIVALENT SCRUBBED CAPACITY - MW 534.0

**** FUEL DATA**
 FUEL TYPE COAL
 FUEL GRADE SUBBITUMINOUS
 AVERAGE HEAT CONTENT - J/G 15841. (8100 BTU/LB)
 AVERAGE ASH CONTENT - % 22.45
 AVERAGE MOISTURE CONTENT - % 14.82
 AVERAGE SULFUR CONTENT - % .80
 AVERAGE CHLORIDE CONTENT - % .07

**** FGD SYSTEM**
 GENERAL PROCESS TYPE WET SCRUBBING
 PROCESS TYPE WELLMAN LORD
 SYSTEM SUPPLIER DAVY POWERGAS
 NEW/RETROFIT NEW
 ENERGY CONSUMPTION - % 3.6
 INITIAL START-UP DATE 12/79
 COMMERCIAL START-UP DATE **/**
 SO2 DESIGN REMOVAL EFFICIENCY - % 90.00
 PARTICULATE DESIGN REMOVAL EFFICIENCY - % 99.50
 ABSORBER SPARE CAPACITY INDEX - % 2.5
 ABSORBER SPARE COMPONENTS INDEX 1.0

**** BYPRODUCT**
 BYPRODUCT NATURE SULFURIC ACID
 DISPOSITION MARKETING

PERFORMANCE DATA									
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART. HOURS	PER BOILER HOURS	FGD CAP. HOURS FACTOR
1/80	M SYSTEM	86.0	54.0		42.0		744	568	
2/80	M SYSTEM	98.0	14.0		1.0		696	44	
3/80	M SYSTEM		80.0		63.0		744	547	

**** PROBLEMS/SOLUTIONS/COMMENTS**

THE ONE MODULE CURRENTLY OPERATIONAL AT SAN JUAN 3 OPERATED WITHOUT ANY MAJOR PROBLEMS DURING THE FIRST QUARTER. THE BOILER WAS OFF LINE FOR 3-4 WEEKS IN FEBRUARY DUE TO AN ELECTRICAL PROBLEM.

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
GROSS UNIT GENERATING CAPACITY - MW      350.0
NET UNIT GENERATING CAPACITY W/FGD - MW   350.0
EQUIVALENT SCRUBBED CAPACITY - MW        280.0

```

```

** FUEL DATA
  FUEL TYPE           COAL
  FUEL GRADE          SUBBITUMINOUS
  AVERAGE HEAT CONTENT - Btu/lb          19306.    ( 8300 Btu/lb)
  AVERAGE ASH CONTENT - %                25.00
  AVERAGE MOISTURE CONTENT - %            16.00
  AVERAGE SULFUR CONTENT - %              1.00
  AVERAGE CHLORIDE CONTENT - %            *****

```

```

** FGD SYSTEM
  GENERAL PROCESS TYPE      WET SCRUBBING
  PROCESS TYPE              LIMESTONE
  SYSTEM SUPPLIER           PULLMAN KELLOGG
  NEW/RETROFIT              NEW
  ENERGY CONSUMPTION - %    4.3
  INITIAL START-UP DATE     11/79
  COMMERCIAL START-UP DATE  12/79
  SO2 DESIGN REMOVAL EFFICIENCY - %      82.50
  PARTICULATE DESIGN REMOVAL EFFICIENCY - % 99.87
  ABSORBER SPARE CAPACITY INDEX - %      .0
  ABSORBER SPARE COMPONENTS INDEX        .0

```

```

** WATER LOOP
  TYPE                      OPEN
  FRESH MAKE-UP WATER - LITER/S      17.0    ( 270 GPM)

```

```

** DISPOSAL
  TYPE                      LINED POND

```

```

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

```

```

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

```

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE PERIOD THE STACK EMISSION TESTS WERE COMPLETED. NO OPERATIONAL INFORMATION WAS AVAILABLE.

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
GROSS UNIT GENERATING CAPACITY - MW	280.0
NET UNIT GENERATING CAPACITY W/FGD - MW	258.0
EQUIVALENT SCRUBBED CAPACITY - MW	140.0

** FUEL DATA	
FUEL TYPE	COAL
FUEL GRADE	BITUMINOUS
AVERAGE HEAT CONTENT - J/G	26749. (11500 BTU/LB)
AVERAGE ASH CONTENT - %	13.50
AVERAGE MOISTURE CONTENT - %	*****
AVERAGE SULFUR CONTENT - %	1.70
AVERAGE CHLORIDE CONTENT - %	*****

** FGD SYSTEM	
GENERAL PROCESS TYPE	WET SCRUBBING
PROCESS TYPE	LIMESTONE
SYSTEM SUPPLIER	BABCOCK & WILCOX
NEW/RETROFIT	NEW
ENERGY CONSUMPTION - %	1.1
INITIAL START-UP DATE	7/77
COMMERCIAL START-UP DATE	**/**
SO2 DESIGN REMOVAL EFFICIENCY - %	69.00
PARTICULATE DESIGN REMOVAL EFFICIENCY - %	99.40
ABSORBER SPARE CAPACITY INDEX - %	.0
ABSORBER SPARE COMPONENTS INDEX	.0

** WATER LOOP	
TYPE	OPEN
FRESH MAKE-UP WATER - LITER/S	6.3 (100 GPM)

** DISPOSAL	
TYPE	POND

-----PERFORMANCE DATA-----

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

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

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE FIRST QUARTER 1980 THE UNIT OPERATED WITH NO MAJOR PROBLEMS.

SECTION 3

DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

```

-----
COMPANY NAME                SOUTH MISSISSIPPI ELEC PWR
PLANT NAME                  R.D. MORROW
UNIT NUMBER                 1
CITY                        HATTISBURG
STATE                       MISSISSIPPI
GROSS UNIT GENERATING CAPACITY - MW      200.0
NET UNIT GENERATING CAPACITY W/FGD - MW   180.0
EQUIVALENT SCRUBBED CAPACITY - MW        124.0

** FUEL DATA
FUEL TYPE                   COAL
FUEL GRADE                  BITUMINOUS
AVERAGE HEAT CONTENT - J/G      27912.      ( 12000 BTU/LB)
AVERAGE ASH CONTENT - %        15.00
AVERAGE MOISTURE CONTENT - %    6.50
AVERAGE SULFUR CONTENT - %     1.30
AVERAGE CHLORIDE CONTENT - %    .01

** FGD SYSTEM
GENERAL PROCESS TYPE        WET SCRUBBING
PROCESS TYPE                LIMESTONE
SYSTEM SUPPLIER             RILEY STOKER/ENVIRONEERING
NEW/RETROFIT               NEW
ENERGY CONSUMPTION - %       5.5
INITIAL START-UP DATE       8/78
COMMERCIAL START-UP DATE    8/78
SO2 DESIGN REMOVAL EFFICIENCY - %      85.00
PARTICULATE DESIGN REMOVAL EFFICIENCY - % 99.60
ABSORBER SPARE CAPACITY INDEX - %      .0
ABSORBER SPARE COMPONENTS INDEX        .0

** WATER LOOP
TYPE                        CLOSED
FRESH MAKE-UP WATER - LITER/S  *****      (***** GPM)

** TREATMENT
TYPE                        FLYASH STABILIZATION

** DISPOSAL
TYPE                        LANDFILL

```

```

-----PERFORMANCE DATA-----
PERIOD  MODULE  AVAILABILITY  OPERABILITY  RELIABILITY  UTILIZATION  % REMOVAL  PER BOILER  FGD  CAP.
          SO2  PART.  HOURS  HOURS  HOURS  HOURS  HOURS  HOURS  FACTOR
-----
1/80  SYSTEM      .0              .0              .0              740      0      0

```

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT REMAINED OFF LINE DURING JANUARY DUE TO THE FAILURE OF THE LININGS.

2/80 SYSTEM 696

3/80 SYSTEM 744

** PROBLEMS/SOLUTIONS/COMMENTS

NO INFORMATION WAS AVAILABLE FOR FEBRUARY AND MARCH.

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	SOUTH MISSISSIPPI ELEC PWR	
PLANT NAME	R.D. MORROW	
UNIT NUMBER	2	
CITY	HATTISBURG	
STATE	MISSISSIPPI	
GROSS UNIT GENERATING CAPACITY - MW	200.0	
NET UNIT GENERATING CAPACITY W/FGD - MW	180.0	
EQUIVALENT SCRUBBED CAPACITY - MW	124.0	
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	BITUMINOUS	
AVERAGE HEAT CONTENT - J/G	27912.	(12000 BTU/LB)
AVERAGE ASH CONTENT - %	15.00	
AVERAGE MOISTURE CONTENT - %	6.50	
AVERAGE SULFUR CONTENT - %	1.30	
AVERAGE CHLORIDE CONTENT - %	.01	
** FGD SYSTEM		
GENERAL PROCESS TYPE	WET SCRUBBING	
PROCESS TYPE	LIMESTONE	
SYSTEM SUPPLIER	RILEY STOKER/ENVIRONEERING	
NEW/RETROFIT	NEW	
ENERGY CONSUMPTION - %	5.5	
INITIAL START-UP DATE	6/79	
COMMERCIAL START-UP DATE	6/79	
SO2 DESIGN REMOVAL EFFICIENCY - %	85.00	
PARTICULATE DESIGN REMOVAL EFFICIENCY - %	99.60	
ABSORBER SPARE COMPONENTS INDEX	.0	
** WATER LOOP		
TYPE	CLOSED	
FRESH MAKE-UP WATER - LITER/S	*****	(***** GPM)
** TREATMENT		
TYPE	FLYASH STABILIZATION	
** DISPOSAL		
TYPE	LANDFILL	

-----PERFORMANCE DATA-----										
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER BOILER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
1/80	SYSTEM	.0		.0	.0		744	698	0	
** PROBLEMS/SOLUTIONS/COMMENTS										
THE UNIT REMAINED OFF LINE DURING JANUARY DUE TO THE FAILURE OF THE LININGS.										
2/80	SYSTEM						696			
3/80	SYSTEM						744			
** PROBLEMS/SOLUTIONS/COMMENTS										
NO INFORMATION WAS AVAILABLE FOR FEBRUARY AND MARCH.										

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
GROSS UNIT GENERATING CAPACITY - MW      184.0
NET UNIT GENERATING CAPACITY W/FGD - MW   160.0
EQUIVALENT SCRUBBED CAPACITY - MW        184.0

** FUEL DATA
FUEL TYPE                   COAL/REFUSE
FUEL GRADE                  *****
AVERAGE HEAT CONTENT - J/G      20934.      ( 9000 BTU/LB)
AVERAGE ASH CONTENT - %        16.00
AVERAGE MOISTURE CONTENT - %    10.00
AVERAGE SULFUR CONTENT - %      3.50
AVERAGE CHLORIDE CONTENT - %    .10

** FGD SYSTEM
GENERAL PROCESS TYPE         WET SCRUBBING
PROCESS TYPE                 LIMESTONE
SYSTEM SUPPLIER              BABCOCK & WILCOX
NEW/RETROFIT                 NEW
ENERGY CONSUMPTION - %       *****
INITIAL START-UP DATE        5/79
COMMERCIAL START-UP DATE     5/79
SO2 DESIGN REMOVAL EFFICIENCY - %      89.40
PARTICULATE DESIGN REMOVAL EFFICIENCY - % 99.60
ABSORBER SPARE CAPACITY INDEX - %      *****
ABSORBER SPARE COMPONENTS INDEX        *****

** WATER LOG
TYPE                         OPEN
FRESH MAKE-UP WATER - LITER/S      *****      (***** GPM)

** TREATMENT
TYPE                          FLYASH STABILIZATION

** DISPOSAL
TYPE                          LANDFILL

```

```

-----PERFORMANCE DATA-----
PERIOD  MODULE  AVAILABILITY  OPERABILITY  RELIABILITY  UTILIZATION  % REMOVAL  PER BOILER  FGD  CAP.
-----  -----  -----  -----  -----  -----  SO2  PART.  HOURS  HOURS  HOURS  FACTOR
-----  -----  -----  -----  -----  -----  ---  ---  ---  ---  ---  ---
10/79  SYSTEM                .0                744      0      0
11/79  SYSTEM          100.0            26.7            720    192    192
12/79  SYSTEM          100.0            71.0            744    528    528

```

** 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 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

```

EPA UTILITY FGD SURVEY: JANUARY - MARCH 1980
SOUTHERN ILLINOIS POWER COOP: MARION 4 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JANUARY THE LOW BOILER AND SCRUBBER HOURS WERE A RESULT OF AN EIGHTEEN 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 1980 WAS KEEPING THE BELT IN THE SLUDGE DISPOSAL SYSTEM PROPERLY ALIGNED.

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
GROSS UNIT GENERATING CAPACITY - MW	265.0
NET UNIT GENERATING CAPACITY W/FGD - MW	250.0
EQUIVALENT SCRUBBED CAPACITY - MW	265.0

** FUEL DATA

FUEL TYPE	COAL
FUEL GRADE	BITUMINOUS
AVERAGE HEAT CONTENT - J/G	25819. (11100 BTU/LB)
AVERAGE ASH CONTENT - %	9.40
AVERAGE MOISTURE CONTENT - %	13.30
AVERAGE SULFUR CONTENT - %	3.35
AVERAGE CHLORIDE CONTENT - %	.05

** FGD SYSTEM

GENERAL PROCESS TYPE	WET SCRUBBING
PROCESS TYPE	DUAL ALKALI
SYSTEM SUPPLIER	FMC
NEW/RETROFIT	NEW
ENERGY CONSUMPTION - %	.8
INITIAL START-UP DATE	4/79
COMMERCIAL START-UP DATE	4/79
SO2 DESIGN REMOVAL EFFICIENCY - %	85.00
PARTICULATE DESIGN REMOVAL EFFICIENCY - %	99.50
ABSORBER SPARE CAPACITY INDEX - %	20.0
ABSORBER SPARE COMPONENTS INDEX	.3

** WATER LOOP

TYPE	CLOSED
FRESH MAKE-UP WATER - LITER/S	***** (***** GPM)

** TREATMENT

TYPE	NONE
------	------

** DISPOSAL

TYPE	LANDFILL
------	----------

-----PERFORMANCE DATA-----

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

1/80	A	99.0	96.5		96.5					
	B	99.0	99.0		99.0					
	SYSTEM	99.0	98.0	98.0	98.0		744	744	727	

** PROBLEMS/SOLUTIONS/COMMENTS

THE 7 HOURS OF FORCED OUTAGE TIME DURING JANUARY WERE DUE TO A THICKENER RAKE STALL.

2/80	A	99.1	70.3		69.4					
	B	98.4	70.0		68.7					
	SYSTEM	99.0	70.0	70.0	69.0		696	687	481	

** PROBLEMS/SOLUTIONS/COMMENTS

SOME OUTAGE TIME IN FEBRUARY WAS DUE TO A WET SLUDGE PRODUCT CAUSED BY A CHEMICAL IMBALANCE.

3/80	A	43.8	44.4		26.5					
	B	38.4	35.4		21.1					
	SYSTEM	45.0	65.0	68.0	27.0		744	304	177	

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

** PROBLEMS/SOLUTIONS/COMMENTS

DURING MARCH, DOWN TIME WAS DUE TO A SCHEDULED UNIT OUTAGE, DURING WHICH
TIME MAINTENANCE WAS PERFORMED ON THE SCRUBBER.

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
GROSS UNIT GENERATING CAPACITY - MW	194.0
NET UNIT GENERATING CAPACITY W/FGD - MW	173.0
EQUIVALENT SCRUBBED CAPACITY - MW	194.0

** FUEL DATA

FUEL TYPE	COAL
FUEL GRADE	BITUMINOUS
AVERAGE HEAT CONTENT - J/B	29075. (12500 BTU/LB)
AVERAGE ASH CONTENT - %	13.00
AVERAGE MOISTURE CONTENT - %	*****
AVERAGE SULFUR CONTENT - %	3.50
AVERAGE CHLORIDE CONTENT - %	.30

** FGD SYSTEM

GENERAL PROCESS TYPE	WET SCRUBBING
PROCESS TYPE	LIMESTONE
SYSTEM SUPPLIER	AIR CORRECTION DIVISION, UOP
NEW/RETROFIT	NEW
ENERGY CONSUMPTION - %	4.6
INITIAL START-UP DATE	4/77
COMMERCIAL START-UP DATE	**/**
SO2 DESIGN REMOVAL EFFICIENCY - %	80.00
PARTICULATE DESIGN REMOVAL EFFICIENCY - %	99.70
ABSORBER SPARE CAPACITY INDEX - %	.0
ABSORBER SPARE COMPONENTS INDEX	.0

** WATER LOOP

TYPE	CLOSED
FRESH MAKE-UP WATER - LITER/S	19.8 (315 GPM)

** DISPOSAL

TYPE	LANDFILL
------	----------

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

1/80	S-1	24.4	38.6	47.9	36.3					
	S-2	68.7	72.5	73.0	68.0					
	SYSTEM	61.5	55.6	61.5	52.2		744	698	388	

** PROBLEMS/SOLUTIONS/COMMENTS

AT THE BEGINNING OF JANUARY THE ID FAN EXPANSION JOINT BROKE FOLLOWED BY THE UNIT COMING OFF LINE.

DURING THE LATER PART OF THIS PERIOD THE DEMISTER AND TRAP OUT TRAY HEADER FROZE. AFTER REPAIRS WERE MADE BOTH MODULES WERE PUT ON LINE. BOTH WERE KEPT RUNNING UNTIL THE 20TH WHEN A FLANGE BROKE LOOSE ON THE DEMISTER HEADER.

AFTER THE REPAIRS WERE COMPLETED THE MODULE OPERATED UNTIL THE 27TH WHEN FREEZING AIR LINES TO THE BALL MILLS PREVENTED THE USE OF BOTH MODULES DUE TO THE LACK OF SLURRY.

THE UNIT WAS ON LINE AT THE BEGINNING OF THE MONTH BUT DEVELOPED PRESATURATION 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	36.6	29.1	29.0	29.0					
	S-2	73.9	71.7	71.6	71.6					
	SYSTEM	55.3	50.4	50.4	50.3		696	695	350	

EPA UTILITY FGD SURVEY: JANUARY - MARCH 1980
 SPRINGFIELD CITY UTILITIES: SOUTHWEST 1 (CONT.)

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

** 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	64.1	64.1					
	S-2	22.0	5.8	5.8	5.8					
	SYSTEM	43.3	34.9	34.9	34.9		744	744	260	

** 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 DEMISTERS FOR NEARLY ALL THE PERIOD BUT WAS AVAILABLE ON THE 25TH. IT WAS NOT RUN, HOWEVER, DUE TO LOW UNIT LOADS.

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
GROSS UNIT GENERATING CAPACITY - MW      60.0
NET UNIT GENERATING CAPACITY W/FGD - MW   60.0
EQUIVALENT SCRUBBED CAPACITY - MW        60.0

** FUEL DATA
  FUEL TYPE                  COAL
  FUEL GRADE                 BITUMINOUS
  AVERAGE HEAT CONTENT - J/G      29075.      ( 12500 BTU/LB)
  AVERAGE ASH CONTENT - %         11.50
  AVERAGE MOISTURE CONTENT - %    *****
  AVERAGE SULFUR CONTENT - %      2.00
  AVERAGE CHLORIDE CONTENT - %    .20

** FGD SYSTEM
  GENERAL PROCESS TYPE        WET SCRUBBING
  PROCESS TYPE                CITRATE
  SYSTEM SUPPLIER             BUREAU OF MINES
  NEW/RETROFIT                RETROFIT
  ENERGY CONSUMPTION - %      *****
  INITIAL START-UP DATE       11/79
  COMMERCIAL START-UP DATE    1/80
  SO2 DESIGN REMOVAL EFFICIENCY - %      90.00
  PARTICULATE DESIGN REMOVAL EFFICIENCY - %  99.60
  ABSORBER SPARE CAPACITY INDEX - %      .0
  ABSORBER SPARE COMPONENTS INDEX      .0

** WATER LOOP
  TYPE                        CLOSED
  FRESH MAKE-UP WATER - LITER/S    *****      (***** GPM)

** BYPRODUCT
  BYPRODUCT NATURE            ELEMENTAL SULFUR
  DISPOSITION

```

```

-----PERFORMANCE DATA-----
PERIOD  MODULE  AVAILABILITY  OPERABILITY  RELIABILITY  UTILIZATION  % REMOVAL  PER  BOILER  FGD  CAP.
              100%          100%          100%          100%          SO2  PART.  HOURS  HOURS  HOURS  FACTOR
-----  -----  -----  -----  -----  -----  -----  -----  -----  -----  -----
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 SULFITE GENERATOR EQUIPMENT. ANOTHER MAJOR PROBLEM AREA HAS BEEN THE HEAT EXCHANGERS, ONE OF WHICH HAD TO BE REMOVED AND SENT BACK. 120 HOURS OF OPERATION WERE LOGGED DURING THE FIRST QUARTER 1980 BRINGING THE TOTAL SYSTEM HOURS OF OPERATION TO 164.

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

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-----
COMPANY NAME      TENNESSEE VALLEY AUTHORITY
PLANT NAME        SHAWNEE
UNIT NUMBER       10A
CITY              PADUCAH
STATE             KENTUCKY
GROSS UNIT GENERATING CAPACITY - MW      10.0
NET UNIT GENERATING CAPACITY W/FGD - MW   10.0
EQUIVALENT SCRUBBED CAPACITY - MW         10.0

** FUEL DATA
FUEL TYPE         COAL
FUEL GRADE        BITUMINOUS
AVERAGE HEAT CONTENT - J/G      ***** (***** BTU/LB)
AVERAGE ASH CONTENT - %        *****
AVERAGE MOISTURE CONTENT - %    *****
AVERAGE SULFUR CONTENT - %      2.90
AVERAGE CHLORIDE CONTENT - %    *****

** FGD SYSTEM
GENERAL PROCESS TYPE  WET SCRUBBING
PROCESS TYPE         LIME/LIMESTONE
SYSTEM SUPPLIER       AIR CORRECTION DIVISION, UOP
NEW/RETROFIT         RETROFIT
ENERGY CONSUMPTION - % *****
INITIAL START-UP DATE  4/72
COMMERCIAL START-UP DATE **/**
SO2 DESIGN REMOVAL EFFICIENCY - % *****
PARTICULATE DESIGN REMOVAL EFFICIENCY - % *****
ABSORBER SPARE COMPONENTS INDEX      .0

** WATER LOOP
TYPE                CLOSED
FRESH MAKE-UP WATER - LITER/S        ***** (***** GPM)
  
```

```

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

3/80 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	
GROSS UNIT GENERATING CAPACITY - MW	10.0	
NET UNIT GENERATING CAPACITY W/FGD - MW	10.0	
EQUIVALENT SCRUBBED CAPACITY - MW	10.0	
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	BITUMINOUS	
AVERAGE HEAT CONTENT - J/G	*****	(***** BTU/LB)
AVERAGE ASH CONTENT - %	*****	
AVERAGE MOISTURE CONTENT - %	*****	
AVERAGE SULFUR CONTENT - %	2.90	
AVERAGE CHLORIDE CONTENT - %	*****	
** FGD SYSTEM		
GENERAL PROCESS TYPE	WET SCRUBBING	
PROCESS TYPE	LIME/LIMESTONE	
SYSTEM SUPPLIER	CHEMICO	
NEW/RETROFIT	RETROFIT	
ENERGY CONSUMPTION - %	*****	
INITIAL START-UP DATE	4/72	
COMMERCIAL START-UP DATE	**/**	
SO2 DESIGN REMOVAL EFFICIENCY - %	*****	
PARTICULATE DESIGN REMOVAL EFFICIENCY - %	*****	
ABSORBER SPARE COMPONENTS INDEX	.0	
** WATER LOOP		
TYPE	CLOSED	
FRESH MAKE-UP WATER - LITER/S	*****	(***** GPM)

PERFORMANCE DATA										
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
1/80	SYSTEM						744			
2/80	SYSTEM						696			
3/80	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 PERCENT AND 26 PERCENT, 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, 1/6 OF 21 GAL/MCF, AND 8.3 INCHES H2O PRESSURE DROP, SO2 REMOVAL WAS 65 PERCENT WITH 2200 PPM INLET SO2 CONCENTRATION. FORCED OXIDATION USING A SINGLE TANK WITH LIMESTONE/ADIPIC ACID SLURRY ON

PERFORMANCE DATA

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.

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
GROSS UNIT GENERATING CAPACITY - MW      550.0
NET UNIT GENERATING CAPACITY W/FGD - MW   516.0
EQUIVALENT SCRUBBED CAPACITY - MW        550.0

** FUEL DATA
FUEL TYPE         COAL
FUEL GRADE        *****
AVERAGE HEAT CONTENT - J/G      23260.      ( 10000 BTU/LB)
AVERAGE ASH CONTENT - %        25.00
AVERAGE MOISTURE CONTENT - %    10.00
AVERAGE SULFUR CONTENT - %      3.70
AVERAGE CHLORIDE CONTENT - %    *****

** FGD SYSTEM
GENERAL PROCESS TYPE      WET SCRUBBING
PROCESS TYPE              LIMESTONE
SYSTEM SUPPLIER           TENNESSEE VALLEY AUTHORITY
NEW/RETROFIT              RETROFIT
ENERGY CONSUMPTION - %     4.7
INITIAL START-UP DATE     5/77
COMMERCIAL START-UP DATE  1/78
SO2 DESIGN REMOVAL EFFICIENCY - %  80.00
PARTICULATE DESIGN REMOVAL EFFICIENCY - %  99.50
ABSORBER SPARE CAPACITY INDEX - %    .0
ABSORBER SPARE COMPONENTS INDEX      .0

** DISPOSAL
TYPE                    POND
  
```

```

-----PERFORMANCE DATA-----
PERIOD  MODULE  AVAILABILITY  OPERABILITY  RELIABILITY  UTILIZATION  % REMOVAL  PER BOILER  FGD  CAP.
              SO2 PART.  HOURS  HOURS  HOURS  HOURS  HOURS  HOURS  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          54.6          26.9
      SYSTEM     70.6          90.4          44.5      83.60      744    366    331
  
```

** 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.

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2/80  A          80.0          88.6          72.7
      B          86.1          90.2          74.0
      C          90.7          97.5          80.0
      D          87.2          98.2          80.6
      SYSTEM     85.9          93.7          76.5      84.00      696    571    535
  
```

** PROBLEMS/SOLUTIONS/COMMENTS

BY FEBRUARY 27, 1980, THE DIFFERENTIAL PRESSURE ACROSS TRAIN "C" ABSORBER HAD REACHED 19 INCHES WATER GAGE. THE HIGH ABSORBER DIFFERENTIAL PRESSURE WAS CAUSED BY PLUGGAGE OF TURBULENT CONTACT ABSORBER (TCA) SPHERES WHICH WERE INSTALLED DURING SCRUBBER OPTIMIZATION TESTS. THE TCA SPHERES WILL BE REMOVED IN MARCH.

```

3/80  A          93.5          88.0          85.3
  
```

-----PERFORMANCE DATA-----										
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PER PART. HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	B	93.0	90.6		87.9					
	C	71.9	73.3		71.1					
	D	93.3	63.9		61.9					
	SYSTEM	87.9	78.9		76.6	82.60	744	722	570	

** 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.

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
GROSS UNIT GENERATING CAPACITY - MW	793.0
NET UNIT GENERATING CAPACITY W/FGD - MW	750.0
EQUIVALENT SCRUBBED CAPACITY - MW	595.0
** FUEL DATA	
FUEL TYPE	COAL
FUEL GRADE	LIGNITE
AVERAGE HEAT CONTENT - J/G	17166. (7380 BTU/LB)
AVERAGE ASH CONTENT - %	8.00
AVERAGE MOISTURE CONTENT - %	33.00
AVERAGE SULFUR CONTENT - %	.90
AVERAGE CHLORIDE CONTENT - %	*****
** FGD SYSTEM	
GENERAL PROCESS TYPE	WET SCRUBBING
PROCESS TYPE	LIMESTONE
SYSTEM SUPPLIER	RESEARCH COTTRELL
NEW/RETROFIT	NEW
ENERGY CONSUMPTION - %	1.3
INITIAL START-UP DATE	4/77
COMMERCIAL START-UP DATE	10/78
SO2 DESIGN REMOVAL EFFICIENCY - %	71.00
PARTICULATE DESIGN REMOVAL EFFICIENCY - %	99.40
ABSORBER SPARE CAPACITY INDEX - %	.0
ABSORBER SPARE COMPONENTS INDEX	.0
** WATER LOOP	
TYPE	CLOSED
FRESH MAKE-UP WATER - LITER/S	34.6 (550 GPM)
** TREATMENT	
TYPE	FLYASH STABILIZATION
** DISPOSAL	
TYPE	LANDFILL

-----PERFORMANCE DATA-----										
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART. HOURS	PER BOILER HOURS	FGD CAP. HOURS	FAC. FACTOR
1/80	SYSTEM							744		
2/80	SYSTEM							696		
3/80	SYSTEM							744		

** PROBLEMS/SOLUTIONS/COMMENTS

PLUGGING PROBLEMS CONTINUED IN THE FIRST QUARTER 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 THEY HAD BEEN TESTING.

THE FRP STRUCTURAL WORK IS BECOMING A PROBLEM. MUCH OF THE FRP SUPPORT WORK WAS REPLACED WITH STAINLESS STEEL.

THE UTILITY HAS PLANS TO INSTALL A NEW MODULE IN EARLY 1982. THE NEW MODULE HAS BECOME NECESSARY DUE TO THE INCREASE IN THE SULFUR CONTENT OF THE LIGNITE.

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
GROSS UNIT GENERATING CAPACITY - MW	793.0
NET UNIT GENERATING CAPACITY W/FGD - MW	750.0
EQUIVALENT SCRUBBED CAPACITY - MW	595.0
** FUEL DATA	
FUEL TYPE	COAL
FUEL GRADE	LIGNITE
AVERAGE HEAT CONTENT - J/G	17166. (7380 BTU/LB)
AVERAGE ASH CONTENT - %	8.00
AVERAGE MOISTURE CONTENT - %	33.00
AVERAGE SULFUR CONTENT - %	.90
AVERAGE CHLORIDE CONTENT - %	*****
** FGD SYSTEM	
GENERAL PROCESS TYPE	WET SCRUBBING
PROCESS TYPE	LIMESTONE
SYSTEM SUPPLIER	RESEARCH COTTRELL
NEW/RETROFIT	NEW
ENERGY CONSUMPTION - %	1.3
INITIAL START-UP DATE	5/78
COMMERCIAL START-UP DATE	**/**
SO2 DESIGN REMOVAL EFFICIENCY - %	71.00
PARTICULATE DESIGN REMOVAL EFFICIENCY - %	99.40
ABSORBER SPARE CAPACITY INDEX - %	.0
ABSORBER SPARE COMPONENTS INDEX	.0
** WATER LOOP	
TYPE	CLOSED
FRESH MAKE-UP WATER - LITER/S	34.6 (550 GPM)
** TREATMENT	
TYPE	FLYASH STABILIZATION
** DISPOSAL	
TYPE	LANDFILL

PERFORMANCE DATA					
PERIOD	MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION	% REMOVAL SO2 PART.	PER BOILER HOURS	FGD HOURS	CAP. FACTOR
1/80	SYSTEM		744		
2/80	SYSTEM		696		
3/80	SYSTEM		744		

** PROBLEMS/SOLUTIONS/COMMENTS

PLUGGING PROBLEMS CONTINUED IN THE FIRST QUARTER 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 THEY HAD BEEN TESTING.

THE FRP STRUCTURAL WORK IS BECOMING A PROBLEM. MUCH OF THE FRP SUPPORT WORK WAS REPLACED WITH STAINLESS STEEL.

THE UTILITY HAS PLANS TO INSTALL A NEW MODULE IN THE FALL 1982. THE NEW MODULE HAS BECOME NECESSARY DUE TO THE INCREASE IN THE SULFUR CONTENT OF THE LIGNITE.

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
GROSS UNIT GENERATING CAPACITY - MW      793.0
NET UNIT GENERATING CAPACITY W/FGD - MW   750.0
EQUIVALENT SCRUBBED CAPACITY - MW        595.0

** FUEL DATA
FUEL TYPE            COAL
FUEL GRADE           LIGNITE
AVERAGE HEAT CONTENT - J/G      17166.      ( 7380 BTU/LB)
AVERAGE ASH CONTENT - %         8.00
AVERAGE MOISTURE CONTENT - %    33.00
AVERAGE SULFUR CONTENT - %      .90
AVERAGE CHLORIDE CONTENT - %    *****

** FGD SYSTEM
GENERAL PROCESS TYPE  WET SCRUBBING
PROCESS TYPE         LIMESTONE
SYSTEM SUPPLIER       RESEARCH COTTRELL
NEW/RETROFIT         NEW
ENERGY CONSUMPTION - %      1.3
INITIAL START-UP DATE    2/79
COMMERCIAL START-UP DATE  **/**
SO2 DESIGN REMOVAL EFFICIENCY - %  71.00
PARTICULATE DESIGN REMOVAL EFFICIENCY - %  99.40
ABSORBER SPARE CAPACITY INDEX - %    .0
ABSORBER SPARE COMPONENTS INDEX    .0

** TREATMENT
TYPE                 FLYASH STABILIZATION

** DISPOSAL
TYPE                 LANDFILL

```

```

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

```

```

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

```

** PROBLEMS/SOLUTIONS/COMMENTS

PLUGGING PROBLEMS CONTINUED IN THE FIRST QUARTER 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 THEY HAD BEEN TESTING.

THE FRP STRUCTURAL WORK IS BECOMING A PROBLEM. MUCH OF THE FRP SUPPORT WORK WAS REPLACED WITH STAINLESS STEEL.

THE UTILITY HAS PLANS TO INSTALL A NEW MODULE IN EARLY 1983. THE NEW MODULE HAS BECOME NECESSARY DUE TO THE INCREASE IN THE SULFUR CONTENT OF THE LIGNITE.

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
GROSS UNIT GENERATING CAPACITY - MW	800.0
NET UNIT GENERATING CAPACITY W/FGD - MW	750.0
EQUIVALENT SCRUBBED CAPACITY - MW	800.0
** FUEL DATA	
FUEL TYPE	COAL
FUEL GRADE	LIGNITE
AVERAGE HEAT CONTENT - J/G	***** (***** BTU/LB)
AVERAGE ASH CONTENT - %	18.90
AVERAGE MOISTURE CONTENT - %	31.90
AVERAGE SULFUR CONTENT - %	1.50
AVERAGE CHLORIDE CONTENT - %	.04
** FGD SYSTEM	
GENERAL PROCESS TYPE	WET SCRUBBING
PROCESS TYPE	LIMESTONE
SYSTEM SUPPLIER	CHEMICO
NEW/RETROFIT	NEW
ENERGY CONSUMPTION - %	*****
INITIAL START-UP DATE	5/78
COMMERCIAL START-UP DATE	10/78
SO2 DESIGN REMOVAL EFFICIENCY - %	74.00
PARTICULATE DESIGN REMOVAL EFFICIENCY - %	99.50
ABSORBER SPARE CAPACITY INDEX - %	.0
ABSORBER SPARE COMPONENTS INDEX	.0
** WATER LOOP	
TYPE	CLOSED
FRESH MAKE-UP WATER - LITER/S	34.4 (546 GPM)
** TREATMENT	
TYPE	FLYASH STABILIZATION
** DISPOSAL	
TYPE	LANDFILL

-----PERFORMANCE DATA-----									
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL	PER BOILER	FGD	CAP.
						SO2	PART. HOURS	HOURS	FACTOR
1/80	SYSTEM							744	
2/80	SYSTEM							696	
3/80	SYSTEM							744	

** PROBLEMS/SOLUTIONS/COMMENTS

NO PROBLEMS WERE ENCOUNTERED DURING THE FIRST QUARTER OF 1980.

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
GROSS UNIT GENERATING CAPACITY - MW      400.0
NET UNIT GENERATING CAPACITY W/FGD - MW   400.0
EQUIVALENT SCRUBBED CAPACITY - MW        360.0

** FUEL DATA
FUEL TYPE             COAL
FUEL GRADE            BITUMINOUS
AVERAGE HEAT CONTENT - J/G      29075.      ( 12500 BTU/LB)
AVERAGE ASH CONTENT - %        10.00
AVERAGE MOISTURE CONTENT - %    6.50
AVERAGE SULFUR CONTENT - %      .55
AVERAGE CHLORIDE CONTENT - %    *****

** FGD SYSTEM
GENERAL PROCESS TYPE  WET SCRUBBING
PROCESS TYPE         LIME
SYSTEM SUPPLIER       CHEMICO
NEW/RETROFIT          NEW
ENERGY CONSUMPTION - % *****
INITIAL START-UP DATE 5/79
COMMERCIAL START-UP DATE **/**
SO2 DESIGN REMOVAL EFFICIENCY - % 80.00
PARTICULATE DESIGN REMOVAL EFFICIENCY - % 99.50
ABSORBER SPARE COMPONENTS INDEX   .0

** WATER LOOP
TYPE                 OPEN
FRESH MAKE-UP WATER - LITER/S      *****      (***** GPM)

** TREATMENT
TYPE                 FLYASH STABILIZATION

** DISPOSAL
TYPE                 POND
  
```

```

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

```

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

** PROBLEMS/SOLUTIONS/COMMENTS

NO INFORMATION WAS AVAILABLE FOR THE FIRST QUARTER 1980.

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
GROSS UNIT GENERATING CAPACITY - MW      430.0
NET UNIT GENERATING CAPACITY W/FGD - MW   400.0
EQUIVALENT SCRUBBED CAPACITY - MW        366.0

** FUEL DATA
FUEL TYPE                   COAL
FUEL GRADE                 BITUMINOUS
AVERAGE HEAT CONTENT - J/G  29075.      ( 12500 BTU/LB)
AVERAGE ASH CONTENT - %    10.00
AVERAGE MOISTURE CONTENT - % 6.50
AVERAGE SULFUR CONTENT - %  .55
AVERAGE CHLORIDE CONTENT - % *****

** FGD SYSTEM
GENERAL PROCESS TYPE       WET SCRUBBING
PROCESS TYPE               LIME
SYSTEM SUPPLIER            CHEMICO
NEW/RETROFIT              NEW
ENERGY CONSUMPTION - %     1.6
INITIAL START-UP DATE      5/78
COMMERCIAL START-UP DATE   **/**
SO2 DESIGN REMOVAL EFFICIENCY - % 80.00
PARTICULATE DESIGN REMOVAL EFFICIENCY - % 99.50
ABSORBER SPARE CAPACITY INDEX - % 2.5
ABSORBER SPARE COMPONENTS INDEX .0

** WATER LOOP
TYPE                       CLOSED
FRESH MAKE-UP WATER - LITER/S 18.9      ( 300 GPM)

** TREATMENT
TYPE                       FLYASH STABILIZATION

** DISPOSAL
TYPE                       LANDFILL

```

-----PERFORMANCE DATA-----

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
1/80	SYSTEM						744			
2/80	SYSTEM						696			
3/80	SYSTEM						744			

** PROBLEMS/SOLUTIONS/COMMENTS

NO INFORMATION WAS AVAILABLE FOR THE FIRST QUARTER 1980.

SECTION 4
SUMMARY OF FGD SYSTEMS BY COMPANY

COMPANY NAME	TOTAL		OPERATIONAL		CONSTRUCTION		STATUS CONTRACT AWARDED		PLANNED	
	NO.	MW	NO.	MW	NO.	MW	NO.	MW	NO.	MW
ALABAMA ELECTRIC COOP	2	358.	2	358.	0	0.	0	0.	0	0.
ALLEGHENY POWER SYSTEM	3	1338.	1	519.	1	519.	1	300.	0	0.
ARIZONA ELECTRIC POWER COOP	2	390.	2	390.	0	0.	0	0.	0	0.
ARIZONA PUBLIC SERVICE	8	2684.	5	1048.	1	126.	2	1510.	0	0.
ASSOCIATED ELECTRIC COOP	1	670.	0	0.	1	670.	0	0.	0	0.
BASIN ELECTRIC POWER COOP	5	2680.	0	0.	4	2240.	0	0.	1	440.
BIG RIVERS ELECTRIC	4	1364.	1	242.	1	242.	0	0.	2	880.
CENTRAL ILLINOIS LIGHT	2	794.	1	378.	0	0.	0	0.	1	416.
CENTRAL ILLINOIS PUBLIC SERV	1	617.	1	617.	0	0.	0	0.	0	0.
CENTRAL MAINE POWER	1	600.	0	0.	0	0.	0	0.	1	600.
CINCINNATI GAS & ELECTRIC	2	1300.	0	0.	1	650.	0	0.	1	650.
COLORADO UTE ELECTRIC ASSN.	3	1341.	1	447.	1	447.	0	0.	1	447.
COLUMBUS & SOUTHERN OHIO ELEC.	4	1572.	2	822.	0	0.	0	0.	2	750.
COMMONWEALTH EDISON	1	450.	0	0.	1	450.	0	0.	0	0.
COOPERATIVE POWER ASSOCIATION	2	654.	1	327.	1	327.	0	0.	0	0.
DELMARVA POWER & LIGHT	2	730.	0	0.	1	180.	0	0.	1	550.
DESERET GENERATION & TRANS COO	2	820.	0	0.	0	0.	0	0.	2	820.
DUQUESNE LIGHT	2	920.	2	920.	0	0.	0	0.	0	0.
EAST KENTUCKY POWER COOP	3	1800.	0	0.	1	500.	0	0.	2	1300.
GENERAL PUBLIC UTILITIES	5	3475.	0	0.	0	0.	0	0.	5	3475.
GRAND HAVEN BRD OF LIGHT & PWR	1	81.	0	0.	0	0.	1	81.	0	0.
HOOSIER ENERGY	2	882.	0	0.	1	441.	1	441.	0	0.
HOUSTON LIGHTING & POWER CO.	1	492.	0	0.	0	0.	1	492.	0	0.
INDIANAPOLIS POWER & LIGHT	5	3012.	1	532.	1	530.	0	0.	3	1950.
KANSAS CITY POWER & LIGHT	3	1054.	3	1054.	0	0.	0	0.	0	0.
KANSAS POWER & LIGHT	4	1575.	3	1085.	1	490.	0	0.	0	0.
KENTUCKY UTILITIES	1	64.	1	64.	0	0.	0	0.	0	0.
LAKELAND UTILITIES	1	364.	0	0.	1	364.	0	0.	0	0.
LOUISVILLE GAS & ELECTRIC	10	3554.	5	1201.	3	1203.	0	0.	2	1150.
MICHIGAN SO. CENTRAL PWR AGENC	1	55.	0	0.	0	0.	1	55.	0	0.
MIDDLE SOUTH UTILITIES	6	5340.	0	0.	0	0.	0	0.	6	5340.
MINNESOTA POWER & LIGHT	1	475.	0	0.	1	475.	0	0.	0	0.
MINNKOTA POWER COOPERATIVE	1	405.	1	405.	0	0.	0	0.	0	0.
MONTANA POWER	4	2120.	2	720.	2	1400.	0	0.	0	0.
MUSCATINE POWER & WATER	1	160.	0	0.	0	0.	1	160.	0	0.
NEVADA POWER	10	3125.	3	375.	0	0.	0	0.	7	2750.
NEW YORK STATE ELEC & GAS	1	870.	0	0.	0	0.	0	0.	1	870.
NIAGARA MOHAWK POWER COOP	1	100.	0	0.	1	100.	0	0.	0	0.
NORTHERN INDIANA PUB SERVICE	3	957.	1	115.	0	0.	0	0.	2	842.
NORTHERN STATES POWER	4	2450.	2	1480.	1	110.	0	0.	1	860.
OTTER TAIL POWER	1	440.	0	0.	1	440.	0	0.	0	0.
PACIFIC GAS & ELECTRIC	2	1600.	0	0.	0	0.	0	0.	2	1600.
PACIFIC POWER & LIGHT	1	550.	1	550.	0	0.	0	0.	0	0.
PENNSYLVANIA POWER	3	2751.	2	1834.	1	917.	0	0.	0	0.
PHILADELPHIA ELECTRIC	4	844.	1	120.	2	574.	1	150.	0	0.
POTOMAC ELECTRIC POWER	1	800.	0	0.	0	0.	0	0.	1	800.
PUBLIC SERVICE INDIANA	1	650.	0	0.	0	0.	1	650.	0	0.
PUBLIC SERVICE OF NEW MEXICO	4	1779.	3	1245.	1	534.	0	0.	0	0.
PWR AUTHORITY OF STATE OF NY	1	700.	0	0.	0	0.	0	0.	1	700.
SALT RIVER PROJECT	3	840.	1	280.	1	280.	0	0.	1	280.
SAN MIGUEL ELECTRIC COOP	1	400.	0	0.	1	400.	0	0.	0	0.
SEMINOLE ELECTRIC	2	1240.	0	0.	0	0.	2	1240.	0	0.
SIKESTON BOARD OF MUNIC. UTIL.	1	235.	0	0.	1	235.	0	0.	0	0.
SOUTH CAROLINA PUBLIC SERVICE	3	700.	1	140.	1	280.	1	280.	0	0.
SOUTH MISSISSIPPI ELEC PWR	2	248.	2	248.	0	0.	0	0.	0	0.
SOUTHERN ILLINOIS POWER COOP	2	484.	1	184.	0	0.	0	0.	1	300.
SOUTHERN INDIANA GAS & ELEC	1	265.	1	265.	0	0.	0	0.	0	0.
SOUTHWESTERN ELECTRIC POWER	1	720.	0	0.	0	0.	1	720.	0	0.
SPRINGFIELD CITY UTILITIES	1	194.	1	194.	0	0.	0	0.	0	0.
SPRINGFIELD WATER, LIGHT & PWR	1	205.	0	0.	1	205.	0	0.	0	0.
ST. JOE ZINC	1	60.	1	60.	0	0.	0	0.	0	0.
TAMPA ELECTRIC	1	475.	0	0.	0	0.	0	0.	1	475.
TENNESSEE VALLEY AUTHORITY	7	3153.	3	570.	3	1983.	1	600.	0	0.
TEXAS MUNICIPAL POWER AGENCY	1	400.	0	0.	1	400.	0	0.	0	0.
TEXAS POWER & LIGHT	3	1882.	0	0.	1	382.	2	1500.	0	0.

NOTE - PLANNED STATUS INCLUDES LETTER OF INTENT S16 NED, REQUESTING/EVALUTING BIDS, AND CONSIDERING ONLY FGD SYSTEMS

SECTION 4
SUMMARY OF FGD SYSTEMS BY COMPANY

COMPANY NAME	TOTAL		OPERATIONAL		CONSTRUCTION		STATUS CONTRACT AWARDED		PLANNED	
	NO.	MW	NO.	MW	NO.	MW	NO.	MW	NO.	MW
TEXAS UTILITIES	8	5585.	4	2585.	0	0.	1	750.	3	2250.
TUCSON ELECTRIC POWER	2	740.	0	0.	0	0.	2	740.	0	0.
UNITED POWER ASSOCIATION	1	50.	0	0.	0	0.	1	50.	0	0.
UTAH POWER & LIGHT	5	1886.	2	726.	1	360.	2	800.	0	0.
TOTALS	181	81568.	65	22100.	42	18454.	23	10519.	51	30495.

NOTE - PLANNED STATUS INCLUDES LETTER OF INTENT SIG NED, REQUESTING/EVALUTING BIDS,
AND CONSIDERING ONLY FGD SYSTEMS

SECTION 5
SUMMARY OF FGD SYSTEMS BY SYSTEM SUPPLIER

SYSTEM SUPPLIER/PROCESS	TOTAL		STATUS					
			OPERATIONAL		CONSTRUCTION		CONTRACT AWARDED	
	NO.	MW	NO.	MW	NO.	MW	NO.	MW
ADL/COMBUSTION EQUIP ASSOCIATE								
DUAL ALKALI	1	299.	1	299.	0	0.	0	0.
LIME	1	500.	0	0.	1	500.	0	0.
LIME/ALKALINE FLYASH	5	2525.	3	1125.	2	1400.	0	0.
SODIUM CARBONATE	3	375.	3	375.	0	0.	0	0.
TOTAL -	10	3699.	7	1799.	3	1900.	0	0.
AIR CORRECTION DIVISION, UOP								
LIME	2	822.	2	822.	0	0.	0	0.
LIMESTONE	4	1896.	2	726.	1	450.	1	720.
LIME/LIMESTONE	1	10.	1	10.	0	0.	0	0.
SODIUM CARBONATE	1	550.	1	550.	0	0.	0	0.
TOTAL -	8	3278.	6	2108.	1	450.	1	720.
AMERICAN AIR FILTER								
LIME	6	1673.	4	936.	2	737.	0	0.
LIMESTONE	1	280.	0	0.	0	0.	1	280.
TOTAL -	7	1953.	4	936.	2	737.	1	280.
BABCOCK & WILCOX								
LIME	4	1769.	1	519.	2	1169.	1	81.
LIMESTONE	8	2532.	3	1198.	4	1279.	1	55.
LIME/SPRAY DRYING	1	600.	0	0.	1	600.	0	0.
TOTAL -	13	4901.	4	1717.	7	3048.	2	136.
BUELL/ENVIROTECH								
DUAL ALKALI	1	617.	1	617.	0	0.	0	0.
TOTAL -	1	617.	1	617.	0	0.	0	0.
BUREAU OF MINES								
CITRATE	1	60.	1	60.	0	0.	0	0.
TOTAL -	1	60.	1	60.	0	0.	0	0.
CHEMICO								
LIME	8	4140.	6	3480.	1	360.	1	300.
LIMESTONE	8	5000.	1	800.	2	1408.	5	2792.
LIME/ALKALINE FLYASH	3	579.	3	579.	0	0.	0	0.
LIME/LIMESTONE	1	10.	1	10.	0	0.	0	0.
TOTAL -	20	9729.	11	4869.	3	1768.	6	3092.
COMBUSTION ENGINEERING								
LIME	6	1160.	4	452.	2	708.	0	0.
LIMESTONE	7	2932.	3	1085.	4	1847.	0	0.
LIMESTONE/ALKALINE FLYASH	2	1480.	2	1480.	0	0.	0	0.
LIME/ALKALINE FLYASH	2	654.	1	327.	1	327.	0	0.
TOTAL -	17	6226.	10	3344.	7	2882.	0	0.
DAVY MCKEE								
WELLMAN LORD	1	180.	0	0.	1	180.	0	0.
TOTAL -	1	180.	0	0.	1	180.	0	0.
DAVY POWERGAS								
WELLMAN LORD	5	1894.	4	1360.	1	534.	0	0.
TOTAL -	5	1894.	4	1360.	1	534.	0	0.
FMC								
DUAL ALKALI	1	265.	1	265.	0	0.	0	0.
TOTAL -	1	265.	1	265.	0	0.	0	0.
JOY MFG/NIRO ATOMIZER								
LIME/SPRAY DRYING	4	1290.	0	0.	2	550.	2	740.
TOTAL -	4	1290.	0	0.	2	550.	2	740.

SECTION 5
SUMMARY OF FGD SYSTEMS BY SYSTEM SUPPLIER

SYSTEM SUPPLIER/PROCESS	TOTAL		STATUS				CONTRACT	
			OPERATIONAL		CONSTRUCTION		AWARDED	
	NO.	MW	NO.	MW	NO.	MW	NO.	MW
KOHLIN & SANDERSON LIME/SPRAY DRYING	1	50.	0	0.	0	0.	1	50.
TOTAL -	1	50.	0	0.	0	0.	1	50.
MITSUBISHI HEAVY INDUSTRIES LIMESTONE	2	882.	0	0.	1	441.	1	441.
TOTAL -	2	882.	0	0.	1	441.	1	441.
PEABODY PROCESS SYSTEMS LIMESTONE	6	2492.	3	805.	1	447.	2	1240.
LIME/ALKALINE FLYASH	1	475.	0	0.	1	475.	0	0.
TOTAL -	7	2967.	3	805.	2	922.	2	1240.
PULLMAN KELLOGG LIME	1	917.	0	0.	1	917.	0	0.
LIMESTONE	4	1880.	1	280.	2	950.	1	650.
TOTAL -	5	2797.	1	280.	3	1867.	1	650.
RESEARCH COTTRELL LIMESTONE	14	5615.	7	2644.	5	2061.	2	910.
TOTAL -	14	5615.	7	2644.	5	2061.	2	910.
RILEY ENVIRONEERING MAGNESIUM OXIDE	1	600.	0	0.	0	0.	1	600.
TOTAL -	1	600.	0	0.	0	0.	1	600.
RILEY STOKER/ENVIRONEERING LIMESTONE	3	626.	3	626.	0	0.	0	0.
TOTAL -	3	626.	3	626.	0	0.	0	0.
ROCKWELL INTERNATIONAL AQUEOUS CARBONATE	1	100.	0	0.	1	100.	0	0.
TOTAL -	1	100.	0	0.	1	100.	0	0.
TENNESSEE VALLEY AUTHORITY LIMESTONE	1	550.	1	550.	0	0.	0	0.
TOTAL -	1	550.	1	550.	0	0.	0	0.
UNITED ENGINEERS LIME	2	1510.	0	0.	0	0.	2	1510.
MAGNESIUM OXIDE	4	844.	1	120.	2	574.	1	150.
TOTAL -	6	2354.	1	120.	2	574.	3	1660.
WHEELABRATOR-FRYE/R.I. AQUEOUS CARBONATE/SPRAY DRYING	1	440.	0	0.	1	440.	0	0.
TOTAL -	1	440.	0	0.	1	440.	0	0.
TOTAL -	130	51073.	65	22100.	42	18454.	23	10519.

SECTION 6
SUMMARY OF FGD SYSTEMS BY PROCESS

PROCESS	TOTAL		STATUS							
			OPERATIONAL		CONSTRUCTION		CONTRACT AWARDED		PLANNED	
	NO.	MW	NO.	MW	NO.	MW	NO.	MW	NO.	MW
AQUEOUS CARBONATE	1	100.	0	0.	1	100.	0	0.	0	0.
CITRATE	1	60.	1	60.	0	0.	0	0.	0	0.
LIMESTONE	3	1760.	0	0.	0	0.	1	160.	2	1600.
MAGNESIUM OXIDE	5	1444.	1	120.	2	574.	2	750.	0	0.
WELLMAN LORD	6	2074.	4	1360.	2	714.	0	0.	0	0.
SUBTOTAL - SALEABLE PRODUCT	16	5438.	6	1540.	5	1388.	3	910.	2	1600.
AQUEOUS CARBONATE/SPRAY DRYING	1	440.	0	0.	1	440.	0	0.	0	0.
DUAL ALKALI	5	2023.	3	1181.	0	0.	0	0.	2	842.
LIME	34	13871.	17	6209.	9	4391.	4	1891.	4	1380.
LIMESTONE	66	29721.	24	8714.	20	8883.	13	6928.	9	5196.
LIMESTONE/ALKALINE FLYASH	2	1480.	2	1480.	0	0.	0	0.	0	0.
LIME/ALKALINE FLYASH	11	4233.	7	2031.	4	2202.	0	0.	0	0.
LIME/LIMESTONE	2	20.	2	20.	0	0.	0	0.	0	0.
LIME/SPRAY DRYING	8	2827.	0	0.	3	1150.	3	790.	2	887.
PROCESS NOT SELECTED	31	20340.	0	0.	0	0.	0	0.	31	20340.
SODIUM CARBONATE	5	1175.	4	925.	0	0.	0	0.	1	250.
SUBTOTAL - THROWAWAY PRODUCT	165	76130.	59	20560.	37	17066.	20	9609.	49	28895.
TOTALS	181	81568.	65	22100.	42	18454.	23	10519.	51	30495.
SALEABLE % OF TOTAL MW		7		7		8		9		5

SECTION 7
SUMMARY OF OPERATIONAL FGD SYSTEMS BY PROCESS AND UNIT

PROCESS/ UNIT NAME	UNIT NO.	CAPACITY MW	INITIAL STARTUP	COMMERCIAL STARTUP
<hr/>				
CITRATE				
G.F. WEATON	1	60.	11/79	1/80

		60.		
DUAL ALKALI				
A.B. BROWN	1	265.	4/79	4/79
CANE RUN	6	299.	4/79	0/ 0
NEWTON	1	617.	9/79	12/79

		1181.		
LIME				
BRUCE MANSFIELD	1	917.	12/75	6/76
BRUCE MANSFIELD	2	917.	7/77	0/ 0
CANE RUN	4	188.	8/76	8/77
CANE RUN	5	200.	12/77	7/78
CONESVILLE	5	411.	1/77	2/77
CONESVILLE	6	411.	6/78	0/ 0
ELPAMA	1-4	510.	10/75	10/75
GREEN	1	242.	12/79	12/79
GREEN RIVER	1-3	64.	9/75	6/76
HAWTHORN	3	90.	11/72	0/ 0
HAWTHORN	4	90.	8/72	0/ 0
HUNTER	1	360.	5/79	0/ 0
HUNTINGTON	1	366.	5/78	0/ 0
MILL CREEK	3	442.	8/78	3/79
PADDY'S RUN	6	72.	4/73	0/ 0
PHILLIPS	1-6	410.	7/73	0/ 0
PLEASANTS	1	519.	3/79	0/ 0

		6209.		
LIMESTONE				
APACHE	2	195.	8/78	1/79
APACHE	3	195.	6/79	4/79
CHOLLA	1	119.	10/73	12/73
CHOLLA	2	350.	4/78	0/ 0
CORONADO	1	280.	11/79	12/79
CRAIG	2	447.	8/79	6/80
DUCK CREEK	1	378.	7/76	8/78
JEFFREY	1	540.	8/78	0/ 0
LA CYGNE	1	874.	2/73	6/73
LAWRENCE	4	125.	1/76	0/ 0
LAWRENCE	5	420.	11/71	0/ 0
MARION	4	184.	5/79	5/79
MARTIN LAKE	1	595.	4/77	10/78
MARTIN LAKE	2	595.	5/78	0/ 0
MARTIN LAKE	3	595.	2/79	0/ 0
MONTICELLO	3	800.	5/78	10/78
PETERSBURG	3	532.	12/77	12/77
R.D. MORROW	1	124.	8/78	8/78
R.D. MORROW	2	124.	6/79	6/79
SOUTHWEST	1	194.	4/77	0/ 0
TOMBIGBEE	2	179.	9/78	9/78
TOMBIGBEE	3	179.	6/79	6/79
WIDOWS CREEK	2	550.	5/77	1/78
WINTAH	2	140.	7/77	0/ 0

		8714.		
LIMESTONE/ALKALINE FLYASH				
SHERBURNE	1	740.	3/76	5/76
SHERBURNE	2	740.	4/77	4/77

		1480.		

SECTION 7
SUMMARY OF OPERATIONAL FGD SYSTEMS BY PROCESS AND UNIT

PROCESS/ UNIT NAME	UNIT NO.	CAPACITY MW	INITIAL STARTUP	COMMERCIAL STARTUP
LIME/ALKALINE FLYASH				
COAL CREEK	1	327.	8/79	7/ 0
COLSTRIP	1	360.	9/75	11/75
COLSTRIP	2	360.	5/76	10/76
FOUR CORNERS	1	175.	11/79	0/ 0
FOUR CORNERS	2	175.	11/79	0/ 0
FOUR CORNERS	3	229.	11/79	0/ 0
MILTON R. YOUNG	2	405.	9/77	6/78
		2031.		
LIME/LIMESTONE				
SHAWNEE	10A	10.	4/72	0/ 0
SHAWNEE	10B	10.	4/72	0/ 0
		20.		
MAGNESIUM OXIDE				
EDDYSTONE	1A	120.	9/75	9/75
		120.		
SODIUM CARBONATE				
JIM BRIDGER	4	550.	9/79	2/80
REID GARDNER	1	125.	4/74	0/ 0
REID GARDNER	2	125.	4/74	0/ 0
REID GARDNER	3	125.	6/76	7/76
		925.		
WELLMAN LORD				
DEAN H. MITCHELL	11	115.	7/76	6/77
SAN JUAN	1	361.	4/78	0/ 0
SAN JUAN	2	350.	8/78	0/ 0
SAN JUAN	3	534.	12/79	0/ 0
		1360.		
TOTAL		22100.		

SECTION 8
SUMMARY OF END-PRODUCT DISPOSAL PRACTICES FOR OPERATIONAL FGD SYSTEMS

PROCESS/ UNIT NAME	UNIT NO	STABILIZED	UNSTABILIZED	TYPE	BYPRODUCT	DISPOSITION

CITRATE						
G.F. WEATON	1			ELEMENTAL SULFUR		
DUAL ALKALI						
A.B. BROWN	1	LANDFILL				
CANE RUN	6	LANDFILL				
NEWTON	1					
LIME						
BRUCE MANSFIELD	1	LANDFILL				
BRUCE MANSFIELD	2	LANDFILL				
CANE RUN	4	LINED POND				
CANE RUN	5	LINED POND				
CONESVILLE	5	POND				
CONESVILLE	6	POND				
ELRAMA	1-4	LANDFILL				
GREEN	1					
GREEN RIVER	1-3		LINED POND			
HAWTHORN	3	POND				
HAWTHORN	4	POND				
HUNTER	1	POND				
HUNTINGTON	1	LANDFILL				
MILL CREEK	3	POND				
PADDY'S RUN	6	POND				
PHILLIPS	1-6	LANDFILL				
PLEASANTS	1					
LIMESTONE						
APACHE	2		POND			
APACHE	3		POND			
CHOLLA	1		POND			
CHOLLA	2		POND			
CORONADO	1		LINED POND			
CRAIG	2		MINEFILL			TO WASTE
DUCK CREEK	1		LINED POND			
JEFFREY	1	POND				
LA CYGNE	1		UNLINED POND			
LAWRENCE	4	POND				
LAWRENCE	5	POND				
MARION	4	LANDFILL				
MARTIN LAKE	1	LANDFILL				
MARTIN LAKE	2	LANDFILL				
MARTIN LAKE	3	LANDFILL				
MONTICELLO	3	LANDFILL				
PETERSBURG	3	LANDFILL				
R.D. MORROW	1	LANDFILL				
R.D. MORROW	2	LANDFILL				
SOUTHWEST	1	LANDFILL				
TOMBIGBEE	2	LINED POND		CAS03-CAS04		POND
TOMBIGBEE	3	LINED POND		CAS03-CAS04		POND
WIDOWS CREEK	8		POND			
WYVAH	2		POND			
LIMESTONE/ALKALINE FLYASH						
SHERBURNE	1	LINED POND				
SHERBURNE	2	LINED POND				
LIME/ALKALINE FLYASH						
COAL CREEK	1	LINED POND				
COLSTRIP	1		POND			
COLSTRIP	2		POND			
FOUR CORNERS	1					
FOUR CORNERS	2					
FOUR CORNERS	3					
MILTON R. YOUNG	2		MINEFILL			

SECTION 8

SUMMARY OF END-PRODUCT DISPOSAL PRACTICES FOR OPERATIONAL FGD SYSTEMS

PROCESS/ UNIT NAME	UNIT NO	THROWAWAY		BYPRODUCT	
		STABILIZED	UNSTABILIZED	TYPE	DISPOSITION
LIME/LIMESTONE					
SHAWNEE	10A				
SHAWNEE	10B				
MAGNESIUM OXIDE					
EDDYSTONE	1A			SULFURIC ACID	
SODIUM CARBONATE					
JIM BRIDGER	4		POND		
REID GARDNER	1		LINED POND		
REID GARDNER	2		LINED POND		
REID GARDNER	3		LINED POND		
WELLMAN LORD					
DEAN H. MITCHELL	11			ELEMENTAL SULFUR	
SAN JUAN	1			ELEMENTAL SULFUR	MARKETED
SAN JUAN	2			ELEMENTAL SULFUR	MARKETED
SAN JUAN	3			SULFURIC ACID	MARKETED

SECTION 9
SUMMARY OF FGD SYSTEMS IN OPERATION

COMPANY NAME/ UNIT NAME	UNIT NO.	NEW OR RETROFIT	CAPACITY MW	PROCESS/ SYSTEM SUPPLIER	START-UP DATE
ALABAMA ELECTRIC COOP TOMBIGBEE	2	NEW	179.0	LIMESTONE PEABODY PROCESS SYSTEMS	9/78
ALABAMA ELECTRIC COOP TOMBIGBEE	3	NEW	179.0	LIMESTONE PEABODY PROCESS SYSTEMS	6/79
ALLEGHENY POWER SYSTEM PLEASANTS	1	NEW	519.0	LIME PABCOCK & WILCOX	3/79
ARIZONA ELECTRIC POWER COOP APACHE	2	NEW	195.0	LIMESTONE RESEARCH COTTRELL	8/78
ARIZONA ELECTRIC POWER COOP APACHE	3	NEW	195.0	LIMESTONE RESEARCH COTTRELL	6/79
ARIZONA PUBLIC SERVICE CHOLLA	1	RETROFIT	119.0	LIMESTONE RESEARCH COTTRELL	10/73
ARIZONA PUBLIC SERVICE CHOLLA	2	NEW	350.0	LIMESTONE RESEARCH COTTRELL	4/78
ARIZONA PUBLIC SERVICE FOUR CORNERS	1	RETROFIT	175.0	LIME/ALKALINE FLYASH CHEMICO	11/79
ARIZONA PUBLIC SERVICE FOUR CORNERS	2	RETROFIT	175.0	LIME/ALKALINE FLYASH CHEMICO	11/79
ARIZONA PUBLIC SERVICE FOUR CORNERS	3	RETROFIT	229.0	LIME/ALKALINE FLYASH CHEMICO	11/79
BIG RIVERS ELECTRIC GREEN	1	NEW	242.0	LIME AMERICAN AIR FILTER	12/79
CENTRAL ILLINOIS LIGHT DUCK CREEK	1	NEW	378.0	LIMESTONE RILEY STOKER/ENVIRONEERING	7/76
CENTRAL ILLINOIS PUBLIC SERV NEWTON	1	NEW	617.0	DUAL ALKALI BUELL/ENVIROTECH	9/79
COLORADO UTE ELECTRIC ASSN. CRAIG	2	NEW	447.0	LIMESTONE PEABODY PROCESS SYSTEMS	8/79
COLUMBUS & SOUTHERN OHIO ELEC. CONESVILLE	5	NEW	411.0	LIME AIR CORRECTION DIVISION, UOP	1/77
COLUMBUS & SOUTHERN OHIO ELEC. CONESVILLE	6	NEW	411.0	LIME AIR CORRECTION DIVISION, UOP	6/78
COOPERATIVE POWER ASSOCIATION COAL CREEK	1	NEW	327.0	LIME/ALKALINE FLYASH COMBUSTION ENGINEERING	8/79
DUQUESNE LIGHT ELRAMA	1-4	RETROFIT	510.0	LIME CHEMICO	10/75
DUQUESNE LIGHT PHILLIPS	1-6	RETROFIT	410.0	LIME CHEMICO	7/73
INDIANAPOLIS POWER & LIGHT PETERSBURG	3	NEW	532.0	LIMESTONE AIR CORRECTION DIVISION, UOP	12/77
KANSAS CITY POWER & LIGHT HAWTHORN	3	RETROFIT	90.0	LIME COMBUSTION ENGINEERING	11/72
KANSAS CITY POWER & LIGHT HAWTHORN	4	RETROFIT	90.0	LIME COMBUSTION ENGINEERING	8/72
KANSAS CITY POWER & LIGHT LA CYGNE	1	NEW	874.0	LIMESTONE PABCOCK & WILCOX	2/73
KANSAS POWER & LIGHT JEFFREY	1	NEW	540.0	LIMESTONE COMBUSTION ENGINEERING	8/78

SECTION 9
SUMMARY OF FGD SYSTEMS IN OPERATION

COMPANY NAME/ UNIT NAME	UNIT NO.	NEW OR RETROFIT	CAPACITY MW	PROCESS/ SYSTEM SUPPLIER	START-UP DATE
KANSAS POWER & LIGHT LAWRENCE	4	RETROFIT	125.0	LIMESTONE COMBUSTION ENGINEERING	1/76
KANSAS POWER & LIGHT LAWRENCE	5	RETROFIT	420.0	LIMESTONE COMBUSTION ENGINEERING	11/71
KENTUCKY UTILITIES GREEN RIVER	1-3	RETROFIT	64.0	LIME AMERICAN AIR FILTER	9/75
LOUISVILLE GAS & ELECTRIC CANE RUN	4	RETROFIT	188.0	LIME AMERICAN AIR FILTER	8/76
LOUISVILLE GAS & ELECTRIC CANE RUN	5	RETROFIT	200.0	LIME COMBUSTION ENGINEERING	12/77
LOUISVILLE GAS & ELECTRIC CANE RUN	6	RETROFIT	299.0	DUAL ALKALI ADL/COMBUSTION EQUIP ASSOCIATE	4/79
LOUISVILLE GAS & ELECTRIC MILL CREEK	3	NEW	442.0	LIME AMERICAN AIR FILTER	8/78
LOUISVILLE GAS & ELECTRIC PADDY'S RUN	6	RETROFIT	72.0	LIME COMBUSTION ENGINEERING	4/73
MINNKOTA POWER COOPERATIVE MILTON R. YOUNG	2	NEW	405.0	LIME/ALKALINE FLYASH ADL/COMBUSTION EQUIP ASSOCIATE	9/77
MONTANA POWER COLSTRIP	1	NEW	360.0	LIME/ALKALINE FLYASH ADL/COMBUSTION EQUIP ASSOCIATE	9/75
MONTANA POWER COLSTRIP	2	NEW	360.0	LIME/ALKALINE FLYASH ADL/COMBUSTION EQUIP ASSOCIATE	5/76
NEVADA POWER REID GARDNER	1	RETROFIT	125.0	SODIUM CARBONATE ADL/COMBUSTION EQUIP ASSOCIATE	4/74
NEVADA POWER REID GARDNER	2	RETROFIT	125.0	SODIUM CARBONATE ADL/COMBUSTION EQUIP ASSOCIATE	4/74
NEVADA POWER REID GARDNER	3	NEW	125.0	SODIUM CARBONATE ADL/COMBUSTION EQUIP ASSOCIATE	6/76
NORTHERN INDIANA PUB SERVICE DEAN H. MITCHELL	11	RETROFIT	115.0	WELLMAN LORD DAVY POWERGAS	7/76
NORTHERN STATES POWER SHERBURNE	1	NEW	740.0	LIMESTONE/ALKALINE FLYASH COMBUSTION ENGINEERING	3/76
NORTHERN STATES POWER SHERBURNE	2	NEW	740.0	LIMESTONE/ALKALINE FLYASH COMBUSTION ENGINEERING	4/77
PACIFIC POWER & LIGHT JIM BRIDGER	4	NEW	550.0	SODIUM CARBONATE AIR CORRECTION DIVISION, UOP	9/79
PENNSYLVANIA POWER BRUCE MANSFIELD	1	NEW	917.0	LIME CHEMICO	12/75
PENNSYLVANIA POWER BRUCE MANSFIELD	2	NEW	917.0	LIME CHEMICO	7/77
PHILADELPHIA ELECTRIC EDDYSTONE	1A	RETROFIT	120.0	MAGNESIUM OXIDE UNITED ENGINEERS	9/75
PUBLIC SERVICE OF NEW MEXICO SAN JUAN	1	RETROFIT	361.0	WELLMAN LORD DAVY POWERGAS	4/78
PUBLIC SERVICE OF NEW MEXICO SAN JUAN	2	RETROFIT	350.0	WELLMAN LORD DAVY POWERGAS	8/78
PUBLIC SERVICE OF NEW MEXICO SAN JUAN	3	NEW	534.0	WELLMAN LORD DAVY POWERGAS	12/79

SECTION 9
SUMMARY OF FGD SYSTEMS IN OPERATION

COMPANY NAME/ UNIT NAME	UNIT NO.	NEW OR RETROFIT	CAPACITY MW	PROCESS/ SYSTEM SUPPLIER	START-UP DATE
SALT RIVER PROJECT CORONADO	1	NEW	280.0	LIMESTONE PULLMAN KELLOGG	11/79
SOUTH CAROLINA PUBLIC SERVICE WINYAH	2	NEW	140.0	LIMESTONE BABCOCK & WILCOX	7/77
SOUTH MISSISSIPPI ELEC PWR R.D. MORROW	1	NEW	124.0	LIMESTONE RILEY STOKER/ENVIRONEERING	8/78
SOUTH MISSISSIPPI ELEC PWR R.D. MORROW	2	NEW	124.0	LIMESTONE RILEY STOKER/ENVIRONEERING	6/79
SOUTHERN ILLINOIS POWER COOP MARION	4	NEW	184.0	LIMESTONE BABCOCK & WILCOX	5/79
SOUTHERN INDIANA GAS & ELEC A.B. BROWN	1	NEW	265.0	DUAL ALKALI FMC	4/79
SPRINGFIELD CITY UTILITIES SOUTHWEST	1	NEW	194.0	LIMESTONE AIR CORRECTION DIVISION, UOP	4/77
ST. JOE ZINC G.F. WEATON	1	RETROFIT	60.0	CITRATE BUREAU OF MINES	11/79
TENNESSEE VALLEY AUTHORITY SHAWNEE	10A	RETROFIT	10.0	LIME/LIMESTONE AIR CORRECTION DIVISION, UOP	4/72
TENNESSEE VALLEY AUTHORITY SHAWNEE	10B	RETROFIT	10.0	LIME/LIMESTONE CHEMICO	4/72
TENNESSEE VALLEY AUTHORITY WIDOWS CREEK	8	RETROFIT	550.0	LIMESTONE TENNESSEE VALLEY AUTHORITY	5/77
TEXAS UTILITIES MARTIN LAKE	1	NEW	595.0	LIMESTONE RESEARCH COTTRELL	4/77
TEXAS UTILITIES MARTIN LAKE	2	NEW	595.0	LIMESTONE RESEARCH COTTRELL	5/78
TEXAS UTILITIES MARTIN LAKE	3	NEW	595.0	LIMESTONE RESEARCH COTTRELL	2/79
TEXAS UTILITIES MONTICELLO	3	NEW	800.0	LIMESTONE CHEMICO	5/78
UTAH POWER & LIGHT HUNTER	1	NEW	360.0	LIME CHEMICO	5/79
UTAH POWER & LIGHT HUNTINGTON	1	NEW	366.0	LIME CHEMICO	5/78

SECTION 10
SUMMARY OF FGD SYSTEMS UNDER CONSTRUCTION

COMPANY NAME/ UNIT NAME	UNIT NO.	NEW OR RETROFIT	CAPACITY MW	PROCESS/ SYSTEM SUPPLIER	START-UP DATE
ALLEGHENY POWER SYSTEM PLEASANTS	2	NEW	519.0	LIME BABCOCK & WILCOX	9/80
ARIZONA PUBLIC SERVICE CHOLLA	4	NEW	126.0	LIMESTONE RESEARCH COTTRELL	6/80
ASSOCIATED ELECTRIC COOP THOMAS HILL	3	NEW	670.0	LIMESTONE PULLMAN KELLOGG	1/82
BASIN ELECTRIC POWER COOP ANTELOPE VALLEY	1	NEW	440.0	LIME/SPRAY DRYING JOY MFG/NIRO ATOMIZER	4/82
BASIN ELECTRIC POWER COOP LARAMIE RIVER	1	NEW	600.0	LIMESTONE RESEARCH COTTRELL	4/80
BASIN ELECTRIC POWER COOP LARAMIE RIVER	2	NEW	600.0	LIMESTONE RESEARCH COTTRELL	11/80
BASIN ELECTRIC POWER COOP LARAMIE RIVER	3	NEW	600.0	LIME/SPRAY DRYING BABCOCK & WILCOX	4/82
BIG RIVERS ELECTRIC GREEN	2	NEW	242.0	LIME AMERICAN AIR FILTER	11/80
CINCINNATI GAS & ELECTRIC EAST BEND	2	NEW	650.0	LIME BABCOCK & WILCOX	9/80
COLORADO UTE ELECTRIC ASSN. CRAIG	1	NEW	447.0	LIMESTONE PEABODY PROCESS SYSTEMS	4/80
COMMONWEALTH EDISON POWERTON	51	RETROFIT	450.0	LIMESTONE AIR CORRECTION DIVISION, UOP	4/80
COOPERATIVE POWER ASSOCIATION COAL CREEK	2	NEW	327.0	LIME/ALKALINE FLYASH COMBUSTION ENGINEERING	7/80
DELMARVA POWER & LIGHT DELAWARE CITY	1-3	RETROFIT	180.0	WELLMAN LORD DAVY MCKEE	4/80
EAST KENTUCKY POWER COOP SPURLOCK	2	NEW	500.0	LIME ADL/COMBUSTION EQUIP ASSOCIATE	1/81
HOOSIER ENERGY MEROM	2	NEW	441.0	LIMESTONE MITSUBISHI HEAVY INDUSTRIES	7/81
INDIANAPOLIS POWER & LIGHT PETERSBURG	4	NEW	530.0	LIMESTONE RESEARCH COTTRELL	10/84
KANSAS POWER & LIGHT JEFFREY	2	NEW	490.0	LIMESTONE COMBUSTION ENGINEERING	4/80
LAKELAND UTILITIES MCINTOSH	3	NEW	364.0	LIMESTONE BABCOCK & WILCOX	10/81
LOUISVILLE GAS & ELECTRIC MILL CREEK	1	RETROFIT	358.0	LIME COMBUSTION ENGINEERING	4/81
LOUISVILLE GAS & ELECTRIC MILL CREEK	2	RETROFIT	350.0	LIME COMBUSTION ENGINEERING	4/82
LOUISVILLE GAS & ELECTRIC MILL CREEK	4	NEW	495.0	LIME AMERICAN AIR FILTER	7/81
MINNESOTA POWER & LIGHT CLAY BOSWELL	4	NEW	475.0	LIME/ALKALINE FLYASH PEABODY PROCESS SYSTEMS	4/80
MONTANA POWER COLSTRIP	3	NEW	700.0	LIME/ALKALINE FLYASH ADL/COMBUSTION EQUIP ASSOCIATE	1/84
MONTANA POWER COLSTRIP	4	NEW	700.0	LIME/ALKALINE FLYASH ADL/COMBUSTION EQUIP ASSOCIATE	0/84

SECTION 10
SUMMARY OF FGD SYSTEMS UNDER CONSTRUCTION

COMPANY NAME/ UNIT NAME	UNIT NO.	NEW OR RETROFIT	CAPACITY MW	PROCESS / SYSTEM SUPPLIER	START-UP DATE
NIAGARA MOHAWK POWER COOP CHARLES R. HUNTLEY	66	RETROFIT	100.0	AQUEOUS CARBONATE ROCKWELL INTERNATIONAL	4/82
NORTHERN STATES POWER RIVERSIDE	6,7	RETROFIT	110.0	LIME/SPRAY DRYING JOY MFG/NIRO ATOMIZER	7/80
OTTER TAIL POWER COVOTE	1	NEW	440.0	AQUEOUS CARBONATE/SPRAY DRYING WHEELABRATOR-FRYE/R.I.	3/81
PENNSYLVANIA POWER BRUCE MANSFIELD	3	NEW	917.0	LIME PULLMAN KELLOGG	10/80
PHILADELPHIA ELECTRIC EDDYSTONE	1B	RETROFIT	240.0	MAGNESIUM OXIDE UNITED ENGINEERS	12/82
PHILADELPHIA ELECTRIC EDDYSTONE	2	RETROFIT	334.0	MAGNESIUM OXIDE UNITED ENGINEERS	12/82
PUBLIC SERVICE OF NEW MEXICO SAN JUAN	4	NEW	534.0	WELLMAN LORD DAVY POWERGAS	6/82
SALT RIVER PROJECT CORONADO	2	NEW	280.0	LIMESTONE PULLMAN KELLOGG	7/80
SAN MIGUEL ELECTRIC COOP SAN MIGUEL	1	NEW	400.0	LIMESTONE BABCOCK & WILCOX	9/80
SIKESTON BOARD OF MUNIC. UTIL. SIKESTON	1	NEW	235.0	LIMESTONE BABCOCK & WILCOX	1/81
SOUTH CAROLINA PUBLIC SERVICE WINYAH	3	NEW	280.0	LIMESTONE BABCOCK & WILCOX	5/80
SPRINGFIELD WATER, LIGHT & PWR DALLMAN	3	NEW	205.0	LIMESTONE RESEARCH COTTRELL	11/80
TENNESSEE VALLEY AUTHORITY PARADISE	1	RETROFIT	704.0	LIMESTONE CHEMICO	3/82
TENNESSEE VALLEY AUTHORITY PARADISE	2	RETROFIT	704.0	LIMESTONE CHEMICO	6/82
TENNESSEE VALLEY AUTHORITY WIDOWS CREEK	7	RETROFIT	575.0	LIMESTONE COMBUSTION ENGINEERING	9/81
TEXAS MUNICIPAL POWER AGENCY GIBBONS CREEK	1	NEW	400.0	LIMESTONE COMBUSTION ENGINEERING	1/82
TEXAS POWER & LIGHT SANDOW	4	NEW	382.0	LIMESTONE COMBUSTION ENGINEERING	7/80
UTAH POWER & LIGHT HUNTER	2	NEW	360.0	LIME CHEMICO	6/80

SECTION 11
SUMMARY OF CONTRACT AWARDED FGD SYSTEMS

COMPANY NAME/ UNIT NAME	UNIT NO.	NEW OR RETROFIT	CAPACITY MW	PROCESS/ SYSTEM SUPPLIER	START-UP DATE
ALLEGHENY POWER SYSTEM MITCHELL	33	RETROFIT	300.0	LIME CHEMICO	8/82
ARIZONA PUBLIC SERVICE FOUR CORNERS	4	RETROFIT	755.0	LIME UNITED ENGINEERS	0/82
ARIZONA PUBLIC SERVICE FOUR CORNERS	5	RETROFIT	755.0	LIME UNITED ENGINEERS	0/82
GRAND HAVEN BRD OF LIGHT & PWR J. B. SIMS	3	NEW	81.0	LIME BABCOCK & WILCOX	6/83
HOOSIER ENERGY MEROM	1	NEW	441.0	LIMESTONE MITSUBISHI HEAVY INDUSTRIES	5/82
HOUSTON LIGHTING & POWER CO. W.A. PARISH	8	NEW	492.0	LIMESTONE CHEMICO	11/82
MICHIGAN SO. CENTRAL PWR AGENC PROJECT	1	NEW	55.0	LIMESTONE BABCOCK & WILCOX	7/82
MUSCATINE POWER & WATER MUSCATINE	9	NEW	160.0	LIMESTONE RESEARCH COTTRELL	9/82
PHILADELPHIA ELECTRIC CROMBY		RETROFIT	150.0	MAGNESIUM OXIDE UNITED ENGINEERS	12/82
PUBLIC SERVICE INDIANA GIBSON	5	NEW	650.0	LIMESTONE PULLMAN KELLOGG	0/82
SEMINOLE ELECTRIC SEMINOLE	1	NEW	620.0	LIMESTONE PEABODY PROCESS SYSTEMS	3/83
SEMINOLE ELECTRIC SEMINOLE	2	NEW	620.0	LIMESTONE PEABODY PROCESS SYSTEMS	3/85
SOUTH CAROLINA PUBLIC SERVICE WINYAH	4	NEW	280.0	LIMESTONE AMERICAN AIR FILTER	7/81
SOUTHWESTERN ELECTRIC POWER HENRY W. PIRKEY	1	NEW	720.0	LIMESTONE AIR CORRECTION DIVISION, UOP	12/84
TENNESSEE VALLEY AUTHORITY JOHNSONVILLE	1-10	RETROFIT	600.0	MAGNESIUM OXIDE RILEY ENVIRONEERING	12/81
TEXAS POWER & LIGHT TWIN OAKS	1	NEW	750.0	LIMESTONE CHEMICO	8/84
TEXAS POWER & LIGHT TWIN OAKS	2	NEW	750.0	LIMESTONE CHEMICO	8/85
TEXAS UTILITIES MARTIN LAKE	4	NEW	750.0	LIMESTONE RESEARCH COTTRELL	0/85
TUCSON ELECTRIC POWER SPRINGERVILLE	1	NEW	370.0	LIME/SPRAY DRYING JOY MFG/NIRO ATOMIZER	6/85
TUCSON ELECTRIC POWER SPRINGERVILLE	2	NEW	370.0	LIME/SPRAY DRYING JOY MFG/NIRO ATOMIZER	1/87
UNITED POWER ASSOCIATION STANTON	2	NEW	50.0	LIME/SPRAY DRYING KOMLINE & SANDERSON	1/82
UTAH POWER & LIGHT HUNTER	3	NEW	400.0	LIMESTONE CHEMICO	0/83
UTAH POWER & LIGHT HUNTER	4	NEW	400.0	LIMESTONE CHEMICO	0/85

SECTION 12
SUMMARY OF PLANNED FGD SYSTEMS

COMPANY NAME/ UNIT NAME	UNIT NO.	NEW OR RETROFIT	CAPACITY MW	PROCESS/ SYSTEM SUPPLIER	START-UP DATE
LETTER OF INTENT SIGNED					
NORTHERN INDIANA PUB SERVICE SCHAFER	17	NEW	421.0	DUAL ALKALI FMC	6/83
NORTHERN INDIANA PUB SERVICE SCHAFER	18	NEW	421.0	DUAL ALKALI FMC	6/85
REQUESTING/EVALUATING BIDS					
BASIN ELECTRIC POWER COOP ANTELOPE VALLEY	2	NEW	440.0	LIME/SPRAY DRYING VENDOR NOT SELECTED	4/84
CENTRAL ILLINOIS LIGHT DUCK CREEK	2	NEW	416.0	LIMESTONE VENDOR NOT SELECTED	1/86
DESERET GENERATION & TRANS COO MOON LAKE	1	NEW	410.0	LIMESTONE VENDOR NOT SELECTED	12/84
DESERET GENERATION & TRANS COO MOON LAKE	2	NEW	410.0	LIMESTONE VENDOR NOT SELECTED	0/88
MIDDLE SOUTH UTILITIES ARKANSAS COAL	5	NEW	890.0	PROCESS NOT SELECTED VENDOR NOT SELECTED	1/86
MIDDLE SOUTH UTILITIES ARKANSAS COAL	6	NEW	890.0	PROCESS NOT SELECTED VENDOR NOT SELECTED	1/88
MIDDLE SOUTH UTILITIES LOUISIANA COAL	1	NEW	890.0	PROCESS NOT SELECTED VENDOR NOT SELECTED	0/86
MIDDLE SOUTH UTILITIES LOUISIANA COAL	2	NEW	890.0	PROCESS NOT SELECTED VENDOR NOT SELECTED	0/88
MIDDLE SOUTH UTILITIES MISSISSIPPI COAL	1	NEW	890.0	PROCESS NOT SELECTED VENDOR NOT SELECTED	0/85
MIDDLE SOUTH UTILITIES MISSISSIPPI COAL	2	NEW	890.0	PROCESS NOT SELECTED VENDOR NOT SELECTED	0/87
NEVADA POWER REID GARDNER	4	NEW	250.0	SODIUM CARBONATE VENDOR NOT SELECTED	4/83
NEW YORK STATE ELEC & GAS SOMERSET	1	NEW	870.0	LIMESTONE VENDOR NOT SELECTED	6/84
NORTHERN STATES POWER SHERBURNE	3	NEW	860.0	LIMESTONE COMBUSTION ENGINEERING	5/84
TAMPA ELECTRIC BIG BEND	4	NEW	475.0	PROCESS NOT SELECTED VENDOR NOT SELECTED	3/85
TEXAS UTILITIES FOREST GROVE	1	NEW	750.0	PROCESS NOT SELECTED VENDOR NOT SELECTED	0/81
CONSIDERING FGD SYSTEMS					
BIG RIVERS ELECTRIC D. B. WILSON	1	NEW	440.0	LIME VENDOR NOT SELECTED	0/84
BIG RIVERS ELECTRIC D. B. WILSON	2	NEW	440.0	LIME VENDOR NOT SELECTED	0/85
CENTRAL MAINE POWER SEARS ISLAND	1	NEW	600.0	PROCESS NOT SELECTED VENDOR NOT SELECTED	1/89
CINCINNATI GAS & ELECTRIC EAST BEND	1	NEW	650.0	PROCESS NOT SELECTED VENDOR NOT SELECTED	0/ 0
COLORADO UTE ELECTRIC ASSN. CRAIG	3	NEW	447.0	LIME/SPRAY DRYING VENDOR NOT SELECTED	0/82

SECTION 12
SUMMARY OF PLANNED FGD SYSTEMS

COMPANY NAME/ UNIT NAME	UNIT NO.	NEW OR RETROFIT	CAPACITY MW	PROCESS/ SYSTEM SUPPLIER	START-UP DATE
COLUMBUS & SOUTHERN OHIO ELEC. POSTON	5	NEW	375.0	PROCESS NOT SELECTED VENDOR NOT SELECTED	8/86
COLUMBUS & SOUTHERN OHIO ELEC. POSTON	6	NEW	375.0	PROCESS NOT SELECTED VENDOR NOT SELECTED	0/89
DELMARVA POWER & LIGHT VIENNA	9	NEW	550.0	PROCESS NOT SELECTED VENDOR NOT SELECTED	6/87
EAST KENTUCKY POWER COOP J. K. SMITH	1	NEW	650.0	PROCESS NOT SELECTED VENDOR NOT SELECTED	1/85
EAST KENTUCKY POWER COOP J. K. SMITH	2	NEW	650.0	PROCESS NOT SELECTED VENDOR NOT SELECTED	1/87
GENERAL PUBLIC UTILITIES COMO	1	NEW	800.0	PROCESS NOT SELECTED VENDOR NOT SELECTED	12/88
GENERAL PUBLIC UTILITIES GILBERT	1	NEW	625.0	PROCESS NOT SELECTED VENDOR NOT SELECTED	7/90
GENERAL PUBLIC UTILITIES SCOTTSVILLE	1	NEW	625.0	PROCESS NOT SELECTED VENDOR NOT SELECTED	0/91
GENERAL PUBLIC UTILITIES SEWARD	7	NEW	800.0	PROCESS NOT SELECTED VENDOR NOT SELECTED	5/87
GENERAL PUBLIC UTILITIES WEHRUM	1	NEW	625.0	PROCESS NOT SELECTED VENDOR NOT SELECTED	0/95
INDIANAPOLIS POWER & LIGHT PATRIOT	1	NEW	650.0	LIMESTONE VENDOR NOT SELECTED	0/87
INDIANAPOLIS POWER & LIGHT PATRIOT	2	NEW	650.0	LIMESTONE VENDOR NOT SELECTED	0/87
INDIANAPOLIS POWER & LIGHT PATRIOT	3	NEW	650.0	LIMESTONE VENDOR NOT SELECTED	0/87
LOUISVILLE GAS & ELECTRIC TRIMBLE COUNTY	1	NEW	575.0	PROCESS NOT SELECTED VENDOR NOT SELECTED	7/84
LOUISVILLE GAS & ELECTRIC TRIMBLE COUNTY	2	NEW	575.0	PROCESS NOT SELECTED VENDOR NOT SELECTED	7/86
NEVADA POWER HARRY ALLEN	1	NEW	500.0	PROCESS NOT SELECTED VENDOR NOT SELECTED	6/86
NEVADA POWER HARRY ALLEN	2	NEW	500.0	PROCESS NOT SELECTED VENDOR NOT SELECTED	6/87
NEVADA POWER HARRY ALLEN	3	NEW	500.0	PROCESS NOT SELECTED VENDOR NOT SELECTED	6/88
NEVADA POWER HARRY ALLEN	4	NEW	500.0	PROCESS NOT SELECTED VENDOR NOT SELECTED	6/89
NEVADA POWER WARNER VALLEY	1	NEW	250.0	LIME VENDOR NOT SELECTED	6/85
NEVADA POWER WARNER VALLEY	2	NEW	250.0	LIME VENDOR NOT SELECTED	6/86
PACIFIC GAS & ELECTRIC MONTEZUMA	1	NEW	800.0	LIMESTONE VENDOR NOT SELECTED	6/87
PACIFIC GAS & ELECTRIC MONTEZUMA	2	NEW	800.0	LIMESTONE VENDOR NOT SELECTED	6/88
POTOMAC ELECTRIC POWER DICKERSON	4	NEW	800.0	PROCESS NOT SELECTED VENDOR NOT SELECTED	5/87

SECTION 12
SUMMARY OF PLANNED FGD SYSTEMS

COMPANY NAME/ UNIT NAME	UNIT NO.	NEW OR RETROFIT	CAPACITY MW	PROCESS/ SYSTEM SUPPLIER	START-UP DATE
PWR AUTHORITY OF STATE OF NY FOSSIL		NEW	700.0	PROCESS NOT SELECTED VENDOR NOT SELECTED	11/87
SALT RIVER PROJECT CORONADO	3	NEW	280.0	LIMESTONE VENDOR NOT SELECTED	6/87
SOUTHERN ILLINOIS POWER COOP MARION	5	NEW	300.0	PROCESS NOT SELECTED VENDOR NOT SELECTED	0/86
TEXAS UTILITIES MILL CREEK	1	NEW	750.0	PROCESS NOT SELECTED VENDOR NOT SELECTED	0/85
TEXAS UTILITIES MILL CREEK	2	NEW	750.0	PROCESS NOT SELECTED VENDOR NOT SELECTED	0/86

SECTION 13

TOTAL FGD UNITS AND CAPACITY (MW) INSTALLED BY YEAR

YEAR	NEW ON LINE NO.	MW	TERMINATED NO.	MW	TOTAL ON LINE NO.	MW
1968	1	140.	0	0.	1	140.
1969	0	0.	1	140.	0	0.
1971	4	702.	0	0.	4	702.
1972	8	518.	0	0.	12	1220.
1973	8	1938.	1	175.	19	2983.
1974	3	606.	3	340.	19	3250.
1975	6	2018.	3	1637.	22	3631.
1976	8	2786.	3	850.	27	5567.
1977	11	4684.	1	47.	37	10204.
1978	13	4736.	0	0.	50	14940.
1979	20	6356.	1	23.	69	21273.
1980	20	8040.	0	0.	89	29313.
1981	11	5038.	0	0.	100	34351.
1982	22	9331.	0	0.	122	43682.
1983	5	1772.	0	0.	127	45454.
1984	11	6995.	0	0.	138	52449.
1985	12	6766.	0	0.	150	59215.
1986	9	4946.	0	0.	159	64161.
1987	13	8290.	0	0.	172	72451.
1988	6	4290.	0	0.	178	76741.
1989	3	1475.	0	0.	181	78216.
1990	1	625.	0	0.	182	78841.
1991	1	625.	0	0.	183	79466.
1995	1	625.	0	0.	184	80091.
UNDEFINED	12	2612.				

SECTION 14
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL PARTICLE SCRUBBERS

COMPANY NAME	COMMONWEALTH EDISON	
PLANT NAME	WILL COUNTY	
UNIT NUMBER	1	
CITY	ROMEDEVILLE	
STATE	ILLINOIS	
REGULATORY CLASSIFICATION	*****	
PARTICULATE EMISSION LIMITATION - NG/J	86.	(.200 LB/MMPTU)
SO2 EMISSION LIMITATION - NG/J	774.	(1.800 LB/MMPTU)
NET PLANT GENERATING CAPACITY - MW	1147.0	
GROSS UNIT GENERATING CAPACITY - MW	167.0	
NET UNIT GENERATING CAPACITY W/FGD - MW	137.0	
NET UNIT GENERATING CAPACITY WO/FGD - MW	*****	
EQUIVALENT SCRUBBED CAPACITY - MW	*****	

** BOILER DATA		
SUPPLIER	BABCOCK & WILCOX	
TYPE	CYCLONE	
SERVICE LOAD	CYCLIC	
COMMERCIAL SERVICE DATE	0/55	
MAXIMUM BOILER FLUE GAS FLOW - CU.M/S	363.36	(770000 ACFM)
FLUE GAS TEMPERATURE - C	179.4	(355 F)
STACK HEIGHT - M	107.	(350 FT)
STACK TOP DIAMETER - M	3.8	(12.4 FT)

** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	*****	
AVERAGE HEAT CONTENT - J/G	22260.	(9570 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		9,100 - 10,500
AVERAGE ASH CONTENT - %	7.40	
RANGE ASH CONTENT - %	3 - 16	
AVERAGE MOISTURE CONTENT - %	*****	
RANGE MOISTURE CONTENT - %	*****	
AVERAGE SULFUR CONTENT - %	1.50	
RANGE SULFUR CONTENT - %	0.3 - 4.5	
AVERAGE CHLORIDE CONTENT - %	*****	
RANGE CHLORIDE CONTENT - %	*****	

** ESP		
NUMBER	1	
TYPE	COLD SIDE	
SUPPLIER	WESTERN PRECIPITATION	
PARTICULATE DESIGN REMOVAL EFFICIENCY - %	79.0	
FLUE GAS TEMPERATURE - C	179.4	(355 F)

** PARTICULATE SCRUBBER		
NUMBER	2	
TYPE	VENTURI	
SUPPLIER	BABCOCK & WILCOX	
SHELL MATERIAL	CARBON STEEL	
LINING MATERIAL	PLASITE AND KAOCRETE	
TYPE OF NOZZLES	STAINLESS STEEL	
FLUE GAS CAPACITY - CU.M/S	181.7	(395000 ACFM)
FLUE GAS TEMPERATURE - C	179.4	(355 F)
LIQUID RECIRCULATION RATE - LITER/S	365.4	(5800 GPM)
L/G RATIO - LITER/CU.M	2.4	(18.0 GAL/1000ACF)
PRESSURE DROP - KPA	*****	(***** IN-H2O)
SUPERFICIAL GAS VELOCITY - M/S	36.6	(120.0 FT/S)
PARTICULATE INLET LOAD - G/CU.M	.4	(.16 GR/SCF)
PARTICULATE DESIGN REMOVAL EFFICIENCY - %	98.0	

-----PERFORMANCE DATA-----					% REMOVAL	PER BOILER	FGD	CAP.	
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY					UTILIZATION
3/75	A	94.0	99.2		81.2				
	B	.0	.0		.0				
	SYSTEM					744	609		

COMMONWEALTH EDISON: WILL COUNTY 1 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

A VENTURI HOSE LEAK FORCED MODULE A OUT ONCE.
MODULE B WAS OUT OF SERVICE TWICE FOR NO DEMAND AND ONCE AS A RESULT OF AN ACCIDENTAL 50 MINUTE TRIP.
COAL BURNED THIS MONTH AVERAGED LESS THAN ONE PERCENT SULFUR.

4/75	A	37.0	39.5		35.0				
	B	.0	.0		.0				
	SYSTEM						720	638	

** PROBLEMS/SOLUTIONS/COMMENTS

CHICAGO FLY ASH IS TREATING MATERIAL FROM THE SCRUBBER WITH LIME AND FLY ASH AND DUMPING IT INTO THE HOLDING BASIN.
A BOILER OUTAGE FORCED MODULE A OUT OF SERVICE ONCE THIS MONTH (MODULE P WAS ALREADY OUT OF SERVICE).
COAL BURNED THIS MONTH WAS RECLAIM COAL AND VARIED IN SULFUR CONTENT.

5/75	A	84.5	84.5		84.5				
	B	37.1	37.1		37.1				
	SYSTEM						744	744	

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE P WAS IN SERVICE ON MAY 20 FOR THE FIRST TIME SINCE APRIL 13, 1973. RECIRCULATION TANK MIXERS.

MODULE A (WHICH WAS THE ONLY ONE OPERATING) WAS FORCED OUT TWICE IN APRIL TO AVOID POND OVERBOARDING INTO THE DES PLAINES RIVER. THE SECOND OUTAGE LASTED UNTIL MAY 5. DURING THE PAST SEVERAL MONTHS OF GENERALLY CONTINUOUS OPERATION OF MODULE A. IT HAS BECOME APPARENT THAT THE PRESENT LIQUID CIRCULATING SYSTEM CANNOT BE OPERATED IN A CONTINUOUSLY CLOSED CYCLE. THE WATER IMBALANCE POSES A HIGH RISK OF OVERBOARDING FROM THE SLUDGE POND DURING LONG PERIODS OF SUSTAINED OPERATION. THE FOLLOWING REVISIONS HAVE BEEN MADE TO REDUCE THE WATER IMBALANCE:

1. THE PUMP GLAND WATER FLOWS HAVE BEEN CUT FROM 10 GPM TO 5 GPM.
2. THE SCRUBBER HOUSE SERVICE WATER FILTER BACKWASH HAS BEEN ROUTED OUT OF THE SYSTEM.
3. THE CONTINUOUS UNDERSPRAY HAS BEEN CHANGED TO AN INTERMITTENT SPRAY 5 MINUTES ON, 5 MINUTES OFF.

THE THICKENER HAS BEEN DOWN SINCE APRIL 21 DUE TO A BROKEN GEAR AND A STUCK SWEEP ARM. THE THICKENER HAS BEEN BYPASSED AND THE SLUDGE IS GOING TO THE POND.

DURING MAY, MODULE A WAS OUT FOR 45 MINUTES DUE TO A DAMPER TRIP.

MODULE A WAS OUT ONCE FOR SPRAY NOZZLE CLEANING.

MODULE B WAS OUT TWICE AFTER START UP, ONCE FOR A VENTURI PUMP TRIP AND ONCE FOR A RECIRCULATION TANK LEVEL TRIP.

CHICAGO FLY ASH IS TREATING THE MATERIAL FROM THE SCRUBBER WITH LIME AND FLY ASH AND DUMPING IT INTO THE HOLDING BASIN. A MIXER HAS BEEN INSTALLED AT THE THICKENER, WHICH ENABLES THEM TO SUBSTITUTE SEALED DUMP TRUCKS FOR THE CEMENT TRUCKS WHICH WERE USED IN THE PAST FOR MIXING AND TRANSPORTING THE WASTE MATERIAL TO THE HOLDING BASIN.

COAL BURNED THIS MONTH VARIED GREATLY IN SULFUR CONTENT, RANGING FROM LOW SULFUR WESTERN COAL TO HIGH SULFUR ILLINOIS COAL.

6/75	A	64.1	60.6		54.1				
	B	85.5	84.6		75.4				
	SYSTEM						720	642	

** PROBLEMS/SOLUTIONS/COMMENTS

A REMEATER PLUGGAGE INSPECTION FORCED ONE MODULE A OUTAGE.

A LOW LEVEL TRIP CAUSED A 35 MINUTE OUTAGE, AND NO DEMAND ACCOUNTED FOR TWO MORE MODULE A OUTAGES.

MODULE B WAS OUT FOR 95 HOURS TO CLEAN THE BOOSTER FAN AND DEMISTER.

HIGH BOOSTER FAN VIBRATIONS CAUSED MODULE B TO SHUT DOWN ON JUNE 30.

DURING THIS MONTH HIGH SULFUR COAL WAS BURNED IN A TWO WEEK TEST, AND LOW SULFUR COAL WAS BURNED THE REST OF THE MONTH.

7/75	A	.0	.0		.0				
	B	79.2	79.4		73.5				
	SYSTEM						744	689	

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

** PROBLEMS/SOLUTIONS/COMMENTS

CHICAGO FLY ASH IS TREATING THE SCRUBBER WASTE MATERIAL WITH LIME AND FLY ASH AND DUMPING IT INTO THE ON SITE HOLDING BASIN. THE MATERIAL FROM THE HOLDING BASIN IS BEING TRUCKED TO AN OFF SITE DUMP.
 MODULE B WAS OUT ONCE (30 MINUTES) TO REPAIR A MINOR STEAM HEADER LEAK. MODULE B WAS OUT ONCE DUE TO NO DEMAND.
 LOW SULFUR COAL WAS BURNED MOST OF THIS MONTH, WITH HIGH SULFUR COAL BEING BURNED DURING THE LAST WEEK OF THE MONTH.

8/75	A	.0	.0	.0		
	B	93.5	100.0	76.4		
	SYSTEM				744	565

** PROBLEMS/SOLUTIONS/COMMENTS

IN JUNE, MODULE A ENCOUNTERED PLUGGAGE IN THE DEMISTER, WHICH REQUIRED ITS REPLACEMENT. THE WORK WAS COMPLETED IN AUGUST.
 MODULE A WENT OUT OF SERVICE ON JUNE 20 AND REMAINED OUT THROUGH AUGUST DUE TO MASSIVE REHEATER LEAKS. THERE IS PRESENTLY A HOLD ON THE NEW REHEATER ORDER BECAUSE OF MATERIAL FAILURES EXPERIENCED IN MODULE B'S CARBON STEEL REHEATER.
 MODULE B SUFFERED TWO OUTAGES IN JULY AND ONE IN AUGUST BECAUSE OF REHEATER TUBE LEAKS. THE FAILURES WERE DUE TO VIBRATION FATIGUE. THE REHEATER, WHICH WAS INSTALLED IN MAY, HAS LOST SIX OF ITS TWELVE TUBE BUNDLES SO FAR. THE LENGTH OF TIME THAT THE TUBES HAVE LASTED WOULD SEEM TO INDICATE THAT THERE IS A DESIGN RELATED MATERIAL DEFICIENCY. THREE OF THE TUBE BUNDLES WERE REPLACED WITH MARGINAL BUNDLES LEFT OVER FROM MODULE A.
 A SMALL STEAM HEADER LEAK CAUSED ONE MODULE B OUTAGE.
 MODULE B WAS OUT FOUR TIMES FOR NO DEMAND AND ONCE FOR A LOW FLOW TRIP.
 HIGH SULFUR COAL WAS BURNED ALL MONTH, CAUSING AN INCREASE IN SLUDGE PRODUCTION WHICH HAS FORCED A MINIMUM SIX DAY A WEEK, TEN HOUR A DAY SLUDGE DISPOSAL OPERATION. THE SLUDGE IS BEING TREATED WITH LIME AND FLY ASH AND BEING DUMPED INTO THE ON SITE HOLDING POND. STABILIZED MATERIAL IS BEING TRUCKED FROM THE POND TO AN OFF SITE DISPOSAL AREA.

9/75	A					
	B					
	SYSTEM				720	

10/75	A	.0	.0	.0		
	B	32.3	100.0	26.6		
	SYSTEM				744	194

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE A WAS OFF THE ENTIRE 11 DAYS THE BOILER OPERATED THIS MONTH, WAITING FOR ITS NEW REHEATER, WHICH HAS NOW BEEN RELEASED FOR MANUFACTURING BY SMD.
 MODULE B HAD TWO OUTAGES, ONE FOR NO DEMAND AND ONE MINOR 15 MINUTE TRIP.
 HIGH SULFUR COAL WAS BURNED THIS MONTH WHEN THE SCRUBBER WAS IN SERVICE.
 THE SLUDGE IS BEING TREATED WITH LIME AND FLY ASH AND HAULED TO AN OFF SITE DISPOSAL AREA.

11/75	A	.0		.0		
	B	.0		.0		
	SYSTEM				720	C

12/75	A	.0		.0		
	B	.0		.0		
	SYSTEM				744	C

1/76	A	.0		.0		
	B	.0		.0		
	SYSTEM				744	C

2/76	A	.0		.0		
	B	.0		.0		
	SYSTEM				696	C

3/76	A	30.1	45.2	18.8		
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COMMONWEALTH EDISON: WILL COUNTY 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO ₂ PART.	PER BOILER HOURS	FGD HOURS	CAP. HOURS	FACTOR
	B SYSTEM	8.8	20.4		8.5		744	309		

** PROBLEMS/SOLUTIONS/COMMENTS

UNIT 1 WAS DOWN FROM OCTOBER 11 THROUGH MARCH 19 FOR ITS BOILER TURBINE AND SCRUBBER OVERHAUL. THE MAJOR ITEMS TO BE ACCOMPLISHED DURING THE OUTAGE WERE:

1. SIMPLIFICATION OF THE MILLING SYSTEM CONTROL.
2. PULLING AND CLEANING OF THE MODULE B REHEATER AND RETURNING IT REPLACED WITH MARGINAL BUNDLES LEFT OVER FROM MODULE A.
3. CLEANING OF THE POND PUMP BAY.
4. REMOVAL OF THE VENTURI AND ABSORBER PUMP CHECK VALVES (ONE OF THEM FAILED LAST SPRING AND DESTROYED A PUMP LINER AND IMPELLER).
5. CLEANING AND REPAIR OF THE VENTURI NOZZLES AND SUPPORTS.
6. REPAIR OF CORRODED REHEATER SUPPORTS.
7. RESETTING AND ADJUSTMENT OF ALL DAMPERS.
8. REVISION OF SCRUBBER CONTROLS BY REMOVING THE CONTROLS NO LONGER USED OR NEEDED.
9. INSPECTION AND CLEANING OF THE ENTIRE SCRUBBER AND RELATED EQUIPMENT.

MODULE A WAS PUT INTO THE GAS PATH ON MARCH 22 AND REMAINED AVAILABLE FOR SERVICE THE REST OF THE MONTH.

MODULE B HAD TO REMAIN OUT OF SERVICE UNTIL MARCH 29 WHILE ITS REPAIRED REHEATER WAS INSTALLED.

4/76	A	23.0	20.0		19.2					
	B		49.3		47.3					
	SYSTEM						720	691		

** PROBLEMS/SOLUTIONS/COMMENTS

UNIT 1 RETURNED TO SERVICE APRIL 2 AFTER A SHORT TURBINE CONTROL OUTAGE. BOTH MODULES CAME ON LINE JUST BEFORE THE BOILER.

A FIVE DAY OUTAGE OF MODULE B WAS DUE TO REHEATER TUBE BUNDLE LEAKS. SEVERAL MODULE B OUTAGES WERE DUE TO PLUGGED ABSORBER TANK SCREENS CAUSED BY MILL AND CLASSIFIER FAILURES WHICH ALLOWED ROCK TO GET INTO THE SYSTEM. MODULE B WAS THOROUGHLY CLEANED.

ONLY ONE ABSORBER PUMP IS BEING USED IN MODULE B, SINCE THE 1B2 PUMP LINER FAILED AS A RESULT OF A BROKEN DISCHARGE VALVE. A REPLACEMENT LINER IS BEING INSTALLED.

A SCRUBBER TESTING AND EVALUATING PROGRAM WAS STARTED THIS MONTH. MUCH OF THE LATTER TWO WEEKS OF THE MONTH WERE SPENT TRAINING THE TESTING PERSONNEL. THE PROGRAM WILL PROVIDE CHEMISTRY DATA AND OPERATING CHARACTERISTICS

5/76	A	.0	.0		.0					
	SYSTEM						744	665		

** PROBLEMS/SOLUTIONS/COMMENTS

A VENTURI HOSE LEAK FORCED MODULE B OFF ONCE THIS MONTH.

MODULE B WAS TAKEN OUT OF SERVICE ONCE BECAUSE OF A PLUGGED ABSORBER TANK SCREEN.

MODULE B WAS OFF ONCE DUE TO A FOULED I.D. FAN.

MODULE B WAS OUT OF THE GAS PATH ONCE DUE TO NO DEMAND.

6/76	A	52.0	44.2		37.6					
	B	86.2	84.5		71.9					
	SYSTEM						720	612		

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE A SUFFERED VENTURI PUMP LINER FAILURES ON APRIL 78 WHEN AN INLET 16 INCH BUTTERFLY ISOLATION VALVE BROKE APART AND FELL INTO THE VENTURI PUMP. BOTH THE A AND BACKUP AB VENTURI PUMP LINERS WERE DESTROYED. MODULE A REMAINED OUT SERVICE UNTIL JUNE 9, WHEN THE LINERS WERE REPLACED.

MODULE A WAS OFF ONCE FOR SHEARED BYPASS DAMPER PINS.

I.D. BOOSTER FAN FOULING FORCED MODULE A OFF ONCE THIS MONTH FOR ABOUT 164 HOURS.

BOTH MODULES WERE OFF TWICE DUE TO NO DEMAND. DURING THESE OUTAGES, THE DEMISTERS WERE WASHED AND ABSORBER TRAY SCALE, IF ANY, WAS KNOCKED OFF. MODULE B WAS OUT OF THE GAS PATH FOR SEVERAL SHORT VENTURI LOW FLOW TRIP OUTAGES DUE TO A PLUGGED, SCALED VENTURI TANK SCREEN. AT THE END OF THE MONTH, THE MODULE WAS TAKEN OUT TO CLEAN THE SCREEN.

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

THE MODULE B I.D. BOOSTER FAN REQUIRED CLEANING DURING THE MONTH.
 THE REHEATER TUBES ARE SCALING, WHICH RESULTS IN A LOWER HEAT TRANSFER RATE
 RATE, AND THEREFORE INCREASES I.D. BOOSTER FAN FOULING. THE ONLY WAY TO
 CLEAN THE REHEATERS EFFECTIVELY IS TO REMOVE THEM, WHICH DEMANDS A SUBSTAN-
 TIAL OUTAGE.

7/76	A	19.9	.0	.0		
	B	86.2	90.0	72.3		
	SYSTEM				744	598

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE A WAS OFF THE FIRST PART OF THE MONTH DURING REPAIRS TO THE ABSORBER
 THE LATTER PART OF THE MONTH THE MODULE WAS READY FOR SERVICE BUT WAS NOT
 OPERATED BECAUSE OF THICKENER-POND SLUDGE OVERLOADING.
 MODULE B WAS FORCED OFF ONCE TO BALANCE THE I.D. BOOSTER FAN, AND ONCE TO
 WASH THE FAN.
 MODULE B WAS OUT OF THE GAS PATH TWICE DUE TO NO DEMAND.

8/76	A	98.2	57.6	39.3		
	B	65.4	67.4	40.9		
	SYSTEM				744	495

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE A WAS OUT OF THE GAS PATH THE FIRST HALF OF THE MONTH TO AVOID
 THICKENER-POND OVERLOADING.
 DURING THE LATTER HALF OF THE MONTH, MODULE A WAS USED WITH THREE MINOR
 FORCED OUTAGES AND ONE FOUR DAY NO DEMAND OUTAGE.
 MODULE B WAS OUT OF THE GAS PATH THREE TIMES DUE TO NO DEMAND.
 LOSS OF CHEMICAL CONTROL CAUSED TWO MODULE A OUTAGES.
 MODULE B WAS OFF FOR NINE DAYS DUE TO FOULING.
 SPENT SLURRY VALVE REPAIRS FORCED A MODULE B OUTAGE.
 ON AUGUST 12 THE OPERATING PH CONTROL SET POINT WAS REDUCED FROM 5.4 TO
 5.1. IT IS BELIEVED THAT THIS LOWER PH IS THE CAUSE OF THE FOULING OUTAGE
 OF MODULE B ON AUGUST 21. MODULE A WAS ALSO OPERATED FOR THREE DAYS, AND
 IT, TOO, EXPERIENCED INCREASED SCALE FOULING. THE PH SET POINT WAS THEN
 INCREASED BACK TO 5.4.

9/76	A	42.3	28.7	22.6		
	B	79.4		59.9		
	SYSTEM				720	566

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE A WENT OFF ONCE DUE TO A LOW FLOW TRIP.
 MODULE A WAS TAKEN OFF ONCE FOR CLEANING OF THE RECIRCULATION TANK AND
 PUMPS, AND INSPECTION OF PUMP ISOLATION VALVES.
 A LINER LEAK IN 1A2 ABSORBER PUMP ALSO FORCED MODULE A OFF.
 MODULE A WAS OUT OF THE GAS PATH TWICE DUE TO NO DEMAND.
 MODULE A WAS TAKEN OFF ONCE TO AVOID THICKENER-POND OVERLOADING.
 SPENT SLURRY VALVE TROUBLE CAUSED TWO MODULE B OUTAGES.

10/76	A	27.9	28.9	37.9		
	B	76.4	56.2	54.8		
	SYSTEM				744	726

** PROBLEMS/SOLUTIONS/COMMENTS

HIGH SULFUR ILLINOIS COAL WAS BURNED IN THE BOILER FROM MARCH THROUGH
 OCTOBER.
 THE SCRUBBER WASTE MATERIAL WAS TREATED WITH LIME AND FLY ASH AND HAULED TO
 AN OFF SITE DISPOSAL AREA.
 MODULE A OPERATED ON ONE ABSORBER PUMP, ALLOWING TESTING ON A LOWER
 ABSORBER FAN.
 MODULE A WAS OUT OF THE GAS PATH ONCE FOR AN I.D. BOOSTER FAN TRIP.
 WORK ON RECIRCULATION TANK LEVEL CONTROLS CAUSED A MODULE A OUTAGE.
 MODULE B WAS FORCED OFF ONCE TO REPAIR A REHEATER HEADER LEAK.
 ONE MODULE B OUTAGE WAS FOR VENTURI NOZZLE CLEANING.
 MODULE B WENT OFF FOR A VENTURI LOW FLOW TRIP.
 MODULE B REMAINED OUT OF SERVICE WHILE MODULE A WAS BEING TESTED TO AVOID
 THICKENER-POND OVERLOADING.
 A VACUUM FILTER WAS TIED IN AT THE THICKENER.

COMMONWEALTH EDISON: WILL COUNTY 1 (CONT.)

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

11/76 A 20.1 25.6 20.1
 B 72.2 69.6 4.7
 SYSTEM 720 566

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE A OPERATED ON ONE ABSORBER PUMP DURING MODULE B OUTAGE.
 MODULE B WAS FORCED OUT OF THE GAS PATH ONCE FOR A MILLING SYSTEM FAILURE.
 MODULE B ENCOUNTERED A VENTURI HEADER LEAK.
 THE VENTURI NOZZLES REQUIRED CLEANING DURING THE MONTH.
 REPLACEMENT OF THE SPENT SLURRY VALVE NECESSITATED A MODULE OUTAGE.
 MODULE B WAS OFF ONCE DUE TO A CHEMICAL SYSTEM UPSET.
 MODULE B WAS OUT OF THE GAS PATH TWICE DUE TO NO DEMAND (MODULE A WAS NOT
 IN SERVICE AT THE TIME OF THE OUTAGE).

12/76 A 44.9 48.3 44.9
 B 53.4 51.7 48.0
 SYSTEM 744 692

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE LAST WEEK OF NOVEMBER, THE 1A2 ABSORBER PUMP WAS TAKEN OUT OF
 SERVICE FOR OVERHAUL. THE REPAIRS WERE COMPLETED ON DECEMBER 6, WHEN THE
 MODULE ASSUMED A ONE ABSORBER PUMP STANDBY CAPABILITY UNTIL THE 1A1 ABSOR-
 BER PUMP CAN BE REPAIRED.
 DURING THE LAST HALF OF THE MONTH, MODULE A OPERATED WHILE MODULE B WAS
 BEING REPAIRED.
 MODULE B PERFORMED SATISFACTORILY DURING THE FIRST HALF OF THE MONTH,
 EXPERIENCING ONLY ONE NO DEMAND OUTAGE. ON THE 17TH, HOWEVER, THE SPENT
 SLURRY VALVE FAILED AND THE MODULE HAS REMAINED OUT OF SERVICE.

1/77 A 98.2 98.7 95.8
 B 13.5 1.1 1.1
 SYSTEM 744 722

** PROBLEMS/SOLUTIONS/COMMENTS

THE 1A1 ABSORBER PUMP WENT OUT IN LATE SEPTEMBER WITH BURNED OUT BEARINGS
 AND REMAINED OUT THROUGH JANUARY WAITING FOR PARTS.
 LOW SULFUR COAL WAS BURNED IN THE BOILER FROM NOVEMBER THROUGH JANUARY.
 DUE TO THE LOW VOLUME OF SLUDGE PRODUCED WHILE BURNING LOW SULFUR COAL,
 MUCH OF THE SLUDGE HANDLING TIME WAS SPENT DIGGING OUT THE ACCUMULATED
 SLUDGE IN THE RECIRCULATION PONDS. THIS MATERIAL, ALONG WITH SCRUBBER
 WASTE MATERIAL, WAS TREATED WITH LIME AND FLYASH AND HAULED TO AN OFF
 SITE DISPOSAL AREA.
 MODULE A WAS FORCED OUT ONCE BY A FAILED SPENT SLURRY VALVE.
 PLUGGED DEMISTER UNDERSPRAYS CAUSED ANOTHER MODULE A OUTAGE.
 MODULE A WENT OUT ONCE BECAUSE OF NO DEMAND AND ONCE DUE TO A BOILER OUTAGE
 (MODULE B WAS ALREADY OUT OF SERVICE FOR REPAIRS).
 MODULE B BECAME AVAILABLE FOR SERVICE ON JANUARY 27, AFTER REPAIRS TO THE
 SPENT SLURRY VALVE WERE COMPLETED. DUE TO SEVERE WEATHER CONDITIONS, THE
 MODULE WAS PLACED IN THE GAS PATH JANUARY 31.

2/77 A 38.8 42.6 38.8
 B 72.0 45.7 41.7
 SYSTEM 672 613

** PROBLEMS/SOLUTIONS/COMMENTS

THERE WAS VERY LITTLE DIGGING IN THE RECIRCULATION PONDS. CHICAGO FLYASH
 SPENT MOST OF THEIR TIME ON CLEANING AND MAINTENANCE.

3/77 A 96.9 66.7 64.2
 B 80.9 75.5 73.9
 SYSTEM 744 728

** PROBLEMS/SOLUTIONS/COMMENTS

AN ERT SO2 ANALYZER WAS INSTALLED ON THE DISCHARGE SIDE OF MODULE B I.D.
 BOOSTER FAN. THIS IS AN "IN SITU" ON-DISPERSIVE ANALYZER THAT CONTINUALLY
 MEASURES AND READS OUT CONCENTRATIONS OF SO2, CO, CO2, AND NO.
 AN ABSORBER SUCTION HEADER LEAK FORCED MODULE B FROM THE GAS PATH.
 MODULE B WAS FORCED OUT DUE TO A SLURRY VALVE GASKET LEAK.

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

A PLUGGED FEED SLURRY RECIRCULATION LINE WAS ENCOUNTERED IN MODULE B. HIGH SULFUR COAL WAS BURNED FOR SEVEN DAYS THIS MONTH TO PROVIDE HIGH SULFUR SLUDGE FOR THE UOP SLUDGE TEST. CHICAGO FLYASH SPENT 75% OF THEIR TIME DIGGING IN THE POND. THE REST WAS SPENT ON THE THICKENER AND VACUUM FILTER OPERATION. THE SCRUBBER WASTE MATERIAL WAS TREATED WITH LIME FLYASH AND HAULED OFF SITE. DISPOSAL AREA.

4/77	A	86.1	67.7	61.2		
	B	45.5	30.2	27.3		
	SYSTEM				720	650

** PROBLEMS/SOLUTIONS/COMMENTS

THE PERFORMANCE OF THE ERT SO2 ANALYZER TO DATE HAS BEEN, AT BEST, UNRELIABLE AND INCONSISTENT. THE ERT TECHNICIANS ARE OUT TO SERVICE THE ANALYZER ALMOST EVERY OTHER DAY. THE PROBLEM, ACCORDING TO ERT TECHNICIANS, IS OF A "THERMAL NATURE". WHEN THE ANALYZER REACHES A CERTAIN TEMPERATURE, A CHIP SHORTS OUT. THEY HAVE NOT BEEN ABLE TO LOCATE THE FAULTY INTEGRATED CIRCUIT YET.

A BOILER TUBE LEAK REPAIR FORCED MODULE A OUT OF THE GAS PATH ONCE THIS MONTH (MODULE B WAS ALREADY DOWN FOR REPAIRS).

MODULE B WAS FORCED OUT OF THE GAS PATH TWICE FOR AN ABSORBER SUCTION HEADER LEAK REPAIR.

MODULE B WAS OUT OF SERVICE ONCE TO WASH THE I. D. BOOSTER FAN.

CHICAGO ADMIXTURES SPENT MOST OF THEIR TIME DIGGING IN THE SMALL POND, GETTING READY FOR THE MGO ADDITION AND FORCED OXIDATION TEST. THE SCRUBBER WASTE MATERIAL WAS TREATED WITH LIME AND FLYASH AND HAULED TO AN OFF SITE DISPOSAL AREA.

5/77	A	89.4	2.2	2.0		
	B	98.0	50.9	47.3		
	SYSTEM				744	691

** PROBLEMS/SOLUTIONS/COMMENTS

THE ERT SO2 ANALYZER HAS BEEN REMOVED FROM SERVICE DUE TO A POOR PERFORMANCE RECORD OVER THE LAST THREE MONTHS. ERT IS IN THE PROCESS OF RE-ENGINEERING THEIR ANALYZER.

THE MGO ADDITION TEST WENT WELL. ALTHOUGH THE MGO INCREASED SO2 REMOVAL EFFICIENCY ABOUT 10%, IT DID PRACTICALLY NOTHING FOR THE TWO MORE SERIOUS PROBLEMS, SINCE THICKENER AND SLUDGE PRODUCTION AND LIMESTONE CONSUMPTION RATE WERE ABOUT THE SAME.

MODULE A WAS FORCED OUT OF THE GAS PATH ONCE THIS MONTH WHEN THE INLET VALVE ON 1A2 ABSORBER PUMP FAILED.

MODULE B WAS TAKEN OFF TO CLEAN AND INSPECT THE REHEATER TUBES.

BOTH MODULES WERE FORCED OFF FOR THE FIRST FIFTEEN DAYS OF THE MONTH DUE TO A FAILED 120V CONTROL TRANSFORMER FOR THE POND RETURN PUMPS. THE TRANSFORMER HAD TO BE ORDERED FROM WESTINGHOUSE.

HIGH SULFUR COAL HAS BURNED FOR ELEVEN DAYS DURING THE MONTH.

6/77	A	31.8	13.3	10.5		
	B	93.2	93.4	73.5		
	SYSTEM				720	566

** PROBLEMS/SOLUTIONS/COMMENTS

THE 1A1 ABSORBER PUMP IS STILL OUT OF SERVICE WAITING FOR PARTS 1A2 ABSORBER PUMP'S ISOLATION VALVES FORCED MODULE A OFF FOR MOST OF THE MONTH. MODULE A HAD ONE NO DEMAND AND ONE BOILER OUTAGE THIS MONTH. MODULE B WAS ALSO FORCED OFF TO CLEAN THE I.D. BOOSTER FAN. NO HIGH SULFUR COAL WAS BURNED THIS MONTH.

7/77	B	70.3	41.4	21.0		
	SYSTEM				744	377

** PROBLEMS/SOLUTIONS/COMMENTS

HIGH SULFUR COAL HAS BURNED FOR EIGHT DAYS THIS MONTH. LIMESTONE OPERATION WAS NORMAL FOR HIGH SULFUR OPERATION.

MODULE B WAS FORCED OUT OF THE GAS PATH ONCE TO REMOVE A PLUGGED DIFFUSER. THE FINAL TEST, FORCED OXIDATION SEEMED TO BE THE MOST SUCCESSFUL OF ALL.

USING LIQUID OXYGEN, UP TO 12,000 CFM OF GASEOUS O2 WAS FED INTO EACH VENTURI DOWNCOMER. OXIDATION OF SULFITE TO SULFATE WAS INCREASED FROM

COMMONWEALTH EDISON: WILL COUNTY 1 (CONT.)

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

35 TO 90 %										
MODULE B WAS ALSO FORCED OFF DUE TO A LOW LEVEL IN THE SLURRY STORAGE TANK.										
MODULE B WAS ALSO FORCED OFF DUE TO REHEATER TUBE BUNDLE LEAKS.										
8/77	A	99.8	99.6		80.8					
	B	9.7	12.0		9.7					
	SYSTEM						744	604		
** PROBLEMS/SOLUTIONS/COMMENTS										
MODULE A WAS AVAILABLE THE ENTIRE MONTH WITH JUST THE VENTURI PUMP OPERATING.										
9/77	A	61.0	77.8		54.0					
	B	52.3	75.4		52.3					
	SYSTEM						720	499		
** PROBLEMS/SOLUTIONS/COMMENTS										
MODULE B ENCOUNTERED HIGH VIBERATIONS IN ITS BOOSTER FAN DURING THE FIRST WEEK OF THE MONTH. AFTER THE FAN WAS BALANCED, THE MODULE OPERATED UNTIL THE UNIT OUTAGE ON SEPTEMBER 21.										
10/77	A	.0			.0					
	B	.0			.0					
	SYSTEM						744	C		
11/77	A	.0			.0					
	B	8.8	50.1		8.8					
	SYSTEM						720	126		
** PROBLEMS/SOLUTIONS/COMMENTS										
UNIT ONE CAME UP ON NOVEMBER 25 AFTER A SIXTY-THREE DAY OUTAGE. MODULE B IS IN THE GAS PATH FATER EXPERIENCING SOME DIFICULTY IN BALANCING ITS BOOSTER FAN.										
12/77	A	42.5	42.5	47.8	42.5					
	B	84.1	84.1	94.6	84.1					
	SYSTEM						744	661		
** PROBLEMS/SOLUTIONS/COMMENTS										
PLUGGAGE WAS ENCOUNTERED IN THE MODULE B REHEATER. BECAUSE NO SPARE REHRAT COILS WERE AVAILABLE, THE UTILITY TRIED TAKING SOME COILS FROM MODULE A. MODULE B APPEARED TO BE MORE OR SEVERELY PLUGGED THAN ORIGINALLY THOUGHT. MODULE A WAS DOWN HALF THE MONTH BECAUSE OF A MAIN STEAM LEAK WHICH COULD NOT BE ISOLATED.										
MODULE A OPERATED UNTIL SEPTEMBER 19, WHEN A COMBINATION OF MUD AND SCALE BUILD-UP ON THE SUMP FLOOR STRUCTURALLY DAMAGED THE MODULE. REPAIRS PUT THE MODULE OUT OF SERVICE UNTIL MID DECEMBER.										
1/78	A	69.0	89.9		66.3					
	B	22.0	29.8		22.0					
	SYSTEM						744	549		
** PROBLEMS/SOLUTIONS/COMMENTS										
ON JANUARY 7, THE MODULE B I.D. BOOSTER FAN DISCHARGE DUCT STARTED VIBRATING WILDLY. THIS FORCED THE BOILER OFF WHILE THE SHOP MADE REPAIRS TO THE DUCTWORK AND BALANCED THE FAN WITH AN I.R.D. MACHINE.										
WHEN THE UTILITY ATTEMPTED TO PUT MODULE B BACK IN THE GAS PATH, A LEAK IN THE SLURRY LINE FORCED IT BACK OFF.										
A PLUGGED VENTURI PUMP FORCED MODULE B OFF THE REST OF THE MONTH.										
DURING THE OUTAGE, THE REHEATER COILS WERE CLEANED WITH A HIGH PRESSURE (5000 LB) SPRAYER.										
MODULE A WAS FORCED OFF WHEN A STEAM REGULATING VALVE BLEW ITS PACKING.										
ON THE 23RD, BOTH MODULES WERE TAKEN OFF AND DRAINED TO ALLOW THE SHOP TO INSTALL NEW ISOLATION VALVES IN THE ABSORBER AND VENTURI PUMPS.										
TOWARD THE END OF THE MONTH, SOME PROBLEMS WERE ENCOUNTERED WITH THE POND RETURN PUMPS FREEZING.										
2/78	A	40.9	56.5		34.4					
	B	69.5	92.9		56.5					
	SYSTEM						672	409		

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

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE A RAN INTO DIFFICULT OPERATIONS CONDITIONS THIS MONTH DUE TO RAPID PLUGGING OF THE REHEAT COILS. INSPECTION AND SUBSEQUENT CLEANING OF MODULE A UNCOVERED PLUGGED SPRAY NOZZLES AND DEMISTER TRAYS DUE TO NOZZLE INEFFICIENCY. MODULE B OPERATED VERY WELL AND AN INSPECTION SHOWED THE MODULE TO BE VERY CLEAN.

3/78	A	93.5	100.0	90.6			
	B	88.5	84.7	76.0	26.2		
	SYSTEM					744	230

** PROBLEMS/SOLUTIONS/COMMENTS

THIS MONTH, DUE TO COAL CONSERVATION, UNIT 1 WAS ON THE SYSTEM VERY LITTLE. MODULE B HAD DIFFICULTY FOR SEVERAL DAYS BECAUSE OF A CRACKED SHEAVE ON THE VENTURI PUMP. HIGH PRESSURE CLEANING ON BOTH MODULES DURING THE COAL CONSERVATION ALONG WITH REMOVING THE VENTURI THROAT RESTRICTOR BLOCKS PROVED BENEFICIAL IN MAINTAINING BETTER CONTROL OF THE DRAFT CONDITIONS IN THE SCRUBBER.

4/78	A	99.9	99.7	92.0			
	B	100.0	99.9	92.2			
	SYSTEM					720	665

** PROBLEMS/SOLUTIONS/COMMENTS

THE PRESSURE DIFFERENTIAL ACROSS THE VENTURIS HAS BEEN REDUCED BY APPROXIMATELY 40% AT 140 MW BY REMOVING THE VENTURI RESTRICTOR BLOCKS. PARTICULATE REMOVAL AND SOLIDS CARRYOVER COULD BE ADVERSELY AFFECTED BY THIS ACTION. SINCE PARTICULATE REMOVAL AT THE VENTURI IS A FUNCTION OF WATER DROPLET SIZE, WHICH IN TURN IS A FUNCTION OF PRESSURE DROP. INCREASED SOLIDS CARRYOVER COULD POSSIBLY COMPOUND REHEATER PLUGGING PROBLEMS. THE UTILITY IS KEEPING A CLOSE WATCH FOR PLUGGING, BUT HAS NOT YET FOUND ANYTHING UNUSUAL. MODULE A WAS FORCED OUT OF THE GAS PATH ONCE THIS MONTH FOR A VENTURI PIPE LEAK.

5/78	A	9.5	99.4	55.2			
	B	89.2	100.0	56.1			
	SYSTEM					744	413

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE LAST PART OF THE MONTH BOTH MODULES WERE FORCED OUT OF THE GAS PATH DUE TO REHEATER LEAKS. IT REQUIRED A TWO DAY OUTAGE TO REMOVE THE LEAKING REHEATER BUNDLES. ADDITIONAL REHEATERS ARE ON ORDER AND ARE EXPECTED TO ARRIVE IN JUNE.

6/78	A	87.1	94.5	23.7			
	B	85.6	100.0	25.1			
	SYSTEM					720	181

** PROBLEMS/SOLUTIONS/COMMENTS

DURING A SCRUBBER INSPECTION, 25% DEMISTER AND 75% ABSORBER SPRAY PLUGGAGE WAS DISCOVERED IN MODULE A. MODULE B WAS NOT AS BAD. HIGH VIBRATION WAS ENCOUNTERED IN THE TURBINE BEARINGS DURING BOILER START UP, CAUSING THE BOILER TO SHUT BACK DOWN. THE PUG MILL FOR CHICAGO ADMIXTURES HAS BEEN APPROVED, AND THE NEW SLUDGE TREATMENT SYSTEM SHOULD BE OPERATING BY FALL. THE SCRUBBER WAS FORCED OUT OF THE GAS PATH ONCE THIS MONTH WHEN THE 1B1 ABSORBER DISCHARGE VALVE FAILED TO OPEN. THE BOILER WAS FORCED OFF THE LAST FOUR DAYS OF THE MONTH FOR CYCLONE LEAKS. DURING THIS OUTAGE, THE A AND B MODULE SPENT SLURRY VALVES WERE REPLACED.

7/78	A	97.0	100.0	11.6			
	B	99.2	100.0	11.6			
	SYSTEM					744	77

COMMONWEALTH EDISON: WILL COUNTY 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO ₂	PER PART. HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
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** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER WAS PLAGUED ALL MONTH BY CYCLONE CASING LEAKS. BECAUSE OF THE CYCLONE PROBLEMS AND THE COAL CONSERVATION PROGRAM, THE BOILER WAS ONLY OPERATED SEVENTY-SEVEN HOURS FOR THE MONTH. THE BOILER DOWN TIME WAS USED FOR PREVENTATIVE MAINTENANCE ON THE SCRUBBER. SIX NEW REHEATERS WERE INSTALLED AND A DRAIN VALVE ON THE SPENT SLURRY LINE WAS REPAIRED. A VALVE FAILURE ON THE 1A1 ABSORBER PUMP FORCED THE SCRUBBER FROM THE GAS PATH ONCE DURING THE MONTH. MODULE B EXPERIENCED A LEAKING VENTURI HEADER.

8/78	A	97.8	100.0	59.1						
	B	99.6	100.0	59.1						
	SYSTEM						744	440		

** PROBLEMS/SOLUTIONS/COMMENTS

CHICAGO ADMIXTURES SPENT MOST OF THEIR TIME OPERATING OUT OF THE THICKENER. THE SCRUBBER WASTE MATERIAL WAS TREATED WITH LIME AND FLY ASH AND HAULED OFF TO AN OFF SITE DISPOSAL AREA. REPAIRS TO THE VENTURI EMERGENCY SPRAY VALVE CAUSED ONE BOILER OUTAGE DURING THE MONTH. A REHEATER FLANGE LEAK WAS RESPONSIBLE FOR FORCING THE UNIT OFF. MODULE A WAS FORCED OFF ONCE DUE TO HIGH VIBRATION OF THE I.D. BOOSTER FAN. THE PROBLEM WAS CORRECTED BY REPACKING THE COUPLING ON THE FAN.

9/78	A	77.7	95.9	55.4						
	B	77.7	96.0	55.5						
	SYSTEM						720	416		

** PROBLEMS/SOLUTIONS/COMMENTS

CHICAGO ADMIXTURES SPENT MOST OF THEIR TIME OPERATING OUT OF THE THICKENER. THE SCRUBBER WASTE MATERIAL WAS TREATED WITH LIME AND FLY ASH AND HAULED TO AN OFF SITE DISPOSAL AREA. REHEATER TUBE LEAKS, ONE IN MODULE A AND FOUR IN MODULE B, CAUSED ONE BOILER OUTAGE AND CAUSED THE FGD SYSTEM TO BE UNAVAILABLE FOR A TOTAL OF NINETY HOURS. SAMPLES OF THE TUBES HAVE BEEN SUBMITTED TO O.A.D. FOR METALLURGICAL EXAMINATION. A RUPTURED AIR LINE ON A VENTURI PUMP ISOLATION VALVE WOULD NOT ALLOW THE VALVE TO GO COMPLETELY CLOSED. WHEN THE A VENTURI PUMP WAS STARTED, A VENTURI SPRAY HOSE RUPTURED. IT WAS DISCOVERED THAT THE MODULE A VENTURI TANK LEVEL PRESSURE SWITCH WAS NOT WORKING PROPERLY. THE PUGMILL ORDERED FOR CHICAGO ADMIXTURES HAS ARRIVED ON SITE. IN OCTOBER, THEY WILL FINISH THE CONVERSION, WHICH WILL ALLOW THE MATERIAL SERVICE MIXER TRUCKS TO BE ELIMINATED. IN OCTOBER, THE THICKENER WILL HAVE TO BE BYPASSED WHILE THE UTILITY DOES MAINTENANCE ON THE RAKE AND REPLACES SOME LEAKING VALVES.

10/78	A	100.0	100.0	35.0						
	B	100.0	100.0	35.0						
	SYSTEM						744	261		

** PROBLEMS/SOLUTIONS/COMMENTS

LOW BOILER HOURS WERE DUE TO FOUR OUTAGES CAUSED BY HIGH BEARING METAL TEMPERATURES AND EXCESSIVE VIBRATION IN THE 1-B FORCED DRAFT FAN. THE BOILER DOWN TIME WAS UTILIZED FOR CLEANING AND REPAIR OF THE VENTURI THROAT, SUMP AND SUMP SCREENS, AND INLET BLOCK DAMPERS OF MODULE A, AS WELL AS THE VENTURI AND ABSORBER TANKS AND SCREENS AND ALL ABSORBER SPRAY NOZZLES OF BOTH MODULES. ON INSPECTION, IT WAS DISCOVERED THAT THE B MODULE ABSORBER DEPARTMENTAL DAMPER HAD SLIPPED 50% CLOSED. THE DAMPERS WERE JACKED OPEN AND WELDED IN PLACE. TO CORRECT A HIGH PRESSURE DROP ACROSS THE MODULE B REHEATER, A NEW METHOD WAS EMPLOYED WHEREBY ONLY THE MIDDLE TUBES WERE REMOVED, ALLOWING THE TOP AND BOTTOM TUBES TO BE SEEN AND CLEANED, ELIMINATING THE REMOVAL OF ALL THE TUBES. THIS PROCEDURE CUT OUTAGE TIME FROM ONE OR TWO WEEKS TO TWO DAYS.

11/78	A	96.2	100.0	48.3						
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-----PERFORMANCE DATA-----									
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER BOILER HOURS HOURS	FGD HOURS	CAP. FACTOR
	B SYSTEM	85.2	100.0		48.3		720	348	
** PROBLEMS/SOLUTIONS/COMMENTS									
THE UNIT WAS DOWN THREE TIMES THIS MONTH DUE TO A VENTURI PUMP AND TWO BOOSTER FAN OUTAGES.									
12/78	A B SYSTEM	65.3 64.5	100.0 100.0		64.5 64.5		744	480	
** PROBLEMS/SOLUTIONS/COMMENTS									
REHEATER TUBE LEAKS CAUSED TWO OUTAGES. THE MODULE B SPENT SLURRY DRAIN WAS REPAIRED.									
1/79	A B SYSTEM	83.5 62.2	100.0 87.1		61.3 53.4		744	456	
** PROBLEMS/SOLUTIONS/COMMENTS									
THE SO2 PLANT WAS FORCED OFF TWICE THIS MONTH DUE TO REHEATER TUBE LEAKS. TWO TUBES ON MODULE A AND FOUR TUBES ON MODULE B WERE REPLACED. THE I.D. BOOSTER FAN ON MODULE B WAS FOULED AND HAD TO BE REPLACED. TWO SPECIAL SECTIONS OF VENTURI PIPING, A SIXTEEN TO EIGHT INCH ECCENTRIC REDUCER AND AN OFFSET TEE WERE PREPARED BY LOCKPORT FABRICATING AND INSTALLED THIS MONTH. THE ORIGINAL REDUCER AND TEE HAD BEEN PATCHED AND WELDED SO MANY TIMES THAT THEY WERE BEYOND REPAIR.									
2/79	A B SYSTEM	93.0 93.0	91.3 91.3		54.2 54.2		672	399	
** PROBLEMS/SOLUTIONS/COMMENTS									
THE UNIT WAS FORCED OFF ONCE FOR A MAIN STEAM HEADER LEAK.									
3/79	A B SYSTEM	100.0 68.6	100.0 100.0		46.0 46.0		744	343	
** PROBLEMS/SOLUTIONS/COMMENTS									
THE SYSTEM WAS FORCED OUT TWICE IN FEBRUARY AND FOUR TIMES IN MARCH DUE TO A VENTURI HEADER LEAK. A TEN FOOT SECTION OF PIPE WILL HAVE TO BE REPLACED DUE TO EXTENSIVE CORROSION. THE SYSTEM WAS DOWN ONCE FOR A SPRAY HEADER LEAK. MODULE B EXPERIENCED A LEAK IN THE VENTURI DOWNCOMER. A FIVE FOOT SECTION OF THE PIPE WILL HAVE TO BE REPLACED.									
4/79	A SYSTEM						720		
5/79	A B SYSTEM				.0 .0		744	0	
** PROBLEMS/SOLUTIONS/COMMENTS									
UNIT 1 WAS OUT OF SERVICE THE ENTIRE MONTH DUE TO A BOILER OVERHAUL. CHICAGO ADMIXTURES WILL STOCKPILE THE FIXED SLUDGE ON STATION PROPERTY.									
6/79	SYSTEM						720	0	
7/79	SYSTEM						744	0	
8/79	SYSTEM						744	0	
** PROBLEMS/SOLUTIONS/COMMENTS									
UNIT 1 WAS OUT OF SERVICE TO REPLACE THE ABR HEATER TUBES, TUBE SHEET AND HOPPERS. DURING THIS OUTAGE, THE WORN VENTURI SPRAY NOZZLES AND DEMISTERS WERE REPLACED. WELDING LEAKS AND GENERAL CLEANING OF THE SO2 INTERNALS WAS ALSO DONE AT THIS TIME.									

COMMONWEALTH EDISON: WILL COUNTY 1 (CONT.)

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

THE BOILER AND THE SCRUBBER ARE SCHEDULED TO RETURN TO SERVICE OCTOBER 1, 1979.

9/79	SYSTEM						720	0		
10/79	SYSTEM						744	0		
11/79	A	53.3	100.0		85.4					
	B	53.3	100.0		85.4					
	SYSTEM	53.3	100.0		85.4		720	336	336	

** PROBLEMS/SOLUTIONS/COMMENTS

ON NOVEMBER 5, UNIT 1 RETURNED TO SERVICE AFTER A SIX MONTH OUTAGE TO REPLACE THE AIR HEATER TUBES, TUBE SHEET AND HOPPERS. DURING THIS OUTAGE, SEVERAL LENGTHS OF VENTURI PIPING HAD TO BE REPLACED WITH NEW RUBBER LINED PIPE. THE UNIT DID NOT FORCE THE BOILER OFF AT ANY TIME DURING NOVEMBER.

12/79	A	77.0	99.5		57.5					
	B	84.9	100.0		57.8					
	SYSTEM	77.0	99.5		57.5		744	431	428	

** PROBLEMS/SOLUTIONS/COMMENTS

ON DECEMBER 4, UNIT 1 CAME OFF LINE SO THAT THE AIR HEATER HOPPERS AND PRECIPITATOR HOPPERS COULD BE EMPTIED OF CARBON CARRY-OVER AND DEBRIS. DURING THIS OUTAGE THE SHOP REPAIRED A LEAK IN THE POND RETURN LINE. ON DECEMBER 10, THE A MODULE DEVELOPED A SERIOUS STEAM LEAK (25,000 MAKE-UP) IN A LOWER REHEAT BUNDLE. THE LEAKING BUNDLE HAD TO BE REMOVED AND REPLACED. THIS RESULTED IN A TWO DAY FORCED OUTAGE. LATTER IN THE MONTH THE A MODULE BLEW ANOTHER REHEATER TUBE FORCING THE BOILER OFF FOR AN ADDITIONAL 25 HOURS AND 12 MINUTES. THE A MODULE WAS REMOVED FROM THE GAS PATH ON DECEMBER 29, FOR THREE HOURS TO ALLOW THE MAINTENANCE SHOP TO WELD A LEAKING REHEATER FLANGE. THE SO2 PLANT FORCED THE BOILER OFF TWICE THIS MONTH. TOTAL FORCED OUTAGE TIME ATTRIBUTED TO THE SCRUBBER WAS 54 HOURS AND 39 MINUTES.

1/80	A	91.0	87.5		63.0					
	B	88.6	84.1		60.6					
	SYSTEM	88.6	84.1		60.6		744	536	451	

** PROBLEMS/SOLUTIONS/COMMENTS

THE FIRST SIX DAYS OF JANUARY, UNIT 1 BOILER WAS OFF THE SYSTEM BECAUSE OF A SLAG SCREEN TUBE LEAK. THE UNIT RETURNED TO SERVICE ON JANUARY 7. ON JANUARY 16, THE UTILITY HAD TO DERATE UNIT 1 TO 50 MW BECAUSE THE REHEATER SECTIONS ON A AND B MODULES WERE PLUGGING. ON JANUARY 17, THE MODULES WERE TAKEN OUT OF THE GAS PATH TO BEGIN REMOVING AND CLEANING THE REHEATER SECTIONS WITH A HIGH PRESSURE (4000 PSI) WATER SPRAY. UNIT 1 BOILER WAS LEFT ON TO PROVIDE STABILITY FOR THE 138 KV SYSTEM. IN THE PAST, ALL FORTY-TWO BUNDLES CONSISTING OF SEVEN TUBES PER BUNDLE, HAD TO BE TAKEN OUTSIDE TO BE CLEANED ON A CONCRETE SLAB. IN THIS CASE SINCE TIME WAS THE MOST IMPORTANT FACTOR, A DIFFERENT APPROACH WAS USED. ONLY THE MIDDLE SIX BUNDLES ON EACH MODULE WAS REMOVED. THIS PROVIDED A LARGE ENOUGH SPACE SO THAT A LANCE WITH AN EXTENSION ON IT COULD BE USED TO CLEAN THE BOTTOM OF THE TWO TOP BUNDLES AND THE TOP OF THE TWO BOTTOM BUNDLES. THERE ARE DOORS THAT ALLOW EASY ACCESS TO THE TOP AND BOTTOM OF THE REHEATER. USING THIS METHOD, ONLY TWELVE OF THE FORTY-TWO BUNDLES WERE REMOVED. IN THE PAST, THIS JOB HAS TAKEN AS LONG AS TWO WEEKS TO COMPLETE. USING THE NEW METHOD, ALL THE REHEATER BUNDLES WERE CLEANED IN TWENTY HOURS.

THE B MODULE WAS FORCED OFF LINE ON TWO OTHER OCCASIONS IN JANUARY. BOTH THESE OUTAGES WERE CAUSED BY THE REHEATER (A COIL LEAK AND A FLANGE LEAK) TOTALING 18 HOURS AND 24 MINUTES.

2/80	SYSTEM						696			
3/80	SYSTEM						744			

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

** PROBLEMS/SOLUTIONS/COMMENTS

NO INFORMATION FOR THE WILL COUNTY UNIT WAS AVAILABLE FOR FEBRUARY AND MARCH.

SECTION 14
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL PARTICLE SCRUBBERS

COMPANY NAME	DETROIT EDISON	
PLANT NAME	ST. CLAIR	
UNIT NUMBER	6	
CITY	BELLE RIVER	
STATE	MICHIGAN	
REGULATORY CLASSIFICATION	C	
PARTICULATE EMISSION LIMITATION - NG/J	*****	(***** LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	1376.	(3.200 LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	1775.0	
GROSS UNIT GENERATING CAPACITY - MW	260.0	
NET UNIT GENERATING CAPACITY W/FGD - MW	*****	
NET UNIT GENERATING CAPACITY WO/FGD - MW	*****	
EQUIVALENT SCRUBBED CAPACITY - MW	*****	

** BOILER DATA		
SUPPLIER	COMBUSTION ENGINEERING	
TYPE	*****	
SERVICE LOAD	BASE	
COMMERCIAL SERVICE DATE	0/61	
MAXIMUM BOILER FLUE GAS FLOW - CU.M/S	465.77	(987000 ACFM)
FLUE GAS TEMPERATURE - C	132.2	(270 F)
STACK HEIGHT - M	*****	(**** FT)
STACK TOP DIAMETER - M	*****	(***** FT)

** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	SUBBITUMINOUS	
AVERAGE HEAT CONTENT - J/G	*****	(***** BTU/LB)
RANGE HEAT CONTENT - BTU/LB		9,500 - 9,600
AVERAGE ASH CONTENT - %	4.00	
RANGE ASH CONTENT - %	*****	
AVERAGE MOISTURE CONTENT - %	*****	
RANGE MOISTURE CONTENT - %	22 - 24	
AVERAGE SULFUR CONTENT - %	.35	
RANGE SULFUR CONTENT - %	0.3 - 0.4	
AVERAGE CHLORIDE CONTENT - %	*****	
RANGE CHLORIDE CONTENT - %	*****	

** ESP

** MECHANICAL COLLECTOR

** PARTICULATE SCRUBBER	
NUMBER	2
TYPE	VENTURI

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

11/74	SYSTEM						720		
12/74	SYSTEM						744		
1/75	SYSTEM						744		

** PROBLEMS/SOLUTIONS/COMMENTS

INSTALLATION OF THE FGD SYSTEM WAS ESSENTIALLY COMPLETED BY THE NOVEMBER, 1974 THROUGH JANUARY 1975 PERIOD.
A FAULTY INSTRUMENT PANEL WHICH WAS INCORRECTLY WIRED HAS BEEN RETURNED TO THE MANUFACTURER FOR REPAIR.
TO DATE, THE UTILITY HAS WATER TESTED ALL THE AUXILIARY EQUIPMENT. THE 10 FAN HAS BEEN TESTED AND AIR BALANCE HAS BEEN CHECKED.

2/75	SYSTEM						672		
3/75	SYSTEM						744		
4/75	SYSTEM						720		

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

** PROBLEMS/SOLUTIONS/COMMENTS

A COLD FLUE GAS RUN WAS SUCCESSFULLY CONDUCTED MARCH 22 AND 23. DURING THIS PERIOD THE RUBBER-LINED PUMPS WERE REPAIRED AND THE LIMESTONE PREPARATION SYSTEM WAS CALIBRATED.

5/75	SYSTEM									744
5/75	SYSTEM									720
7/75	SYSTEM									744

** PROBLEMS/SOLUTIONS/COMMENTS

THE FIRST HOT FLUE GAS RUN WAS CONDUCTED ON JUNE 22, 1975. THE RUN LASTED FOR A PERIOD OF 22 HOURS. DURING THIS RUN, THE SCRUBBER WAS PURPOSELY TRIPPED OFF AT LOADS OF 40 AND 80 PERCENT. THIS WAS PERFORMED TO OBSERVE IF ANY DETRIMENTAL EFFECTS TO THE STEAM GENERATION OPERATIONS RESULTED. NONE WERE DETECTED. THE SYSTEM WAS TAKEN OUT OF SERVICE FOLLOWING THIS GAS RUN TO CORRECT THE FOLLOWING MAJOR OPERATION AREAS:

GAS CIRCUIT: LUGI THROAT POSITIONAL FAILURE; DETERIORATION OF THE DAMPER SEALS; SEVERE VIBRATIONS; SO2 ANALYZERS INOPERATIVE.

LIQUID CIRCUIT: FAILURE OF PH CONTROL SYSTEM; TARGET FLOW METER TARGETS HAVE BEEN BROKEN OFF; PUMP SEAL WATER LOW FLOW ALARM TRIPS.

8/75	SYSTEM									744
9/75	SYSTEM									720

** PROBLEMS/SOLUTIONS/COMMENTS

A SECOND HOT FLUE GAS RUN WAS INITIATED ON AUGUST 6 AND LASTED 27 HOURS. THE RUN WAS TERMINATED BECAUSE OF A REHEATER THERMOCOUPLE FAILURE. A SUBSEQUENT INSPECTION OF THE SCRUBBING SYSTEM REVEALED NO APPARENT ABNORMALITIES OR MALFUNCTIONS.

A THIRD HOT FLUE GAS RUN OF 41 HOURS DURATION WAS COMPLETED OCTOBER 9. THE MAIN OBJECTIVE OF THIS RUN WAS TO EVALUATE VARIOUS COMPONENTS OF THE FRESH WATER SPRAY SYSTEM AND EFFECTS ON SYSTEM OPERATION. THE TEST RUN WAS PREMATURELY TERMINATED BECAUSE OF A BOILER FEED PUMP MALFUNCTION, RESULTING IN A REDUCED BOILER LOAD CAUSING SUBSEQUENT WEEPING OF THE WASH TRAY.

10/75	SYSTEM									744
11/75	SYSTEM									720
12/75	SYSTEM									744

** PROBLEMS/SOLUTIONS/COMMENTS

A FOURTH FLUE GAS RUN OF 23 DAYS DURATION WAS TERMINATED DUE TO EXCESSIVE VIBRATION IN THE I.D. & BOOSTER FAN. ONE OTHER SCRUBBER-RELATED OUTAGE OCCURRED WHEN THE PACKING OF ONE OF THE SCRUBBER RECIRCULATION PUMPS NEEDED MAINTENANCE. SO2 REMOVAL DURING THIS PERIOD WAS 90 PERCENT AND PARTICULATE OUTLET LOADING WAS 0.1 LB/1000 LBS OF FLUE GAS FOR 1-3 PERCENT SULFUR COAL.

1/76	SYSTEM									744
2/76	SYSTEM									696
3/76	SYSTEM									744
4/76	SYSTEM	100.0	100.0							720

** PROBLEMS/SOLUTIONS/COMMENTS

THE 30-DAY VENDOR QUALIFICATION RUN AND FINAL ACCEPTANCE TEST WERE COMPLETED BY MAY 29. THE QUALIFICATION RUN WAS CONDUCTED ON A "HANDS OFF" BASIS USING PLANT PERSONNEL EXCLUSIVELY. THE SYSTEM WAS IN SERVICE 100 PERCENT OF THE TIME THE BOILER WAS OPERATIONAL. THE FINAL ACCEPTANCE TEST CONSISTED OF SIX 4-HR. TEST RUNS CONDUCTED IN THE SPACE OF ONE WEEK. THE SO2 REMOVAL EFFICIENCY FOR HIGH SULFUR COAL WAS 90.9 PERCENT. PARTICULATE REMOVAL ALSO EXCEEDED DESIGN LEVELS. NO MAJOR CHEMICAL OR MECHANICAL-RELATED PROBLEMS WERE ENCOUNTERED.

5/76	SYSTEM									744
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DETROIT EDISON: ST. CLAIR 6 (CONT.)

-----PERFORMANCE DATA-----									
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO ₂	PER PART. HOURS	BOILER HOURS	FGD CAP. HOURS FACTOR
6/76	SYSTEM						720		
7/76	SYSTEM						744		
8/76	SYSTEM						744		
** PROBLEMS/SOLUTIONS/COMMENTS									
THE UTILITY IS NOW PREPARING TO CONDUCT A 2 MONTH MINIMUM INTERNAL SCRUBBER DEMONSTRATION PROGRAM TO ACQUIRE OPERATING DATA AND INFORMATION. FOLLOWING THE COMPLETION OF THIS PROGRAM THE BOILERS WILL FIRE LOW SULFUR DECKER COAL (0.3 TO 4.0 PERCENT) TO MEET SO ₂ EMISSION REGULATIONS. THE SCRUBBERS WILL CONTINUE TO OPERATE IN THE PARTICULATE REMOVAL MODE.									
9/76	SYSTEM						720		
10/76	SYSTEM						744		
** PROBLEMS/SOLUTIONS/COMMENTS									
THE INTERNAL SO ₂ SCRUBBING DEMONSTRATION PROGRAM COMMENCED ON OCTOBER 14. THE SCRUBBERS OPERATED CONTINUOUSLY FOR 10 DAYS. OPERATION ON THE DEMONSTRATION PROGRAM WAS INTERRUPTED BY A FORCED SCRUBBER OUTAGE RESULTING FROM SCALE AND SOLIDS CARRYOVER FROM THE WASH TRAY AND MIST ELIMINATOR TO THE SCRUBBER I.D. BOOSTER FAN ASSEMBLY, CAUSING VIBRATION AND BALANCE PROBLEMS. IT WAS DECIDED TO SANDBLAST THE FAN TO REMOVE SOLIDS BUILDUP ON THE FAN ASSEMBLY. THE UTILITY PLANS TO MODIFY THE COMPONENT'S WASH SYSTEM FOR GREATER FLOW CAPABILITY AFTER COMPLETION OF THE SO ₂ SCRUBBING PROGRAM. DECO ALSO PLANS TO CONTINUE PARTICULATE SCRUBBING FOLLOWING THE TERMINATION OF THE SO ₂ PROGRAM BY UNCOUPLING THE SPRAY TOWERS AND MAINTAINING THE PEABODY-LURGI VENTURI SCRUBBERS IN THE FLUE GAS STREAM. SOME LIMESTONE MAY HAVE TO BE ADDED TO THE PARTICULATE SCRUBBING SOLUTION IN ORDER TO PREVENT LOW PH SWINGS AND MINIMIZE THE POSSIBILITY OF ACID CORROSION DAMAGE TO THE INTERNAL COMPONENTS.									
11/76	SYSTEM	80.0					720		
** PROBLEMS/SOLUTIONS/COMMENTS									
FOLLOWING THE COMPLETION OF SAND BLASTING OPERATIONS TO SCRUBBER'S I.D. BOOSTER FAN FOR REMOVAL OF SOLIDS BUILD UP, OPERATIONS RESUMED ON NOVEMBER 7 AND CONTINUED THROUGHOUT THE MONTH. THE SYSTEM'S AVAILABILITY INDEX FOR THE MONTH WAS 80 PERCENT. THE MAJORITY OF THE OUTAGE TIME WAS CONSUMED PROCURING SAND BLASTING SERVICES. THE OPERATION ITSELF REQUIRED ONLY 8 HOURS.									
12/76	SYSTEM	51.0					744		
** PROBLEMS/SOLUTIONS/COMMENTS									
THE SO ₂ DEMONSTRATION PROGRAM CONTINUED THROUGHOUT DECEMBER. THE SYSTEM'S AVAILABILITY INDEX FOR THE PERIOD WAS 51 PERCENT. SCRUBBER OUTAGES RESULTED FROM LIMESTONE FEEDER PROBLEMS. SCRUBBER OUTAGES RESULTED FROM DENSE SLURRY TRAVERSE PUMP PROBLEMS. SCRUBBER OUTAGES RESULTED FROM DENSE SLURRY TANK AGITATOR MALFUNCTIONS. PH SAMPLING LINE PLUGGING RESULTED IN SOME OUTAGE TIME.									
1/77	SYSTEM	.0					744		
2/77	SYSTEM	.0					672		
** PROBLEMS/SOLUTIONS/COMMENTS									
THE SO ₂ DEMONSTRATION PROGRAM WAS OFFICIALLY TERMINATED ON DEC. 31, 1976. THE SCRUBBER PLANT WAS SHUT DOWN AT THIS POINT AND FLUE GAS WAS BY-PASSED AROUND THE SYSTEM.									
3/77	SYSTEM	.0					744		

-----PERFORMANCE DATA-----										
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO ₂ PART.	PER BOILER HOURS	FGD HOURS	CAP. HOURS	FACTOR

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER REMAINS IN SERVICE, FIRING LOW SULFUR (0.3%) WESTERN COAL. CURRENT PLANS CALL FOR THE SCRUBBER PLANT TO REMAIN OUT OF SERVICE UNTIL MID-JUNE FOR DESIGN AND OPERATING MODIFICATIONS. RESUMPTION OF SCRUBBER OPERATIONS WILL OCCUR IN THE PRIMARY PARTICULATE-REMOVAL MODE. THE PEABODY-LURGI VENTURI SCRUBBERS AND SPRAY TOWER ABSORBERS WILL REMAIN IN THE GAS STREAM. SOLUTION WILL BE CIRCULATED THROUGH THE VENTURI'S WASH TRAYS, AND MIST ELIMINATORS. NO SOLUTION WILL BE CIRCULATED THROUGH THE SPRAY ZONE OF THE ABSORBER TOWERS. LIMESTONE REAGENT WILL BE ADDED TO THE SCRUBBING SOLUTION IN ORDER TO PREVENT LOW PH SWINGS AND SUBSEQUENT MATERIALS DAMAGE TO THE SCRUBBER'S INTERNALS. SO₂ REMOVAL SHOULD RESIDE IN THE 35 TO 50% RANGE IN THIS MODE OF OPERATION BECAUSE OF THE SOLUTION'S ALKALINITY DUE TO THE FLY ASH AND LIMESTONE. ALSO DECO PLANS TO MAINTAIN A HIGHER L/G RATIO IN THE SCRUBBER MODULES. THIS MODE OF OPERATION IS PROJECTED TO CONTINUE FOR A ONE TO THREE YEAR PERIOD FOLLOWING THE MID-JUNE RESTART.

4/77	SYSTEM	.0					720
5/77	SYSTEM	.0					744
6/77	SYSTEM	.0					720
7/77	SYSTEM	.0					744
8/77	SYSTEM	.0					744
9/77	SYSTEM	.0					720
10/77	SYSTEM						744

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS PULLED OFF LINE IN DECEMBER 1976 AND DID NOT RESTART UNTIL OCTOBER 1977. WHILE THE UNIT WAS DOWN THE UTILITY INSTALLED BUILDINGS AROUND PUMPS THAT WERE EXPOSED TO SEVERE WEATHER CONDITIONS.

11/77	SYSTEM						720
12/77	SYSTEM						744
1/78	SYSTEM						744
2/78	SYSTEM	96.0					672
3/78	SYSTEM	85.6					744
4/78	SYSTEM	90.0					720
5/78	SYSTEM	74.6					744

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT EXPERIENCED SPRAY HEADER PROBLEMS IN THE ABSORBER TOWER. SOME BROKEN NOZZLES WERE DISCOVERED. THERE WERE SOME I.D. BOOSTER FAN PROBLEMS. THE UTILITY MUST SAND BLAST THE FAN EVERY 4 TO 5 WEEKS WHEN THE MAGNITUDE OF VIBRATION OF THE FAN BECOMES EXCESSIVE FROM SCALE FORMATION; HOWEVER, IN THIS INSTANCE THE PROBLEM WAS A RESULT OF A LOW FAN OIL LEVEL. THE UTILITY NOW OPERATES 3 RECYCLE TANK AGITATORS. PREVIOUSLY ONLY 2 WERE OPERATED. IT WAS FELT THAT PART OF THE TANK PLUGGING WAS A RESULT OF INSUFFICIENT AGITATION. THE SLURRY SPRAY SURGE TANK ENCOUNTERED CONTINUAL OVERFLOW PROBLEMS WHEN THE ABSORBER SUMP PUMP WAS OPERATING. THIS WAS BELIEVED TO BE A RESULT OF A BROKEN SECTION IN THE SPRAY NOZZLE LINES. SPRAY WAS BEING DIRECTED UPWARD TO THE BOTTOM OF A TRAY INSTEAD OF DOWN, COUNTERCURRENT TO THE GAS FLOW AS INTENDED. REHEATER PROBLEMS OCCURRED WITH THE FORMATION OF OIL CLINKERS IN THE BURNER AREA. IT WAS DISCOVERED THAT THE AIR SUPPLY TO THE BURNER WAS INSUFFICIENT.

DETROIT EDISON: ST. CLAIR 6 (CONT.)

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

SOME SPRAY HEADER PROBLEMS WERE ENCOUNTERED. THE FRP PIPING WAS RUPTURING. IT WAS SUSPECTED THAT THE RUPTURES WERE A RESULT OF "WATER HAMMER" I.E. THE SURGE THAT OCCURRS IN THE PIPE WITH A SUDDEN FLOW RATE CHANGE. THE SPRAY HEADERS WERE PLUGGING. WHEN THE HEADERS ARE DRAINED (E.G. SYSTEMS SHUTDOWN) SOME SLURRY SETTLES IN THE HEADER LINES ETC. RINSE LINES ARE NOW BEING INSTALLED TO FLUSH OUT HEADERS DURING FUTURE SHUTDOWNS.

6/78 SYSTEM 87.9

720

** PROBLEMS/SOLUTIONS/COMMENTS

ONE OF THE BLADES CAME LOOSE FROM AN I.D. BOOSTER FAN AND PASSED THROUGH THE HOUSING. REPAIRS WERE MADE WITHOUT SERIOUS COMPLICATIONS.

7/78 SYSTEM 96.0

744

** PROBLEMS/SOLUTIONS/COMMENTS

THE INSTALLATION OF RINSE LINES HAS NOT YET BEEN COMPLETED. PROBLEMS WITH RUPTURED SPRAY HEADER PIPING CONTINUED. IT HAS BEEN POSSIBLE TO OPERATE THE SCRUBBER WITH THE RUPTURED LINES WITHOUT SERIOUS CONSEQUENCES. IT IS NOT CRUCIAL THAT REPAIRS BE MADE IMMEDIATELY.

8/78 SYSTEM 90.4

744

9/78 SYSTEM 69.0

720

10/78 SYSTEM .0

744

11/78 SYSTEM .0

720

12/78 SYSTEM .0

744

1/79 SYSTEM

744

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THIS PERIOD RECYCLE TANK AGITATORS WERE BREAKING LOOSE AND SIMILAR PROBLEMS WERE ENCOUNTERED WITH THE SLURRY STORAGE TANK AGITATORS. THE SCRUBBING SYSTEM WAS REMOVED FROM SERVICE FROM SEPTEMBER THROUGH JANUARY. STEADY BEARINGS WERE INSTALLED AT THE BOTTOM OF THE RECYCLE TANK SOLVING THE RECYCLE TANK AGITATOR PROBLEM. THE SLURRY STORAGE TANK SYSTEM ALREADY HAD STEADY BEARINGS. THESE WERE REWORKED TO IMPROVE OPERATIONS.

2/79 SYSTEM

672

3/79 SYSTEM

744

** PROBLEMS/SOLUTIONS/COMMENTS

SOME REHEATER PROBLEMS OCCURRED.

4/79 SYSTEM

720

5/79 SYSTEM

744

6/79 SYSTEM

720

7/79 SYSTEM

744

8/79 SYSTEM

744

9/79 SYSTEM

720

10/79 SYSTEM

744

** PROBLEMS/SOLUTIONS/COMMENTS

THE SYSTEM IS CURRENTLY DOWN BUT IS EXPECTED TO BE BACK ON LINE SOON. THE SCRUBBING SYSTEM HAS OPERATED ONLY 1 WEEK SINCE MAY 18, 1979 BECAUSE OF SUMP PROBLEMS. THE AGITATOR BEARING SYSTEM WAS POORLY DESIGNED. THE BEARING SYSTEM HAS NOW BEEN COMPLETELY REDESIGNED. THE AGITATORS HAVE NOW OPERATED 2000 HOURS ON THE NEW BEARINGS. THE UTILITY WILL PROBABLY DRAIN THE TANK AFTER ABOUT 500 MORE HOURS TO INSPECT AND READJUST THE BEARINGS. THE NEW BEARING

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

SYSTEM IS COMPOSED OF STAINLESS STEEL PARTS.

100% OF THE ST. CLAIR FLUE GAS PASSES THROUGH THE ESP. 50% OF THAT FLUE GAS ENTERS THE SCRUBBER. THE UNIT IS REQUIRED TO MEET A 55% OPACITY, HOWEVER, A VARIANCE HAS BEEN GRANTED ALLOWING A 65% OPACITY UNTIL THE SCRUBBER IS AGAIN OPERATIONAL. THE UTILITY IS PREPARING TO INSTALL A NEW ESP WHICH WOULD BE OPERATIONAL IN 2 YEARS. WHEN THE NEW ESP IS INSTALLED THE SCRUBBING SYSTEM AND OLD ESP WILL BE SCRAPPED. THE UNIT WILL THEN BE REQUIRED TO MEET A 20% OPACITY.

11/79	SYSTEM	90.0						720		
12/79	SYSTEM	90.0						744		

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT CAME BACK ON LINE AROUND MID-NOVEMBER.
NEW DENVER PUMPS WITH EJECTORS WERE INSTALLED TO ASSIST THE SUMP PUMPS UNTIL THE ESP'S COME ON LINE.
THE ABSORBER PUMPS HAVE BEEN A PROBLEM RESULTING IN A CAPACITY TURNDOWN TO 225 MW (FROM 230 MW).
ONE OF THE COAL MILLS HAS BEEN DOWN CAUSING LIMITED OPERATIONS.

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

** PROBLEMS/SOLUTIONS/COMMENTS

THE SCRUBBING SYSTEM OPERATED AT BETTER THAN 80% DURING THE FIRST QUARTER OF 1980.
THE SCRUBBER ID FAN FAILED. THE BOLTS HOLDING PART OF THE SHROUDING IN PLACE SHEERED CAUSING THE PLATE TO FALL ONTO THE SHAFT.
BECAUSE OF ADDITIONAL PROBLEMS WITH THE A-S-H SUMP PUMPS, THE DENVER PUMPS INSTALLED TO ASSIST THE A-S-H PUMPS NOW CARRY THE ENTIRE LOAD. THE A-S-H PUMPS DRIVES HAVE BEEN DISCONNECTED. THE SLURRY CIRCULATES THROUGH THE THE NON-OPERATING A-S-H PUMPS TO THE DENVER PUMPS.
THE CONTINUAL PROBLEMS WITH THE LOUVER BY PASS DAMPERS WAS SOLVED BY DISCONNECTING THE EXTREME LOUVER AT EITHER END. THE DAMPERS OPERATE NOW WITH 12 OF THE H LOUVERS. THE UTILITY IS PLEASED WITH RECENT DAMPER OPERATIONS. SOME RECENT SCRUBBER OUTAGES RESULTED FROM THE OCCASIONAL UNAVAILABILITY OF LIMESTONE.

SECTION 14

DESIGN AND PERFORMANCE DATA FOR OPERATIONAL PARTICLE SCRUBBERS

COMPANY NAME	MINNESOTA POWER & LIGHT	
PLANT NAME	CLAY BOSWELL	
UNIT NUMBER	3	
CITY	COMHASSET	
STATE	MINNESOTA	
REGULATORY CLASSIFICATION	E	
PARTICULATE EMISSION LIMITATION - NG/J	258.	(.600 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	1720.	(4.000 LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	350.0	
GROSS UNIT GENERATING CAPACITY - MW	364.0	
NET UNIT GENERATING CAPACITY W/FGD - MW	347.1	
NET UNIT GENERATING CAPACITY WO/FGD - MW	350.0	
EQUIVALENT SCRUBBED CAPACITY - MW	350.0	
** BOILER DATA		
SUPPLIER	COMBUSTION ENGINEERING	
TYPE	PULVERIZED COAL	
SERVICE LOAD	BASE	
COMMERCIAL SERVICE DATE	5/73	
MAXIMUM BOILER FLUE GAS FLOW - CU.M/S	613.47	(1300000 ACFM)
FLUE GAS TEMPERATURE - C	123.3	(254 F)
STACK HEIGHT - M	213.	(700 FT)
STACK TOP DIAMETER - M	7.9	(26.0 FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	SUBBITUMINOUS	
AVERAGE HEAT CONTENT - J/G	19538.	(8400 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		7500-9900
AVERAGE ASH CONTENT - %	9.00	
RANGE ASH CONTENT - %	4.81-16.0	
AVERAGE MOISTURE CONTENT - %	26.00	
RANGE MOISTURE CONTENT - %	24.0-28.0	
AVERAGE SULFUR CONTENT - %	.92	
RANGE SULFUR CONTENT - %	0.5-1.5	
AVERAGE CHLORIDE CONTENT - %	.01	
RANGE CHLORIDE CONTENT - %	0.0-0.07	
** FABRIC FILTER		
NUMBER	0	
TYPE	NONE	
** ESP		
NUMBER	0	
** MECHANICAL COLLECTOR		
NUMBER	0	
** PARTICULATE SCRUBBER		
NUMBER	1	
TYPE	SPRAY IMPINGEMENT TOWER	
SUPPLIER	KREBS ENGINEERS	
NUMBER OF STAGES	1	
SHELL MATERIAL	316L SS	
LINING MATERIAL	NONE	
INTERNAL MATERIAL	316L SS	
TYPE OF NOZZLES	SPRAY NOZZLES WITH CERAMIC INSERTS	
BOILER LOAD/SCRUBBER - %	110.0	
FLUE GAS CAPACITY - CU.M/S	613.5	(1300000 ACFM)
FLUE GAS TEMPERATURE - C	123.3	(254 F)
LIQUID RECIRCULATION RATE - LITER/S	714.4	(11340 GPM)
L/G RATIO - LITER/CU.M	1.1	(8.3 GAL/1000ACF)
PRESSURE DROP - KPA	*****	(***** IN-H2O)
SUPERFICIAL GAS VELOCITY - M/S	2.4	(8.0 FT/S)
PARTICULATE INLET LOAD - G/CU.M	6.9	(3.00 GR/SCF)
PARTICULATE OUTLET LOAD - NG/J	34.	(.078 LB/MMBTU)
PARTICULATE DESIGN REMOVAL EFFICIENCY - %	98.7	
SO2 INLET CONCENTRATION - PPM	800.000	
SO2 DESIGN REMOVAL EFFICIENCY - %	.0	

EPA UTILITY FGD SURVEY: JANUARY - MARCH 1980
MINNESOTA POWER & LIGHT: CLAY BOSWELL 3 (CONT.)

-----PERFORMANCE DATA-----											
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART. HOURS	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
10/79	SYSTEM								744		
11/79	SYSTEM								720		
12/79	SYSTEM								744		
** PROBLEMS/SOLUTIONS/COMMENTS											
NO INFORMATION WAS AVAILABLE FOR THE FOURTH QUARTER 1979.											
1/80	SYSTEM								744		
2/80	SYSTEM								696		
3/80	SYSTEM								744		
** PROBLEMS/SOLUTIONS/COMMENTS											
THE UTILITY REPORTED THAT THE SCRUBBER EXPERIENCED NO PROBLEMS DURING THE 1ST QUARTER 1980.											

SECTION 14
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL PARTICLE SCRUBBERS

COMPANY NAME	MINNESOTA POWER & LIGHT	
PLANT NAME	SVL LASKIN	
UNIT NUMBER	1	
CITY	AURORA	
STATE	MINNESOTA	
REGULATORY CLASSIFICATION	E	
PARTICULATE EMISSION LIMITATION - NG/J	258.	(.600 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	1720.	(4.000 LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	116.0	
GROSS UNIT GENERATING CAPACITY - MW	62.0	
NET UNIT GENERATING CAPACITY W/FGD - MW	57.3	
NET UNIT GENERATING CAPACITY WO/FGD - MW	58.0	
EQUIVALENT SCRUBBED CAPACITY - MW	58.0	
** BOILER DATA		
SUPPLIER	COMBUSTION ENGINEERING	
TYPE	PULVERIZED COAL	
SERVICE LOAD	INTERMEDIATE	
COMMERCIAL SERVICE DATE	0/53	
MAXIMUM BOILER FLUE GAS FLOW - CU.M/S	141.57	(300000 ACFM)
FLUE GAS TEMPERATURE - C	171.1	(340 F)
STACK HEIGHT - M	91.	(300 FT)
STACK TOP DIAMETER - M	3.2	(10.5 FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	SUBBITUMINOUS	
AVERAGE HEAT CONTENT - J/G	20469.	(8800 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		7509-9923
AVERAGE ASH CONTENT - %	9.00	
RANGE ASH CONTENT - %	4.81-16.0	
AVERAGE MOISTURE CONTENT - %	26.70	
RANGE MOISTURE CONTENT - %	24.0-28.0	
AVERAGE SULFUR CONTENT - %	1.00	
RANGE SULFUR CONTENT - %	.5-1.5	
AVERAGE CHLORIDE CONTENT - %	.01	
RANGE CHLORIDE CONTENT - %	0.00-0.07	
** FABRIC FILTER		
NUMBER	0	
TYPE	NONE	
** ESP		
NUMBER	0	
TYPE	NONE	
** MECHANICAL COLLECTOR		
NUMBER	0	
TYPE	NONE	
** PARTICULATE SCRUBBER		
NUMBER	1	
TYPE	SPRAY IMPINGEMENT TOWER	
SUPPLIER	KREBS ENGINEERS	
NUMBER OF STAGES	1	
SHELL MATERIAL	316 ELC SS	
LINING MATERIAL	NONE	
INTERNAL MATERIAL	316 ELC SS	
TYPE OF NOZZLES	SPRAY NOZZLES WITH CERAMIC INSERTS	
BOILER LOAD/SCRUBBER - %	100.0	
FLUE GAS CAPACITY - CU.M/S	137.4	(291160 ACFM)
FLUE GAS TEMPERATURE - C	171.1	(340 F)
LIQUID RECIRCULATION RATE - LITER/S	151.2	(2400 GPM)
L/G RATIO - LITER/CU.M	1.1	(8.3 GAL/1000ACF)
PRESSURE DROP - KPA	*****	(***** IN-H2O)
SUPERFICIAL GAS VELOCITY - M/S	2.1	(7.0 FT/S)
PARTICULATE INLET LOAD - G/CU.M	4.7	(2.06 GR/SCF)
PARTICULATE OUTLET LOAD - NG/J	34.	(.078 LB/MMBTU)
PARTICULATE DESIGN REMOVAL EFFICIENCY - %	97.8	
SO2 INLET CONCENTRATION - PPM	800.000	
SO2 OUTLET CONCENTRATION - PPM	500.000	
SO2 DESIGN REMOVAL EFFICIENCY - %	.0	

EPA UTILITY FGD SURVEY: JANUARY - MARCH 1980
 MINNESOTA POWER & LIGHT: SYL LASKIN 1 (CONT.)

-----PERFORMANCE DATA-----										
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PER PART. HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
10/79	SYSTEM							744		
11/79	SYSTEM							720		
12/79	SYSTEM							744		
** PROBLEMS/SOLUTIONS/COMMENTS										
NO INFORMATION WAS AVAILABLE FOR THE FOURTH QUARTER 1979.										
1/80	SYSTEM							744		
2/80	SYSTEM							696		
3/80	SYSTEM							744		
** PROBLEMS/SOLUTIONS/COMMENTS										
THE UTILITY REPORTED THAT THE SCRUBBER EXPERIENCED NO PROBLEMS DURING THE 1ST QUARTER 1980.										

SECTION 14
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL PARTICLE SCRUBBERS

COMPANY NAME	MINNESOTA POWER & LIGHT	
PLANT NAME	SYL LASKIN	
UNIT NUMBER	2	
CITY	AURORA	
STATE	MINNESOTA	
REGULATORY CLASSIFICATION	E	
PARTICULATE EMISSION LIMITATION - NG/J	258.	(.600 LB/MMBTU)
SO ₂ EMISSION LIMITATION - NG/J	1720.	(4.000 LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	116.0	
GROSS UNIT GENERATING CAPACITY - MW	62.0	
NET UNIT GENERATING CAPACITY W/FGD - MW	57.3	
NET UNIT GENERATING CAPACITY WO/FGD - MW	59.0	
EQUIVALENT SCRUBBED CAPACITY - MW	58.0	
** BOILER DATA		
SUPPLIER	COMBUSTION ENGINEERING	
TYPE	PULVERIZED COAL	
SERVICE LOAD	INTERMEDIATE	
COMMERCIAL SERVICE DATE	0/53	
MAXIMUM BOILER FLUE GAS FLOW - CU.M/S	141.57	(300000 ACFM)
FLUE GAS TEMPERATURE - C	171.1	(340 F)
STACK HEIGHT - M	91.	(300 FT)
STACK TOP DIAMETER - M	3.2	(10.5 FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	SUBBITUMINOUS	
AVERAGE HEAT CONTENT - J/G	23469.	(8800 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		7509-9923
AVERAGE ASH CONTENT - %	9.00	
RANGE ASH CONTENT - %	4.81-16.0	
AVERAGE MOISTURE CONTENT - %	26.70	
RANGE MOISTURE CONTENT - %	24.0-28.0	
AVERAGE SULFUR CONTENT - %	1.00	
RANGE SULFUR CONTENT - %	.5-1.5	
AVERAGE CHLORIDE CONTENT - %	.01	
RANGE CHLORIDE CONTENT - %	0.00-0.07	
** FABRIC FILTER		
NUMBER	0	
TYPE	NONE	
** ESP		
NUMBER	0	
TYPE	NONE	
** MECHANICAL COLLECTOR		
NUMBER	0	
TYPE	NONE	
** PARTICULATE SCRUBBER		
NUMBER	1	
TYPE	SPRAY IMPINGEMENT TOWER	
SUPPLIER	KREES ENGINEERS	
NUMBER OF STAGES	1	
SHELL MATERIAL	316 ELC SS	
LINING MATERIAL	NONE	
INTERNAL MATERIAL	316 ELC SS	
TYPE OF NOZZLES	SPRAY NOZZLES WITH CERAMIC INSERTS	
BOILER LOAD/SCRUBBER - %	100.0	
FLUE GAS CAPACITY - CU.M/S	137.4	(291160 ACFM)
FLUE GAS TEMPERATURE - C	171.1	(340 F)
LIQUID RECIRCULATION RATE - LITER/S	151.2	(2400 GPM)
L/G RATIO - LITER/CU.M	1.1	(8.3 GAL/1000ACF)
PRESSURE DROP - KPA	*****	(***** IN-H ₂ O)
SUPERFICIAL GAS VELOCITY - M/S	2.1	(7.0 FT/S)
PARTICULATE INLET LOAD - G/CU.M	4.7	(2.06 GR/SCF)
PARTICULATE OUTLET LOAD - NG/J	34.	(.078 LB/MMBTU)
PARTICULATE DESIGN REMOVAL EFFICIENCY - %	97.8	
SO ₂ INLET CONCENTRATION - PPM	800.000	
SO ₂ OUTLET CONCENTRATION - PPM	500.000	
SO ₂ DESIGN REMOVAL EFFICIENCY - %	.0	

EPA UTILITY FGD SURVEY: JANUARY - MARCH 1980
MINNESOTA POWER & LIGHT: SYL LASKIN 2 (CONT.)

-----PERFORMANCE DATA-----										
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO ₂	PER PART. HOURS	PER BOILER HOURS	FGD HOURS	CAP. FACTOR
10/79	SYSTEM							744		
11/79	SYSTEM							720		
12/79	SYSTEM							744		
** PROBLEMS/SOLUTIONS/COMMENTS										
NO INFORMATION WAS AVAILABLE FOR THE FOURTH QUARTER 1979.										
1/80	SYSTEM							744		
2/80	SYSTEM							696		
3/80	SYSTEM							744		
** PROBLEMS/SOLUTIONS/COMMENTS										
THE UTILITY REPORTED THAT THE SCRUBBER EXPERIENCED NO PROBLEMS DURING THE 1ST QUARTER 1980.										

SECTION 14

DESIGN AND PERFORMANCE DATA FOR OPERATIONAL PARTICLE SCRUBBERS

COMPANY NAME	MONTANA-DAKOTA UTILITIES CO.	
PLANT NAME	LEWIS & CLARK	
UNIT NUMBER	1	
CITY	SIDNEY	
STATE	MONTANA	
REGULATORY CLASSIFICATION	*****	
PARTICULATE EMISSION LIMITATION - NG/J	86.	(.200 LB/MMBTU)
SO ₂ EMISSION LIMITATION - NG/J	437.	(1.000 LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	50.3	
GROSS UNIT GENERATING CAPACITY - MW	55.1	
NET UNIT GENERATING CAPACITY W/FGD - MW	50.3	
NET UNIT GENERATING CAPACITY WO/FGD - MW	51.5	
EQUIVALENT SCRUBBED CAPACITY - MW	*****	
** BOILER DATA		
SUPPLIER	COMBUSTION ENGINEERING	
TYPE	PULVERIZED COAL	
SERVICE LOAD	BASE	
COMMERCIAL SERVICE DATE	10/58	
MAXIMUM BOILER FLUE GAS FLOW - CU.M/S	153.37	(325000 ACFM)
FLUE GAS TEMPERATURE - C	215.6	(420 F)
STACK HEIGHT - M	76.	(250 FT)
STACK TOP DIAMETER - M	4.4	(14.5 FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	LIGNITE	
AVERAGE HEAT CONTENT - J/G	15003.	(6450 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		6200-6700
AVERAGE ASH CONTENT - %	7.80	
RANGE ASH CONTENT - %	7.2-9.3	
AVERAGE MOISTURE CONTENT - %	36.20	
RANGE MOISTURE CONTENT - %	34.25-38.16	
AVERAGE SULFUR CONTENT - %	.61	
RANGE SULFUR CONTENT - %	.32-1.43	
AVERAGE CHLORIDE CONTENT - %	.03	
RANGE CHLORIDE CONTENT - %	*****	
** MECHANICAL COLLECTOR		
NUMBER	1	
TYPE	MULTICLONE	
SUPPLIER	WESTERN PRECIPITATION	
PARTICULATE DESIGN REMOVAL EFFICIENCY - %	85.7	
FLUE GAS CAPACITY - CU.M/S	106.2	(225000 ACFM)
FLUE GAS TEMPERATURE - C	176.7	(350 F)
PRESSURE DROP - KPA	*****	(***** IN-H ₂ O)
PARTICULATE OUTLET LOAD - G/CU.M	2.93	(1.02E GR/SCF)
** PARTICULATE SCRUBBER		
TYPE	VENTURI	
SUPPLIER	RESEARCH COTTRELL	
NUMBER OF STAGES	1	
SHELL MATERIAL	CARBON STEEL	
LINING MATERIAL	CEILCOTE FLAKELINE 103	
INTERNAL MATERIAL	CARBON STEEL WITH 1" NORTON CA-308	
NUMBER OF NOZZLES	-	
BOILER LOAD/SCRUBBER - %	100.0	
FLUE GAS CAPACITY - CU.M/S	149.0	(313730 ACFM)
FLUE GAS TEMPERATURE - C	215.6	(420 F)
LIQUID RECIRCULATION RATE - LITER/S	212.6	(3374 GPM)
L/G RATIO - LITER/CU.M	1.7	(13.0 GAL/1000ACF)
PRESSURE DROP - KPA	*****	(***** IN-H ₂ O)
PARTICULATE INLET LOAD - G/CU.M	327.2	(143.00 GR/SCF)
PARTICULATE OUTLET LOAD - G/CU.M	.1	(.030 GR/SCF)
SO ₂ INLET CONCENTRATION - NG/J	28134.	(***** LB/MMBTU)

-----PERFORMANCE DATA-----									
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO ₂	PER BOILER PART. HOURS	FGD HOURS	CAP. FACTOR

10/79 SYSTEM

720

** PROBLEMS/SOLUTIONS/COMMENTS

DURING A SCHEDULED BOILER OUTAGE GENERAL SCRUBBER MAINTENANCE WAS PERFORMED.

11/79 SYSTEM

720

** PROBLEMS/SOLUTIONS/COMMENTS

DURING NOVEMBER THE SCRUBBER WAS TEMPORARILY BYPASSED TO ALLOW FOR REPAIRS NECESSITATED BY A LEAK IN THE FLOODED DISC SCRUBBER.

12/79 SYSTEM

744

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO SCRUBBER PROBLEMS OCCURRED DURING DECEMBER.

1/80 SYSTEM

744

2/80 SYSTEM

696

3/80 SYSTEM

744

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE JANUARY THROUGH MARCH PERIOD THE SCRUBBER WAS AVAILABLE MORE THAN 95% OF THE TIME.

THE EROSION PROBLEM MENTIONED DURING NOVEMBER CONTINUED. SECTIONS OF THE LINED CARBON STEEL COLUMN WALL SUPPORTING THE FLOODED DISC WERE RUPTURING, FILLING THE INNER CHAMBER WITH SLURRY AND ULTIMATELY RENDERING THE DISC MOVEMENT MECHANISM INOPERATIVE. THE UTILITY HAS MANAGED TO KEEP THE SCRUBBER OPERATING AS A STOP-GAP MEASURE BETWEEN UNIT SHUTDOWNS BY INSERTING A GARDEN HOSE IN THE COLUMN HOLES AND CONTINUALLY FLUSHING THE INNER CHAMBER. THE UTILITY HAS HAD SOME SUCCESS IN OTHER EROSION AREAS BY MAKING REPAIRS WITH A HASTELLOY MATERIAL. PLANS ARE BEING MADE TO JACKET THE ENTIRE DISC SUPPORT COLUMN WITH HASTELLOY G.

SECTION 14

DESIGN AND PERFORMANCE DATA FOR OPERATIONAL PARTICLE SCRUBBERS

COMPANY NAME	PACIFIC POWER & LIGHT
PLANT NAME	DAVE JOHNSTON
UNIT NUMBER	4
CITY	GLENROCK
STATE	WYOMING
REGULATORY CLASSIFICATION	*****
PARTICULATE EMISSION LIMITATION - NG/J	90. (.210 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	215. (.500 LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	*****
GROSS UNIT GENERATING CAPACITY - MW	330.0
NET UNIT GENERATING CAPACITY W/FGD - MW	326.5
NET UNIT GENERATING CAPACITY WO/FGD - MW	330.0
EQUIVALENT SCRUBBED CAPACITY - MW	33.0
** BOILER DATA	
SUPPLIER	COMBUSTION ENGINEERING
TYPE	PULVERIZED COAL
SERVICE LOAD	*****
COMMERCIAL SERVICE DATE	**/**
MAXIMUM BOILER FLUE GAS FLOW - CU.M/S	707.85 (1500000 ACFM)
FLUE GAS TEMPERATURE - C	132.2 (270 F)
STACK HEIGHT - M	76. (250 FT)
STACK TOP DIAMETER - M	***** (***** FT)
** FUEL DATA	
FUEL TYPE	COAL
FUEL GRADE	SUBBITUMINOUS
AVERAGE HEAT CONTENT - J/G	17282. (7430 BTU/LB)
RANGE HEAT CONTENT - BTU/LB	5,000-9,000
AVERAGE ASH CONTENT - %	12.00
RANGE ASH CONTENT - %	*****
AVERAGE MOISTURE CONTENT - %	26.00
RANGE MOISTURE CONTENT - %	*****
AVERAGE SULFUR CONTENT - %	.50
RANGE SULFUR CONTENT - %	*****
AVERAGE CHLORIDE CONTENT - %	.04
RANGE CHLORIDE CONTENT - %	*****
** PARTICULATE SCRUBBER	
NUMBER	3
TYPE	VENTURI
SUPPLIER	CHEMICO
SHELL MATERIAL	CARBON STEEL, 3/8" AT VENTURI THROAT
LINING MATERIAL	POLYESTER-LINED STEEL
BOILER LOAD/SCRUBBER - %	33.3
FLUE GAS CAPACITY - CU.M/S	327.5 (694000 ACFM)
FLUE GAS TEMPERATURE - C	135.0 (275 F)
LIQUID RECIRCULATION RATE - LITER/S	409.5 (6500 GPM)
L/G RATIO - LITER/CU.M	1.7 (13.0 GAL/1000ACF)
PRESSURE DROP - KPA	***** (***** IN-H2O)
PARTICULATE INLET LOAD - G/CU.M	9.2 (4.00 GR/SCF)
PARTICULATE OUTLET LOAD - G/CU.M	.1 (.040 GR/SCF)
PARTICULATE DESIGN REMOVAL EFFICIENCY - %	99.7
SO2 INLET CONCENTRATION - PPM	500,000
SO2 DESIGN REMOVAL EFFICIENCY - %	40.0

-----PERFORMANCE DATA-----										
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PER PART.	BOILER HOURS	FGD HOURS	CAP. FACTOR
10/79	SYSTEM							744		
11/79	SYSTEM							720		
12/79	SYSTEM							744		

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

** PROBLEMS/SOLUTIONS/COMMENTS

NO INFORMATION WAS AVAILABLE FOR THE FOURTH QUARTER 1979.

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

** PROBLEMS/SOLUTIONS/COMMENTS

NO INFORMATION WAS AVAILABLE FOR THE FIRST QUARTER 1980.

SECTION 14
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL PARTICLE SCRUBBERS

COMPANY NAME	POTOMAC ELECTRIC POWER
PLANT NAME	DICKERSON
UNIT NUMBER	1
CITY	DICKERSON
STATE	MARYLAND
REGULATORY CLASSIFICATION	*****
PARTICULATE EMISSION LIMITATION - NG/J	***** (***** LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	***** (***** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	1348.0
GROSS UNIT GENERATING CAPACITY - MW	197.0
NET UNIT GENERATING CAPACITY W/FGD - MW	123.0
NET UNIT GENERATING CAPACITY WO/FGD - MW	*****
EQUIVALENT SCRUBBED CAPACITY - MW	*****

** BOILER DATA

SUPPLIER	*****
TYPE	PULVERIZED COAL
SERVICE LOAD	*****
COMMERCIAL SERVICE DATE	**/**
MAXIMUM BOILER FLUE GAS FLOW - CU.M/S	***** (***** ACFM)
FLUE GAS TEMPERATURE - C	***** (**** F)
STACK HEIGHT - M	***** (**** FT)
STACK TOP DIAMETER - M	***** (***** FT)

** FUEL DATA

FUEL TYPE	COAL
FUEL GRADE	*****
AVERAGE HEAT CONTENT - J/G	27214. (11700 BTU/LB)
RANGE HEAT CONTENT - BTU/LB	*****
AVERAGE ASH CONTENT - %	14.00
RANGE ASH CONTENT - %	*****
AVERAGE MOISTURE CONTENT - %	*****
RANGE MOISTURE CONTENT - %	*****
AVERAGE SULFUR CONTENT - %	2.20
RANGE SULFUR CONTENT - %	*****
AVERAGE CHLORIDE CONTENT - %	*****
RANGE CHLORIDE CONTENT - %	*****

** PARTICULATE SCRUBBER

TYPE	VENTURI
NUMBER OF STAGES	2

-----PERFORMANCE DATA-----									
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER BOILER HOURS	FGD HOURS	CAP. FACTOR
10/79	SYSTEM		100.0		83.6		744	622	622
11/79	SYSTEM		96.0		80.1		720	601	577
12/79	SYSTEM		100.0		87.4		744	650	650

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THIS PERIOD ONLY ONE SCRUBBER RELATED OUTAGE OCCURRED. THE OUTAGE WAS FOR AN ID FAN INSPECTION WHICH LASTED ONE DAY.

1/80	SYSTEM	100.0	100.0		100.0		744	744	744
2/80	SYSTEM	94.3	95.8		94.3		696	695	656
3/80	SYSTEM	100.0	100.0		100.0		744	744	744

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE FIRST QUARTER 1980 ONLY ONE SCRUBBER OUTAGE OCCURRED. IN FEBRUARY OUTAGE TIME WAS NECESSARY TO REPAIR A SLURRY RECYCLE LINE LEAK.

SECTION 14
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL PARTICLE SCRUBBERS

COMPANY NAME	POTOMAC ELECTRIC POWER
PLANT NAME	DICKERSON
UNIT NUMBER	2
CITY	DICKERSON
STATE	MARYLAND
REGULATORY CLASSIFICATION	*****
PARTICULATE EMISSION LIMITATION - NG/J	***** (***** LB/MMBTU)
SO ₂ EMISSION LIMITATION - NG/J	***** (***** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	1348.0
GROSS UNIT GENERATING CAPACITY - MW	190.0
NET UNIT GENERATING CAPACITY W/FGD - MW	183.0
NET UNIT GENERATING CAPACITY WO/FGD - MW	*****
EQUIVALENT SCRUBBED CAPACITY - MW	*****

** BOILER DATA	
SUPPLIER	*****
TYPE	PULVERIZED COAL
SERVICE LOAD	*****
COMMERCIAL SERVICE DATE	**/**
MAXIMUM BOILER FLUE GAS FLOW - CU.M/S	***** (***** ACFM)
FLUE GAS TEMPERATURE - C	***** (**** F)
STACK HEIGHT - M	***** (**** FT)
STACK TOP DIAMETER - M	***** (**** FT)

** FUEL DATA	
FUEL TYPE	COAL
FUEL GRADE	*****
AVERAGE HEAT CONTENT - J/G	27214. (11700 BTU/LB)
RANGE HEAT CONTENT - BTU/LB	*****
AVERAGE ASH CONTENT - %	14.00
RANGE ASH CONTENT - %	*****
AVERAGE MOISTURE CONTENT - %	*****
RANGE MOISTURE CONTENT - %	*****
AVERAGE SULFUR CONTENT - %	2.00
RANGE SULFUR CONTENT - %	*****
AVERAGE CHLORIDE CONTENT - %	*****
RANGE CHLORIDE CONTENT - %	*****

** PARTICULATE SCRUBBER	
TYPE	VENTURI
NUMBER OF STAGES	2

-----PERFORMANCE DATA-----										
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO ₂	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
10/79	SYSTEM		100.0		97.0		744	722	722	
11/79	SYSTEM		96.4		88.9		720	664	640	
12/79	SYSTEM		100.0		100.0		744	744	744	

** PROBLEMS/SOLUTIONS/COMMENTS

A ONE DAY OUTAGE OCCURRED, DUE TO A FAN LINING PROBLEM. NO OTHER UNIT PROBLEMS WERE ENCOUNTERED DURING THE PERIOD.

1/80	SYSTEM	95.4	96.4		95.4		744	736	710	
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** PROBLEMS/SOLUTIONS/COMMENTS

IN JANUARY THE SCRUBBER WAS DOWN FOR 3 HOURS TO REPAIR A SLURRY RECYCLE LINE LEAK.
31 HOURS OF THE OUTAGE TIME IN JANUARY WAS NECESSARY TO REPAIR A RECYCLE PUMP.

2/80	SYSTEM	100.0	100.0		100.0		696	696	696	
3/80	SYSTEM	96.9	96.9		96.9		744	744	721	

POTOMAC ELECTRIC POWER: DICKERSON 2 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

IN MARCH THE SCRUBBER WAS DOWN FOR A SCRUBBER LINING WARRANTY INSPECTION.
NO REPAIR WORK WAS NECESSARY.

SECTION 14
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL PARTICLE SCRUBBERS

COMPANY NAME	POTOMAC ELECTRIC POWER
PLANT NAME	DICKERSON
UNIT NUMBER	3
CITY	DICKERSON
STATE	MARYLAND
REGULATORY CLASSIFICATION	*****
PARTICULATE EMISSION LIMITATION - NG/J	***** (***** LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	688. (1.600 LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	548.0
GROSS UNIT GENERATING CAPACITY - MW	197.0
NET UNIT GENERATING CAPACITY W/FGD - MW	183.0
NET UNIT GENERATING CAPACITY WO/FGD - MW	*****
EQUIVALENT SCRUBBED CAPACITY - MW	*****

** BOILER DATA	
SUPPLIER	COMBUSTION ENGINEERING
TYPE	PULVERIZED COAL
SERVICE LOAD	BASE
COMMERCIAL SERVICE DATE	0/62
MAXIMUM BOILER FLUE GAS FLOW - CU.M/S	278.42 (590000 ACFM)
FLUE GAS TEMPERATURE - C	126.1 (259 F)
STACK HEIGHT - M	122. (400 FT)
STACK TOP DIAMETER - M	***** (***** FT)

** FUEL DATA	
FUEL TYPE	COAL
FUEL GRADE	*****
AVERAGE HEAT CONTENT - J/G	27214. (11700 BTU/LB)
RANGE HEAT CONTENT - BTU/LB	*****
AVERAGE ASH CONTENT - %	14.00
RANGE ASH CONTENT - %	*****
AVERAGE MOISTURE CONTENT - %	*****
RANGE MOISTURE CONTENT - %	*****
AVERAGE SULFUR CONTENT - %	2.00
RANGE SULFUR CONTENT - %	*****
AVERAGE CHLORIDE CONTENT - %	*****
RANGE CHLORIDE CONTENT - %	*****

** ESP	
NUMBER	1
SUPPLIER	RESEARCH COTTRELL
PARTICULATE DESIGN REMOVAL EFFICIENCY - %	94.0

** PARTICULATE SCRUBBER	
NUMBER	1
TYPE	VENTURI
SUPPLIER	CHEMICO
BOILER LOAD/SCRUBBER - %	50.0
FLUE GAS CAPACITY - CU.M/S	139.2 (295000 ACFM)
FLUE GAS TEMPERATURE - C	126.1 (259 F)
L/G RATIO - LITER/CU.M	2.7 (20.0 GAL/100ACF)
PRESSURE DROP - KPA	***** (***** IN-H2O)

PERFORMANCE DATA									
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER BOILER HOURS	FGD HOURS	CAP. FACTOR
9/73	SYSTEM						720		
10/73	SYSTEM						744		
11/73	SYSTEM						720		
12/73	SYSTEM						744		
1/74	SYSTEM						744		

POTOMAC ELECTRIC POWER: DICKERSON 3 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

PROBLEMS DURING THIS PERIOD RANGED FROM CORROSION LEAKS IN EXPANSION JOINTS TO PROBLEMS IN MATERIAL HANDLING EQUIPMENT, FEEDING AND SLAKING OF MGO, PLUGGING IN THE MGO MIX TANK AND SUCTION LINES TO THE MGO MAKE-UP PUMPS.

2/74	SYSTEM								672	
3/74	SYSTEM								744	
4/74	SYSTEM								720	
4/74	SYSTEM								720	

** PROBLEMS/SOLUTIONS/COMMENTS

MAINTENANCE AND MODIFICATIONS WERE PERFORMED ON THE SYSTEM. THE MAJOR SYSTEM REVISION MADE DURING THIS PERIOD WAS THE ADDITION OF A PRE-MIX TANK IN THE MGO SYSTEM.

5/74	SYSTEM								744	
6/74	SYSTEM								720	
7/74	SYSTEM								744	

** PROBLEMS/SOLUTIONS/COMMENTS

LIMITED OPERATION OCCURRED BECAUSE THE UTILITY DID NOT HAVE ACCESS TO THE EPA CALCINING FACILITY AT THE ESSEX CHEMICAL COMPANY SULFURIC ACID PLANT. BY THE END OF JUNE 1974, ALL THE MGO AT DICKERSON HAD BEEN USED AND A SILO PLUS THREE CARS WERE FULL OF MGSO3.

8/74	SYSTEM								744	87
9/74	SYSTEM								720	
10/74	SYSTEM								744	
11/74	SYSTEM								720	
12/74	SYSTEM								744	

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THIS PERIOD THE SYSTEM GENERALLY OPERATED AT 75 PERCENT OF THE DESIGN GAS FLOW.

1/75	SYSTEM								744	
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** PROBLEMS/SOLUTIONS/COMMENTS

PROBLEMS DEVELOPED IN THE BUCKET ELEVATOR TRANSPORTING THE MGSO3 FROM THE DRYER TO THE STORAGE SILO.

2/75	SYSTEM								672	
3/75	SYSTEM								744	
5/75	SYSTEM								744	
6/75	SYSTEM								720	
7/75	SYSTEM								744	

** PROBLEMS/SOLUTIONS/COMMENTS

UNIT NO. 3 WAS TAKEN OUT OF SERVICE FOR AN 8 TO 12 WEEK TURBINE OVERHAUL. THE SCRUBBER WAS INSPECTED, MAINTENANCE AND MODIFICATIONS WERE MADE.

8/75	SYSTEM								744	
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-----PERFORMANCE DATA-----					
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION
				% REMOVAL SO2 PART.	PER BOILER FGD HOURS HOURS CAP. HOURS FACTOR

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM CONSISTS OF A SINGLE, TWO-STAGE SCRUBBER/ABSORBER, WHICH INCORPORATES AN ADJUSTABLE-THROAT VENTURI SCRUBBER FOR PARTICULATE REMOVAL AND A SECOND STAGE ABSORBER WITH A FIXED VENTURI TO REMOVE SO2. THE LIQUOR STREAMS FOR BOTH STAGES ARE SEPARATE AND OPERATE IN A CLOSED-LOOP MODE. UNTIL MID-1975 THE MAGNESIUM SULFITE GENERATED WAS TRANSFERRED TO AN EPA FINANCED FACILITY AT THE ESSEX CHEMICAL COMPANY SULFURIC ACID MANUFACTURING PLANT IN RUMFORD, RHODE ISLAND WHERE MAGNESIUM OXIDE WAS REGENERATED AND SO2 FROM THE REGENERATION PROCESS WAS CONVERTED TO SULFURIC ACID. THE RUMFORD FACILITY HAS SINCE BEEN CLOSED DOWN. CONSTRUCTION WAS COMPLETED IN AUGUST AND THE SYSTEM STARTED UP IN SEPTEMBER 1973. DURING INTERMITTENT OPERATIONS FOR SHAKEDOWN THROUGH JANUARY 1974, THE SYSTEM'S LONGEST CONTINUOUS RUN WAS 271 HOURS. THE SYSTEM HAS RE-STARTED FROM JULY THROUGH DECEMBER 1974, AND AGAIN ON AUGUST 11, 1975, FOR APPROXIMATELY 87 HOURS. FGD UNIT OUTAGES WERE CAUSED PRIMARILY BY PIPE AND PUMP CORROSION AND MAJOR TURBINE OVERHAUL OF THE BOILER. PARTICULATE AND SO2 REMOVAL EFFICIENCY GUARANTEES WERE CORROBORATED DURING OPERATIONAL PHASES. THE FGD SYSTEM WAS RESTARTED IN AUGUST. STEAM WAS LOST TO THE WGO MIX TANK, RESULTING IN A VERY MOIST PRODUCT FROM THE CENTRIFUGE. CAKING IN THE DRYER OCCURRED. AT THIS POINT, THE UTILITY DECIDED TO TEST ONLY THE FIRST-STAGE OF THE SCRUBBING SYSTEM, TAKING GAS AHEAD OF THE PRECIPITATOR. FGD OPERATION AT DICKERSON TERMINATED AT THIS POINT. THE REMAINING SUPPLY OF MAGNESIUM OXIDE, ABOUT 100 TONS (10 DAYS), HAS BEEN DEPLETED, AND THE DICKERSON UNIT HAS BEEN TERMINATED AS A FGD SYSTEM.

9/75	SYSTEM	720
10/75	SYSTEM	744
11/75	SYSTEM	720
12/75	SYSTEM	744
1/76	SYSTEM	744
2/76	SYSTEM	606
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
11/76	SYSTEM	720
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

POTOMAC ELECTRIC POWER: DICKERSON 3 (CONT.)

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

8/77	SYSTEM						744			
9/77	SYSTEM						720			
10/77	SYSTEM						744			
11/77	SYSTEM						720			
12/77	SYSTEM						744			
1/78	SYSTEM						744			
2/78	SYSTEM	38.0	38.0		38.0		672	672	252	
** PROBLEMS/SOLUTIONS/COMMENTS										
THERE HAVE BEEN MANY MAINTENANCE PROBLEMS AND PROBLEMS WITH LINER FAILURES. SINCE SHIFTING FROM SO2 TO PARTICULATE SCRUBBING ONLY, PLUGGING PROBLEMS HAVE NOT OCCURRED. LOW PH HAS CAUSED CORROSION WHICH WAS AGGRAVATED BY PARTICULATE EROSION. THE UTILITY WILL PROBABLY RELINE WITH A FLAKE GLASS TYPE LINER. NO CHEMICALS (E.G. LIME) ARE ADDED TO THE CIRCULATING LIQUOR FOR PH BALANCE.										
OUTAGE TIME WAS CAUSED BY LEAK REPAIRS IN SLURRY PIPING.										
3/78	SYSTEM	21.0	22.0		21.0		744	717	156	
** PROBLEMS/SOLUTIONS/COMMENTS										
OUTAGE TIME WAS DUE TO RUBBER LINING FAILURE IN THE RECYCLE PUMP DISCHARGE LINE.										
4/78	SYSTEM	80.7	79.8		76.4		720	689	550	
** PROBLEMS/SOLUTIONS/COMMENTS										
26 HOURS OF OUTAGE TIME WERE DUE TO SMALL LEAKS IN PIPING.										
5/78	SYSTEM	84.5	82.7		74.0		744	666	551	
** PROBLEMS/SOLUTIONS/COMMENTS										
A LEAK OCCURRED IN A MIST ELIMINATOR DRAIN.										
THERE WAS A LEAK IN A BLEED LINE FOR THE SCRUBBER RECYCLE CIRCUIT.										
OUTAGE TIME WAS REQUIRED FOR BLEED LINE REPLACEMENT.										
6/78	SYSTEM	100.0	90.1		68.7		720	549	495	
7/78	SYSTEM	100.0	.0		.0		744	16	0	
** PROBLEMS/SOLUTIONS/COMMENTS										
THE VENTURI SCRUBBER HAD AN AVAILABILITY OF 100% FOR JUNE AND JULY. THE ONLY VENTURI OUTAGE TIME WAS IN JUNE. THE OUTAGE TIME WAS REQUIRED TO TIE IN EQUIPMENT COMMON TO THE NEW UNIT AND UNIT 3.										
THE BOILER WAS DOWN IN JULY FOR AN OVERHAUL.										
THE REASON VENTURI HOURS CAN BE LOWER THAN BOILER HOURS WHEN THE VENTURI HAS A 100% AVAILABILITY IS BECAUSE THE VENTURI IS NOT OPERATED UNDER LOW LOAD CONDITIONS.										
8/78	SYSTEM						744			
9/78	SYSTEM						720			
10/78	SYSTEM						744			
11/78	SYSTEM						720			
12/78	SYSTEM						744			
1/79	SYSTEM						744			
2/79	SYSTEM						672			
3/79	SYSTEM						744			

-----PERFORMANCE DATA-----									
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO ₂	PART. HOURS	PER BOILER HOURS	FGD CAP. HOURS FACTOR
4/79	SYSTEM							720	
5/79	SYSTEM							744	
** PROBLEMS/SOLUTIONS/COMMENTS									
SCRUBBER OUTAGE HOURS SINCE SEPTEMBER 1978 (I.E. SEPTEMBER 1978 THROUGH MAY 30, 1979) TOTAL 140. THE UTILITY INDICATED THAT IT IS NO LONGER ALLOWABLE TO BYPASS THE SCRUBBER WHEN PROBLEMS OCCUR, CLEANING THE PARTICULATE MATTER SOLELY WITH THE ESP. THE UTILITY MUST DROP THE BOILER LOAD SO THE UNIT REMAINS IN COMPLIANCE. THERE HAVE BEEN NO PROBLEMS REPORTED FOR THE LAST FEW MONTHS. THE UTILITY IS KEEPING AHEAD OF PROBLEMS WITH A CONSCIENTIOUS INSPECTION AND MAINTENANCE PROGRAM.									
5/79	SYSTEM							720	
7/79	SYSTEM							744	
8/79	SYSTEM							744	
9/79	SYSTEM							720	
10/79	SYSTEM	98.6			95.4			744	720 710
** PROBLEMS/SOLUTIONS/COMMENTS									
A TEN HOUR OUTAGE OCCURRED FOR REPAIRS OF A LEAD LINE LEAK.									
11/79	SYSTEM	95.2			88.8			720	672 640
** PROBLEMS/SOLUTIONS/COMMENTS									
IN NOVEMBER, 8 HOURS OUTAGE TIME WAS REQUIRED TO REPAIR A LEAK IN A RECYCLE LINE.									
12/79	SYSTEM	96.1			93.5			744	724 696
** PROBLEMS/SOLUTIONS/COMMENTS									
AN OUTAGE FOR GENERAL INSPECTION TOOK PLACE DURING DECEMBER.									
1/80	SYSTEM	78.7	88.2		78.7			744	664 586
** PROBLEMS/SOLUTIONS/COMMENTS									
DURING JANUARY THE SCRUBBER WAS DOWN TO REPAIR THE FLAKEGLASS LINING.									
2/80	SYSTEM	100.0	100.0		100.0			696	696 696
3/80	SYSTEM	100.0	100.0		100.0			744	744 744
** PROBLEMS/SOLUTIONS/COMMENTS									
DURING FEBRUARY AND MARCH THE SCRUBBER OPERATED WITH NO MAJOR PROBLEMS.									

SECTION 14

DESIGN AND PERFORMANCE DATA FOR OPERATIONAL PARTICLE SCRUBBERS

COMPANY NAME	PUBLIC SERVICE OF COLORADO
PLANT NAME	ARAPAHOE
UNIT NUMBER	4
CITY	DENVER
STATE	COLORADO
REGULATORY CLASSIFICATION	*****
PARTICULATE EMISSION LIMITATION - NG/J	43. (.100 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	***** (***** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	*****
GROSS UNIT GENERATING CAPACITY - MW	112.0
NET UNIT GENERATING CAPACITY W/FGD - MW	109.8
NET UNIT GENERATING CAPACITY WO/FGD - MW	*****
EQUIVALENT SCRUBBED CAPACITY - MW	11.2
** BOILER DATA	
SUPPLIER	*****
TYPE	PULVERIZED COAL
SERVICE LOAD	*****
COMMERCIAL SERVICE DATE	0/55
MAXIMUM BOILER FLUE GAS FLOW - CU.M/S	245.39 (520000 ACFM)
FLUE GAS TEMPERATURE - C	148.9 (300 F)
STACK HEIGHT - M	***** (**** FT)
STACK TOP DIAMETER - M	***** (***** FT)
** FUEL DATA	
FUEL TYPE	COAL
FUEL GRADE	SUBBITUMINOUS
AVERAGE HEAT CONTENT - J/G	23725. (10200 BTU/LB)
RANGE HEAT CONTENT - BTU/LB	*****
AVERAGE ASH CONTENT - %	9.30
RANGE ASH CONTENT - %	*****
AVERAGE MOISTURE CONTENT - %	13.70
RANGE MOISTURE CONTENT - %	*****
AVERAGE SULFUR CONTENT - %	.95
RANGE SULFUR CONTENT - %	0.6-0.95
AVERAGE CHLORIDE CONTENT - %	.01
RANGE CHLORIDE CONTENT - %	*****
** FUEL DATA	
FUEL TYPE	COAL
FUEL GRADE	BITUMINOUS
AVERAGE HEAT CONTENT - J/G	23493. (10100 BTU/LB)
RANGE HEAT CONTENT - BTU/LB	*****
AVERAGE ASH CONTENT - %	12.50
RANGE ASH CONTENT - %	*****
AVERAGE MOISTURE CONTENT - %	11.20
RANGE MOISTURE CONTENT - %	*****
AVERAGE SULFUR CONTENT - %	.65
RANGE SULFUR CONTENT - %	*****
AVERAGE CHLORIDE CONTENT - %	.01
RANGE CHLORIDE CONTENT - %	*****
** FABRIC FILTER	
NUMBER	0
TYPE	NONE
** ESP	
NUMBER	1
** MECHANICAL COLLECTOR	
NUMBER	1
** PARTICULATE SCRUBBER	
NUMBER	1
TYPE	MOBILE PACKED TOWER
SUPPLIER	AIR CORRECTION DIVISION, UOP
NUMBER OF STAGES	3
SHELL MATERIAL	CARBON STEEL
LINING MATERIAL	RUBBER
INTERNAL MATERIAL	STAINLESS STEEL GRIDS, PLASTIC SPHERES
BOILER LOAD/SCRUBBER - %	100.0
FLUE GAS CAPACITY - CU.M/S	245.4 (520000 ACFM)

PUBLIC SERVICE OF COLORADO: ARAPAHOE 4 (CONT.)

FLUE GAS TEMPERATURE - C	151.7	(305 F)
L/G RATIO - LITER/CU.M	7.5	(56.0 GAL/1000ACF)
PRESSURE DROP - KPA	*****	(***** IN-H2O)
SUPERFICIAL GAS VELOCITY - M/S	3.4	(11.0 FT/S)
PARTICULATE INLET LOAD - G/CU.M	1.8	(.80 GR/SCF)
PARTICULATE OUTLET LOAD - G/CU.M	.0	(.020 GR/SCF)
PARTICULATE DESIGN REMOVAL EFFICIENCY - %	93.0	
SO2 INLET CONCENTRATION - PPM	500.000	
SO2 OUTLET CONCENTRATION - PPM	350.000	
SO2 DESIGN REMOVAL EFFICIENCY - %	30.0	

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

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

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE FOURTH QUARTER REHEATER FAILURES OCCURRED. LEAKAGE IN THE INLINE STEAM TUBES HAS BEEN ENCOUNTERED. CORROSION IS KNOWN TO OCCUR AFTER LEAKS ARE EXPERIENCED. THE PRIMARY PROBLEM WITH THE SYSTEM IS THE INABILITY TO ISOLATE MODULES. IF A PROBLEM OCCURS NO MODULE MAINTENANCE CAN BE PERFORMED UNLESS THE UNIT LOAD IS CUT BACK OR THE UNIT IS SHUT DOWN.

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

** PROBLEMS/SOLUTIONS/COMMENTS

THE MODULE ISOLATION PROBLEMS CONTINUED THROUGH THE FIRST QUARTER 1980. USE OF THE CARBON STEEL DAMPERS HAS BEEN ABANDONED. THE PROGRAM FOR REPLACING THE DAMPERS HAS BEEN SUSPENDED INDEFINITELY. REHEATER STEAM TUBE LEAKS ARE STILL CAUSING PROBLEMS. THE 6 STEAM COILS ON THIS IN-LINE REHEAT SYSTEM, 2 OF WHICH ARE 316SS AND 4 OF WHICH ARE CARBON STEEL, ARE EXPERIENCING CORROSION PROBLEMS. A SOLUTION TO THE PROBLEM HAS NOT YET BEEN DETERMINED.

IN FEBRUARY THE UTILITY REPLACED THE SCRUBBER BALLS AND GRIDS. THEY WERE REPLACED WITH THE NEW HOLLOW HARD PLASTIC-WALLED BALLS WITH NOTCHED SEAMS. THE GRIDS WERE ORIGINALLY 316L SS, CERAMIC, POLYPROPYLENE, AND RUBBER LINE CARBON STEEL, BUT HAVE BEEN REPLACED WITH 317L SS GRIDS. THE SCRUBBERS OPERATED CONTINUOUSLY THROUGHOUT THE QUARTER EXCEPT FOR BALL AND GRID REPLACEMENT DOWNTIME.

SECTION 14
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL PARTICLE SCRUBBERS

COMPANY NAME	PUBLIC SERVICE OF COLORADO	
PLANT NAME	CHEROKEE	
UNIT NUMBER	1	
CITY	DENVER	
STATE	COLORADO	
REGULATORY CLASSIFICATION	*****	
PARTICULATE EMISSION LIMITATION - NG/J	43.	(.100 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	*****	(***** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	710.0	
GROSS UNIT GENERATING CAPACITY - MW	115.0	
NET UNIT GENERATING CAPACITY W/FGD - MW	100.0	
NET UNIT GENERATING CAPACITY WO/FGD - MW	115.0	
EQUIVALENT SCRUBBED CAPACITY - MW	102.2	
** BOILER DATA		
SUPPLIER	BABCOCK & WILCOX	
TYPE	PULVERIZED COAL	
SERVICE LOAD	*****	
COMMERCIAL SERVICE DATE	0/57	
MAXIMUM BOILER FLUE GAS FLOW - CU.M/S	245.39	(520000 ACFM)
FLUE GAS TEMPERATURE - C	146.1	(295 F)
STACK HEIGHT - M	*****	(**** FT)
STACK TOP DIAMETER - M	*****	(**** FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	BITUMINOUS	
AVERAGE HEAT CONTENT - J/G	23493.	(10100 BTU/LB)
RANGE HEAT CONTENT - BTU/LB	*****	
AVERAGE ASH CONTENT - %	12.50	
RANGE ASH CONTENT - %	9.4-12.5	
AVERAGE MOISTURE CONTENT - %	11.30	
RANGE MOISTURE CONTENT - %	*****	
AVERAGE SULFUR CONTENT - %	.65	
RANGE SULFUR CONTENT - %	*****	
AVERAGE CHLORIDE CONTENT - %	.01	
RANGE CHLORIDE CONTENT - %	*****	
** FABRIC FILTER		
NUMBER	0	
TYPE	NONE	
** ESP		
NUMBER	1	
** MECHANICAL COLLECTOR		
NUMBER	1	
** PARTICULATE SCRUBBER		
NUMBER	1	
TYPE	MOBILE PACKED TOWER	
SUPPLIER	AIR CORRECTION DIVISION, UOP	
NUMBER OF STAGES	3	
SHELL MATERIAL	CARBON STEEL	
LINING MATERIAL	RUBBER	
INTERNAL MATERIAL	STAINLESS STEEL, 1.5 INCH PLASTIC SPHERES	
BOILER LOAD/SCRUBBER - %	67.0	
FLUE GAS CAPACITY - CU.M/S	164.4	(348400 ACFM)
FLUE GAS TEMPERATURE - C	146.1	(295 F)
L/G RATIO - LITER/CU.M	7.5	(56.0 GAL/1000ACF)
PRESSURE DROP - KPA	*****	(***** IN-H2O)
SUPERFICIAL GAS VELOCITY - M/S	3.4	(11.0 FT/S)
PARTICULATE INLET LOAD - G/CU.M	1.8	(.80 GR/SCF)
PARTICULATE OUTLET LOAD - G/CU.M	.0	(.020 GR/SCF)
PARTICULATE DESIGN REMOVAL EFFICIENCY - %	97.0	
SO2 INLET CONCENTRATION - PPM	500.000	
SO2 OUTLET CONCENTRATION - PPM	420.000	
SO2 DESIGN REMOVAL EFFICIENCY - %	16.0	

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

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

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE PERIOD 10 FAN FAILURES HAVE OCCURRED DUE TO EROSION FROM THE FLYASH.
THE ISOLATION DAMPER HAS BEEN A PROBLEM DUE TO FREEZE UPS MAKING IT INOPERATIVE.
REHEATER FAILURES HAVE OCCURRED DUE TO PLUGGING OF THE HOT AIR INJECTION STEAM COILS.
THE SCRUBBER EXIT DUCTWORK WILL BE REPAIRED TEMPORARILY WITH A SPRAY ON FIBERGLASS-LIKE MATERIAL.

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

** PROBLEMS/SOLUTIONS/COMMENTS

THE SCRUBBERS OPERATED CONTINUOUSLY THROUGHOUT THE FIRST QUARTER 1980.
THE ISOLATION DAMPERS HAVE NOT CAUSED ANY PROBLEMS BECAUSE THERE USE HAS NOT BEEN NECESSARY.
THE FANS ARE STILL EXPERIENCING EROSION PROBLEMS.
ON MAY 24TH A BOILER/SCRUBBER OVERHAUL WILL BEGIN. DURING THIS TIME THE CARBON STEEL ISOLATION DAMPERS WILL BE REPLACED WITH 316 SS. THE NEW FANS WILL BE INSTALLED IN THE OLD HOUSINGS. THE NEW HIGH STRENGTH CARBON STEEL FANS WILL CONTAIN REPLACABLE CHROMIUM ALLOY WEAR PLATE-TIPS ON THE BLADES.

SECTION 14
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL PARTICLE SCRUBBERS

COMPANY NAME	PUBLIC SERVICE OF COLORADO	
PLANT NAME	CHEROKEE	
UNIT NUMBER	4	
CITY	DENVER	
STATE	COLORADO	
REGULATORY CLASSIFICATION	*****	
PARTICULATE EMISSION LIMITATION - NG/J	43.	(.100 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	*****	(***** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	710.0	
GROSS UNIT GENERATING CAPACITY - MW	375.0	
NET UNIT GENERATING CAPACITY W/FGD - MW	350.0	
NET UNIT GENERATING CAPACITY WO/FGD - MW	375.0	
EQUIVALENT SCRUBBED CAPACITY - MW	356.4	
** BOILER DATA		
SUPPLIER	COMBUSTION ENGINEERING	
TYPE	PULVERIZED COAL	
SERVICE LOAD	*****	
COMMERCIAL SERVICE DATE	3/68	
MAXIMUM BOILER FLUE GAS FLOW - CU.M/S	717.29	(1520000 ACFM)
FLUE GAS TEMPERATURE - C	135.0	(275 F)
STACK HEIGHT - M	*****	(**** FT)
STACK TOP DIAMETER - M	*****	(***** FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	BITUMINOUS	
AVERAGE HEAT CONTENT - J/G	23493.	(10100 BTU/LB)
RANGE HEAT CONTENT - BTU/LB	*****	
AVERAGE ASH CONTENT - %	12.50	
RANGE ASH CONTENT - %	9.4-12.5	
AVERAGE MOISTURE CONTENT - %	11.30	
RANGE MOISTURE CONTENT - %	*****	
AVERAGE SULFUR CONTENT - %	.65	
RANGE SULFUR CONTENT - %	*****	
AVERAGE CHLORIDE CONTENT - %	.01	
RANGE CHLORIDE CONTENT - %	*****	
** FABRIC FILTER		
NUMBER	0	
TYPE	NONE	
** ESP		
NUMBER	1	
** MECHANICAL COLLECTOR		
NUMBER	1	
** PARTICULATE SCRUBBER		
NUMBER	4	
TYPE	MOBILE PACKED TOWER	
SUPPLIER	AIR CORRECTION DIVISION, UOP	
NUMBER OF STAGES	3	
SHELL MATERIAL	CARBON STEEL	
LINING MATERIAL	RUBBER	
INTERNAL MATERIAL	STAINLESS STEEL, 1.5 INCH PLASTIC SPHERES	
L/G RATIO - LITER/CU.M	7.5	(56.0 GAL/1000ACF)
PRESSURE DROP - KPA	*****	(***** IN-H2O)
SUPERFICIAL GAS VELOCITY - M/S	3.4	(11.0 FT/S)
PARTICULATE INLET LOAD - G/CU.M	1.6	(.70 GR/SCF)
PARTICULATE OUTLET LOAD - G/CU.M	.0	(.020 GR/SCF)
PARTICULATE DESIGN REMOVAL EFFICIENCY - %	97.0	
SO2 INLET CONCENTRATION - PPM	500.000	
SO2 OUTLET CONCENTRATION - PPM	420.000	
SO2 DESIGN REMOVAL EFFICIENCY - %	16.0	

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

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

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE PERIOD 10 FAN FAILURES HAVE OCCURRED DUE TO EROSION FROM THE FLYASH.
THE ISOLATION DAMPER HAS BEEN A PROBLEM DUE TO FREEZE UPS MAKING IT INOPERATIVE.
REHEATER FAILURES HAVE OCCURRED DUE TO PLUGGING OF THE HOT AIR INJECTION STEAM COILS.
THE SCRUBBER EXIT DUCTWORK WILL BE REPAIRED TEMPORARILY WITH A SPRAY ON FIBERGLASS LIKE MATERIAL.

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

** PROBLEMS/SOLUTIONS/COMMENTS

A BOILER/SCRUBBER OUTAGE BEGAN IN MID-MARCH AND IS SCHEDULED TO CONTINUE THROUGH EARLY MAY. THE OUTLET DUCT WORK IS BEING REBUILT INTERNALLY WITH FIBERGLASS FOR STRUCTURAL SUPPORT AND ACID RESISTANCE. WITH REGULAR MAINTENANCE THE UTILITY EXPECTS THIS TO PROVE TO BE A PERMANENT SOLUTION.
ALSO DURING THE OUTAGE A SECOND LAYER OF VERTICAL GRIDS IS BEING INSTALLED ON THE THREE LAYER MOBLE BED TOWER. THE VERTICAL GRIDS SHOULD CHECK THE POTENTIAL FOR SIDE TO SIDE BALL MIGRATION.
THE OLD FANS ARE BEING REPLACED WITH HIGH STRENGTH CARBON STEEL FANS HAVING REPLACABLE CHROMIUM ALLOY WEAR PLATE BLADE TIPS.

SECTION 14
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL PARTICLE SCRUBBERS

COMPANY NAME	PUBLIC SERVICE OF COLORADO	
PLANT NAME	VALMONT	
UNIT NUMBER	5	
CITY	VALMONT	
STATE	COLORADO	
REGULATORY CLASSIFICATION	*****	
PARTICULATE EMISSION LIMITATION - NG/J	43.	(.100 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	*****	(***** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	273.8	
GROSS UNIT GENERATING CAPACITY - MW	166.0	
NET UNIT GENERATING CAPACITY W/FGD - MW	157.0	
NET UNIT GENERATING CAPACITY WO/FGD - MW	163.0	
EQUIVALENT SCRUBBED CAPACITY - MW	166.0	
** BOILER DATA		
SUPPLIER	COMBUSTION ENGINEERING	
TYPE	PULVERIZED COAL	
SERVICE LOAD	BASE	
COMMERCIAL SERVICE DATE	0/64	
MAXIMUM BOILER FLUE GAS FLOW - CU.M/S	436.98	(926000 ACFM)
FLUE GAS TEMPERATURE - C	126.7	(260 F)
STACK HEIGHT - M	*****	(**** FT)
STACK TOP DIAMETER - M	*****	(***** FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	SUBBITUMINOUS	
AVERAGE HEAT CONTENT - J/G	25121.	(10800 BTU/LB)
RANGE HEAT CONTENT - BTU/LB	*****	
AVERAGE ASH CONTENT - %	6.00	
RANGE ASH CONTENT - %	5.4-7.0	
AVERAGE MOISTURE CONTENT - %	15.00	
RANGE MOISTURE CONTENT - %	12.7-18.3	
AVERAGE SULFUR CONTENT - %	.70	
RANGE SULFUR CONTENT - %	0.68-.73	
AVERAGE CHLORIDE CONTENT - %	*****	
RANGE CHLORIDE CONTENT - %	*****	
** FABRIC FILTER		
NUMBER	0	
TYPE	NONE	
** ESP		
NUMBER	1	
TYPE	COLD SIDE	
FLUE GAS CAPACITY - CU.M/S	218.5	(463000 ACFM)
** MECHANICAL COLLECTOR		
NUMBER	1	
FLUE GAS CAPACITY - CU.M/S	218.5	(463000 ACFM)
** PARTICULATE SCRUBBER		
NUMBER	2	
TYPE	MOBILE PACKED TOWER	
SUPPLIER	AIR CORRECTION DIVISION, UOP	
NUMBER OF STAGES	3	
SHELL MATERIAL	CARBON STEEL	
LINING MATERIAL	RUBBER	
INTERNAL MATERIAL	STAINLESS STEEL, 1.5 INCH PLASTIC SPHERES	
TYPE OF NOZZLES	25.	
BOILER LOAD/SCRUBBER - %	36.0	
FLUE GAS CAPACITY - CU.M/S	109.2	(231500 ACFM)
FLUE GAS TEMPERATURE - C	132.8	(271 F)
L/G RATIO - LITER/CU.M	7.8	158.3 GAL/1000ACF)
PRESSURE DROP - KPA	*****	(**** IN-H2O)
SUPERFICIAL GAS VELOCITY - M/S	3.4	(11.0 FT/S)
PARTICULATE INLET LOAD - G/CU.M	1.8	(.80 GR/SCF)
PARTICULATE OUTLET LOAD - G/CU.M	.0	(.020 GR/SCF)
SO2 INLET CONCENTRATION - PPM	500.000	
SO2 DESIGN REMOVAL EFFICIENCY - %	40.0	

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

10/74 SYSTEM

744

** PROBLEMS/SOLUTIONS/COMMENTS

THE SCRUBBER WAS ORIGINALLY INSTALLED FOR PARTICULATE REMOVAL SINCE THE PLANT BURNS LOW SULFUR COAL; HOWEVER, 45% OF THE SO2 IS REMOVED AS WELL BECAUSE OF THE ALKALINITY OF THE FLYASH.

11/74 SYSTEM

720

12/74 SYSTEM

744

1/75 SYSTEM

744

2/75 SYSTEM

672

3/75 SYSTEM

744

4/75 SYSTEM

720

5/75 SYSTEM

744

6/75 SYSTEM

720

7/75 SYSTEM

744

8/75 SYSTEM

744

9/75 SYSTEM

720

10/75 SYSTEM

744

11/75 SYSTEM

720

12/75 SYSTEM

744

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE FIRST YEAR OF OPERATION PROBLEMS INCLUDED DIFFICULTIES WITH THE MODULE PACKING GRID SUPPORT, GENERAL VESSEL SCALE FORMATION, FLOW DISTRIBUTION PROBLEMS, BALL BREAKAGE, SCALING IN THE MIST ELIMINATOR SECTION, AND PLUGGING OF THE REHEATER. SCALE FORMATION WAS THE MOST PREDOMINANT CONTINUING MAJOR CAUSE OF DOWNTIME IN THE SCRUBBER. SCALE ACCUMULATION WAS NOTED ON THE WET-DRY INTERFACE IMMEDIATELY DOWNSTREAM OF THE PRESATURATION NOZZLES. SCALE ALSO ACCUMULATED HEAVILY ON THE UNDERSIDE OF THE FIRST LAYER OF GRID BARS. SCALE ON THE UPPER GRID BARS WAS LESS PREVALENT AS THE ACTION OF THE "PING PONG" BALLS TENDED TO KEEP THE SCALE OFF OF THESE SECTIONS. SCALE ALSO COLLECTED ON THE WALLS OF THE VESSEL AND INTERMITTENTLY SLOUGHED OFF AND FELL INTO THE SUMP IN LARGE PIECES CAUSING BLOCKAGE OF THE RECIRCULATION PUMP SUCTION SCREENS. SCALING OF THE MIST ELIMINATOR ABATED SOMEWHAT WITH THE INTRODUCTION OF A CLEAR RINSE WATER WASH. SCALE FORMATION IN THE REHEAT SECTION SOMETIMES REQUIRED SUPPLEMENTAL CLEANING OF THE REHEATER IN ADDITION TO THE CLEANING OBTAINED BY THE USE OF THE SOOTBLOWERS WHICH WERE INSTALLED AS A PART OF THE REHEATER EQUIPMENT. UNDER NORMAL OPERATION, THE SOOTBLOWERS LOCATED IN THIS REHEAT SECTION WERE FAIRLY SUCCESSFUL IN REMOVING THE ACCUMULATION OF THE SCALE IN THE REHEATER. ALTHOUGH MANY OF THE INITIAL START-UP PROBLEMS WERE SOLVED OVER A PERIOD OF TIME, THE CALCIUM SULFATE-FLYASH SCALING CONTINUED TO BE A SIGNIFICANT OPERATING PROBLEM AT THE VALMONT INSTALLATION. IN ADDITION TO THESE SCALING RELIABILITY PROBLEMS, A WATER QUALITY CONCERN ALSO SURFACED THAT WAS A DIRECT RESULT OF THE PARTICULATE SCRUBBER OPERATION. THE RELATIVELY HIGH CAO CONCENTRATION IN THE VALMONT FLYASH RESULTED IN FAIRLY HIGH SO2 REMOVAL RATES (45-50 PERCENT) WITHIN THE UNITS. SINCE NO PH CONTROL CAPABILITY FOR EITHER THE RECIRCULATING SLURRY OR THE SYSTEM BLOWDOWN SLURRY WAS DESIGNED INTO THE SYSTEM, AN ACID CONDITION WAS CREATED IN THE SLURRY AND THE BLOWDOWN STREAM. PH LEVELS OF THE BLOWDOWN NORMALLY RANGED BETWEEN 1.7 AND 2.0. ALTHOUGH THE STREAM WAS NEUTRALIZED TO A DEGREE BY ALKALINE FLYASH, PSCC FELT THAT IT WAS IMPORTANT TO INVESTIGATE VARIOUS CONTROL MEASURES WHICH COULD BE APPLIED TO THIS STREAM. THE CALCIUM SULFATE SCALING PROBLEM WAS THOUGHT TO BE THE RESULT OF A SUPER-SATURATED CALCIUM

-PERFORMANCE DATA

SULFATE CONDITION IN THE RECIRCULATING SLURRY. BECAUSE OF THIS IT WAS FELT THAT CONTINUOUS PH CONTROL OF THE RECIRCULATING SLURRY, CONVERSION OF THE SYSTEM TO CLOSED LOOP OPERATION AND ESTABLISHING A HIGHER CONCENTRATION OF SEEDING SOLIDS IN THE RECIRCULATION SLURRY (THEREBY CONTROLLING THE SCALING PROBLEMS WITHOUT CHEMICAL ADDITIVES) WOULD BE NECESSARY MEASURES.

FOR PH CONTROL, LIMESTONE WAS TESTED INITIALLY, THEN LIME WAS UTILIZED FOR THE ALKALI REAGENT. IN THE FIRST TEST, SINCE LIMESTONE UTILIZATION WAS A MAJOR CONCERN, A SPECIAL EFFORT WAS MADE TO REDUCE THE POTENTIAL FOR THE SHORT CIRCUITING OF THE ADDED LIMESTONE AND TO PROVIDE SUFFICIENT RESIDENCE TIME IN THE REACTOR SECTION OF THE SYSTEM. BY UTILIZING FOUR REACTION MIX TANKS IN SERIES, PLUG FLOW WAS EXPECTED TO BE MORE CLOSELY SIMULATED. TO MAINTAIN A CLOSED LOOP SYSTEM WHERE THE QUANTITY OF WATER REMOVED FROM THE SYSTEM WAS HELD TO A MINIMUM, FOUR SYSTEM DESIGN FEATURES WERE UTILIZED.

1. UTILIZATION OF A COMBINATION OF POND SUPERNATANT AND MAKE-UP WATER FOR RECYCLE WATER.
2. PRESATURATION OF THE INCOMING FLUE GAS WITH RECIRCULATING SLURRY.
3. INTERMITTENT MIST ELIMINATOR WASH.
4. PROPER SELECTION OF MATERIALS OF CONSTRUCTION TO PROTECT AGAINST ATTACK CAUSED BY HIGH CHLORIDE CONCENTRATIONS.

THE SCRUBBERS R & D FACILITY WAS NOT EQUIPPED WITH A MECHANICAL THICKENER FOR CONTROL OF THE SUSPENDED SOLIDS CONCENTRATION OF THE RECIRCULATING SLURRY (ALL PURGED MATERIAL WAS SENT TO THE SLUDGE POND). WITH A 50C PPM SO₂ CONCENTRATION IN THE FLUE GAS, IT IS EXPECTED THAT THE RECIRCULATING SLURRY SOLIDS COULD BE REALLY CONTROLLED IN THE 5 TO 7 PERCENT RANGE. DUE TO THE MIXED FUEL FIRED AT THE UNIT DURING THE TEST PERIOD, HOWEVER, THE SO₂ CONCENTRATIONS EMITTED FROM THE BOILER AND HENCE PRESENT IN THE FLUE GAS STREAM VARIED SIGNIFICANTLY AND FINALLY FELL TO SUCH LOW LEVELS (OFTEN 100-200 PPM) THAT SUSPENDED SOLIDS CONCENTRATIONS IN THE SLURRY COULD NOT BE MAINTAINED. IT IS ALMOST CERTAIN THAT A THICKENER, WITH THE SUBSEQUENT RETURN OF SOLIDS TO THE SCRUBBER LIQUOR, COULD HAVE BEEN USED TO GOOD ADVANTAGE DURING THIS TIME PERIOD. GENERALLY SPEAKING, THE SEVERE SCALING CONDITIONS PLAGUING THE TEST MODULE WERE INTENSIFIED DURING THESE PERIODS OF LOW INLET SO₂ CONDITION.

1/76	SYSTEM	744
2/76	SYSTEM	696
3/76	SYSTEM	744
4/76	SYSTEM	720
5/76	SYSTEM	
6/76	SYSTEM	720
7/76	SYSTEM	744
8/76	SYSTEM	744
9/76	SYSTEM	720
10/76	SYSTEM	744
11/76	SYSTEM	720
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

EPA UTILITY FGD SURVEY: JANUARY - MARCH 1980
PUBLIC SERVICE OF COLORADO: VALMONT 5 (CONT.)

-----PERFORMANCE DATA-----										
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART. HOURS	PER BOILER HOURS	FGD HOURS	CAP. FACTOR
8/77	SYSTEM							744		
9/77	SYSTEM							720		
10/77	SYSTEM							744		
11/77	SYSTEM							720		
12/77	SYSTEM							744		
1/78	SYSTEM							744		
2/78	SYSTEM							672		
3/78	SYSTEM							744		
** PROBLEMS/SOLUTIONS/COMMENTS										
THERE HAVE BEEN RECURRING PROBLEMS ASSOCIATED WITH BALL MIGRATION IN THE BALL COMPARTMENT AS WELL AS RECIRCULATION PUMP MOTOR BEARING FAILURE, AND WEAR AND FAILURE IN THE BALL COMPARTMENT LINING. THERE HAVE BEEN CONTINUAL PROBLEMS WITH REHEATER PLUGGING. THERE ALSO HAVE BEEN EXPANSION JOINT FAILURES AT BOTH THE INLET AND OUTLET OF THE SCRUBBER. MORE RECENTLY THERE WAS A PINCH BELT FAILURE. THE SCRUBBING SYSTEM HAS HAD AN AVAILABILITY RANGE OF 50 TO 79% WITH AN AVERAGE OF 66%.										
4/78	SYSTEM							720		
5/78	SYSTEM							744		
** PROBLEMS/SOLUTIONS/COMMENTS										
NO SIGNIFICANT PROBLEMS WERE ENCOUNTERED.										
6/78	SYSTEM							720		
7/78	SYSTEM							744		
8/78	SYSTEM							744		
** PROBLEMS/SOLUTIONS/COMMENTS										
THE UTILITY HAD NO COMMENTS FOR THIS PERIOD.										
9/78	SYSTEM							720		
10/78	SYSTEM							744		
11/78	SYSTEM							720		
12/78	SYSTEM							744		
1/79	SYSTEM							744		
2/79	SYSTEM							672		
3/79	SYSTEM							744		
4/79	SYSTEM							720		
5/79	SYSTEM							744		
6/79	SYSTEM							720		
** PROBLEMS/SOLUTIONS/COMMENTS										
AVERAGE SCRUBBER AVAILABILITY FROM START UP THROUGH APRIL 1979 WAS 64.42%. AVERAGE SCRUBBER AVAILABILITY FOR 1978 WAS 66.85%. AVERAGE SCRUBBER AVAILABILITY FROM JANUARY 1, 1979 THROUGH MAY, 1979 WAS APPROXIMATELY 80%. BALL MIGRATION, ALTHOUGH NOT SERIOUS, IS A CHRONIC PROBLEM FOR VALMONT 5.										

PUBLIC SERVICE OF COLORADO: VALMONT 5 (CONT.)

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

EROSION AND CORROSION HAVE OCCURRED ON THE SCRUBBER GRID BAR AREA (PACKING SUPPORT).

EROSION/CORROSION IS EVIDENT IN THE MIST ELIMINATOR SECTION.
 EROSION/CORROSION OCCURS IN THE REHEATER AREA AND SOOT BLOWER.
 THE UTILITY HAD TO REPLACE INLET AND OUTLET EXPANSION JOINTS.
 REHEATER PLUGGING HAS BEEN A PROBLEM.
 RECYCLE PUMP BEARING FAILURES OCCURRED.
 THE JACK SCREW DRIVE HAS BEEN MALFUNCTIONING ON INLET AND OUTLET ISOLATION DAMPERS.

7/79	SYSTEM							744	
8/79	SYSTEM							744	
9/79	SYSTEM							720	

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE ANNUAL SHUTDOWN IN SEPTEMBER THE OLD SCRUBBER BALLS WERE REPLACED WITH A NEW BRAND. DUE TO BALL MOTION THE RUBBER LINER ERODED. IN THE MIST ELIMINATOR SECTION EROSION AND CORROSION OCCURRED.

10/79	SYSTEM	100.0						744	
11/79	SYSTEM	92.3						720	
12/79	SYSTEM	98.1						744	

** PROBLEMS/SOLUTIONS/COMMENTS

ONE OF THE MAJOR SYSTEM PROBLEMS IS THE SCRUBBER WALL WEAR WHICH HAS TO BE PATCHED DURING THE SPRING AND FALL.
 REHEATER PLUGGING HAS BEEN A CHRONIC PROBLEM.
 THE UTILITY HAS REPORTED THE FOLLOWING ANNUAL AVAILABILITIES FOR THE UNIT.
 1972 - 1978: 64.3%
 1972 - 1979: 65.9%
 1978: 66.8%
 1979: 80.5%

1/80	A	98.5							
	B	98.5							
	SYSTEM	98.5						744	
2/80	A	84.4							
	B	94.9							
	SYSTEM	89.7						696	
3/80	A	85.0							
	B	85.0							
	SYSTEM	85.0						744	

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE FIRST QUARTER 1980, NO MAJOR PROBLEMS WERE ENCOUNTERED WITH THE SCRUBBER.

SECTION 14
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL PARTICLE SCRUBBERS

COMPANY NAME	SOUTHWESTERN PUBLIC SERVICE	
PLANT NAME	HARRINGTON	
UNIT NUMBER	1	
CITY	AMARILLO	
STATE	TEXAS	
REGULATORY CLASSIFICATION	*****	
PARTICULATE EMISSION LIMITATION - NG/J	43.	(.100 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	516.	(1.200 LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	360.0	
GROSS UNIT GENERATING CAPACITY - MW	360.0	
NET UNIT GENERATING CAPACITY W/FGD - MW	*****	
NET UNIT GENERATING CAPACITY WO/FGD - MW	*****	
EQUIVALENT SCRUBBED CAPACITY - MW	*****	
** BOILER DATA		
SUPPLIER	COMBUSTION ENGINEERING	
TYPE	PULVERIZED COAL	
SERVICE LOAD	BASE	
COMMERCIAL SERVICE DATE	8/76	
MAXIMUM BOILER FLUE GAS FLOW - CU.M/S	778.63	(1650000 ACFM)
FLUE GAS TEMPERATURE - C	176.7	(350 F)
STACK HEIGHT - M	76.	(250 FT)
STACK TOP DIAMETER - M	.8	(2.7 FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	SUBBITUMINOUS	
AVERAGE HEAT CONTENT - J/G	19538.	(8400 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		8000-8900
AVERAGE ASH CONTENT - %	5.00	
RANGE ASH CONTENT - %	4.5-6	
AVERAGE MOISTURE CONTENT - %	27.10	
RANGE MOISTURE CONTENT - %	25-30	
AVERAGE SULFUR CONTENT - %	.42	
RANGE SULFUR CONTENT - %	.39-.45	
AVERAGE CHLORIDE CONTENT - %	*****	
RANGE CHLORIDE CONTENT - %	*****	
** ESP		
NUMBER	1	
TYPE	COLD SIDE	
SUPPLIER	RESEARCH COTTRELL	
PARTICULATE DESIGN REMOVAL EFFICIENCY - %	95.0	
FLUE GAS CAPACITY - CU.M/S	778.6	(1650000 ACFM)
FLUE GAS TEMPERATURE - C	168.3	(335 F)
PRESSURE DROP - KPA	*****	(***** IN-H2O)
PARTICULATE OUTLET LOAD - G/CU.M	.18	(.08 GR/SCF)
** PARTICULATE SCRUBBER		
NUMBER	6	
TYPE	MOBILE PACKED TOWER	
SUPPLIER	COMBUSTION ENGINEERING	
NUMBER OF STAGES	1	
SHELL MATERIAL	CARBON STEEL	
LINING MATERIAL	RIGID LINE POLYESTER	
INTERNAL MATERIAL	316L SS FIBERGLASS ALLOY 20	
NUMBER OF NOZZLES	99	
TYPE OF NOZZLES	OPEN PIPE	
BOILER LOAD/SCRUBBER - %	20.0	
FLUE GAS CAPACITY - CU.M/S	141.6	(300000 ACFM)
FLUE GAS TEMPERATURE - C	60.0	(140 F)
LIQUID RECIRCULATION RATE - LITER/S	444.1	(7050 GPM)
L/G RATIO - LITER/CU.M	3.1	(23.0 GAL/1000ACF)
SUPERFICIAL GAS VELOCITY - M/S	2.4	(8.0 FT/S)
PARTICULATE INLET LOAD - NG/J	80.	(.185 LB/MMBTU)
PARTICULATE OUTLET LOAD - NG/J	30.	(.070 LB/MMBTU)
PARTICULATE DESIGN REMOVAL EFFICIENCY - %	50.0	
SO2 INLET CONCENTRATION - NG/J	430.	(1.000 LB/MMBTU)
SO2 OUTLET CONCENTRATION - NG/J	215.	(.500 LB/MMBTU)

SOUTHWESTERN PUBLIC SERVICE: HARRINGTON 1 (CONT.)

-----PERFORMANCE DATA-----										
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PER PART. HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
10/79	SYSTEM								744	
11/79	SYSTEM								720	
12/79	SYSTEM								744	

** PROBLEMS/SOLUTIONS/COMMENTS

DURING OCTOBER THROUGH DECEMBER, TWO SPRAY PUMP MOTORS FAILED. THE FRP MATERIAL IN THE FLUSH PIPING HAS FAILED CAUSING SOME LEAKAGE. PLUGGING IN ONE MARBLE BED WAS ENCOUNTERED WHEN THE CHEMISTRY CONTROL WAS TEMPORARILY LOST.

THE CONE SHAPED EXPANDED METAL SCREEN COVERING THE BED DRAIN PIPES HAS ERODED AWAY FROM BALL MOVEMENT. THE MARBLE BALLS HAVE BEEN DROPPING INTO THE CONE SHAPED EXPANDED METAL SCREEN COVERING THE BED DRAIN PIPES HAS ERODED AWAY FROM BALL MOVEMENT. THE MARBLE BALLS HAVE BEEN DROPPING INTO THE RECYCLE TANK. WHERE THE UTILITY HAS REPLACED THE METAL SCREEN WITH ANE THE CONE SHAPED EXPANDED METAL SCREEN COVERING THE BED DRAIN PIPES HAS ERODED AWAY FROM BALL MOVEMENT. THE MARBLE BALLS HAVE BEEN DROPPING INTO THE RECYCLE TANK. WHERE THE UTILITY HAS REPLACED THE METAL SCREEN WITH ANE EXPANDED PLASTIC SCREEN, EROSION HAS NOT OCCURRED.

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

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE FIRST QUARTER 1980 THE MIST ELIMINATOR WASH PIPING RUPTURED CAUSING PLUGGING IN SCRUBBERS 4 AND 5. THE UTILITY PLANS TO REPLACE ALL FRP PIPING WITH STEEL. THE RUPTURE ON NO. 5 ALSO DAMAGED THE WATER SUPPLY HEADER.

THE MARBLE BED PLUGGING REPORTED DURING THE LAST QUARTER IS NOT YET COMPLETELY CLEARED. THE SOFT SCALE IS GRADUALLY GOING BACK INTO THE SOLUTION. THE PLATE AREA IS CLEAN.

THE DUCT BENEATH THE REHEATER TUBING ON ONE OF THE MODULES HAS CORRODED TO THE POINT THAT HOLES HAVE FORMED. SCALE AND MOISTURE WERE FOUND ON THE PLATE WHERE THE CORROSION FORMED. THE PLATE WAS REMOVED AND A NEW CARBON STEEL PLATE WAS WELDED IN. NO OTHER REHEATER AREA HAS EXPERIENCED ANY SCA OR MOISTURE.

SECTION 15
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FOREIGN FGD SYSTEMS

COMPANY NAME	CHUGOKU ELECTRIC
PLANT NAME	SHIMONOSEKI
UNIT NUMBER	1
CITY	SHIMONOSEKI
STATE	
GROSS UNIT GENERATING CAPACITY - MW	175.0
NET UNIT GENERATING CAPACITY W/FGD - MW	175.0
EQUIVALENT SCRUBBED CAPACITY - MW	175.0
** FUEL DATA	
FUEL TYPE	COAL
FUEL GRADE	*****
AVERAGE HEAT CONTENT - J/G	25046. (10768 BTU/Lb)
AVERAGE ASH CONTENT - %	24.60
AVERAGE MOISTURE CONTENT - %	2.30
AVERAGE SULFUR CONTENT - %	.59
AVERAGE CHLORIDE CONTENT - %	.04
** FGD SYSTEM	
GENERAL PROCESS TYPE	WET SCRUBBING
PROCESS TYPE	LIMESTONE
SYSTEM SUPPLIER	MITSUBISHI HEAVY INDUSTRIES
NEW/RETROFIT	RETROFIT
ENERGY CONSUMPTION - %	*****
INITIAL START-UP DATE	5/79
COMMERCIAL START-UP DATE	7/79
SO2 DESIGN REMOVAL EFFICIENCY - %	85.00
PARTICULATE DESIGN REMOVAL EFFICIENCY - %	*****
ABSORBER SPARE COMPONENTS INDEX	.0
** BYPRODUCT	
BYPRODUCT NATURE	GYPSUM
DISPOSITION	

-----PERFORMANCE DATA-----										
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER BOILER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
7/79	SYSTEM	100.0	100.0	100.0	54.8		744	408	408	
8/79	SYSTEM	100.0	100.0	100.0	100.0		744	744	744	
9/79	SYSTEM	100.0	100.0	100.0	100.0		720	720	720	

** PROBLEMS/SOLUTIONS/COMMENTS

COMMERCIAL OPERATIONS BEGAN IN THE MIDDLE OF JULY 1979. THE FGD UNIT HAS OPERATED CONTINUOUSLY THROUGH THE THIRD QUARTER WITH NO PROBLEMS.

10/79	SYSTEM	100.0	100.0	100.0	100.0		744	744	744	
11/79	SYSTEM	100.0	100.0	100.0	100.0		720	720	720	
12/79	SYSTEM	93.5	93.5	93.5	93.5		744	744	696	

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD UNIT OPERATED CONTINUOUSLY THROUGH THE FOURTH QUARTER EXCEPT FOR A 2 DAY SHUTDOWN TO INSPECT THE GAS-GAS HEATER DURING DECEMBER. THE BOILER WAS OPERATED FIRING A LOW SULFUR OIL DURING THE TWO DAYS.

1/80	SYSTEM	100.0	100.0	100.0	100.0		744	744	744	
2/80	SYSTEM	55.2	100.0	55.2	55.2		6960	384	384	

CHUGOKU ELECTRIC: SHIMONOSEKI 1 (CONT.)

-----PERFORMANCE DATA-----										
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO ₂	PER PART.	BOILER HOURS	FGD HOURS	CAP. HOURS FACTOR

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JANUARY AND THE FIRST HALF OF FEBRUARY THE FGD UNIT OPERATED WITH NO PROBLEMS. THE UNIT WAS TAKEN OFF-LINE IN THE MIDDLE OF FEBRUARY FOR SCHEDULED MAINTENANCE.

SECTION 15
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FOREIGN FGD SYSTEMS

COMPANY NAME	ELECTRIC POWER DEVELOPMENT CO.
PLANT NAME	ISOGO
UNIT NUMBER	1
CITY	YOKOHAMA
STATE	JAPAN
GROSS UNIT GENERATING CAPACITY - MW	265.0
NET UNIT GENERATING CAPACITY W/FGD - MW	238.0
EQUIVALENT SCRUBBED CAPACITY - MW	265.0

** FUEL DATA	
FUEL TYPE	COAL
FUEL GRADE	*****
AVERAGE HEAT CONTENT - J/G	25958. (11160 BTU/LB)
AVERAGE ASH CONTENT - %	16.00
AVERAGE MOISTURE CONTENT - %	7.00
AVERAGE SULFUR CONTENT - %	.60
AVERAGE CHLORIDE CONTENT - %	*****

** FGD SYSTEM	
GENERAL PROCESS TYPE	WET SCRUBBING
PROCESS TYPE	LIMESTONE
SYSTEM SUPPLIER	IMI - CHEMICO
NEW/RETROFIT	RETROFIT
ENERGY CONSUMPTION - %	*****
INITIAL START-UP DATE	12/75
COMMERCIAL START-UP DATE	3/76
SO2 DESIGN REMOVAL EFFICIENCY - %	90.00
PARTICULATE DESIGN REMOVAL EFFICIENCY - %	96.70
ABSORBER SPARE COMPONENTS INDEX	.0

** WATER LOOP	
TYPE	OPEN
FRESH MAKE-UP WATER - LITER/S	22.3 (354 GPM)

** BYPRODUCT	
BYPRODUCT NATURE	GYP SUM
DISPOSITION	MARKETED

-----PERFORMANCE DATA-----									
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PER BOILER PART. HOURS	FGD HOURS	CAP. FACTOR
4/78	SYSTEM							720	
5/78	SYSTEM							744	
6/78	SYSTEM							720	
7/78	SYSTEM							744	
8/78	SYSTEM							744	
9/78	SYSTEM							720	
10/78	SYSTEM							744	
11/78	SYSTEM							720	
12/78	SYSTEM							744	
1/79	SYSTEM							744	
2/79	SYSTEM							672	
3/79	SYSTEM							744	

ELECTRIC POWER DEVELOPMENT CO.: ISOGO 1 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

100% AVAILABILITY WAS REPORTED FOR THE PERIOD FROM APRIL 1978 THROUGH
MARCH 1979.

SECTION 15
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FOREIGN FGD SYSTEMS

COMPANY NAME	ELECTRIC POWER DEVELOPMENT CO.
PLANT NAME	ISOGO
UNIT NUMBER	2
CITY	YOKOHAMA
STATE	JAPAN
GROSS UNIT GENERATING CAPACITY - MW	265.0
NET UNIT GENERATING CAPACITY W/FGD - MW	238.0
EQUIVALENT SCRUBBED CAPACITY - MW	265.0

** FUEL DATA	
FUEL TYPE	COAL
FUEL GRADE	*****
AVERAGE HEAT CONTENT - J/G	25958. (11160 BTU/LB)
AVERAGE ASH CONTENT - %	16.00
AVERAGE MOISTURE CONTENT - %	7.00
AVERAGE SULFUR CONTENT - %	.60
AVERAGE CHLORIDE CONTENT - %	*****

** FGD SYSTEM	
GENERAL PROCESS TYPE	WET SCRUBBING
PROCESS TYPE	LIMESTONE
SYSTEM SUPPLIER	IHI - CHEMICO
NEW/RETROFIT	RETROFIT
ENERGY CONSUMPTION - %	3.0
INITIAL START-UP DATE	3/76
COMMERCIAL START-UP DATE	5/76
SO2 DESIGN REMOVAL EFFICIENCY - %	90.00
PARTICULATE DESIGN REMOVAL EFFICIENCY - %	96.70
ABSORBER SPARE COMPONENTS INDEX	.0

** WATER LOOP	
TYPE	OPEN
FRESH MAKE-UP WATER - LITER/S	22.3 (354 GPM)

** BYPRODUCT	
BYPRODUCT NATURE	GYP SUM
DISPOSITION	MARKETED

-----PERFORMANCE DATA-----										
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER BOILER HOURS	FGD HOURS	CAP. FACTOR
4/78	SYSTEM							720		
5/78	SYSTEM							744		
6/78	SYSTEM							720		
7/78	SYSTEM							744		
8/78	SYSTEM							744		
9/78	SYSTEM							720		
10/78	SYSTEM							744		
11/78	SYSTEM							720		
12/78	SYSTEM							744		
1/79	SYSTEM							744		
2/79	SYSTEM							672		
3/79	SYSTEM							744		

ELECTRIC POWER DEVELOPMENT CO.: ISOGO 2 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

100% AVAILABILITY WAS REPORTED FOR THE PERIOD FROM APRIL 1978 THROUGH
MARCH 1979.

SECTION 15
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FOREIGN FGD SYSTEMS

COMPANY NAME	ELECTRIC POWER DEVELOPMENT CO.
PLANT NAME	TAKASAGO
UNIT NUMBER	1
CITY	TAKASAGO
STATE	JAPAN
GROSS UNIT GENERATING CAPACITY - MW	250.0
NET UNIT GENERATING CAPACITY W/FGD - MW	230.0
EQUIVALENT SCRUBBED CAPACITY - MW	250.0

** FUEL DATA	
FUEL TYPE	COAL
FUEL GRADE	*****
AVERAGE HEAT CONTENT - J/G	25958. (11160 BTU/LB)
AVERAGE ASH CONTENT - %	22.00
AVERAGE MOISTURE CONTENT - %	7.00
AVERAGE SULFUR CONTENT - %	1.80
AVERAGE CHLORIDE CONTENT - %	*****

** FGD SYSTEM	
GENERAL PROCESS TYPE	WET SCRUBBING
PROCESS TYPE	LIMESTONE
SYSTEM SUPPLIER	mitsui - chemico
NEW/RETROFIT	RETROFIT
ENERGY CONSUMPTION - %	3.2
INITIAL START-UP DATE	2/75
COMMERCIAL START-UP DATE	**/**
SO2 DESIGN REMOVAL EFFICIENCY - %	93.00
PARTICULATE DESIGN REMOVAL EFFICIENCY - %	*****
ABSORBER SPARE COMPONENTS INDEX	.0

** WATER LOOP	
TYPE	OPEN
FRESH MAKE-UP WATER - LITER/S	13.1 (208 GPM)

** BYPRODUCT	
BYPRODUCT NATURE	GYPSUM
DISPOSITION	

-----PERFORMANCE DATA-----											
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
4/78	SYSTEM								720		
5/78	SYSTEM								744		
6/78	SYSTEM								720		
7/78	SYSTEM								744		
8/78	SYSTEM								744		
9/78	SYSTEM								720		
10/78	SYSTEM								744		
11/78	SYSTEM								720		
12/78	SYSTEM								744		
1/79	SYSTEM								744		
2/79	SYSTEM								672		
3/79	SYSTEM								744		

ELECTRIC POWER DEVELOPMENT CO.: TAKASAGO 1 (CONT.)

```

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

```

** PROBLEMS/SOLUTIONS/COMMENTS

DURING APRIL 1978 THROUGH MARCH 1979 NO FORCED OUTAGES OCCURRED. THE FGD SYSTEM AVAILABILITY WAS 99.9%.

SECTION 15

DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FOREIGN FGD SYSTEMS

COMPANY NAME	ELECTRIC POWER DEVELOPMENT CO.
PLANT NAME	TAKASAGO
UNIT NUMBER	2
CITY	TAKASAGO
STATE	JAPAN
GROSS UNIT GENERATING CAPACITY - MW	250.0
NET UNIT GENERATING CAPACITY W/FGD - MW	230.0
EQUIVALENT SCRUBBED CAPACITY - MW	250.0

** FUEL DATA	
FUEL TYPE	COAL
FUEL GRADE	*****
AVERAGE HEAT CONTENT - J/G	25956. (11160 BTU/LB)
AVERAGE ASH CONTENT - %	22.00
AVERAGE MOISTURE CONTENT - %	7.00
AVERAGE SULFUR CONTENT - %	1.80
AVERAGE CHLORIDE CONTENT - %	*****

** FGD SYSTEM	
GENERAL PROCESS TYPE	WET SCRUBBING
PROCESS TYPE	LIMESTONE
SYSTEM SUPPLIER	mitsui - chemico
NEW/RETROFIT	RETROFIT
ENERGY CONSUMPTION - %	3.2
INITIAL START-UP DATE	3/76
COMMERCIAL START-UP DATE	**/**
SO2 DESIGN REMOVAL EFFICIENCY - %	93.00
PARTICULATE DESIGN REMOVAL EFFICIENCY - %	*****
ABSORBER SPARE COMPONENTS INDEX	.0

** WATER LOOP	
TYPE	OPEN
FRESH MAKE-UP WATER - LITER/S	13.1 (208 GPM)

** BYPRODUCT	
BYPRODUCT NATURE	GYP SUM
DISPOSITION	

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
4/78	SYSTEM							720			
5/78	SYSTEM							744			
6/78	SYSTEM							720			
7/78	SYSTEM							744			
8/78	SYSTEM							744			
9/78	SYSTEM							720			
10/78	SYSTEM							744			
11/78	SYSTEM							720			
12/78	SYSTEM							744			
1/79	SYSTEM							744			
2/79	SYSTEM							672			
3/79	SYSTEM							744			

ELECTRIC POWER DEVELOPMENT CO.: TAKASAGO 2 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE PERIOD FROM APRIL 1978 THROUGH MARCH 1979 THE FGD SYSTEM OPERATED WITH 99.8% AVAILABILITY. THERE WERE NO FORCED OUTAGES DURING THIS TIME. A TOTAL OF 8147.4 HOURS WERE LOGGED WITH 19.5 HOURS OF SCHEDULED OUTAGE TIME.

SECTION 15
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FOREIGN FGD SYSTEMS

COMPANY NAME	ELECTRIC POWER DEVELOPMENT CO.
PLANT NAME	TAKEHARA
UNIT NUMBER	1
CITY	MIHARA
STATE	JAPAN
GROSS UNIT GENERATING CAPACITY - MW	250.0
NET UNIT GENERATING CAPACITY W/FGD - MW	231.0
EQUIVALENT SCRUBBED CAPACITY - MW	250.0

** FUEL DATA	
FUEL TYPE	COAL
FUEL GRADE	MITSUI MINING
AVERAGE HEAT CONTENT - J/G	25130. (10804 BTU/LB)
AVERAGE ASH CONTENT - %	23.00
AVERAGE MOISTURE CONTENT - %	9.05
AVERAGE SULFUR CONTENT - %	2.00
AVERAGE CHLORIDE CONTENT - %	.05

** FGD SYSTEM	
GENERAL PROCESS TYPE	WET SCRUBBING
PROCESS TYPE	LIMESTONE
SYSTEM SUPPLIER	BABCOCK - HITACHI
NEW/RETROFIT	RETROFIT
ENERGY CONSUMPTION - %	3.2
INITIAL START-UP DATE	2/77
COMMERCIAL START-UP DATE	2/79
SO2 DESIGN REMOVAL EFFICIENCY - %	94.20
PARTICULATE DESIGN REMOVAL EFFICIENCY - %	91.70
ABSORBER SPARE COMPONENTS INDEX	.0

** WATER LOOP	
TYPE	OPEN
FRESH MAKE-UP WATER - LITER/S	14.1 (204 GPM)

** BYPRODUCT	
BYPRODUCT NATURE	GYP SUM
DISPOSITION	MARKETED

-----PERFORMANCE DATA-----										
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
4/78	SYSTEM							720		
5/78	SYSTEM							744		
6/78	SYSTEM							720		
7/78	SYSTEM							744		
8/78	SYSTEM							744		
9/78	SYSTEM							720		
10/78	SYSTEM							744		
11/78	SYSTEM							720		
12/78	SYSTEM							744		
1/79	SYSTEM							744		
2/79	SYSTEM							672		
3/79	SYSTEM							744		

ELECTRIC POWER DEVELOPMENT CO.: TAKEHARA 1 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

99.95% AVAILABILITY WAS REPORTED FOR THE PERIOD FROM APRIL 1978 THROUGH
MARCH 1979.

APPENDIX A

FGD SYSTEM COST DATA: OPERATIONAL AND NONOPERATIONAL SYSTEMS

INTRODUCTION

The cost of flue gas desulfurization (FGD) systems for the control of sulfur dioxide emissions is an area of intense interest and substantial controversy. As a result, many computer models have recently been developed to estimate capital and annual costs. As part of an effort by the U.S. Environmental Protection Agency to provide meaningful economic data concerning FGD systems, reported economic data have been incorporated into the EPA Utility FGD Survey report. This information has appeared as a separate appendix of the report since October 1976. Until January 1978, this cost appendix consisted entirely of data reported by the utilities with little or no interpretation provided by PEDCo Environmental, Inc. Beginning with the May 1978 report, the format and content of the cost appendix were revised to include reported and adjusted costs for the operational FGD systems.

The rationale for including adjusted as well as reported costs stems primarily from the lack of comparability of the reported costs. Many of the reported cost figures, both capital and operating, are largely site-sensitive values that cannot be accurately compared because they refer to different FGD battery limits and different years in which the expenditures were made. As a result, an analysis of the cost data was made for the operational units since these systems offer the potential of having complete and accurate economic data. The adjustments were made to provide comparable, accurate cost data for the sulfur dioxide portion of the emission control system. This, in effect, will eliminate much of the confusion that exists concerning the reported data, and it will provide a common basis for the reported costs.

In an attempt to promote further comparability of the figures, the adjustment procedure was carried one step further and standardized adjusted figures were developed. This was done by modifying the fixed annual cost rates such that they would be identical for each unit (i.e. cost of depreciation, interim replacement, taxes, insurance and capital costs). The newly adjusted total fixed annual cost rate was applied to the total adjusted capital cost in each case and a standardized adjusted annual cost was obtained.

APPROACH

In March 1978, each utility having at least one operational FGD system was given a cost form containing all available cost information then in the PEDCo files. The utility was asked to verify the data and fill in any missing information called for on the form. A follow-up visit by the PEDCo Environmental staff was arranged to assist in data acquisition and to insure completeness and reliability of information. Results of the cost analysis were forwarded to each participating utility for final review and comment.

The cost data were treated solely to establish the accurate costs for FGD systems, on a common basis, not to critique the design or reasonableness of the costs reported by any utility. Adjustments focused primarily on the following items:

- ° All capital costs were adjusted to July 1, 1977, dollars using the Chemical Engineering Index. All capital costs, represented in dollars/kilowatt (\$/kW), were expressed in terms of gross megawatts (MW). Actual costs were reported by utilities in dollar values for years 1970 to 1980. These values are represented in terms of the year of greatest capital expenditures.
- ° Gross unit capacity was used to express all FGD capital expenditures because the capital requirement of an FGD system is dependent on actual boiler size before derating for auxiliary and air quality control power requirements.
- ° Particulate control costs were deducted. Since the purpose of the study was to estimate the incremental cost for sulfur dioxide control, particulate control costs were deducted using either data contained in the cost breakdowns or as a percentage of the total direct cost (capital and annual). The percentage reduction varied depending upon system design and operation.

- ° The capital costs associated with the modification or installation of equipment not part of the FGD system but needed for its proper functioning, were included (e.g. - stack lining, modification to existing ductwork or fans, etc.).
- ° Indirect charges were adjusted to provide adequate funds for engineering, field expenses, legal expenses, insurance, interest during construction, allowance for startup, taxes, and contingency.
- ° All annual costs, represented in mills/kilowatt-hour (mills/kWh), were expressed in terms of net megawatts (MW).
- ° Net unit capacity was used to express all FGD annual expenditures because the annual cost requirement of an FGD system is dependent on the actual amount of kilowatt-hours (kWh) produced by the unit after derating for auxiliary and air quality control power requirements.
- ° All annual costs were adjusted to a common capacity factor (65%).
- ° Replacement power costs were not included since only a few utilities reported such costs and these were presented using a variety of methods.
- ° Sludge disposal costs were adjusted to reflect the costs of sulfur dioxide waste disposal only (i.e., excluding fly ash disposal) and to provide for disposal over the anticipated lifetime of the FGD system. This latter correction was necessary since several utilities reported costs for sludge disposal capacity that would last only a fraction of the FGD system life. The adjustments were based on a land cost of \$2000/acre with a sludge depth of 50 ft in a clay-lined pond (clay is assumed to be available at the site).
- ° A 30-year life was assumed for all process and economic considerations for all new systems that were installed for the life of the unit. A 20-year life was assumed for all process and economic considerations for retro-

fit systems that were installed for the remaining portion of the life of the unit.*

- ° Regeneration and by-product recovery facility costs were added for those regenerable systems not reporting such costs.

To the extent possible, all cost adjustments were made using the previous assumptions developed by PEDCo Environmental. When cost data were inadequate, adjustments were made using process design data in conjunction with the previous cost assumptions. In some cases, no adjustments were possible because of insufficient data.

* The use of a 30-year service life for new units coincides with the conclusion of the National Power Survey of the Federal Power Commission which recognized this value as reasonable for steam-electric plants. A 20-year service life was assumed for all retrofit units even if the remaining life of the units is less than this value. Thus, two different rates are used and should be noted when making comparisons between new and retrofit systems.

DESCRIPTION OF COST ELEMENTS

Capital costs consist of direct costs, indirect costs, contingency costs, and other capital costs. Direct costs include the "bought-out" cost of the equipment, the cost of installation, and site development. Indirect costs include interest during construction, contractor's fees and expenses, engineering, legal expenses, taxes, insurance, allowance for start-up and shake-down, and spares. Contingency costs include those costs resulting from malfunctions, equipment alterations, and similar unforeseen sources. Other capital costs include the nondepreciable items of land and working capital.

Annual costs consist of direct costs, fixed costs, and overhead costs. Direct costs include the cost of raw materials, utilities, operating labor and supervision, and maintenance and repairs. Fixed costs include those of depreciation, interim replacement, insurance, taxes, and interest on borrowed capital. Overhead costs include those of plant and payroll expenses. The various capital and annual cost components are discussed and defined in greater detail in the following paragraphs.

The direct capital costs include the following elements:

- ° Equipment required for the FGD system. Table A-1 provides a summary of the major process equipment used in regenerable and nonregenerable systems.
- ° Installation of equipment, including foundations; steel work for support, buildings, piping and ducting for effluents, slurries, sludge, and make-up water, control panels, instrumentation, insulation of ducting, buildings, piping, and other equipment, painting and piling.
- ° Site development may include clearing and grading, construction of access roads and walkways, establishment of rail, barge, and/or truck facilities, and parking facilities.

TABLE A-1. MAJOR FGD SYSTEM EQUIPMENT SUMMARY

Category	Description
Material handling-raw materials	Equipment for the handling and transfer of raw materials includes unloading facilities, conveyors, storage areas and silos, vibrators, atmospheric emission control associated with these facilities, and related accessories.
Feed preparation-raw materials	Equipment for the preparation of raw material to produce a feed slurry consists of feed weighers, crushers, grinders, classifiers, ball mills, mixing tanks, pumps, agitators, and related accessories.
Sulfur dioxide absorption	Equipment for treating the flue gas includes absorbers, mist eliminators, hold tanks, agitators, circulating pumps, pond water return pumps, and related accessories.
Flue gas reheat	Equipment required includes air, steam, or hot water heaters, condensate tanks, pumps, soot blowers, fans, fuel storage facilities, gas bypass equipment, and related accessories.
Gas handling	Equipment to handle the boiler flue gas includes booster fans, ductwork, flue gas bypass system, turning vanes, supports, platforms, and related accessories.
Sludge disposal	Nonregenerable FGD systems require solids/water separation equipment such as clarifiers, vacuum filters, centrifuges, sludge fixation equipment, and related accessories.
Utilities	Equipment to supply power and water to the FGD equipment consists of switch-gear, breakers, transformers, piping, and related accessories.
By-product handling	Equipment for processing the by-product of regenerable FGD systems may include a rotary kiln, fluid bed dryer, conveyor, storage silo, vibrator, combustion equipment and oil storage tanks, waste heat boilers, hammer mills, evaporators, crystallizers, strippers, tanks, agitators, pumps, compressors, sulfuric acid absorber and cooling, mist eliminator, pumps, acid coolers, tanks, etc.

(continued)

TABLE A-1. (continued)

Category	Description
Regeneration	Equipment for regeneration of the absorbing medium of an FGD system may consist of reactor vessels, material handling system, storage, weigh feeder, conveyor, rotary kiln, fluid bed calciner, dust collector, storage silo, vibrator, combustion equipment and oil storage tanks, waste heat boiler, hammer mill, evaporators, crystallizers, strippers, tanks, agitators, pumps, compressors, sulfuric acid absorber and cooling, mist eliminator, pumps, acid coolers, tanks, etc.
Purge treatment	Equipment for the removal of purge material (e.g. sodium sulfate) includes refrigeration, pumps, tanks, crystallizer, centrifuge, dryer, dust collector, conveyors, storage, and related equipment.
Auxiliary	Equipment not directly related to the FGD system, but which may require design or modification to accommodate an FGD system may include such items as existing fans, ducts, or stack. If new fans, ducts, or stacks are added to improve boiler performance and accommodate the FGD system, the costs are prorated to the boiler and FGD system.

Indirect capital costs include the following elements:

- ° Interest accrued on borrowed capital during construction.
- ° Contractor's fee and expenses, including costs for field labor payroll; field office supervision; personnel; construction offices; temporary roadways; railroad trackage; maintenance and welding shops; parking lot; communications; temporary piping and electrical and sanitary facilities; safety security (fire, material, medical, etc.); construction tools and rental equipment; unloading and storage of materials; travel expenses; permits; licenses; taxes; insurance; overhead; legal liabilities; field testing of equipment; start-up; and labor relations.
- ° Engineering costs, including administrative, process, project, and general; design and related functions for specifications; bid analysis; special studies; cost analysis; accounting; reports; consultant fees; purchasing; procurement; travel expenses; living expenses; expediting; inspection; safety; communications; modeling; pilot plant studies (if required because of process design or application novelty); royalty payments during construction; training of plant personnel; field engineering; safety engineering; and consultant services.
- ° Legal expenses, including those for securing permits, rights-of-way, etc.
- ° Taxes, including sales, and excise taxes.
- ° Insurance covering liability for equipment in transit and at site; fire, casualty, injury, and death; damage to property; delay; and noncompliance.
- ° Allowance for start-up and shakedown includes the cost associated with system start-up.
- ° Spare parts including pumps, valves, controls, special piping and fittings, instruments, spray nozzles, and similar items.

Other capital costs include the following elements:

- ° Land required for the FGD process, waste disposal, regeneration facility, and storage.
- ° Working capital, including the total amount of money invested in raw materials and supplies in stock, finished products in stock, and unfinished products

in the process of being manufactured; accounts receivable; cash kept on hand for payment of operating expenses such as salaries, wages, and raw materials purchases; accounts payable; and taxes payable.

Annual cost of an FGD system includes the following direct, fixed and overhead charges:

° Direct Charges

- Raw materials, including those required by the FGD process for sulfur dioxide control, absorbent regeneration, sludge treatment, sludge fixation, flocculants, etc.
- Utilities, including water for slurries, cooling and cleaning; electricity for pumps, fans, valves, lighting controls, conveyors, and mixers; fuel for reheating of flue gases; and steam for processing.
- Operating labor, including supervisory, skilled, and unskilled labor required to operate, monitor, and control the FGD process.
- Maintenance and repairs, consisting of both manpower and materials to keep the unit operating efficiently. The function of maintenance is both preventive and corrective to keep outages to a minimum.
- Byproduct Sales: credit from the sale of byproducts regenerable FGD processes (e.g. sulfur, sulfuric acid) is a negative charge deducted from the annual direct cost to obtain the net annual direct cost of the FGD system.

° Fixed Charges

- Depreciation - the annual charge to recover direct and indirect costs of physical assets over the life of the asset.
- Interim, replacement - costs expended for temporary or provisional replacement of equipment that has failed or malfunctioned prematurely.
- Insurance, including the costs of protection from loss by a specified contingency, peril, or unforeseen event. Required coverage could include losses due to fire, personal injury or death, property damage, explosion, lightning, or other natural phenomena.

- Taxes, including franchise, excise, and property taxes levied by a city, county, state, or Federal government.
- Interest on borrowed funds.
- Overhead

Plant and administrative overhead is a business expense that is not charged directly to a particular part of a project, but is allocated to it. Overhead costs include administrative, safety, engineering, legal and medical services; payroll; employee benefits; recreation; and public relations.

Table A-2 provides a summary of the means used to determine the missing cost elements if the costs were not reported or insufficient information prevented their actual determination. The assumptions and cost bases for determining the capital and annual costs of FGD systems were developed by the PEDCo staff based upon previous economic studies conducted for the U.S. EPA (Flue Gas Desulfurization Process Cost Assessment, May 1975; Simplified Procedures for Estimating Flue Gas Desulfurization System Costs, June 1976, EPA-600/2-76-150; Particulate and Sulfur Dioxide Emission Control Costs for Large Coal-Fired Boilers, March 1978, EPA-600/7-78-032).

TABLE A-2. COST ELEMENT FACTORS

Category	Value
Indirect capital costs:	
Interest during construction	10% of total direct capital costs
Field overhead	10% of total direct capital costs
Contractor's fee and expenses	5% of total direct capital costs
Engineering	10% of total direct capital costs
Taxes	2% of total direct capital costs
Spares	1% of total direct capital costs
Shakedown allowance	5% of total direct capital costs
Other capital costs:	
Contingency ^a	20% of total direct and indirect capital costs
Direct annual costs:	
Raw materials:	
Fixation chemicals	\$2/ton
Lime	\$40/ton
Limestone	\$10/ton
Magnesium oxide	\$150/ton
Sodium carbonate	\$80/ton
Salt cake (credit)	\$50/ton
Sulfur (credit)	\$65/ton
Sulfuric acid (credit)	\$25/ton
Utilities:	
Electricity	25 mills/kWh
Water	\$0.20/10 ³ gal
Steam	\$0.80/10 ⁶ Btu
Operating labor:	
Direct labor	\$8.50/man-hour
Supervision	15% of direct labor costs

^a Contingency costs are used only when the cost data supplied are incomplete (such as equipment costs or direct costs only) and a contingency cost must be factored in to give an accurate estimate of the total capital cost.

(continued)

TABLE A-2. (continued)

Category	Value
Maintenance:	
Labor and materials	4% of total direct capital costs
Supplies	15% of labor and materials costs
Overhead:	
Plant	50% of operation and maintenance costs
Payroll	20% of operating labor costs
Fixed annual costs:	
Depreciation	3.33% or 5% (new or retrofit)
Interim replacement ^b	0.7% or 0.35%
Taxes	4%
Insurance	0.3%
Capital costs	9%

^b Some system components have life spans less than the expected service life of the system. Interim replacement is an allowance factor used in estimating annual revenue requirements to provide for the replacement of these short-lived items. An average allowance of 0.35% of the total investment is normally provided and used for systems with an expected service life of 20 years or less. A higher allowance of 0.70% of the total investment is provided and used for systems with an expected service life of 30 years or more.

DEFINITION OF COST ELEMENTS

The costs displayed in Appendix A are accompanied by a series of alphabetic characters summarizing data presented for each FGD system. These relate to the cost elements described earlier in this section and identify what has been included and excluded for reported and adjusted capital and annual costs. The alphabetic characters, along with their titles, are briefly described in Table A-3.

TABLE A-3. DESCRIPTION OF COST

Code	Title	Description
A	Particulate control (required for FGD process) included in capital cost.	Particulate precollection device (ESP, fabric filter, venturi) prior to FGD system required for proper operation of SO ₂ control system.
B	Particulate control (included in FGD process) included in capital cost.	Particulate collection equipment (venturi scrubber) is included in the FGD system.
C	Total direct capital costs included.	Complete cost of all FGD equipment, the labor and materials required for equipment installation, and interconnecting the system is included in the total capital cost.
D	Partial direct capital costs included.	One or a number of direct cost items, or the cost associated with one or a number of direct cost items, are excluded from the total capital cost.
E	Total indirect capital costs included.	Complete cost of all the indirect cost elements, including interest during construction, contractor's fees, engineering, legal expenses, taxes, insurance, allowance for start-up, and spares, is included in total capital cost.
F	Partial indirect costs included.	One or a number of indirect cost items, or the cost associated with one or a number of indirect cost items, are excluded from the total capital cost.
G	Chemical fixation of sludge included in capital cost.	The cost of a chemical fixation process which stabilizes the flue gas cleaning wastes prior to disposal is included in the total capital cost.
H	Dry sludge disposal included in capital cost.	The cost of a secondary dewatering or treatment method, such as filtration, centrifugation, or forced oxidation, which ultimately produces a dry sludge cake for final disposal, is included in the total capital cost.
I	Off-site landfill area included in capital cost.	The cost of an off-site area used as a landfill for flue gas cleaning wastes is included in the total capital cost.
J	Sludge pond included in capital cost.	The cost of an on-site disposal area for ponding of treated or untreated flue gas cleaning wastes is included in the total capital cost.
K	Additional sludge disposal capacity added for life of system.	The cost of additional SO ₂ waste disposal capacity required for FGD ² system operation over the anticipated service life of the unit is included in the total capital cost.
L	Stack included in capital cost.	The cost of the stack is included in the total capital cost.
M	Modifications to stack, ducts, and/or fans included in capital cost.	Modifications to existing equipment (stack, fans, ducts, etc.) which are required because of inclusion of an FGD system.
N	Total regeneration facility cost included in capital cost.	Complete cost of entire regeneration facility included in total capital cost.
O	Partial regeneration facility cost included in capital cost.	Part of the cost associated with the regeneration facility included in the total capital cost.
P	R & D costs included in capital cost.	Bench scale or pilot plant studies to determine process and design characteristics.

(continued)

TABLE A-3. (continued)

Code	Title	Description
Q	Costs underwritten by system supplier included in capital cost.	Capital expenditures underwritten by the system supplier for system repairs or modifications for optimization of performance or R & D programs.
R	Excess reagent supply costs included in capital cost.	Capital expenditures for reagent supply exceeds the amount required for the period of initial operation.
S	Total direct annual costs included.	Complete cost of all raw materials, utilities, operating labor and maintenance and repairs is included in the total annual cost.
T	Partial direct annual costs included.	One or a number of direct annual cost items, or the cost associated with one or a number of direct annual cost items, are excluded from the total annual cost.
U	Total fixed annual costs included.	Complete cost of all fixed cost elements, including depreciation, interim replacement, insurance, taxes, and interest, is included in the total annual cost.
V	Partial fixed annual costs included.	One or a number of fixed annual cost items, or the cost associated with one or a number of fixed annual cost items, are excluded from the total annual cost.
W	Overhead cost included in total annual cost.	Plant and payroll overhead costs are included in the total annual cost.
X	Particulate control costs included in direct annual cost.	The cost of operating particulate collection equipment included in the FGD system is included in the total annual cost.
Y	Sludge disposal service costs (contract) included in direct annual cost.	The treatment and disposal of flue gas cleaning wastes that are handled by an outside firm.
Z	Replacement energy costs included in total annual costs.	The cost of additional power-generating capacity required to compensate for power used by the FGD system.

RESULTS OF COST ANALYSIS

The results of the operational FGD system survey are summarized in Table A-4 and Section A-1. Table A-4 produces a summary of a categorical analysis of the reported and adjusted capital and annual costs for the operational FGD systems addressed in the survey. Included in this categorical analysis are the ranges, means, and standard deviation for all the various types and categories of FGD systems examined. Section A-1 summarizes the reported and adjusted capital and annual costs for all the operational FGD systems that were addressed in the cost study (Section A-2 summarizes available cost data for nonoperational FGD systems).

TABLE A-4. CATEGORICAL RESULTS OF THE REPORTED AND ADJUSTED
CAPITAL AND ANNUAL COSTS FOR OPERATIONAL FGD SYSTEMS

CATEGORY	REPORTED						ADJUSTED					
	CAPITAL, \$/KW			ANNUAL, MILLS/KWH			CAPITAL, \$/KW			ANNUAL, MILLS/KWH		
	RANGE	AVG	DEV	RANGE	AVG	DEV	RANGE	AVG	DEV	RANGE	AVG	DEV
ALL	29.2-189.0	80.9	40.2	.1- 14.9	4.4	4.4	56.0-233.2	93.2	35.4	2.6- 13.0	5.7	2.7
NEW	31.8-189.0	80.4	39.6	.1- 14.3	3.3	3.9	66.4-117.6	86.1	17.8	2.8- 8.7	5.2	2.0
RETROFIT	29.2-156.9	82.0	41.3	2.0- 14.9	6.1	4.5	56.0-233.2	100.2	45.8	2.6- 13.0	6.1	3.2
THROWAWAY PRODUCT	29.2-189.0	75.6	37.2	.1- 14.3	4.2	4.1	56.0-140.6	86.2	21.9	2.6- 8.7	5.1	2.0
SALEABLE PRODUCT	127.9-156.9	142.3	14.5	2.0- 14.9	8.4	6.5	134.8-233.2	184.0	49.2	12.4- 13.0	12.7	.3
LIMESTONE	31.8-168.0	74.0	37.9	1.3- 3.3	2.1	.6	56.0-117.6	88.6	25.5	2.6- 6.6	4.6	1.6
LINE	29.2-128.3	74.9	32.2	.1- 14.3	6.9	4.8	67.5-140.6	90.8	22.2	2.7- 8.7	6.4	2.0
DUAL ALKALI	43.2-189.0	96.7	65.5	3.2- 3.2	3.2	.0	*****	.0	.0	*****	.0	.0
LINE/ALKALINE FLYASH	77.1- 85.9	80.0	4.1	.3- .3	.3	.0	77.2- 93.0	82.5	7.4	4.1- 5.2	4.5	.5
SODIUM CARBONATE	42.9-120.0	79.8	37.0	2.1- 2.1	2.1	.0	60.9-107.9	76.6	22.2	3.2- 4.4	3.6	.6
WELLMAN LORD	127.9-156.9	137.6	13.7	14.9- 14.9	14.9	.0	134.8-134.8	134.8	.0	12.4- 12.4	12.4	.0
LIMESTONE/ALKALINE FLYASH	47.9- 47.9	47.9	.0	2.0- 2.0	2.0	.0	71.2- 71.2	71.2	.0	2.8- 2.8	2.8	.0
MAGNESIUM OXIDE	156.7-156.7	156.7	.0	2.0- 2.0	2.0	.0	233.2-233.2	233.2	.0	13.0- 13.0	13.0	.0

SECTION A-1
COSTS FOR OPERATIONAL FGD SYSTEMS

UNIT DESCRIPTION	COST DESCRIPTION	COST		
		REPORTED	ADJUSTED	STANDARDIZED ADJUSTED
ALABAMA ELECTRIC COOP TOMBIGBEE 3 179.0 MW (NET)	CAPACITY FACTOR, % TOTAL CAPITAL, \$/KW(YEAR) TOTAL ANNUAL, MILLS/KWH(YEAR) COST ELEMENTS	*** 49.5(1978) ***** (C) C,E,J	65 ***** (C) ***** (C) ***** (C)	65 ***** (C) ***** (C) ***** (C)
ALLEGHENY POWER SYSTEM PLEASANTS 1 519.0 MW (NET)	CAPACITY FACTOR, % TOTAL CAPITAL, \$/KW(YEAR) TOTAL ANNUAL, MILLS/KWH(YEAR) COST ELEMENTS	65 128.3(1978) 2.8(1978) B,C,J,S	65 ***** (C) ***** (C) ***** (C)	65 ***** (C) ***** (C) ***** (C)
ARIZONA ELECTRIC POWER COOP APACHE 2 195.0 MW (NET)	CAPACITY FACTOR, % TOTAL CAPITAL, \$/KW(YEAR) TOTAL ANNUAL, MILLS/KWH(YEAR) COST ELEMENTS	44 35.9(1977) 2.1(1978) C,E,H,J,L,S, U,W,Y,Z	65 ***** (C) ***** (C) ***** (C)	65 ***** (C) ***** (C) ***** (C)
ARIZONA ELECTRIC POWER COOP APACHE 3 195.0 MW (NET)	CAPACITY FACTOR, % TOTAL CAPITAL, \$/KW(YEAR) TOTAL ANNUAL, MILLS/KWH(YEAR) COST ELEMENTS	44 31.8(1977) 2.1(1978) C,E,H,J,L,S, U,W,Y,Z	65 ***** (C) ***** (C) ***** (C)	65 ***** (C) ***** (C) ***** (C)
ARIZONA PUBLIC SERVICE CHOLLA 1 119.0 MW (NET)	CAPACITY FACTOR, % TOTAL CAPITAL, \$/KW(YEAR) TOTAL ANNUAL, MILLS/KWH(YEAR) COST ELEMENTS	85 52.0(1973) 2.2(1976) P,C,E,S,U,X	65 56.0(1977) 2.6(1977) C,E,K,S,U,W	65 56.0(1977) 2.3(1977) C,E,K,S,U,W
ARIZONA PUBLIC SERVICE CHOLLA 2 350.0 MW (NET)	CAPACITY FACTOR, % TOTAL CAPITAL, \$/KW(YEAR) TOTAL ANNUAL, MILLS/KWH(YEAR) COST ELEMENTS	65 168.0(1978) 1.5(1978) B,D,T,X	65 ***** (C) ***** (C) ***** (C)	65 ***** (C) ***** (C) ***** (C)
BIG RIVERS ELECTRIC GREEN 1 242.0 MW (NET)	CAPACITY FACTOR, % TOTAL CAPITAL, \$/KW(YEAR) TOTAL ANNUAL, MILLS/KWH(YEAR) COST ELEMENTS	*** 43.2(1976) ***** (C) B,C	65 ***** (C) ***** (C) ***** (C)	65 ***** (C) ***** (C) ***** (C)
CENTRAL ILLINOIS LIGHT DUCK CREEK 1 378.0 MW (NET)	CAPACITY FACTOR, % TOTAL CAPITAL, \$/KW(YEAR) TOTAL ANNUAL, MILLS/KWH(YEAR) COST ELEMENTS	*** 93.3(1978) 3.3(1976) C,E,J,M	65 ***** (C) ***** (C) ***** (C)	65 ***** (C) ***** (C) ***** (C)
CENTRAL ILLINOIS PUBLIC SERV NEWTON 1 617.0 MW (NET)	CAPACITY FACTOR, % TOTAL CAPITAL, \$/KW(YEAR) TOTAL ANNUAL, MILLS/KWH(YEAR) COST ELEMENTS	*** 189.0(1979) ***** (C) C,E,G	65 ***** (C) ***** (C) ***** (C)	65 ***** (C) ***** (C) ***** (C)
COLORADO UTE ELECTRIC ASSN. CRAIG 2 447.0 MW (NET)	CAPACITY FACTOR, % TOTAL CAPITAL, \$/KW(YEAR) TOTAL ANNUAL, MILLS/KWH(YEAR) COST ELEMENTS	*** 73.7(1979) ***** (C) A,C	65 ***** (C) ***** (C) ***** (C)	65 ***** (C) ***** (C) ***** (C)

***** INDICATES COST FIGURES NOT YET AVAILABLE

SECTION A-1
COSTS FOR OPERATIONAL FGD SYSTEMS

UNIT DESCRIPTION	COST DESCRIPTION	COST		
		REPORTED	ADJUSTED	STANDARDIZED ADJUSTED
COLUMBUS & SOUTHERN OHIO ELEC. CONESVILLE 5 611.0 MW (NET)	CAPACITY FACTOR, % TOTAL CAPITAL, \$/KW(YEAR) TOTAL ANNUAL, MILLS/KWH(YEAR) COST ELEMENTS	48 55.5(1975) 5.8(1978) B,C,J,M,S,U, W,X,Y	65 70.7(1977) 7.4(1977) C,E,J,M,S,U, W,Y	65 70.7(1977) 7.4(1977) C,E,J,M,S,U, W,Y
COLUMBUS & SOUTHERN OHIO ELEC. CONESVILLE 6 611.0 MW (NET)	CAPACITY FACTOR, % TOTAL CAPITAL, \$/KW(YEAR) TOTAL ANNUAL, MILLS/KWH(YEAR) COST ELEMENTS	48 55.5(1978) 5.8(1978) B,C,J,M,S,U, W,X,Y	65 70.7(1977) ***** (C) C,E,J,M,S,U, W,Y	65 ***** (C) ***** (C) C,E,J,M,S,U, W,Y
DUQUESNE LIGHT ELRAMA 1-4 510.0 MW (NET)	CAPACITY FACTOR, % TOTAL CAPITAL, \$/KW(YEAR) TOTAL ANNUAL, MILLS/KWH(YEAR) COST ELEMENTS	64 113.4(1976) 8.6(1977) B,D,F,I,J,M, T,V,X,Y	65 127.1(1977) 7.8(1977) C,E,I,J,M,S, U,Y	65 127.1(1977) 7.5(1977) C,E,I,J,M,S, U,Y
DUQUESNE LIGHT PHILLIPS 1-6 410.0 MW (NET)	CAPACITY FACTOR, % TOTAL CAPITAL, \$/KW(YEAR) TOTAL ANNUAL, MILLS/KWH(YEAR) COST ELEMENTS	70 106.9(1972) 7.8(1977) B,D,F,I,J,M, T,V,X,Y	65 140.6(1977) 6.6(1977) C,E,I,J,M,S, U,Y	65 140.6(1977) 8.2(1977) C,E,I,J,M,S, U,Y
INDIANAPOLIS POWER & LIGHT PETERSBURG 3 532.0 MW (NET)	CAPACITY FACTOR, % TOTAL CAPITAL, \$/KW(YEAR) TOTAL ANNUAL, MILLS/KWH(YEAR) COST ELEMENTS	*** 99.5(1976) ***** (C) C,F,G,J,M	65 110.6(1977) 6.6(1977) C,E,G,J,M,S, U,W,Y	65 110.6(1977) 7.4(1977) C,E,G,J,M,S, U,W,Y
KANSAS CITY POWER & LIGHT HAWTHORN 3 90.0 MW (NET)	CAPACITY FACTOR, % TOTAL CAPITAL, \$/KW(YEAR) TOTAL ANNUAL, MILLS/KWH(YEAR) COST ELEMENTS	14 29.2(1972) 8.4(1977) B,D,F,T,X	65 87.2(1977) 4.3(1977) B,C,E,J,K,S, U,W,X	65 87.2(1977) 4.4(1977) B,C,E,J,K,S, U,W,X
KANSAS CITY POWER & LIGHT HAWTHORN 4 90.0 MW (NET)	CAPACITY FACTOR, % TOTAL CAPITAL, \$/KW(YEAR) TOTAL ANNUAL, MILLS/KWH(YEAR) COST ELEMENTS	*** 29.2(1972) 8.4(1977) B,D,F,T,X	65 87.2(1977) 4.3(1977) B,C,E,J,K,S, U,W,X	65 87.2(1977) 4.4(1977) B,C,E,J,K,S, U,W,X
KANSAS CITY POWER & LIGHT LA CYGNE 1 874.0 MW (NET)	CAPACITY FACTOR, % TOTAL CAPITAL, \$/KW(YEAR) TOTAL ANNUAL, MILLS/KWH(YEAR) COST ELEMENTS	42 53.6(1972) 1.3(1978) T	65 68.0(1977) 3.8(1977) C,E,J,K,S,U	65 68.0(1977) 3.9(1977) C,E,J,K,S,U
KANSAS POWER & LIGHT JEFFREY 1 540.0 MW (NET)	CAPACITY FACTOR, % TOTAL CAPITAL, \$/KW(YEAR) TOTAL ANNUAL, MILLS/KWH(YEAR) COST ELEMENTS	*** 56.8(1978) ***** (1978) B,C	65 ***** (C) ***** (C) C	65 ***** (C) ***** (C) C
KENTUCKY UTILITIES GREEN RIVER 1-3 64.0 MW (NET)	CAPACITY FACTOR, % TOTAL CAPITAL, \$/KW(YEAR) TOTAL ANNUAL, MILLS/KWH(YEAR) COST ELEMENTS	16 70.3(1975) 14.3(1977) B,C,E,J,S,U, W	65 77.5(1977) 2.7(1977) C,E,J,S,U,W	65 77.5(1977) 5.2(1977) C,E,J,S,U,W

***** INDICATES COST FIGURES NOT YET AVAILABLE

SECTION A-1
COSTS FOR OPERATIONAL FGD SYSTEMS

UNIT DESCRIPTION	COST DESCRIPTION	REPORTED	COST ADJUSTED	STANDARDIZED ADJUSTED
LOUISVILLE GAS & ELECTRIC CANE RUN 4 188.0 MW (NET)	CAPACITY FACTOR, % TOTAL CAPITAL, \$/KW(YEAR) TOTAL ANNUAL, MILLS/KWH(YEAR) COST ELEMENTS	55 66.5(1975) 2.7(1977) C,F,H,J,Q,T	65 80.6(1977) 5.8(1977) C,E,H,J,K,Q, S,U,W	65 90.6(1977) 6.2(1977) C,E,H,J,K,Q, S,U,W
LOUISVILLE GAS & ELECTRIC CANE RUN 5 200.0 MW (NET)	CAPACITY FACTOR, % TOTAL CAPITAL, \$/KW(YEAR) TOTAL ANNUAL, MILLS/KWH(YEAR) COST ELEMENTS	*** 62.4(1977) ***** () C,E,H,J	65 67.5(1977) 5.6(1977) C,E,H,J,K,S, U,W	65 67.5(1977) 5.6(1977) C,E,H,J,K,S, U,W
LOUISVILLE GAS & ELECTRIC CANE RUN 5 299.0 MW (NET)	CAPACITY FACTOR, % TOTAL CAPITAL, \$/KW(YEAR) TOTAL ANNUAL, MILLS/KWH(YEAR) COST ELEMENTS	*** 57.9(1977) 3.2(1979) C,E,H,M,S,V, W	65 ***** () ***** () C,E,H,J,K,S, U,W	65 ***** () ***** () C,E,H,J,K,S, U,W
LOUISVILLE GAS & ELECTRIC MILL CREEK 3 442.0 MW (NET)	CAPACITY FACTOR, % TOTAL CAPITAL, \$/KW(YEAR) TOTAL ANNUAL, MILLS/KWH(YEAR) COST ELEMENTS	10 42.6(1978) 1.3(1978) C,S	65 ***** () ***** () C,S	65 ***** () ***** () C,S
LOUISVILLE GAS & ELECTRIC PADDY'S RUN 6 72.0 MW (NET)	CAPACITY FACTOR, % TOTAL CAPITAL, \$/KW(YEAR) TOTAL ANNUAL, MILLS/KWH(YEAR) COST ELEMENTS	*** 52.8(1973) ***** () C,E	65 76.4(1977) 6.5(1977) C,E,S,U,W	65 76.4(1977) 6.4(1977) C,E,S,U,W
MINNKOTA POWER COOPERATIVE MILTON R. YOUNG 2 405.0 MW (NET)	CAPACITY FACTOR, % TOTAL CAPITAL, \$/KW(YEAR) TOTAL ANNUAL, MILLS/KWH(YEAR) COST ELEMENTS	*** 85.9(1976) ***** () C,F,H,P	65 93.0(1977) 5.2(1977) C,E,H,M,P,S, U,W	65 93.0(1977) 5.2(1977) C,E,H,M,P,S, U,W
MONTANA POWER COLSTRIP 1 360.0 MW (NET)	CAPACITY FACTOR, % TOTAL CAPITAL, \$/KW(YEAR) TOTAL ANNUAL, MILLS/KWH(YEAR) COST ELEMENTS	76 77.1(1975) .3(1977) B,C,E,J,P,T	65 77.2(1977) 4.1(1977) C,E,J,K,P,S, U,W	65 77.2(1977) 4.1(1977) C,E,J,K,P,S, U,W
MONTANA POWER COLSTRIP 2 360.0 MW (NET)	CAPACITY FACTOR, % TOTAL CAPITAL, \$/KW(YEAR) TOTAL ANNUAL, MILLS/KWH(YEAR) COST ELEMENTS	76 77.1(1975) .3(1977) B,C,E,J,P,T	65 77.2(1977) 4.1(1977) C,E,J,K,P,S, U,W	65 77.2(1977) 4.1(1977) C,E,J,K,P,S, U,W
NEVADA POWER REID GARDNER 1 125.0 MW (NET)	CAPACITY FACTOR, % TOTAL CAPITAL, \$/KW(YEAR) TOTAL ANNUAL, MILLS/KWH(YEAR) COST ELEMENTS	67 42.9(1973) 2.9(1977) B,D,E,P,S,U, W,X	65 60.9(1977) 3.2(1977) B,D,E,P,S,U, W,X	65 60.9(1977) 3.4(1977) B,D,E,P,S,U, W,X
NEVADA POWER REID GARDNER 2 125.0 MW (NET)	CAPACITY FACTOR, % TOTAL CAPITAL, \$/KW(YEAR) TOTAL ANNUAL, MILLS/KWH(YEAR) COST ELEMENTS	67 42.9(1973) 2.9(1977) B,D,E,P,S,U, W,X	65 60.9(1977) 3.2(1977) B,D,E,P,S,U, W,X	65 60.9(1977) 3.4(1977) B,D,E,P,S,U, W,X

***** INDICATES COST FIGURES NOT YET AVAILABLE

SECTION A-1
COSTS FOR OPERATIONAL FGD SYSTEMS

UNIT DESCRIPTION	COST DESCRIPTION	COST		
		REPORTED	ADJUSTED	STANDARDIZED ADJUSTED
NEVADA POWER REID GARDNER 3 125.0 MW (NET)	CAPACITY FACTOR, % TOTAL CAPITAL, \$/KW(YEAR) TOTAL ANNUAL, MILLS/KWH(YEAR) COST ELEMENTS	67 113.6(1975) 2.1(1977) B,C,E,L,S,U, W,X	65 107.9(1977) 4.4(1977) B,C,E,L,S,U, W,X	65 107.9(1977) 5.0(1977) B,C,E,L,S,U, W,X
NORTHERN INDIANA PUB SERVICE DEAN H. MITCHELL 11 115.0 MW (NET)	CAPACITY FACTOR, % TOTAL CAPITAL, \$/KW(YEAR) TOTAL ANNUAL, MILLS/KWH(YEAR) COST ELEMENTS	77 156.9(1976) 14.9(1976) B,C,E,L,N,S, U,W,X,Y,Z	65 134.8(1977) 12.4(1977) C,E,L,N,S,U, W,Z	65 134.8(1977) 11.0(1977) C,E,L,N,S,U, W,Z
NORTHERN STATES POWER SHERBURNE 1 740.0 MW (NET)	CAPACITY FACTOR, % TOTAL CAPITAL, \$/KW(YEAR) TOTAL ANNUAL, MILLS/KWH(YEAR) COST ELEMENTS	73 47.9(1972) 2.0(1977) B,C,J,S,U,X, Z	65 71.2(1977) 2.8(1977) C,E,J,K,S,U, W	65 71.2(1977) 3.3(1977) C,E,J,K,S,U, W
NORTHERN STATES POWER SHERBURNE 2 740.0 MW (NET)	CAPACITY FACTOR, % TOTAL CAPITAL, \$/KW(YEAR) TOTAL ANNUAL, MILLS/KWH(YEAR) COST ELEMENTS	73 47.9(1972) 2.0(1977) B,C,J,S,U,X, Z	65 71.2(1977) 2.8(1977) C,E,J,K,S,U, W	65 71.2(1977) 3.3(1977) C,E,J,K,S,U, W
PACIFIC POWER & LIGHT JIM BRIDGER 4 550.0 MW (NET)	CAPACITY FACTOR, % TOTAL CAPITAL, \$/KW(YEAR) TOTAL ANNUAL, MILLS/KWH(YEAR) COST ELEMENTS	*** 120.0(1979) ***** (C) C,E,J	65 ***** (C) ***** (C) C,E,J	65 ***** (C) ***** (C) C,E,J
PENNSYLVANIA POWER BRUCE MANSFIELD 1 917.0 MW (NET)	CAPACITY FACTOR, % TOTAL CAPITAL, \$/KW(YEAR) TOTAL ANNUAL, MILLS/KWH(YEAR) COST ELEMENTS	40 120.6(1975) 14.3(1977) B,C,E,G,I,L, S,U,W,X	65 102.1(1977) 8.7(1977) C,E,G,I,M,S, U,W	65 102.1(1977) 10.8(1977) C,E,G,I,M,S, U,W
PENNSYLVANIA POWER BRUCE MANSFIELD 2 917.0 MW (NET)	CAPACITY FACTOR, % TOTAL CAPITAL, \$/KW(YEAR) TOTAL ANNUAL, MILLS/KWH(YEAR) COST ELEMENTS	40 120.6(1975) 14.3(1977) B,C,E,G,I,L, S,U,W,X	65 102.1(1977) 8.7(1977) C,E,G,I,M,S, U,W	65 102.1(1977) 10.8(1977) C,E,G,I,M,S, U,W
PHILADELPHIA ELECTRIC EDDYSTONE 1A 120.0 MW (NET)	CAPACITY FACTOR, % TOTAL CAPITAL, \$/KW(YEAR) TOTAL ANNUAL, MILLS/KWH(YEAR) COST ELEMENTS	*** 156.7(1972) 2.0(1972) D,F,N,P	65 233.2(1977) 13.0(1977) C,E,N,P	65 233.2(1977) 12.4(1977) C,E,N,P
PUBLIC SERVICE OF NEW MEXICO SAN JUAN 1 361.0 MW (NET)	CAPACITY FACTOR, % TOTAL CAPITAL, \$/KW(YEAR) TOTAL ANNUAL, MILLS/KWH(YEAR) COST ELEMENTS	*** 127.9(1977) ***** (C) A,C,E,N	65 ***** (C) ***** (C) A,C,E,N	65 ***** (C) ***** (C) A,C,E,N
PUBLIC SERVICE OF NEW MEXICO SAN JUAN 2 350.0 MW (NET)	CAPACITY FACTOR, % TOTAL CAPITAL, \$/KW(YEAR) TOTAL ANNUAL, MILLS/KWH(YEAR) COST ELEMENTS	*** 127.9(1977) ***** (C) A,C,E,N	65 ***** (C) ***** (C) A,C,E,N	65 ***** (C) ***** (C) A,C,E,N

***** INDICATES COST FIGURES NOT YET AVAILABLE

SECTION A-1
COSTS FOR OPERATIONAL FGD SYSTEMS

UNIT DESCRIPTION	COST DESCRIPTION	COST		
		REPORTED	ADJUSTED	STANDARDIZED ADJUSTED
SALT RIVER PROJECT CORONADO 1 280.0 MW (NET)	CAPACITY FACTOR, % TOTAL CAPITAL, \$/KW(YEAR) TOTAL ANNUAL, MILLS/KWH(YEAR) COST ELEMENTS	*** 74.0(1978) ***** (C) C,F	65 ***** (C) ***** (C)	65 ***** (C) ***** (C)
SOUTH CAROLINA PUBLIC SERVICE #INYAH 2 140.0 MW (NET)	CAPACITY FACTOR, % TOTAL CAPITAL, \$/KW(YEAR) TOTAL ANNUAL, MILLS/KWH(YEAR) COST ELEMENTS	80 47.4(1976) 1.6(1975) C,F,J,M,S,V	65 66.4(1977) 2.9(1977) C,E,J,K,M,S, U,W	65 66.4(1977) 3.2(1977) C,E,J,K,M,S, U,W
SOUTH MISSISSIPPI ELEC PWR R.D. MORROW 1 124.0 MW (NET)	CAPACITY FACTOR, % TOTAL CAPITAL, \$/KW(YEAR) TOTAL ANNUAL, MILLS/KWH(YEAR) COST ELEMENTS	*** 37.4(1975) ***** (C) C,E	65 ***** (C) ***** (C)	65 ***** (C) ***** (C)
SOUTH MISSISSIPPI ELEC PWR R.D. MORROW 2 124.0 MW (NET)	CAPACITY FACTOR, % TOTAL CAPITAL, \$/KW(YEAR) TOTAL ANNUAL, MILLS/KWH(YEAR) COST ELEMENTS	*** 37.4(1975) ***** (C) C,E	65 ***** (C) ***** (C)	65 ***** (C) ***** (C)
SOUTHERN ILLINOIS POWER COOP MARION 4 184.0 MW (NET)	CAPACITY FACTOR, % TOTAL CAPITAL, \$/KW(YEAR) TOTAL ANNUAL, MILLS/KWH(YEAR) COST ELEMENTS	65 152.7(1978) 1.8(1978) B,C,T,X	65 ***** (C) ***** (C)	65 ***** (C) ***** (C)
SOUTHERN INDIANA GAS & ELEC A.B. BROWN 1 265.0 MW (NET)	CAPACITY FACTOR, % TOTAL CAPITAL, \$/KW(YEAR) TOTAL ANNUAL, MILLS/KWH(YEAR) COST ELEMENTS	*** 43.2(1979) ***** (C) C,E,G	65 ***** (C) ***** (C)	65 ***** (C) ***** (C)
SPRINGFIELD CITY UTILITIES SOUTHWEST 1 194.0 MW (NET)	CAPACITY FACTOR, % TOTAL CAPITAL, \$/KW(YEAR) TOTAL ANNUAL, MILLS/KWH(YEAR) COST ELEMENTS	*** 77.3(1974) ***** (C) C,F,H,J,P	65 117.6(1977) 6.2(1977) C,E,H,J,K,P, S,U,W	65 117.6(1977) 6.9(1977) C,E,H,J,K,P, S,U,W
TENNESSEE VALLEY AUTHORITY #IDOWS CREEK 8 550.0 MW (NET)	CAPACITY FACTOR, % TOTAL CAPITAL, \$/KW(YEAR) TOTAL ANNUAL, MILLS/KWH(YEAR) COST ELEMENTS	60 98.1(1976) 3.0(1977) B,C,E,P,R,T, U	65 113.1(1977) 5.3(1977) C,E,J,S,U,W	65 113.1(1977) 5.1(1977) C,E,J,S,U,W
UTAH POWER & LIGHT HUNTER 1 360.0 MW (NET)	CAPACITY FACTOR, % TOTAL CAPITAL, \$/KW(YEAR) TOTAL ANNUAL, MILLS/KWH(YEAR) COST ELEMENTS	65 91.1(1978) 1(1978) B,C,T,X	65 ***** (C) ***** (C)	65 ***** (C) ***** (C)
UTAH POWER & LIGHT HUNTINGTON 1 366.0 MW (NET)	CAPACITY FACTOR, % TOTAL CAPITAL, \$/KW(YEAR) TOTAL ANNUAL, MILLS/KWH(YEAR) COST ELEMENTS	80 85.9(1978) 1.4(1978) B,C,T,X	65 ***** (C) ***** (C)	65 ***** (C) ***** (C)

***** INDICATES COST FIGURES NOT YET AVAILABLE

SECTION A-2
 COSTS FOR NON-OPERATIONAL FGD SYSTEMS

UNIT DESCRIPTION	COST DESCRIPTION	COST		
		REPORTED	ADJUSTED	STANDARDIZED ADJUSTED
BASIN ELECTRIC POWER COOP LARAMIE RIVER 1 600.0 MW (NET)	CAPACITY FACTOR, % TOTAL CAPITAL, \$/KW(YEAR) TOTAL ANNUAL, MILLS/KWH(YEAR) COST ELEMENTS	*** 56.0(1980) .9(7800) C,E	65 ***** (0) ***** (0)	65 ***** (0) ***** (0)
BASIN ELECTRIC POWER COOP LARAMIE RIVER 2 600.0 MW (NET)	CAPACITY FACTOR, % TOTAL CAPITAL, \$/KW(YEAR) TOTAL ANNUAL, MILLS/KWH(YEAR) COST ELEMENTS	*** 56.0(1980) .9(7800) C,E	65 ***** (0) ***** (0)	65 ***** (0) ***** (0)
BOSTON EDISON MYSTIC 6 150.0 MW (NET)	CAPACITY FACTOR, % TOTAL CAPITAL, \$/KW(YEAR) TOTAL ANNUAL, MILLS/KWH(YEAR) COST ELEMENTS	*** 63.4(1972) 3.0(1974) B,C,E,N,D	65 ***** (0) ***** (0)	65 ***** (0) ***** (0)
COLORADO UTE ELECTRIC ASSN. CRAIG 1 447.0 MW (NET)	CAPACITY FACTOR, % TOTAL CAPITAL, \$/KW(YEAR) TOTAL ANNUAL, MILLS/KWH(YEAR) COST ELEMENTS	*** 86.5(1979) ***** (0) B,D,E	65 ***** (0) ***** (0)	65 ***** (0) ***** (0)
COMMONWEALTH EDISON POWERTON 51 450.0 MW (NET)	CAPACITY FACTOR, % TOTAL CAPITAL, \$/KW(YEAR) TOTAL ANNUAL, MILLS/KWH(YEAR) COST ELEMENTS	*** 125.0(1979) ***** (C) C,E,H,J	65 ***** (0) ***** (0)	65 ***** (0) ***** (0)
COMMONWEALTH EDISON WILL COUNTY 1 .0 MW (NET)	CAPACITY FACTOR, % TOTAL CAPITAL, \$/KW(YEAR) TOTAL ANNUAL, MILLS/KWH(YEAR) COST ELEMENTS	49 113.0(1972) 13.1(1975) B,C,E,G,J,X	65 ***** (0) ***** (0)	65 ***** (0) ***** (0)
DETROIT EDISON ST. CLAIR 6 .0 MW (NET)	CAPACITY FACTOR, % TOTAL CAPITAL, \$/KW(YEAR) TOTAL ANNUAL, MILLS/KWH(YEAR) COST ELEMENTS	*** 80.3(1976) 9.6(1976) B,C,E,J,M,X	65 ***** (0) ***** (0)	65 ***** (0) ***** (0)
ILLINOIS POWER COMPANY WOOD RIVER 4 110.0 MW (NET)	CAPACITY FACTOR, % TOTAL CAPITAL, \$/KW(YEAR) TOTAL ANNUAL, MILLS/KWH(YEAR) COST ELEMENTS	*** 82.5(1972) ***** (C) A,C,E,M,N	65 ***** (0) ***** (0)	65 ***** (0) ***** (0)
POTOMAC ELECTRIC POWER DICKERSON 3 .0 MW (NET)	CAPACITY FACTOR, % TOTAL CAPITAL, \$/KW(YEAR) TOTAL ANNUAL, MILLS/KWH(YEAR) COST ELEMENTS	*** 68.0(1978) ***** (0) A,C,E,M	65 ***** (0) ***** (0)	65 ***** (0) ***** (0)
PUBLIC SERVICE OF COLORADO VALMONT 5 166.0 MW (NET)	CAPACITY FACTOR, % TOTAL CAPITAL, \$/KW(YEAR) TOTAL ANNUAL, MILLS/KWH(YEAR) COST ELEMENTS	*** 87.0(1974) ***** (C) B,C,E,J	65 ***** (0) ***** (0)	65 ***** (0) ***** (0)

***** INDICATES COST FIGURES NOT YET AVAILABLE

SECTION A-2
COSTS FOR NON-OPERATIONAL FGD SYSTEMS

UNIT DESCRIPTION	COST DESCRIPTION	COST		
		REPORTED	ADJUSTED	STANDARDIZED ADJUSTED
SALT RIVER PROJECT	CAPACITY FACTOR, %	***	65	65
CORONADO	TOTAL CAPITAL, \$/KW(YEAR)	74.0(1978)	***** (0)	***** (0)
2	TOTAL ANNUAL, MILLS/KWH(YEAR)	***** (0)	***** (0)	***** (0)
280.0 MW (NET)	COST ELEMENTS	C,E		

***** INDICATES COST FIGURES NOT YET AVAILABLE

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	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: stabilized or unstabilized sludge, interim and final disposal sites and disposal type (minefill, landfill, etc.) as well as disposal location.
Efficiency: Particulate Matter	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.
SO ₂	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 Saleable

The SO₂ removed from the flue gas is recovered in a usable or marketable form (e.g., sulfur, sulfuric acid, gypsum,

	ammonium sulfate, sodium sulfate).
Throwaway	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.
Energy Consumption, %	<p>The percentage of gross unit electrical generating capacity consumed by the FGD system, as defined by the following equation:</p> $\frac{[\text{Net MW w/o FGD} - \text{Net MW w/FGD}]}{\text{Gross unit rating}}$
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.
Category 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.
General Process Type	The manner in which the SO ₂ from the flue gas is collected, e.g., wet scrubbing, spray drying, dry adsorption.
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	<p>A. New boiler constructed subject to Federal New Source Performance Standards (NSPS), 8/17/71.</p> <p>B. Existing boiler subject to State Standard that is more stringent than the NSPS, 8/17/71.</p> <p>C. Existing boiler subject to State Standard that is equal to or less stringent than NSPS, 8/17/71.</p> <p>D. Other (unknown, undetermined).</p>
Retrofit	FGD unit will be/was added to an existing boiler not specifically designed to accommodate FGD unit.
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 SO₂ emission standards.

Unit Rating
Gross

Operational - Maximum continuous gross generation capacity in MW; Preoperational - maximum continuous design generation capacity in MW.

New 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/g	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 ₂ O	IN. H ₂ O	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

TECHNICAL REPORT DATA
(Please read Instructions on the reverse before completing)

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16. ABSTRACT The report is the first of three supplements updating the October-December 1979 report (EPA-600/7-80-029a) and should be used in conjunction with it. The report, 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, 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.					
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