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Utility FGD Survey January - December 1987

Categorical Summaries of FGD Systems

Volume 1

June 1989

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Prepared for:

U.S. Department of Energy
Office of Policy, Planning and Analysis
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Utility FGD Survey January - December 1987

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Prepared by:

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Cincinnati, Ohio 45246-0100
DOE Contract No. DE-AC05-84OR21400

Prepared for:

U.S. Department of Energy
Office of Policy, Planning and Analysis
Office of Environmental Analysis
Washington, DC 20585

UTILITY FLUE GAS DESULFURIZATION SURVEY

JANUARY - DECEMBER 1987

ACKNOWLEDGMENT

The authors of this report appreciate the assistance provided by the U.S. Environmental Protection Agency (Air & Energy Engineering Research Laboratory, Research Triangle Park, North Carolina) for the Flue Gas Desulfurization Information System (FGDIS), in extending technical support for this project.

NOTICE

The data in this information transfer document are supplied voluntarily by utility representatives, flue gas desulfurization (FGD) system suppliers and designers, regulatory agencies, and others. The accuracy or completeness of the information contained herein is not warranted by the Department of Energy or the designated contractor. Portions of the work upon which this publication is based were performed pursuant to Contract Nos. RP982-32 with the Electric Power Research Institute and 68-02-3173 with the Environmental Protection Agency.

Copies of preceding issues of this report through December 1981 and reports after the October 1983-September 1984 issue can be purchased from the National Technical Information Service (NTIS), Springfield, Virginia 22161, (703) 487-4650. Succeeding issues of this report through the October 1983-September 1984 issue can be purchased from the Electric Power Research Institute Research Reports Center, P.O. Box 50490, Palo Alto, California 94303, (415) 965-4081. Reports following the October 1983-September 1984 issue may be obtained through NTIS as above.

This report summarizes the FGD system design and performance data contained in a computerized data base known as the Flue Gas Desulfurization Information System (FGDIS). Access to the FGDIS is available through NTIS for a nonprofit user's fee. Users also have access to additional design and performance data stored within the data base that cannot conveniently be printed in this report. Direct access to the data base affords analyses of the data (e.g., averages, maxima, minima, and standard deviations of various parameters), the use of simple mathematical functions, the capability of virtually unlimited data cross-referencing, and data tabulation to fit the user's individual information needs. An FGDIS users manual is available from NTIS (NTIS No. PB 83 146 209).

Requests for further information concerning the FGDIS should be directed to Michael Melia or Skip Jones, PEI Associates, Inc. (513/782-4700). Information concerning access to the FGDIS can be obtained from Walter Finch, NTIS, 5285 Port Royal Road, Springfield, Virginia 22161 (703/487-4808).

USE OF THIS REPORT

This report is the first fully compiled edition since the January-December 1986 issue released in April 1988, which contains more complete design and performance data from individual FGD system startup dates through the end of 1987. This report supersedes all previous issues. Volume 1 includes several categorial summaries of key data and the appendix sections. Volume 2 contains basic design and performance data for operational FGD systems (Section 13).

The Executive Summary contains the number and capacity of FGD systems as of the end of December 1987, future (December 1997) projections of controlled and uncontrolled generating capacity, and unit-by-unit summaries of status changes (e.g., contract awarded, under construction, or operational) and performance and status highlights for the period.

Appendix sections include definitions, a table of unit notation and simplified process flow diagrams, as well as data on terminated FGD systems, particle scrubbers and Japanese FGD systems.

Several ways are available for identifying individual power plant units. Power plants are usually represented by turbine or boiler number in government and industry documents. Because more than one boiler may feed a given turbine in some cases, or a particular boiler may not be dedicated to a single power plant turbine, such identification can be misleading. This situation may be further complicated when FGD systems are being identified. In general, a one-to-one relationship exists between boilers or turbines and FGD systems for power plants included in this report. For the most part, the power plant boiler designation is used to identify FGD systems in this document. When several boilers feed a single FGD system, however, the boilers feeding the FGD system are indicated in the FGD system name. For example, Duquesne Light's Elrama plant consists of four boilers, the exhausts of which are ducted to a common header that serves a single multimodule FGD system. The plant is thus identified in the data base as "Elrama 1-4."

The Utility FGD Survey tracks the status and performance of FGD systems. The method of identifying FGD systems described in the preceding paragraph is the convention for this document and for the FGDIS.

ABSTRACT

The Utility FGD Survey report, which is generated by a computerized data base management system, represents a survey of operational and planned domestic utility flue gas desulfurization (FGD) systems. It summarizes information contributed by the utility industry, system and equipment suppliers, system designers, research organizations, and regulatory agencies. The data cover system design, fuel characteristics, operating history, and actual system performance. Also included is a unit-by-unit discussion of problems and solutions associated with the boilers, scrubbers, and FGD systems.

The development status (operational, under construction, or in the planning stages), system supplier, process, waste disposal practice, and regulatory class are tabulated alphabetically by utility company. Simplified process flow diagrams of FGD systems, definitions, and a glossary of terms are attached to the report. Current data for domestic FGD systems show 151 systems in operation, 7 systems under construction, and 50 systems planned. The current total FGD-controlled capacity in the United States is 65,520 MW.

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EXECUTIVE SUMMARY

This report is prepared by PEI Associates, Inc., under contract to the U.S. Department of Energy through Martin Marietta Energy Systems, Inc. It is generated by a computerized data base system, the structure of which is illustrated in Figure 1.

Table 1 summarizes the status of flue gas desulfurization (FGD) systems in the United States as of the end of December 1987. Table 2 lists the units on which the status has changed during the January-December 1987 period.

TABLE 1. NUMBER AND TOTAL CAPACITY OF FGD SYSTEMS

Status	No. of units	Total controlled capacity,[a] MW	Equivalent[b] scrubbed capacity, MW
Operational	151	65,520	60,643
Under construction	7	4,135	3,990
Planned:			
Contract awarded	10	6,530	6,470
Letter of intent	-	-	-
Requesting/evaluating bids	6	1,765	1,765
Considering only FGD systems for SO_2 control	34	16,873	16,377
TOTAL	208	94,823	89,245

[a]Summation of the gross unit capacities (MW) brought into compliance by the use of FGD systems, regardless of the percentage of the flue gas scrubbed by the FGD system(s).

[b]Summation of the effective scrubbed flue gas capacities in equivalent MW, based on the percentage of flue gas scrubbed by the FGD system(s).

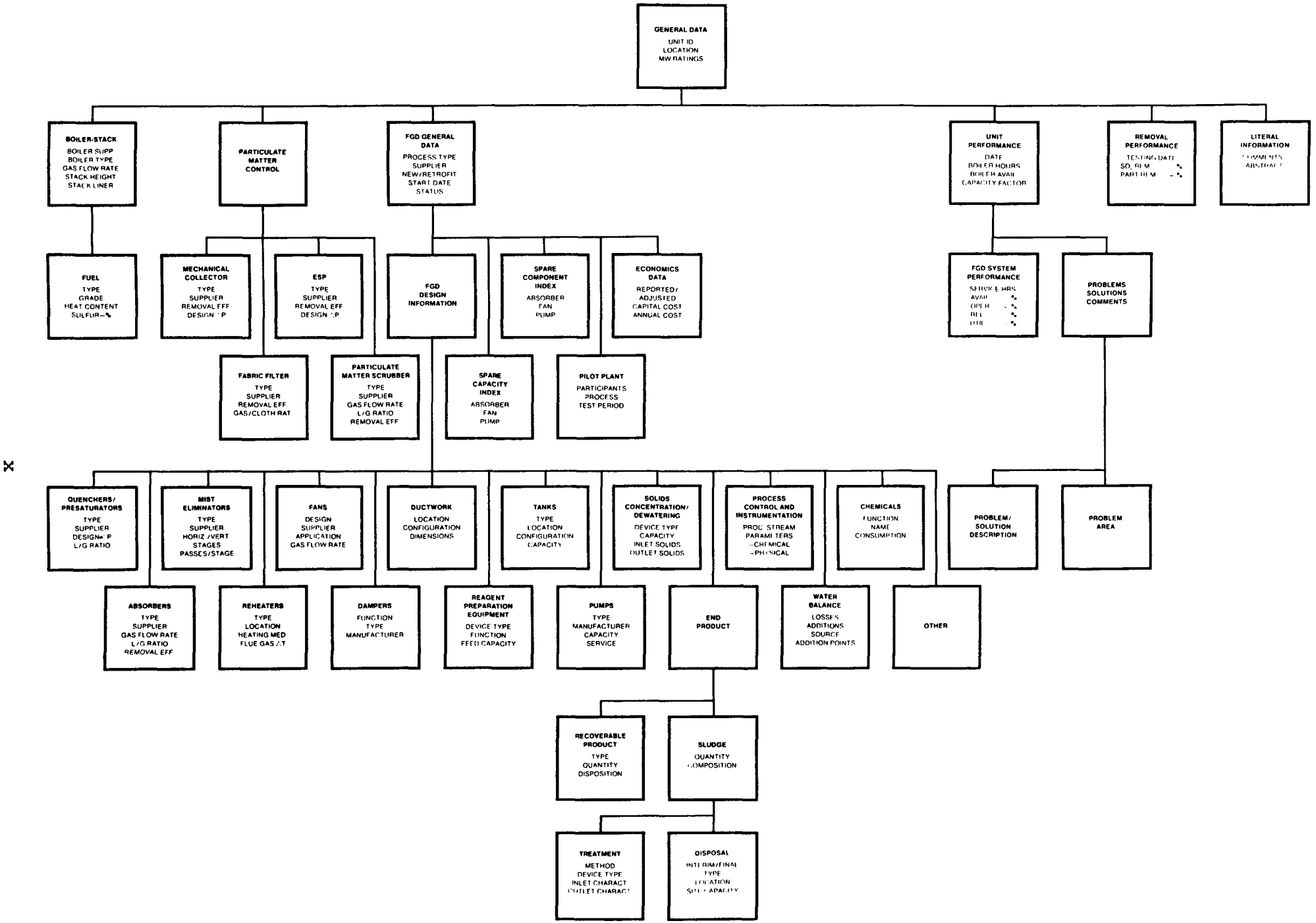

Figure 1. Computerized data base structure diagram.

TABLE 2. SUMMARY OF FGD SYSTEM STATUS CHANGES, JANUARY - DECEMBER 1987

	Operational		Under Construction		Contract awarded		Letter of intent	Requesting/ eval. bids		Considering FGD		Total	
Applied Energy Service													
Beaver Valley 1	+1	+126										+1	+126
Cincinnati Gas & Electric													
East Bend 1										-1	-650	-1	-650
Zimmer 1			+1	+1,389	-1	-1,389							
Cogentrix													
Adrian 1								+1	+55			+1	+55
Otsego 1								+1	+55			+1	+55
General Public Utilities													
Coal 2										-1	-690	-1	-690
Los Angeles Dept. of Water & Power													
Intermountain 2	+1	+841	-1	-841									
Nebraska Public Power District													
Fossil III 1										-1	-400	-1	-400
Northern States Power													
Sherburne Co. 3	+1	+801	-1	-801									
Orlando Utilities Commission													
C.H. Stanton 1	+1	+460	-1	-460									
Oxford Energy													
Sterling 1								+1	+30			+1	+30
Westley 1	+1	+14										+1	+14
Pacific Power & Light													
Dave Johnston 4	+1	+330										+1	+330
Public Service of Colorado													
Cherokee 4			+1	+350	-1	-350							

(continued)

TABLE 2 (continued)

	Operational		Under Construction		Contract awarded		Letter of intent		Requesting/ eval. bids		Considering FGD		Total	
Salt River Project														
Coronado 3			+1	+320							-1	-320		
South Carolina Public Service														
Pee Dee 1											+1	+550	+1	+550
Pee Dee 2											+1	+550	+1	+550
Tennessee Valley Authority														
Shawnee 9	+1	+10											+1	+10
Texas Utilities														
Martin Lake 4					-1	-750							-1	-750
FGD status report December 31, 1986	144	58,061[b]	7	4,033[b]	13	8,959[b]	0	0	3	1,625	36	17,337[b]	203	90,015[b]
Total	151	60,643	7	3,990	10	6,470	0	0	6	1,765	34	16,377	208	89,245

[a] Equivalent scrubbed capabity.

[b] This value was modified slightly to reflect adjustments in reported unit generating capacities.

Figure 2 presents a historic breakdown of utility status reports for operational, under-construction, and planned FGD capacity. The operating FGD capacity has grown significantly each year since 1972. Since 1977 the capacity under construction has been fairly stable. The planned capacity reported by the utilities has increased each year in the past until 1980, when it reached its peak, and has dropped sharply since that time. This drop resulted because fewer power plants were built than had been planned.

Figure 3 presents a comparison of actual coal-fired generating capacity and FGD capacity from 1975 through 1987 and projections thereafter through 1997. Although the retirement of older units is taken into account in these plots, such retirements affect only the overall coal-fired capacity rate because FGD-controlled capacity represents primarily new power generating capacity. This accounts for the slightly greater slope of the lower line, which depicts FGD-controlled capacity.

Further comparisons between these populations can be made with the help of other DOE data sources. The information given in Table 3 was extracted from the FGDIS and DOE's Form EIA 767 data base.[9] The 1985 767 data is the reference data base for the National Acid Precipitation Assessment Program (NAPAP). Emission reduction targets, source inventories, and models prepared under this program use the 1985 767 data base as a reference for comparison. This table shows interesting comparisons between the FGD-equipped utility boiler population and the U.S. utility boiler population as a whole as of the end of 1985. As one might expect, the FGD-equipped population is newer, achieves a higher capacity factor, and burns coal having slightly higher sulfur content.

Current projections estimate the total power-generating capacity of the U.S. electric utility industry will be 751 GW by the end of 1997.[10] (This value reflects the loss resulting from the retirement of older units, which is considered to be approximately 10,309 MW by the end of 1997.[10]) Approximately 335 GW, or 44 percent of the 1997 total, is estimated to be produced by coal-fired units. Table 4 presents a distribution of present (December 1987) and future (December 1997) power generation sources.

It is interesting to note that the breakdown for the actual power produced by these sources during the past year (Table 5) differs appreciably, especially for coal- and oil-fired sources, from the power generating capacity shown in Table 4. This is due to the effect of the changing economy on the operation of various types of powerplants.

Based on known commitments of utilities to FGD (as presented in Table 1) and other coal-fired generating capacity expected to be required to incorporate FGD (Figure 3), current and projected percentages of electrical generating capacity controlled by FGD are shown in Table 6. The utility FGD survey includes non-utility generators that contribute all or part of the power they produce to the utility grid.

Cogeneration and independent power producing facilities are becoming a larger factor of electrical energy production partially as a result of legislation requiring utilities to purchase power whenever possible and the high cost of constructing new units.

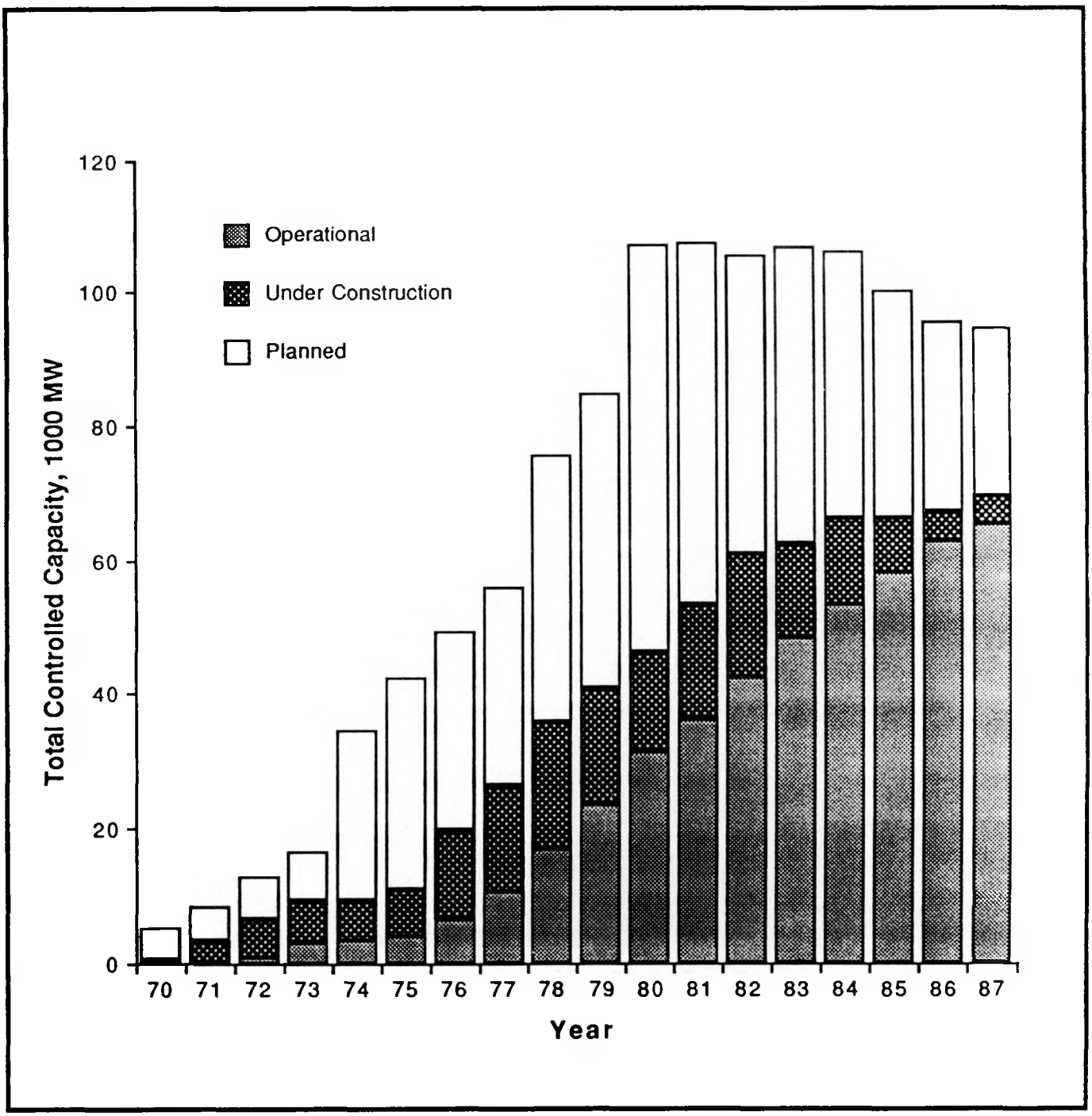

Figure 2. History of utility FGD status reports for operational, under construction, and planned FGD capacity - December 1970 through December 1987.

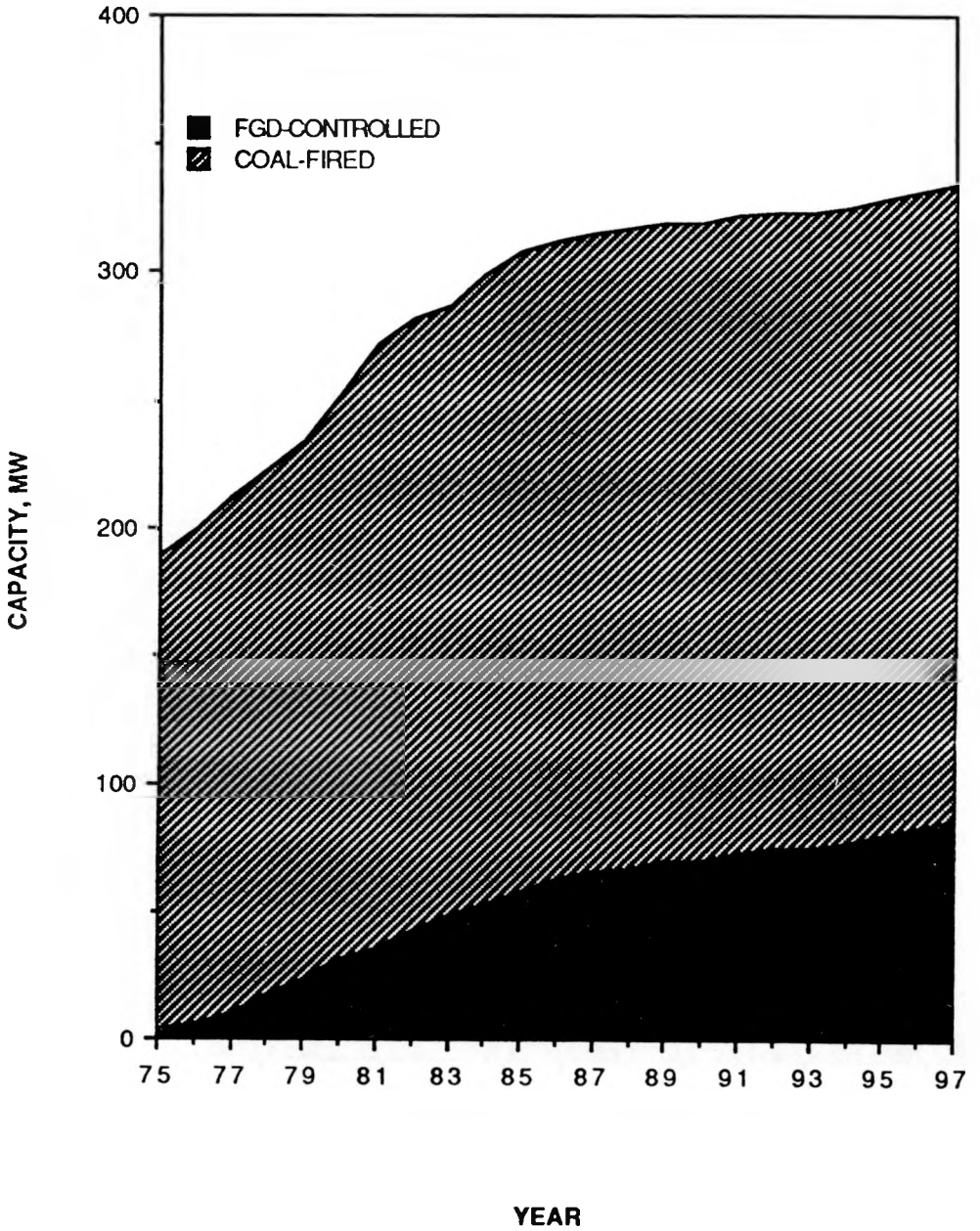

Figure 3. Actual and projected coal-fired generating capacity and FGD capacity, 1987.[1-8]

TABLE 3. COMPARISON OF FGD-EQUIPPED BOILERS AND THE ENTIRE U.S. COAL-FIRED BOILER POPULATION AS OF THE END OF 1985[a]

	Utility boilers equipped with FGD systems	All coal-fired utility boilers
Number of operational units	131[b]	1098
Capacity, GW	55	295
Average age, yrs	11.9	22.5
Average capacity factor, %	50	44
Boiler type, % (by capacity)		
Pulverized coal	93	90
Cyclone	5	9
Other/not reported	2	1
Average heating value, Btu/lb	10,267	11,001
Average coal sulfur content, %	1.6	1.5
Average ash content, %	11.6	9.6
Average standard, $lb/10^6$ Btu		
Particulate matter	0.10	0.17
SO_2	0.97	3.81
NO_x	0.7	0.7[c]

[a] This table is based on data extracted from the FGDIS and a data base called PC-767 developed by PEI from DOE Form EIA 767, available from the U.S. Department of Energy. This data set, which covers the period ending December 1985, is the reference data base for comparisons and projections of the National Acid Precipitation Assessment Program (NAPAP). The DOE 767 data base does not include units with generating capacities under 100 MW.

[b] This figure differs somewhat from the FGDIS-reported number of 1985 because the DOE 767 data base did not include four new FGD-equipped units that were actually in service for at least part of 1985.

[c] Only those units subject to NO_x regulations were included in this average.

TABLE 4. POWER GENERATION SOURCES: PRESENT AND FUTURE[10]

	Coal	Nuclear	Oil	Hydro	Gas	Other	Total generating capacity, GW
December 1987	44%	14%	12%	12%	18%	0.66%	718
December 1997	44%	15%	11%	12%	17%	1%	753

TABLE 5. POWER PRODUCTION BY SOURCE[12]

	Coal	Nuclear	Oil	Hydro	Gas	Other	Total energy generated, GWh
January-December 1987	57%	18%	4%	10%	11%	0	2,571,401

TABLE 6. FGD-CONTROLLED GENERATING CAPACITY: PRESENT AND FUTURE[1,10]

	Coal-fired generating capacity controlled by FGD, %	Total generating capacity controlled by FGD, %
December 1987[a]	20.9	9.1
December 1997	25.7	11.4

[a]The December 1987 FGD capacity figures are based on reports by utilities. The figures used for the total generating capacity and the December 1997 coal-fired generating capacity are based on December 1987 DOE-projected figures.

Currently the capacity of non-utility generators is over 10,000 MW[13] (approximately 1.4 percent of the total in the United States). By 1997, this capacity is expected to increase to 27,656 MW[14] (approximately 3.7 percent of the 1997 capacity). Non-utility generators are expected to produce 2.1 percent of the electricity in 1988 and 5.0 percent in 1997.[14]

Table 7 presents data on the planned additions to the electric generating units of independent power producers compared with utility additions for the next five years. As shown, the independent producers will account for as much as 40 percent of the new capacity in 1988 and will be from 10 to 30 percent of the additional capacity in the following years.

TABLE 7. CAPACITY ADDITIONS OF UTILITIES VERSUS INDEPENDENT POWER PRODUCERS

	Independent generators, MW[a] [15]	Utilities, MW [14]
1988	3936	5757
1989	3858	8902
1990	1870	3881
1991	1838	6236
1992	237	2878

[a]These are committed projections by companies; the actual capacities projected for the 1990s are expected to be higher.

Table 8 gives the percentage of each fuel type that will be added from 1988 to 1997. As shown, coal accounts for 6.5 percent (1315 MW) of these additions. FGD systems will be used by some of the coal-fired units as well as other fuels (e.g., tires, waste). Other coal units will use fluidized bed boilers or will burn low-sulfur coal.

FGD is not the only avenue for SO_2 compliance. The use of fluidized bed boilers is now considered as an option to FGD systems for SO_2 control when the coal alkali content is high. Currently, four fluidized bed boilers are installed at utilities. Three of these are demonstration projects sponsored by EPRI: a 160-MW unit at TVA, which is the only one that is operational; a 130-MW unit at Northern States Power; and a 110-MW unit at Colorado Ute Electric. Another unit owned by Montana-Dakota Utilities has an 80-MW capacity.[16] Texas-New Mexico Power Company has plans to construct four 150-MW units that will use fluidized bed boilers and become operational from 1990 to 2000.[17]

Further development in this area is expected with the trend toward power- plant life extensions and "repowering" old units with new more-sophisticated generating equipment.

TABLE 8. NON-UTILITY GENERATOR ADDITIONS BY FUEL TYPE[14]
(Courtesy of North American Electric Reliability Council)

Fuel type	1988-1997 MW	Percent of total
Natural gas	3,029	15.0
Hydro	500	2.5
Coal	1,315	6.5
Geothermal	594	3.0
Wind	84	0.4
Solar	100	0.5
Refuse (solid waste)	458	2.3
Wood/wood wastes	346	1.7
Other or unknown	13,702	68.1
TOTAL	20,128	100.0

Table 9 shows both the current (December 1987) and projected (after December 2000) breakdown of throwaway-product FGD systems versus saleable-product FGD systems as a percentage of the total known commitments to FGD.

TABLE 9. SUMMARY OF FGD SYSTEMS BY PROCESS
(percentage of total MW)

Process	Byproduct	December 1987	December 2000	December 2000 (Normalized)[a]
Throwaway-product process				
Wet systems				
Lime		19.5	15.5	16.9
Limestone		48.4	44.1	48.0
Lime/alkaline fly ash		7.2	4.9	5.4
Limestone/alkaline fly ash		2.5	1.7	1.8
LIMB/dry injection		0.5	0.4	0.4
Dual alkali		3.4	2.3	2.6
Sodium carbonate		3.3	3.4	3.7
NA[b]		-	0.6	0.6
Dry systems				
Lime		8.5	10.2	11.1
Sodium carbonate		0.7	0.5	0.5
NA[b]		-	2.1	2.3
Dry injection				
Sodium bicarbonate		-	0.4	0.4
Trona/dry injection		-	0.5	0.6
Saleable-product process				
Lime	Metals/fly ash/ other	<1	<1	<1
Limestone	Gypsum	1.3	2.1	2.3
Magnesium oxide	Sulfuric acid	1.5	1.0	1.1
Wellman Lord	Sulfuric acid	3.2	2.2	2.3
Process undecided		-	8.1	-
TOTAL		100.0	100.0	100.0

[a]The effect of those systems listed as "Process undecided" is removed.

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

HIGHLIGHTS: JANUARY - DECEMBER 1987

The following paragraphs highlight FGD system activities and availabilities during the period of January through December 1987.

Applied Energy Service operates Beaver Valley 1, which sells power to West Penn Power and steam to Arco Refinery. The facility, located in Monaca, Pennsylvania, was originally owned by Arco but later purchased by AES and converted into a cogeneration plant. An ESP was added for particulate control, and later a wet scrubbing lime system with a disc contactor was added for SO_2 control. The unit has a 126-MW capacity.

Cincinnati Gas and Electric reported the cancellation of East Bend 1, a 650-MW unit scheduled for Rabbit Hash, Kentucky.

Cincinnati Gas and Electric also reported that fabrication on the FGD system for Zimmer 1 began in November 1987. Zimmer 1 is a 1389-MW nuclear-to-coal conversion unit in Moscow, Ohio. The unit will employ a Babcock and Wilcox lime tray tower for SO_2 control and a cold-side ESP for particulate control. Startup of the FGD system is scheduled for June 30, 1991.

Cogentrix reported that in the second quarter of 1989 construction will begin on cogeneration units Adrian 1 in Adrian, Michigan, and Otsego 1 in Otsego, Michigan. Initial startup is scheduled for the third quarter of 1990. The units are identical and will each have a capacity of 55 MW. They will have a lime spray drying FGD system for SO_2 control and an integrated fabric filter for particulate control. Power will be sold to Consumers Power and steam will be sold to local industry.

General Public Utilities reported that they are no longer considering building Coal 2. This would have been a 690-MW unit located in the western United States.

Los Angeles Department of Water and Power announced that the commercial startup of the Intermountain 2 unit occurred in May 1987. This 841-MW unit located in Delta, Utah, has a GEESI wet limestone scrubbing system for SO_2 control and fabric filters for particulate control.

Nebraska Public Power District announced the cancellation of their Fossil III 1 unit, which had a planned capacity of 400 MW and was to be located near Sargeant, Nebraska.

Northern States announced that Sherburne Co. 3 began initial operation July 1987 and commercial operation November 1987. This 801-MW unit is located in Becker, Minnesota. It has a lime spray drying FGD system (manufactured by Joy Manufacturing/Niro Atomizer) for SO_2 control; fabric filters are employed for particulate control.

Orlando Utilities reported that their CH Stanton Unit 1 came on line on May 12, 1987, and commercial operation began July 1, 1987. This 460-MW unit located near Orlando, Florida, has a wet limestone FGD system for SO_2 control and an ESP for particulate control.

Oxford Energy Company reported that operations began on their 14-MW tire burning facility in October 1987. Westley 1, located in Westley, California, sells electricity to Pacific Gas and Electric. It consists of a Standard Kessel Boiler whose particulate and SO_2 emissions are controlled by a lime wet scrubbing FGD system and an integrated fabric filter. Construction is expected to begin on a similar 30-MW facility in Sterling, Connecticut, in December 1988. An FGD system has not been selected for this unit.

Pacific Power & Light reported that its Dave Johnston 4 unit (previously identified as having a particulate scrubber) underwent a modification of its scrubbing system configuration to reduce SO_2 emissions. The 330-MW coal-fired unit in Glenrock, Wyoming, is equipped with an FGD system that consists of a hydrated lime injection bank in the ductwork approximately 10 feet prior to the existing wet particulate scrubber inlet. The design SO_2 removal efficiency of the lime injection scrubbing system combination is 60 percent, which brings the unit in compliance with a 0.5 $lb/10^6$ Btu emission limitation.

Public Service Of Colorado announced that construction began on the FGD system for Cherokee 4 in the Fall of 1987. The system consists of a GEESI fabric filter with sodium bicarbonate injection for SO_2 and particulate control of the 350-MW unit. Startup of this system in Denver, Colorado, is scheduled for April 1989.

Salt River Project announced that construction began on Coronado 3 in 1987. This 320-MW unit located in St. John's, Arizona, is scheduled for startup in 1991. The unit will have two limestone spray towers for SO_2 control and fabric filters for particulate control.

South Carolina Public Service announced that it has plans to install two units (Pee Dee 1 and 2) in Florence, South Carolina. Startup of the two 550-MW units is scheduled for the year 2000.

Tennessee Valley Authority reported that operations began in March 1987 on their pilot-scale spray drying FGD system, which controls emissions from Shawnee 9. The project, which was cofunded by EPRI and Ontario Hyro, was begun to determine whether spray dryers could effectively be retrofitted to existing power plants. Operation is scheduled to continue through 1989.

Texas Utilities announced that they were cancelling their planned unit, Martin Lake 4. This unit, which was to be located in Tatum, Texas, had a planned capacity of 750 MW.

Table 10 lists the names of the utility systems that reported achieving operating availabilities of 90 percent or greater for the period January through December 1987.

TABLE 10. UTILITY FGD SYSTEMS ACHIEVING AVERAGE ANNUAL AVAILABILITIES OF 90 PERCENT OR GREATER FOR 1987

Utility	Unit
Alabama Electric	Tombigbee 2 Tombigbee 3
Central Illinois Light	Duck Creek 1
Central Illinois Public Service	Newton 1
Delmarva Power and Light	Delaware City 3
Hoosier Energy	Merom 1 Merom 2
Montana Power	Colstrip 2 Colstrip 3 Colstrip 4
Muscatine Power and Water	Muscatine 9
Nevada Power	Reid Gardner 1 Reid Gardner 2 Reid Gardner 3 Reid Gardner 4
Northern Indiana Public Service	R. M. Schahfer 17 R. M. Schahfer 18
Pennsylvania Power	Bruce Mansfield 3
Public Service of Indiana	Gibson 5
Public Service of New Mexico	San Juan 1 San Juan 2 San Juan 3
South Carolina Public Service	Cross 2 Winyah 3 Winyah 4
South Mississippi Electric Power	R. D. Morrow, Sr. 1 R. D. Morrow, Sr. 2
Sunflower Electric	Holcomb 1
United Power Association	Stanton 1A

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17. Personal Communication with Alan Davis, Texas-New Mexico Power, November 10, 1988.

The Complete report, entitled "Utility FGD Survey: January - December 1987," will be available only from:

National Technical Information Service
5285 Port Royal Road
Springfield, Virginia 22161
(703) 487-4650

For further information, contact:

James Kelley U.S. Department of Energy
(202) 586-8420

SECTION 1
SUMMARY LIST OF FGD SYSTEMS

COMPANY NAME/ UNIT NAME	UNIT NO.	UNIT LOCATION		START-UP DATE	STATUS	REG CLASS
ALABAMA ELECTRIC						
TOMBIGBEE	2	LEROY	ALABAMA	9/1978	1	D
TOMBIGBEE	3	LEROY	ALABAMA	6/1979	1	D
ALAMITO CO						
SPRINGERVILLE	1	SPRINGERVILLE	ARIZONA	2/1985	1	D
SPRINGERVILLE	2	SPRINGERVILLE	ARIZONA	6/1989	2	D
SPRINGERVILLE	3	SPRINGERVILLE	ARIZONA	0/1991	6	A
APPLIED ENERGY SERVICE						
BEAVER VALLEY	1	MONACA	PENNSYLVANIA	8/1980	1	
DEEPWATER	1	PASADENA	TEXAS	3/1986	1	B
ARIZONA ELECTRIC POWER						
APACHE	2	COCHISE	ARIZONA	8/1978	1	C
APACHE	3	COCHISE	ARIZONA	6/1979	1	C
ARIZONA PUBLIC SERVICE						
CHOLLA	1	JOSEPH CITY	ARIZONA	10/1973	1	C
CHOLLA	2	JOSEPH CITY	ARIZONA	4/1978	1	C
CHOLLA	4	JOSEPH CITY	ARIZONA	3/1981	1	A
CHOLLA	5	JOSEPH CITY	ARIZONA	99/2050	6	A
FOUR CORNERS	1	FRUITLAND	NEW MEXICO	11/1979	1	C
FOUR CORNERS	2	FRUITLAND	NEW MEXICO	11/1979	1	C
FOUR CORNERS	3	FRUITLAND	NEW MEXICO	11/1979	1	C
FOUR CORNERS	4	FARMINGTON	NEW MEXICO	10/1984	1	A
FOUR CORNERS	5	FARMINGTON	NEW MEXICO	10/1984	1	A
ASSOCIATED ELECTRIC						
THOMAS HILL	3	MOBERLY	MISSOURI	10/1982	1	B
ATLANTIC CITY ELECTRIC						
CUMBERLAND	1	MILLVILLE	NEW JERSEY	99/2050	6	A
BASIN ELECTRIC POWER						
ANTELOPE VALLEY	1	BEULAH	NORTH DAKOTA	5/1983	1	C
ANTELOPE VALLEY	2	BEULAH	NORTH DAKOTA	10/1985	1	A
ANTELOPE VALLEY	3	BEULAH	NORTH DAKOTA	99/2050	6	A
LARAMIE RIVER	1	WHEATLAND	WYOMING	7/1980	1	A
LARAMIE RIVER	2	WHEATLAND	WYOMING	7/1981	1	A
LARAMIE RIVER	3	WHEATLAND	WYOMING	11/1982	1	A
BIG RIVERS ELECTRIC						
D.B. WILSON	1	CENTERTOWN	KENTUCKY	9/1984	1	A
GREEN	1	SEBREE	KENTUCKY	12/1979	1	D
GREEN	2	SEBREE	KENTUCKY	11/1980	1	D
CENTRAL ILLINOIS LIGHT						
DUCK CREEK	1	CANTON	ILLINOIS	7/1976	1	D
CENTRAL ILLINOIS PUBLIC SERV						
NEWTON	1	NEWTON	ILLINOIS	9/1979	1	D
CENTRAL POWER & LIGHT						
COLETO CREEK	2	FANNIN	TEXAS	0/2003	3	B

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CINCINNATI GAS & ELECTRIC						
EAST BEND	2	RABBIT HASH	KENTUCKY	3/1981	1	C
ZIMMER	1	MOSCOW	OHIO	6/1991	2	A
CITY UTILITIES OF SPRINGFIELD						
SOUTHWEST	1	SPRINGFIELD	MISSOURI	4/1977	1	D
COGENTRIX						
ADRIAN	1	ADRIAN	MICHIGAN	7/1990	5	
OTSEGO	1	OTSEGO	MICHIGAN	7/1990	5	
COLORADO SPRINGS DEPT. OF PUBL						
R.D. NIXON	2	COLO. SPRINGS	COLORADO	4/1995	6	A
COLORADO UTE ELECTRIC						
CRAIG	1	CRAIG	COLORADO	10/1980	1	C
CRAIG	2	CRAIG	COLORADO	12/1979	1	C
CRAIG	3	CRAIG	COLORADO	6/1984	1	C
COLUMBUS & SOUTHERN OHIO ELEC						
CONESVILLE	5	CONESVILLE	OHIO	1/1977	1	D
CONESVILLE	6	CONESVILLE	OHIO	6/1978	1	D
COOPERATIVE POWER ASSOCIATION						
COAL CREEK	1	UNDERWOOD	NORTH DAKOTA	7/1979	1	D
COAL CREEK	2	UNDERWOOD	NORTH DAKOTA	7/1980	1	D
DELMARVA POWER & LIGHT						
DELAWARE CITY	1	DELAWARE CITY	DELAWARE	5/1980	1	E
DELAWARE CITY	2	DELAWARE CITY	DELAWARE	5/1980	1	E
DELAWARE CITY	3	DELAWARE CITY	DELAWARE	5/1980	1	E
DESERET GEN & TRANS						
BONANZA	1	VERNAL	UTAH	12/1985	1	A
BONANZA	2	VERNAL	UTAH	99/2050	6	A
DINEH SERVICE COMANY						
DINEH	1	BISTI	NEW MEXICO	0/1998	5	A
DINEH	2	BISTI	NEW MEXICO	0/1999	6	A
DINEH	3	BISTI	NEW MEXICO	0/2000	6	A
DINEH	4	BISTI	NEW MEXICO	0/2001	6	A
DUQUESNE LIGHT						
ELRAMA	1-4	ELRAMA	PENNSYLVANIA	10/1975	1	C
PHILLIPS	1-6	SOUTH HEIGHTS	PENNSYLVANIA	7/1973	1	C
EAST KENTUCKY POWER						
J.K. SMITH	1	WINCHESTER	KENTUCKY	0/2001	3	A
SPURLOCK	2	MAYSVILLE	KENTUCKY	12/1982	1	C
GENERAL PUBLIC UTILITIES						
COAL	1	FORKED RIVER	NEW JERSEY	0/2005	6	B
GRAND HAVEN BRD OF LIGHT & PWR						
J.B. SIMS	3	GRAND HAVEN	MICHIGAN	5/1983	1	B

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GRAND RIVER DAM AUTHORITY						
GRDA	2	PRYOR	OKLAHOMA	3/1985	1	B
HOOSIER ENERGY						
MEROM	1	MEROM	INDIANA	8/1982	1	D
MEROM	2	MEROM	INDIANA	12/1981	1	D
HOUSTON LIGHTING & POWER						
LIMESTONE	1	JEWITT	TEXAS	10/1985	1	B
LIMESTONE	2	JEWITT	TEXAS	10/1986	1	B
MALAKOFF	1	MALAKOFF	TEXAS	0/1997	3	B
MALAKOFF	2	MALAKOFF	TEXAS	0/1999	3	B
W.A. PARISH	8	THOMPSONS	TEXAS	10/1982	1	B
INDIANAPOLIS POWER & LIGHT						
PATRIOT	1	PATRIOT	INDIANA	99/2050	6	A
PATRIOT	2	PATRIOT	INDIANA	99/2050	6	A
PATRIOT	3	PATRIOT	INDIANA	99/2050	6	A
PETERSBURG	3	PETERSBURG	INDIANA	12/1977	1	D
PETERSBURG	4	PETERSBURG	INDIANA	1/1986	1	D
JACKSONVILLE ELEC AUTHORITY						
ST.JOHNS RIVER PWR PARK	1	JACKSONVILLE	FLORIDA	12/1986	1	B
ST.JOHNS RIVER PWR PARK	2	JACKSONVILLE	FLORIDA	3/1988	2	A
KANSAS CITY POWER & LIGHT						
LA CYGNE	1	LA CYGNE	KANSAS	12/1972	1	E
KANSAS POWER & LIGHT						
JEFFREY	1	WAMEGO	KANSAS	8/1978	1	C
JEFFREY	2	WAMEGO	KANSAS	1/1980	1	C
JEFFREY	3	WAMEGO	KANSAS	5/1983	1	C
LAWRENCE	4	LAWRENCE	KANSAS	1/1977	1	C
LAWRENCE	5	LAWRENCE	KANSAS	4/1978	1	C
KENTUCKY UTILITIES						
GREEN RIVER	1-3	CENTRAL CITY	KENTUCKY	9/1975	1	C
LAKELAND UTILITIES						
MCINTOSH	3	LAKELAND	FLORIDA	7/1982	1	C
LOS ANGELES DEPT OF WTR & PWR						
INTERMOUNTAIN	1	DELTA	UTAH	2/1986	1	A
INTERMOUNTAIN	2	DELTA	UTAH	3/1987	1	A
LOUISVILLE GAS & ELECTRIC						
CANE RUN	4	LOUISVILLE	KENTUCKY	8/1976	1	E
CANE RUN	5	LOUISVILLE	KENTUCKY	12/1977	1	E
CANE RUN	6	LOUISVILLE	KENTUCKY	4/1979	1	E
MILL CREEK	1	LOUISVILLE	KENTUCKY	12/1980	1	E
MILL CREEK	2	LOUISVILLE	KENTUCKY	12/1981	1	E
MILL CREEK	3	LOUISVILLE	KENTUCKY	8/1978	1	D
MILL CREEK	4	LOUISVILLE	KENTUCKY	7/1982	1	D
TRIMBLE COUNTY	1	BEDFORD	KENTUCKY	12/1990	3	A

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LOWER COLORADO RIVER AUTH						
FAYETTE POWER PROJECT	3	LA GRANGE	TEXAS	3/1988	2	B
FAYETTE POWER PROJECT	4	LA GRANGE	TEXAS	99/2050	6	B
MARQUETTE BOARD OF LIGHT & PWR						
SHIRAS	3	MARQUETTE	MICHIGAN	3/1983	1	B
MICHIGAN SO CENTRAL PWR AGENCY						
ENDICOTT	1	LITCHFIELD	MICHIGAN	5/1983	1	B
MINNESOTA POWER & LIGHT						
CLAY BOSWELL	4	COHASSET	MINNESOTA	2/1980	1	D
MINNKOTA POWER						
MILTON R. YOUNG	2	CENTER	NORTH DAKOTA	9/1977	1	D
MONONGAHELA POWER						
PLEASANTS	1	WILLOW ISLAND	WEST VIRGINIA	12/1978	1	D
PLEASANTS	2	WILLOW ISLAND	WEST VIRGINIA	10/1980	1	D
MONTANA POWER						
COLSTRIP	1	COLSTRIP	MONTANA	9/1975	1	D
COLSTRIP	2	COLSTRIP	MONTANA	5/1976	1	D
COLSTRIP	3	COLSTRIP	MONTANA	10/1983	1	A
COLSTRIP	4	COLSTRIP	MONTANA	12/1985	1	A
MONTANA-DAKOTA UTILITIES						
COYOTE	1	BEULAH	NORTH DAKOTA	4/1981	1	D
MUSCATINE POWER & WATER						
MUSCATINE	9	MUSCATINE	IOWA	4/1983	1	B
NEVADA POWER						
HARRY ALLEN	1	LAS VEGAS	NEVADA	0/1997	6	B
HARRY ALLEN	2	LAS VEGAS	NEVADA	0/1999	6	B
HARRY ALLEN	3	LAS VEGAS	NEVADA	0/2001	6	B
HARRY ALLEN	4	LAS VEGAS	NEVADA	0/2003	6	B
REID GARDNER	1	MOAPA	NEVADA	3/1974	1	D
REID GARDNER	2	MOAPA	NEVADA	4/1974	1	D
REID GARDNER	3	MOAPA	NEVADA	6/1976	1	D
REID GARDNER	4	MOAPA	NEVADA	6/1983	1	B
NEW YORK STATE ELEC & GAS						
SOMERSET	1	SOMERSET	NEW YORK	7/1984	1	A
NORTHERN INDIANA PUB SERVICE						
R.M. SCHAHFER	17	WHEATFIELD	INDIANA	4/1983	1	B
R.M. SCHAHFER	18	WHEATFIELD	INDIANA	12/1985	1	B
NORTHERN STATES POWER						
RIVERSIDE	6-7	MINNEAPOLIS	MINNESOTA	11/1980	1	E
SHERBURNE CO.	1	BECKER	MINNESOTA	3/1976	1	C
SHERBURNE CO.	2	BECKER	MINNESOTA	3/1977	1	C
SHERBURNE CO.	3	BECKER	MINNESOTA	7/1987	1	A

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ORLANDO UTILITIES COMMISSION						
C.H. STANTON	1	ORLANDO	FLORIDA	5/1987	1	A
OXFORD ENERGY CO.						
STERLING	1	STERLING	CONNETICUT	6/1990	5	
WESTLEY	1	WESTLEY	CALIFORNIA	10/1987	1	
PACIFIC POWER & LIGHT						
DAVE JOHNSTON	4	GLENROCK	WYOMING	2/1985	1	C
JIM BRIDGER	1	ROCK SPRINGS	WYOMING	0/1990	3	C
JIM BRIDGER	2	ROCK SPRINGS	WYOMING	6/1986	1	C
JIM BRIDGER	3	ROCK SPRINGS	WYOMING	0/1988	2	C
JIM BRIDGER	4	ROCK SPRINGS	WYOMING	9/1979	1	C
WYODAK	1	JOLIET	WYOMING	9/1986	1	A
PENNSYLVANIA POWER						
BRUCE MANSFIELD	1	SHIPPINGPORT	PENNSYLVANIA	12/1975	1	C
BRUCE MANSFIELD	2	SHIPPINGPORT	PENNSYLVANIA	7/1977	1	C
BRUCE MANSFIELD	3	SHIPPINGPORT	PENNSYLVANIA	6/1980	1	C
PHILADELPHIA ELECTRIC						
CROMBY	1	PHOENIXVILLE	PENNSYLVANIA	10/1982	1	C
EDDYSTONE	1	EDDYSTONE	PENNSYLVANIA	9/1982	1	C
EDDYSTONE	2	EDDYSTONE	PENNSYLVANIA	11/1982	1	C
PLAINS ELECTRIC G & T						
PLAINS ESCALANTE	1	PREWITT	NEW MEXICO	11/1984	1	D
PLATTE RIVER POWER AUTHORITY						
RAWHIDE	1	WELLINGTON	COLORADO	12/1983	1	A
PUBLIC SERVICE INDIANA						
GIBSON	5	PRINCETON	INDIANA	10/1982	1	D
PUBLIC SERVICE OF COLORADO						
CHEROKEE	4	DENVER	COLORADO	4/1989	2	D
PAWNEE	2	RUSH	COLORADO	0/1994	6	B
PUBLIC SERVICE OF NEW MEXICO						
SAN JUAN	1	WATERFLOW	NEW MEXICO	4/1978	1	A
SAN JUAN	2	WATERFLOW	NEW MEXICO	8/1978	1	A
SAN JUAN	3	WATERFLOW	NEW MEXICO	12/1979	1	A
SAN JUAN	4	WATERFLOW	NEW MEXICO	5/1982	1	A
SALT RIVER PROJECT						
CORONADO	1	ST. JOHNS	ARIZONA	11/1979	1	C
CORONADO	2	ST. JOHNS	ARIZONA	7/1980	1	C
CORONADO	3	ST. JOHNS	ARIZONA	0/1991	2	B
SAN ANTONIO PUBLIC SERVICE						
CALAVERAS	5	SAN ANTONIO	TEXAS	5/1992	5	B
CALAVERAS	6	SAN ANTONIO	TEXAS	5/1997	5	B
SAN MIGUEL ELECTRIC						
SAN MIGUEL	1	SAN MIGUEL	TEXAS	8/1981	1	D

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SEMINOLE ELECTRIC						
SEMINOLE	1	PALATKA	FLORIDA	5/1983	1	A
SEMINOLE	2	PALATKA	FLORIDA	9/1984	1	A
SIERRA PACIFIC POWER						
NORTH VALMY	2	VALMY	NEVADA	5/1985	1	B
THOUSAND SPRINGS	1	WELLS	NEVADA	99/2050	6	B
THOUSAND SPRINGS	2	WELLS	NEVADA	99/2050	6	B
THOUSAND SPRINGS	3	WELLS	NEVADA	99/2050	6	B
SIKESTON BRD OF MUNICIPAL UTIL						
SIKESTON	1	SIKESTON	MISSOURI	6/1981	1	D
SOUTH CAROLINA PUBLIC SERVICE						
CROSS	1	CROSS	SOUTH CAROLINA	99/2050	3	A
CROSS	2	CROSS	SOUTH CAROLINA	10/1983	1	A
PEE DEE	1	FLORENCE	SOUTH CAROLINA	0/2005	6	
PEE DEE	2	FLORENCE	SOUTH CAROLINA	0/2006	6	
WINYAH	2	GEORGETOWN	SOUTH CAROLINA	7/1977	1	C
WINYAH	3	GEORGETOWN	SOUTH CAROLINA	7/1980	1	C
WINYAH	4	GEORGETOWN	SOUTH CAROLINA	7/1981	1	A
SOUTH MISSISSIPPI ELEC PWR						
R.D. MORROW, SR.	1	PURVIS	MISSISSIPPI	8/1978	1	D
R.D. MORROW, SR.	2	PURVIS	MISSISSIPPI	6/1979	1	D
SOUTHERN ILLINOIS POWER						
MARION	4	MARION	ILLINOIS	4/1979	1	D
SOUTHERN INDIANA GAS & ELEC						
A.B. BROWN	1	WEST FRANKLIN	INDIANA	3/1979	1	D
A.B. BROWN	2	WEST FRANKLIN	INDIANA	2/1986	1	B
SOUTHWESTERN ELECTRIC POWER						
DOLET HILLS	1	MANSFIELD	LOUISIANA	12/1985	1	B
HENRY W. PIRKEY	1	HALLSVILLE	TEXAS	12/1984	1	D
WALKER CO.	1	HUNTSVILLE	TEXAS	0/2004	6	B
WALKER CO.	2	HUNTSVILLE	TEXAS	0/2004	6	B
SOUTHWESTERN PUBLIC SERVICE						
SOUTH PLAINS	1	IDALOU	TEXAS	99/2050	6	B
SPRINGFIELD WATER, LIGHT & PWR						
DALLMAN	3	SPRINGFIELD	ILLINOIS	10/1980	1	D
SUNFLOWER ELECTRIC						
HOLCOMB	1	HOLCOMB	KANSAS	7/1983	1	B
TAMPA ELECTRIC						
BIG BEND	4	TAMPA	FLORIDA	12/1984	1	A
TENNESSEE VALLEY AUTHORITY						
PARADISE	1	PARADISE	KENTUCKY	5/1983	1	C
PARADISE	2	PARADISE	KENTUCKY	7/1983	1	C
SHAWNEE	9	PADUCAH	KENTUCKY	3/1987	1	
WIDOWS CREEK	7	BRIDGEPORT	ALABAMA	3/1981	1	C

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TENNESSEE VALLEY AUTHORITY						
WIDOWS CREEK	8	STEVENSON	ALABAMA	5/1977	1	C
TEXAS MUNICIPAL POWER AGENCY						
GIBBONS CREEK	1	CARLOS	TEXAS	11/1982	1	D
TEXAS UTILITIES						
FOREST GROVE	1	ATHENS	TEXAS	0/1997	3	B
MARTIN LAKE	1	TATUM	TEXAS	4/1977	1	D
MARTIN LAKE	2	TATUM	TEXAS	5/1978	1	D
MARTIN LAKE	3	TATUM	TEXAS	2/1979	1	D
MONTICELLO	3	MT. PLEASANT	TEXAS	5/1978	1	D
SANDOW	4	ROCKDALE	TEXAS	12/1980	1	D
TWIN OAK	1	BREMOND	TEXAS	0/1994	3	B
TWIN OAK	2	BREMOND	TEXAS	0/1995	3	B
UNITED POWER ASSOCIATION						
STANTON	10	STANTON	NORTH DAKOTA	7/1982	1	D
UTAH POWER & LIGHT						
HUNTER	1	CASTLE DALE	UTAH	3/1979	1	C
HUNTER	2	CASTLE DALE	UTAH	6/1980	1	C
HUNTER	3	CASTLE DALE	UTAH	4/1983	1	B
HUNTINGTON	1	HUNTINGTON	UTAH	5/1978	1	C
NAUGHTON	3	KEMMERER	WYOMING	9/1981	1	A
WASHINGTON WATER POWER						
CRESTON COAL	1	CRESTON	WASHINGTON	99/2050	6	A
CRESTON COAL	2	CRESTON	WASHINGTON	99/2050	6	A
CRESTON COAL	3	CRESTON	WASHINGTON	99/2050	6	A
CRESTON COAL	4	CRESTON	WASHINGTON	99/2050	6	A
WEST PENN POWER						
MITCHELL	3	COURTNEY	PENNSYLVANIA	8/1982	1	A
WEST TEXAS UTILITIES						
OKLAUNION	1	OKLAUNION	TEXAS	11/1986	1	B
OKLAUNION	2	OKLAUNION	TEXAS	99/2050	6	B
WHITE PINE COUNTY						
WHITE PINE PWR PROJ.	1	ELY	NEVADA	3/1994	6	B
WHITE PINE PWR PROJ.	2	ELY	NEVADA	3/1995	6	B

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A. STANDARD(S) MORE STRINGENT THAN NSPS (6/1979)
B. FEDERAL NSPS (6/1979)
C. STANDARD(S) MORE STRINGENT THAN NSPS (12/1971) BUT NOT MORE STRINGENT THAN NSPS (6/1979)
D. FEDERAL NSPS (12/1971)
E. STANDARD(S) EQUAL TO OR LESS STRINGENT THAN NSPS (12/1971)

SECTION 2
STATUS OF FGD SYSTEMS

UNIT IDENTIFICATION	ABSTRACT
ALABAMA ELECTRIC TOMBIGBEE 2 NEW 255 MW (GROSS) 179 MW (ESC) COAL 1.61 %S BITUMINOUS LIMESTONE PEABODY PROCESS SYSTEMS ENERGY CONSUMPTION: 3.1% STATUS 1 STARTUP 9/1978	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 1.61% AND AN AVERAGE HEAT CONTENT OF 11,424 BTU/LB. THE UNIT SO2 EMMISSION LIMITATION VALUE IS 1.2 LB/MMBTU. PRIMARY PARTICULATE MATTER CONTROL IS PROVIDED BY A HOT SIDE ESP. THE SO2 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 A CLOSED WATER LOOP MODE AND SPENT ABSORBENT IS DISPOSED OF IN AN ON-SITE LINED POND.
ALABAMA ELECTRIC TOMBIGBEE 3 NEW 255 MW (GROSS) 179 MW (ESC) COAL 1.61 %S BITUMINOUS LIMESTONE PEABODY PROCESS SYSTEMS ENERGY CONSUMPTION: 3.1% STATUS 1 STARTUP 6/1979	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 1.61 AND AN AVERAGE HEAT CONTENT OF 11,424 BTU/LB. THE UNIT SO2 EMISSION LIMITATION VALUE IS 1.2 LB/MMBTU. PRIMARY PARTICULATE CONTROL IS PROVIDED BY A HOT SIDE ESP. THE SO2 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 A CLOSED WATER LOOP MODE, AND SPENT ABSORBENT IS DISPOSED IN AN ON-SITE LINED POND.
ALAMITO CO SPRINGERVILLE 1 NEW 400 MW (GROSS) 360 MW (ESC) COAL 0.61 %S SUBBITUMINOUS LIME/SPRAY DRYING JOY MFG/NIRO ATOMIZER ENERGY CONSUMPTION: 3.3% STATUS 1 STARTUP 2/1985	SPRINGERVILLE 1 OF ALAMITO CO IS A SUBBITUMINOUS COAL FIRED UNIT THAT IS LOCATED IN SPRINGERVILLE, ARIZONA. A CONTRACT WAS AWARDED TO JOY MANUFACTURING/NIRO ATOMIZER FOR A LIME/SPRAY DRYING FGD SYSTEM TO CONTROL PARTICULATE MATTER AND SO2 EMISSIONS. THE SYSTEM IS DESIGNED TO ACCOMODATE A REHEATER (SHOULD ONE BE REQUIRED) AND OPERATES IN A CLOSED WATER LOOP. CLEANED FLUE GAS EXITS THE SYSTEM VIA A 500 FOOT CONCRETE STACK. INITIAL START-UP BEGAN IN FEBRUARY 1985.
ALAMITO CO SPRINGERVILLE 2 NEW 400 MW (GROSS) 360 MW (ESC) COAL 0.61 %S SUBBITUMINOUS LIME/SPRAY DRYING JOY MFG/NIRO ATOMIZER ENERGY CONSUMPTION: 3.3% STATUS 2 STARTUP 6/1989	THE ALAMITO CO IS CURRENTLY BUILDING TWO NEW UNITS IN SPRINGERVILLE, ARIZONA, 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 ACCOMODATE 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. START-UP IS SCHEDULED FOR JUNE 1989.
ALAMITO CO SPRINGERVILLE 3 NEW 400 MW (GROSS) 360 MW (ESC) COAL 0.61 %S SUBBITUMINOUS PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: 3.3% STATUS 6 STARTUP 0/1991	THE ALAMITO CO HAS PLANS FOR A NEW UNIT, SPRINGERVILLE 3, THAT WILL BE LOCATED IN SPRINGERVILLE, ARIZONA. THE PULVERIZED COAL (.53-.69% S, 850 8900 BTU/LB) FIRED UNIT WILL HAVE A GROSS MEGAWATT RATING OF 370 AND WIL UTILIZE A FGD SYSTEM FOR CONTROL OF SO2 EMISSIONS. INITIAL START-UP IS SCHEDULED FOR 1991.
APPLIED ENERGY SERVICE BEAVER VALLEY 1 RETROFIT 126 MW (GROSS) 126 MW (ESC) COAL 2.25 %S BITUMINOUS LIME FMC ENERGY CONSUMPTION: 4.8% STATUS 1 STARTUP 8/1980	BEAVER VALLEY 1, OF APPLIED ENERGY SERVICE, IS A 126 MW (GROSS) UNIT LOCATED IN MONACA, PENNSYLVANIA. THE COGENERATION PLANT SELLS POWER TO WEST PENN POWER AND STEAM TO ARCO REFINERY. THE FACILITY, ORIGINALLY OWNED BY ARCO, WAS BOUGHT BY AES AND CONVERTED INTO A COGENERATION PLANT. AN FMC WET LIME SCRUBBER IS USED FOR SO2 REMOVAL AND AN ESP IS USED FOR PARTICULATE CONTROL. THE COAL BURNED HAS AN AVERAGE SULFUR CONTENT OF 2.25% AND A HEAT CONTENT OF 13,200 BTU/LB. THE BOILER HAS BEEN OPERATIONAL SINCE 1943, THE ESP ADDED IN 1972, AND THE FGD SYSTEM IN 1980.

SECTION 2
STATUS OF FGD SYSTEMS

UNIT IDENTIFICATION	ABSTRACT
APPLIED ENERGY SERVICE DEEPWATER 1 NEW 165 MW (GROSS) 165 MW (ESC) COKE 4.00 %S PETROLEUM COKE LIMESTONE BABCOCK & WILCOX ENERGY CONSUMPTION: 3.0% STATUS 1 STARTUP 3/1986	DEEPWATER 1, OF APPLIED ENERGY SERVICE, IS A 165 MW(GROSS) UNIT LOCATED IN PASADENA, TEXAS. THE COGENERATION FACILITY SUPPLIES STEAM TO THE NEARBY ARCO PETROLEUM REFINERY WITH THE REMAINDER BEING USED TO GENERATE ELECTRICITY. THE ELECTRICITY IS PURCHASED BY HOUSTON POWER & LIGHT. AES IS UTILIZING A B&W WET LIMESTONE FGD SYSTEM WITH GYPSUM STACKING FOR SO2 CONTROL AND A COLD SIDE ESP FOR PARTICULATE REMOVAL. THE PETROLEUM COKE FIRED UNIT COMMENCED OPERATIONS IN MARCH 1986.
ARIZONA ELECTRIC POWER APACHE 2 NEW 195 MW (GROSS) 98 MW (ESC) COAL 0.70 %S SUBBITUMINOUS LIMESTONE RESEARCH-COTTRELL ENERGY CONSUMPTION: 4.1% STATUS 1 STARTUP 8/1978	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. SUBBITUMINOUS COAL WITH A HEATING VALUE OF 10,000 BTU/LB, A SULFUR CONTENT OF 0.70% AND AN ASH CONTENT OF 15% IS THE FUEL USED FOR THIS UNIT PARTICULATE MATTER IS CONTROLLED BY A HOT SIDE ESP. HALF THE FLUE GAS PASSES THROUGH TWO RESEARCH-COTTRELL PACKED TOWERS EMPLOYING LIMESTONE ABSORBENT AND HAVING A DESIGN SO2 REMOVAL OF 85%. ENTRAINED DROPLETS ARE REMOVED BY CHEVRON TYPE MIST ELIMINATORS. NO REHEAT IS EMPLOYED. THE SYSTEM OPERATES IN AN OPEN WATER LOOP MODE AND WASTE MATERIAL IS DISPOSED OF IN OFF-SITE SLUDGE PONDS. OPERATIONS COMMENCED IN AUGUST 1978.
ARIZONA ELECTRIC POWER APACHE 3 NEW 195 MW (GROSS) 98 MW (ESC) COAL 0.70 %S SUBBITUMINOUS LIMESTONE RESEARCH-COTTRELL ENERGY CONSUMPTION: 4.1% STATUS 1 STARTUP 6/1979	APACHE 3 OF ARIZONA ELECTRIC POWER COOP IS A DRY BOTTOM, PULVERIZED COAL FIRED UNIT IN COCHISE, ARIZONA. LOW (0.70%) SULFUR SUBBITUMINOUS COAL WITH AN AVERAGE HEATING VALUE OF 10,000 BTU/LB PRODUCES A MAXIMUM FLUE GAS FLOW OF 735,000 ACFM. HALF OF THE FLUE GAS PASSES THROUGH A HOT SIDE ESP TO TW RESEARCH COTTRELL PACKED TOWERS, WHERE LIMESTONE IS USED TO REMOVE 85% OF THE SO2. 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 SYSTEM 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 AR PLANNED, WHICH WOULD ADD ANOTHER 20 YEARS OF DISPOSAL CAPACITY.
ARIZONA PUBLIC SERVICE CHOLLA 1 RETROFIT 126 MW (GROSS) 126 MW (ESC) COAL 0.50 %S BITUMINOUS LIMESTONE RESEARCH-COTTRELL ENERGY CONSUMPTION: 3.2% STATUS 1 STARTUP 10/1973	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 STARTED UP IN OCTOBER, 1973 AND IS NOW OPERATIONAL. SO2 IS CONTROLLED BY ONE TOWER WITH MUNTERS PACKING EMPLOYING A LIMESTONE ABSORBENT. THE UNIT, SUPPLIED BY RESEARCH COTTRELL, HAS A DESIGN SO2 REREMOVAL EFFICIENCY OF 92%. CHEVRON MIST ELIMINATORS ARE LOCATED PRIOR TO AN IN-LINE STEAM REHEAT SYSTEM. THE TREATED FLUE GAS IS VENTED TO A 250 FT ACID BRICK LINED STACK. THE 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 250 MW (GROSS) 250 MW (ESC) COAL 0.50 %S BITUMINOUS LIMESTONE RESEARCH-COTTRELL ENERGY CONSUMPTION: 4.0% STATUS 1 STARTUP 4/1978	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 INITIAL PARTICULATE CONTROL. FOUR PARALLEL FLOODED DISC AND PACKED TOWER SO2 ABSORBER TRAINS (THREE ARE REQUIRED FOR FULL LOAD) PROVIDE PRIMARY PARTICULATE AND SO2 CONTROL. THE DESIGN SO2 REMOVAL FOR THE SYSTEM, WHICH BEGAN OPERATIONS IN APRIL, 1978, IS 75%. THE CLEANED GAS PASSES THROUGH AN IN-LINE STEAM REHEATER INTO A 550 FOOT ACID BRICK LINED STACK. SLUDGE FROM THE OPEN WATER LOOP SYSTEM IS DEPOSITED IN A FLY ASH POND.
ARIZONA PUBLIC SERVICE CHOLLA 4 NEW 380 MW (GROSS) 137 MW (ESC) COAL 0.50 %S LIMESTONE RESEARCH-COTTRELL ENERGY CONSUMPTION: 0.5% STATUS 1 STARTUP 3/1981	CHOLLA 4 OF ARIZONA PUBLIC SERVICE IS LOCATED IN JOSEPH CITY, ARIZONA. THE PULVERIZED COAL (0.5% S, 10150 BTU/LB) FIRED BOILER EXHAUSTS FLUE GAS THROUGH AN ESP TO A DOUBLE LOOP COMBINATION TOWER (RESEARCH-COTTRELL DESIGN) WHICH TREATS 36% OF THE GAS WITH LIMESTONE. OPERATIONS COMMENCED IN MARCH, 1981.

SECTION 2
STATUS OF FGD SYSTEMS

UNIT IDENTIFICATION	ABSTRACT
ARIZONA PUBLIC SERVICE CHOLLA 5 NEW 375 MW (GROSS) 135 MW (ESC) COAL 0.50 %S PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: 0.5% STATUS 6 STARTUP 99/2050	ARIZONA PUBLIC SERVICE HAS PLANS FOR A NEW UNIT, CHOLLA 5, TO BE LOCATED IN JOSEPH CITY, ARIZONA. THE 375 MW (GROSS) PULVERIZED COAL (13.5 % S, 10,150 BTU/LB) FIRED BOILER SUPPLIED BY COMBUSTION ENGINEERING WILL EMPLOY AN FGD SYSTEM FOR CONTROL OF SO2 EMISSIONS. START-UP FOR THE UNIT HAS BEEN DEFFERED INDEFINITELY.
ARIZONA PUBLIC SERVICE FOUR CORNERS 1 RETROFIT 186 MW (GROSS) 186 MW (ESC) COAL 0.75 %S SUBBITUMINOUS LIME/ALKALINE FLYASH GE ENVIRONMENTAL SERVICES ENERGY CONSUMPTION: 2.7% STATUS 1 STARTUP 11/1979	ARIZONA PUBLIC SERVICE HAS UPGRADED THE OPERATIONAL PARTICULATE SCRUBBER AT FOUR CORNERS 1, 2, AND 3 IN FRUITLAND, NEW MEXICO TO HANDLE ADDITIONAL SO2 REMOVAL. THE FRONT FIRED, DRY BOTTOM, PULVERIZED COAL (SUBBITUMUNIUS, 0.75% S, 8600 BTU/LB) UNITS 1 AND 2 SUPPLY 814,000 ACFM EACH INTO 2 GEESI VENTURI SCRUBBERS PER UNIT FOR PRIMARY PARTICLE CONTROL AND APPROXIMATELY 30% SO2 REMOVAL USING ALKALINE FLY ASH. THE DESIGN SO2 REMOVAL EFFICIENCY SINCE THE CONVERSION TO LIME AND ALKALINE FLY ASH SCRUBBING IS 67.5%. THE SYSTEM OPERATES IN AN OPEN WATER LOOP MODE AND FLUE GAS EXITS A 250 FOOT STACK. OPERATIONS COMMENCED IN NOVEMBER 1979.
ARIZONA PUBLIC SERVICE FOUR CORNERS 2 RETROFIT 186 MW (GROSS) 186 MW (ESC) COAL 0.75 %S SUBBITUMINOUS LIME/ALKALINE FLYASH GE ENVIRONMENTAL SERVICES ENERGY CONSUMPTION: 2.7% STATUS 1 STARTUP 11/1979	ARIZONA PUBLIC SERVICE HAS UPGRADED THE OPERATIONAL PARTICULATE SCRUBBER AT FOUR CORNERS 1,2, AND 3 IN FRUITLAND, NEW MEXICO TO HANDLE ADDITIONAL SO2 REMOVAL. THE FRONT FIRED, DRY BOTTOM, PULVERIZED COAL (SUBBITUMINOUS, 0.75% S, 8600 BTU/LB) UNITS 1 AND 2 SUPPLY 814,000 ACFM EACH INTO 2 GEESI VENTURI SCRUBBERS PER UNIT FOR PRIMARY PARTICLE CONTROL AND APPROXIMATELY 30% SO2 REMOVAL USING ALKALINE FLY ASH. THE DESIGN SO2 REMOVAL EFFICIENCY SINCE THE CONVERSION TO LIME AND ALKALINE FLY ASH SCRUBBING IS 67.5%. THE SYSTEM OPERATES IN AN OPEN WATER LOOP MODE AND FLUE GAS EXITS A 250 FOOT STACK. OPERATIONS COMMENCED IN NOVEMBER 1979.
ARIZONA PUBLIC SERVICE FOUR CORNERS 3 RETROFIT 244 MW (GROSS) 244 MW (ESC) COAL 0.75 %S SUBBITUMINOUS LIME/ALKALINE FLYASH GE ENVIRONMENTAL SERVICES ENERGY CONSUMPTION: 4.5% STATUS 1 STARTUP 11/1979	ARIZONA PUBLIC SERVICE HAS UPGRADED THE OPERATIONAL PARTICULATE SCRUBBERS AT FOUR CORNERS 1,2, AND 3 IN FRUITLAND, NEW MEXICO TO HANDLE ADDITIONAL SO2 REMOVAL. THE FRONT FIRED, DRY BOTTOM, PULVERIZED COAL (SUBBITUMINOUS, 0.75% S, 8600 BTU/LB) UNIT 3 SUPPLIES 1,030,000 ACFM INTO 2 GEESI VENTURI SCRUBBERS PER UNIT FOR PRIMARY PARTICLE CONTROL AND APPROXIMATELY 30% SO2 REMOVAL USING ALKALINE FLY ASH. THE DESIGN SO2 REMOVAL EFFICIENCY SINCE THE CONVERSION TO LIME AND ALKALINE FLY ASH SCRUBBING IS 67.5%. THE SYSTEM OPERATES IN AN OPEN WATER LOOP MODE AND FLUE GAS EXITS A 250 FOOT STACK. OPERATIONS COMMENCED IN NOVEMBER 1979.
ARIZONA PUBLIC SERVICE FOUR CORNERS 4 RETROFIT 786 MW (GROSS) 668 MW (ESC) COAL 0.75 %S SUBBITUMINOUS LIME BABCOCK & WILCOX ENERGY CONSUMPTION: 2.4% STATUS 1 STARTUP 10/1984	ARIZONA PUBLIC SERVICE'S FOUR CORNERS 4 AND 5 RETROFIT FGD SYSTEMS ARE LOCATED IN FARMINGTON, NEW MEXICO. THE TWO 745 MW (GROSS) UNITS BURN SUBITUMINOUS COAL (0.75% S, 8650 BTU/LB) AND EACH EMPLOYS A BABCOCK & WILCOX WET LIME FGD SYSTEM FOR SO2 CONTROL. FABRIC FILTERS ARE USED FOR CONTROL OF PARTICULATE MATTER. EACH UNIT SUPPLIES 560,000 ACFM TO 10 ABSORBER MODULES WITH AN OVERALL DESIGN SO2 REMOVAL EFFICIENCY OF 98%. INITIAL START-UP COMMENCED IN OCTOBER 1984.
ARIZONA PUBLIC SERVICE FOUR CORNERS 5 RETROFIT 786 MW (GROSS) 668 MW (ESC) COAL 0.75 %S SUBBITUMINOUS LIME BABCOCK & WILCOX ENERGY CONSUMPTION: 2.4% STATUS 1 STARTUP 10/1984	ARIZONA PUBLIC SERVICE'S FOUR CORNERS 4 AND 5 RETROFIT FGD SYSTEMS ARE LOCATED IN FARMINGTON, NEW MEXICO. THE TWO 745 MW (GROSS) UNITS BURN SUBBITUMINOUS COAL (0.75% S, 8650 BTU/LB) AND EACH EMPLOYS A BABCOCK & WILCOX WET LIME FGD SYSTEM FOR SO2 CONTROL. FABRIC FILTERS ARE USED FOR CONTROL OF PARTICULATE MATTER. EACH UNIT SUPPLIES 560,000 ACFM TO 10 ABSORBER MODULES WITH AN OVERALL DESIGN SO2 REMOVAL EFFICIENCY OF 98%. INITIAL START-UP COMMENCED IN OCTOBER 1984.

SECTION 2
STATUS OF FGD SYSTEMS

UNIT IDENTIFICATION	ABSTRACT
ASSOCIATED ELECTRIC THOMAS HILL 3 NEW 670 MW (GROSS) 615 MW (ESC) COAL 4.80 %S LIMESTONE M.W. KELLOGG ENERGY CONSUMPTION: 2.2% STATUS 1 STARTUP 10/1982	THOMAS HILL 3 OF ASSOCIATED ELECTRIC COOP IS A PULVERIZED COAL(48% S, 10,500 BTU/LB) FIRED UNIT LOCATED IN MOBERLY, MISSOURI. TWO COLD SIDE ESP'S PRECEDE THE FOUR 91.5% EFFICIENT M. W. KELLOGG HORIZONTAL WEIR FGD MODULES USING MAG-PROMOTED LIMESTONE AS THE ABSORBENT. THE CLEANED GAS PASSES THROUGH A VERTICAL CHEVRON MIST ELIMINATOR TO A 650 FOOT BRICK LINED STACK. REHEAT IS ACCOMPLISHED BY FLUE GAS BYPASS. THE FIXATED SLUDGE IS TRUCKED TO AN ACTIVE STRIP MINE. THE SYSTEM OPERATES IN A CLOSED WATER LOOP. THE FGD SYSTEM HAS BEEN OPERATIONAL SINCE OCTOBER 1982.
ATLANTIC CITY ELECTRIC CUMBERLAND 1 NEW 330 MW (GROSS) 330 MW (ESC) COAL 3.25 %S BITUMINOUS LIMESTONE VENDOR NOT SELECTED ENERGY CONSUMPTION: 2.7% STATUS 6 STARTUP 99/2050	CUMBERLAND 1 IS A PULVERIZED COAL (3.25% S) FIRED BOILER TO BE LOCATED IN MILVILLE, NEW JERSEY. THE UTILITY IS CONSIDERING A LIMESTONE FGD SYSTEM WITH NO BYPRODUCT RECOVERY FOR SO2 CONTROL. START-UP FOR THE UNIT HAS BEEN DEFERRED INDEFINITELY.
BASIN ELECTRIC POWER ANTELOPE VALLEY 1 NEW 490 MW (GROSS) 490 MW (ESC) COAL 0.68 %S LIGNITE LIME/SPRAY DRYING JOY MFG/NIRO ATOMIZER ENERGY CONSUMPTION: 3.5% STATUS 1 STARTUP 5/1983	ANTELOPE VALLEY 1 OF BASIN ELECTRIC POWER IS A PULVERIZED COAL (0.68% S, 6600 BTU/LB LIGNITE) FIRED UNIT LOCATED IN BEULAH, NORTH DAKOTA. THE BOILER FEEDS 2,055,000 ACFM OF FLUE GAS TO A LIME/SPRAY DRYING SYSTEM SUPPLIED BY JOY MFG/NIRO ATOMIZER. THE 62% EFFICIENT SYSTEM CONSISTS OF FIVE NIRO ATOMIZER SPRAY DRYERS FOLLOWED BY TWO JOY MFG BAGHOUSES. THE CLEANED GAS, ALONG WITH A 4% BYPASS REHEAT, EXIT A 600 FOOT PVC LINED STACK. THE SYSTEM OPERATES IN AN OPEN WATER LOOP AND THE SLUDGE IS USED FOR LANDFILL IN A COAL MINE. INITIAL OPERATIONS COMMENCED IN MAY, 1983.
BASIN ELECTRIC POWER ANTELOPE VALLEY 2 NEW 490 MW (GROSS) 490 MW (ESC) COAL 0.68 %S LIGNITE LIME/SPRAY DRYING JOY MFG/NIRO ATOMIZER ENERGY CONSUMPTION: 3.5% STATUS 1 STARTUP 10/1985	ANTELOPE VALLEY 2 OF BASIN ELECTRIC POWER IS A PULVERIZED COAL (0.63% S, 6600 BTU/LB LIGNITE) FIRED UNIT LOCATED IN BEULAH, NORTH DAKOTA. THE BOILER FEEDS 2,055,000 ACFM OF FLUE GAS TO A LIME/SPRAY DRYING SYSTEM SUPPLIED BY JOY/NIRO ATOMIZER. THE 62% EFFICIENT SYSTEM CONSISTS OF FIVE NIRO ATOMIZER SPRAY DRYERS FOLLOWED BY TWO JOY MFG BAGHOUSES. THE CLEANED GAS, ALONG WITH A 4% BYPASS REHEAT, EXIT A 600 FOOT PVC LINED STACK. THE SYSTEM OPERATES IN A OPEN WATER LOOP AND THE SLUDGE IS USED FOR LANDFILL IN A COAL MINE. INITIAL OPERATIONS COMMENCED IN OCTOBER 1985.
BASIN ELECTRIC POWER ANTELOPE VALLEY 3 NEW 560 MW (GROSS) 560 MW (ESC) LIGNITE 0.68 %S LIME/SPRAY DRYING VENDOR NOT SELECTED ENERGY CONSUMPTION: 3.4% STATUS 6 STARTUP 99/2050	ANTELOPE VALLEY 3 OF BASIN ELECTRIC POWER IS A PLANNED 560 MW (GROSS) LIGNITE FIRED BOILER TO BE LOCATED IN BEULAH, NORTH DAKOTA. THE UTILITY IS PRESENTLY INVESTIGATING LIME/SPRAY DRYING AS THE POSSIBLE EMISSION CONSTRATEGY. START-UP DATE FOR THE UNIT HAS BEEN DEFERRED INDEFINITELY.
BASIN ELECTRIC POWER LARAMIE RIVER 1 NEW 600 MW (GROSS) 600 MW (ESC) COAL 0.54 %S SUBBITUMINOUS LIMESTONE RESEARCH-COTTRELL ENERGY CONSUMPTION: 0.8% STATUS 1 STARTUP 7/1980	BASIN ELECTRIC POWER COOP'S LARAMIE RIVER 1 IS A PULVERIZED COAL (0.54% S, 8400 BTU/LB) FIRED UNIT LOCATED IN WHEATLAND, WYOMING. THE BOILER FEEDS 2,300,000 ACFM OF FLUE GAS THROUGH A COLD SIDE ESP TO FIVE RESEARCH COTTRELL LIMESTONE PACKED TOWER MODULES, WHICH REMOVE 90% OF THE SO2. THE CLEANED GAS EXITS FROM A VERTICAL CHEVRON MIST ELIMINATOR INTO A 600 FOOT ACID BRICK LINED STACK. NO REHEAT IS USED. THE FLYASH STABLIIZED SLUDGE IS DEWATERED TO 83% SOLIDS BEFORE BEING LANDFILLED, AND THE SYSTEM EMPLOYS A CLOSED WATER LOOP. OPERATIONS BEGAN ON JULY 1, 1980.

SECTION 2
STATUS OF FGD SYSTEMS

UNIT IDENTIFICATION	ABSTRACT
BASIN ELECTRIC POWER LARAMIE RIVER 2 NEW 600 MW (GROSS) 600 MW (ESC) COAL 0.54 %S SUBBITUMINOUS LIMESTONE RESEARCH-COTTRELL ENERGY CONSUMPTION: 3.5% STATUS 1 STARTUP 7/1981	BASIN ELECTRIC POWER COOP'S LARAMIE RIVER 2 IS A NEW UNIT LOCATED IN WHEATLAND, WYOMING. THE PULVERIZED SUBBITUMINOUS COAL (0.54% S, 8400 BTU/LB) FIRED BOILER FEEDS 2,300,000 ACFM OF FLUE GAS THROUGH A COLD SIDE ESP TO FIVE RESEARCH-COTTRELL LIMESTONE PACKED TOWER MODULES, WHICH REMOVES 90% OF THE SO2. THE CLEANED GAS EXITS FROM A VERTICAL CHEVRON MIST ELIMINATOR INTO A 600 FOOT ACID BRICK LINED STACK. NO REHEAT IS USED. THE FLYASH FIXATED SLUDGE IS DEWATERED TO 83% SOLIDS BEFORE BEING LANDFILLED IN THIS CLOSED WATER LOOP SYSTEM. START-UP TOOK PLACE IN JULY 1981.
BASIN ELECTRIC POWER LARAMIE RIVER 3 NEW 600 MW (GROSS) 600 MW (ESC) COAL 0.54 %S SUBBITUMINOUS LIME/SPRAY DRYING BABCOCK & WILCOX ENERGY CONSUMPTION: 3.5% STATUS 1 STARTUP 11/1982	LARAMIE RIVER 3 OF BASIN ELECTRIC POWER COOP IS A NEW UNIT LOCATED IN WHEATLAND, WYOMING. IT UTILIZES FOUR BABCOCK & WILCOX LIME SPRAY DRIERS AND A COLD SIDE ESP. THE BOILER FIRES PULVERIZED COAL (0.54% S, 8400 BTU/LB) AND SUPPLYS 2,800,000 ACFM OF FLUE GAS TO THE FGD SYSTEM, WHICH REMOVES 85% OF THE SO2 BEFORE THE GAS EXITS THROUGH A 600 FOOT FIBER-REINFORCED POLYESTER LINED STACK. A 3% BYPASS IS USED FOR REHEAT. THE SYSTEM OPERATES IN AN OPEN WATER LOOP, AND THE DRY POWDER WASTE IS LANDFILLED.
BIG RIVERS ELECTRIC D.B. WILSON 1 NEW 440 MW (GROSS) 440 MW (ESC) COAL 3.75 %S BITUMINOUS LIMESTONE M.W. KELLOGG ENERGY CONSUMPTION: 2.3% STATUS 1 STARTUP 9/1984	BIG RIVERS ELECTRIC'S D.B. WILSON 1 IS A NEW UNIT LOCATED IN CENTERTOWN, KENTUCKY. THE PULVERIZED BITUMINOUS COAL (3.75% S) FIRED FOSTER WHEELER BOILER HAS A GROSS MW RATING OF 440. A COLD SIDE ESP IS EMPLOYED FOR PARTICULATE CONTROL AND SLUDGE IS TREATED VIA FORCED OXIDATION. THE M. W. KELLOG WET LIME FGD SYSTEM AT UNIT 1 BEGAN INITIAL OPERATIONS IN SEPTEMBER 1984.
BIG RIVERS ELECTRIC GREEN 1 NEW 250 MW (GROSS) 250 MW (ESC) COAL 3.91 %S BITUMINOUS LIME AMERICAN AIR FILTER ENERGY CONSUMPTION: 2.0% STATUS 1 STARTUP 12/1979	UNIT 1 OF BIG RIVERS ELECTRIC'S GREEN STATION IS LOCATED IN SEBREE, KENTUCKY. THE DRY BOTTOM PULVERIZED COAL (3.91% S, 9800 BTU/LB) FIRED BOILER SUPPLIES 1,000,000 ACFM TO A COLD SIDE ESP FOLLOWED BY TWO AMERICAN AIR FILTER LIME SPRAY TOWERS WHICH REMOVE 90% OF THE SO2. THE CLEANED GAS PASSES THROUGH A CHEVRON MIST ELIMINATOR AND EXITS A 350 FT SAUERISEN 72 LINED STACK AFTER IT IS HEATED BY A STEAM COIL REHEATER. THE SLUDGE FROM THE CLOSED WATER LOOP SYSTEM IS POZ-O-TEC STABILIZED. OPERATIONS COMMENCE IN DECEMBER 1979.
BIG RIVERS ELECTRIC GREEN 2 NEW 242 MW (GROSS) 242 MW (ESC) COAL 3.91 %S BITUMINOUS LIME AMERICAN AIR FILTER ENERGY CONSUMPTION: 2.1% STATUS 1 STARTUP 11/1980	UNIT 2 OF BIG RIVERS ELECTRIC'S GREEN STATION IS LOCATED IN SEBREE, KENTUCKY. THE DRY BOTTOM PULVERIZED COAL (3.91% S, 9800 BTU/LB) FIRED BOILER SUPPLIES 1,000,000 ACFM TO A COLD SIDE ESP FOLLOWED BY TWO AMERICAN AIR FILTER LIME SPRAY TOWERS WHICH REMOVE 90% OF THE SO2. THE CLEANED GAS PASSES THROUGH A CHEVRON MIST ELIMINATOR AND EXITS A 350 FT SAUERISEN 72 LINED STACK AFTER IT IS HEATED BY A STEAM COIL REHEATER. THE SLUDGE FROM THE CLOSED WATER LOOP SYSTEM IS POZ-O-TEC STABILIZED. OPERATIONS COMMENCE IN NOVEMBER 1980.
CENTRAL ILLINOIS LIGHT DUCK CREEK 1 NEW 396 MW (GROSS) 396 MW (ESC) COAL 3.40 %S BITUMINOUS LIMESTONE ENVIRONEERING, RILEY STOKER ENERGY CONSUMPTION: 2.8% STATUS 1 STARTUP 7/1976	DUCK CREEK 1 OF CENTRAL ILLINOIS LIGHT IS LOCATED IN CANTON, ILLINOIS. THE BALANCED DRAFT, FRONT FIRED, DRY BOTTOM UNIT BURNS PULVERIZED BITUMINOUS COAL (3.40% S, 10,396 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 LIMESTONE FGD SYSTEM HAS BEEN OPERATIONAL (AT LEAST ONE MODULE) SINCE JULY, 1976. IT IS DESIGNED TO REMOVE 85% OF THE SO2. HORIZONTAL CHEVRON MIST ELIMINATORS FOLLOW THE ABSORBERS, AND THE CLEANED GAS EXITS TO A 500 FOOT CEILCOTE LINED STACK WITHOUT REHEAT. SLUDGE FROM THE CLOSED WATER LOOP SYSTEM IS DIPOSED OF IN AN ON-SITE CLAY LINED POND.

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UNIT IDENTIFICATION	ABSTRACT
CENTRAL ILLINOIS PUBLIC SERV NEWTON 1 NEW 590 MW (GROSS) 590 MW (ESC) COAL 3.00 %S BITUMINOUS DUAL ALKALI GE ENVIRONMENTAL SERVICES ENERGY CONSUMPTION: 2.5% STATUS 1 STARTUP 9/1979	NEWTON 1 OF CENTRAL ILLINOIS PUBLIC SERVICE IS A TANGENTIALLY FIRED, DRY BOTTOM, PULVERIZED BITUMINOUS COAL (3.00% 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 GEESI POLYSPHERE PACKED TRAY TOWER ABSORBERS 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 RE-HEATRS 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. OPERATIONS COMMENCED IN SEPTEMBER, 1979.
CENTRAL POWER & LIGHT COLETO CREEK 2 NEW 720 MW (GROSS) 720 MW (ESC) COAL 0.39 %S SUBBITUMINOUS LIME/SPRAY DRYING JOY MFG/NIRO ATOMIZER ENERGY CONSUMPTION: 2.6% STATUS 3 STARTUP 0/2003	COLETO CREEK 2 OF CENTRAL POWER AND LIGHT IS A COAL SUBBITUMINOUS (.39-.60% S) FIRED UNIT PLANNED FOR CONSTRUCTION IN FANNIN, TEXAS. A CONTRACT HAS BEEN AWARDED TO JOY MFG/NIRO ATOMIZER FOR A LIME/SPRAY DRYING FGD SYSTEM ON THIS UNIT. PARTICULATE MATTER WILL BE CONTROLLED VIA A RIGID FRAME COLD SIDE ESP. THE BOILER WILL BE SUPPLIED BY COMBUSTION ENGINEERING AND FLUE GAS WILL EXIT THROUGH A 450 FOOT STACK. SLUDGE WILL BE DISPOSED OF IN A LANDFILL. THE UNIT WILL BE OWNED BY CENTRAL AND SOUTHWEST SERVICES, BUT WILL BE OPERATED BY CENTRAL POWER & LIGHT. INITIAL START-UP IS TENTATIVELY SCHEDULED FOR 2003.
CINCINNATI GAS & ELECTRIC EAST BEND 2 NEW 643 MW (GROSS) 643 MW (ESC) COAL 2.60 %S BITUMINOUS LIME BABCOCK & WILCOX ENERGY CONSUMPTION: 3.0% STATUS 1 STARTUP 3/1981	EAST BEND 2 OF CINCINNATI GAS AND ELECTRIC IS A PULVERIZED COAL (2.60% S, 11,000 BTU/LB) FIRED BOILER LOCATED IN RABBIT HASH, KENTUCKY. THE EMISSION CONTROL SYSTEM CONSISTS OF A HOT-SIDE ESP FOLLOWED BY THREE BABCOCK & WILCOX LIME FGD MODULES '87% SO2 REMOVAL EFFICIENCY. THE CLEANED GAS PASSES THROUGH A CHEVRON MIST ELIMINATOR BEFORE BEING HEATED BY AN IN-DIRECT AIR REHEATER AND EXITS THROUGH A BRICK LINED 650 FOOT STACK. THE SLUDGE FROM THIS CLOSED WATER LOOP IS POZ-O-TEC STABILIZED BEFORE DISPOSAL IN AN ON-SITE LANDFILL. OPERATIONS COMMENCED IN MARCH 1981.
CINCINNATI GAS & ELECTRIC ZIMMER 1 NEW 1389 MW (GROSS) 1389 MW (ESC) COAL 4.50 %S SUBBITUMINOUS LIME BABCOCK & WILCOX ENERGY CONSUMPTION: 1.4% STATUS 2 STARTUP 6/1991	CINCINNATI GAS AND ELECTRIC HAS STARTED CONSTRUCTION ON THE NUCLEAR TO COAL CONVERSION UNIT LOCATED IN MOSCOW, OHIO. SO2 EMISSIONS FROM THE 1386 MW (GROSS) UNIT FIRED BALANCED DRAFT BOILER WILL BE CONTROLLED WITH LIME TRAY TOWERS SUPPLIED BY BABCOCK & WILCOX. PRIMARY PARTICULATE CONTROL WILL BE PROVIDED BY A FLAKT COLD-SIDE ESP. THE SYSTEM WILL OPERATE CLOSED LOOP AND THE FLUE GAS WILL EXIT VIA A WET STACK. INITIAL START-UP IS TENTATIVELY SCHEDULED FOR 1991.
CITY UTILITIES OF SPRINGFIELD SOUTHWEST 1 NEW 195 MW (GROSS) 195 MW (ESC) COAL 3.50 %S BITUMINOUS LIMESTONE AIR CORRECTION DIVISION, UOP ENERGY CONSUMPTION: 4.6% STATUS 1 STARTUP 4/1977	SOUTHWEST 1 OF CITY UTILITIES OF SPRINGFILES IS A PULVERIZED BITUMINOUS COAL (3.5% S, 11,000 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 SO2. ONE CHEVRON/MODULE LEADS TO A 385 FOOT CEILCOTE LINED STACK THE DRY FLYASH STABILIZED SLUDGE IS DEWATERED BY A ROTARY DRUM VACUUM FILTER AND TRUCKED TO A LANDFILL. THE SYSTEM OPERATES IN A CLOSED WATER LOOP MODE. OPERATIONS COMMENCED IN APRIL 1977.
COGENTRIX ADRIAN 1 NEW 55 MW (GROSS) 55 MW (ESC) COAL 1.00 %S BITUMINOUS LIME/SPRAY DRYING VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 5 STARTUP 7/1990	ADRIAN 1, OF COGENTRIX, IS A 55 MW (GROSS) UNIT LOCATED IN ADRIAN, MICHIGAN. THE COGENERATION FACILITY SELLS ELECTRICITY TO CONSUMERS POWER AND STEAM TO LOCAL INDUSTRY. THE FACILITY WILL INCLUDE LIME/SPRAY DRIER FGD SYSTEM FOR SO2 REMOVAL AND A FABRIC FILTER FOR PARTICULATE REMOVAL. THE COAL TO BE BURNED HAS A SULFUR CONTENT OF 1.0% AND A HEAT CONTENT OF 12,500 BTU/LB. INITIAL STARTUP OF THE FACILITY IS SCHEDULED FOR THE THIRD QUARTER OF 1990.

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COGENTRIX OTSEGO 1 NEW 55 MW (GROSS) 55 MW (ESC) COAL 1.00 %S LIME/SPRAY DRYING VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 5 STARTUP 7/1990	OTSEGO 1, OF COGENTRIX, IS A 55 MW (GROSS) UNIT LOCATED IN OTSEGO, MICHIGAN. THE COGENERATION FACILITY SELLS POWER TO CONSUMERS POWER AND STEAM TO LOCAL INDUSTRY. THE FACILITY WILL INCLUDE A LIME/SPRAY DRIER FGD SYSTEM FOR SO2 REMOVAL AND A FABRIC FILTER FOR PARTICULATE REMOVAL. THE COAL TO BE BURNED HAS A SULFUR CONTENT OF 1.0% AND A HEAT CONTENT OF 12,500 BTU/LB. INITIAL STARTUP IS SCHEDULED FOR THE THIRD QUARTER OF 1990.
COLORADO SPRINGS DEPT. OF PUBL R.D. NIXON 2 NEW 250 MW (GROSS) 250 MW (ESC) COAL ***** %S PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: 2.4% STATUS 6 STARTUP 4/1995	COLORADO SPRINGS DEPARTMENT OF PUBLIC UTILITIES HAS PLANS FOR A NEW UNIT, R.D. NIXON 2, TO BE LOCATED NEAR COLORADO SPRINGS, COLORADO. THE UNIT IS TO BE COAL FIRED AND WILL HAVE A GROSS MEGAWATT RATING OF 250. THE UTILITY IS CONSIDERING BOTH DRY SORBENT INJECTION AND LIME/SPRAY DRYING FGD SYSTEM FOR SO2 CONTROL FOLLOWED BY FABRIC FILTERS FOR PARTICULATE CONTROL. INITIAL START-UP IS SCHEDULED FOR 1995.
COLORADO UTE ELECTRIC CRAIG 1 NEW 454 MW (GROSS) 350 MW (ESC) COAL 0.45 %S SUBBITUMINOUS LIMESTONE PEABODY PROCESS SYSTEMS ENERGY CONSUMPTION: 0.7% STATUS 1 STARTUP 10/1980	THE COLORADO UTE ELECTRIC ASSN HAS CONSTRUCTED A NEW UNIT, CRAIG 1, LOCATED IN CRAIG, COLORADO. CRAIG 1 FIRES PULVERIZED SUBBITUMINOUS COAL (0.45% S, 10,000 BTU/LB). THE EMISSION CONTROL SYSTEM FOR THIS UNIT CONSISTS OF A HOT SIDE ESP AND FOUR LIMESTONE SPRAY TOWERS (PEABODY PROCESS SYSTEMS) FOR REMOVAL OF PARTICULATE MATTER AND 85% OF THE SO2. THE SCRUBBER EXHAUST IS REHEATED BYPASS GAS AND PASSES THROUGH A 600 FOOT ACID LINED STACK. THE SYSTEM OPERATES IN A CLOSED WATER LOOP AND THE STABILIZED SLUDGE IS DISPOSED OF IN AN OFF-SITE MINEFILL. UNIT 1 HAS BEEN OPERATING SINCE OCTOBER 1980.
COLORADO UTE ELECTRIC CRAIG 2 NEW 454 MW (GROSS) 350 MW (ESC) COAL 0.45 %S SUBBITUMINOUS LIMESTONE PEABODY PROCESS SYSTEMS ENERGY CONSUMPTION: 0.7% STATUS 1 STARTUP 12/1979	THE CRAIG 2 UNIT OF THE COLORADO UTE ELECTRIC ASSN IS LOCATED IN CRAIG, COLORADO AND FIRES PULVERIZED SUBBITUMINOUS COAL (0.45%S, 10,000 BTU/LB). THE EMISSION CONTROL SYSTEM FOR THIS UNIT CONSISTS OF A HOT SIDE ESP AND FOUR PEABODY PROCESS SYSEMS LIMESTONE SPRAY TOWERS FOR REMOVAL OF PARTICULATE AND 85% OF THE SO2. THE SCRUBBER EXHAUST IS HEATED BY A BYPASS REHEATER AND PASSES THROUGH A 600 FOOT ACID BRICK LINED STACK. THE SYSTEM OPERATES IN A CLOSED LOOP, AND THE STABILIZED SLUDGE IS DISPOSED OF IN AN OFF-SITE MINEFILL. START-UP OF UNIT 2 WAS IN DECEMBER 1979.
COLORADO UTE ELECTRIC CRAIG 3 NEW 427 MW (GROSS) 427 MW (ESC) COAL 0.45 %S SUBBITUMINOUS LIME/SPRAY DRYING BABCOCK & WILCOX ENERGY CONSUMPTION: 0.2% STATUS 1 STARTUP 6/1984	CRAIG 3 OF COLORADO UTE ELECTRIC ASSN. IS LOCATED IN CRAIG, COLORADO. THE UNIT, SUPPLIED BY BABCOCK & WILCOX FIRES PULVERIZED SUBBITUUMINOUS COAL (0.45% S, 10,000 BTU/LB). THE DRY SCRUBBING SYSTEM UTILIZING LIME/SPRAY DRYING WITH A DESIGN REMOVAL EFFICIENCY OF 85% IS SUPPLIED BY BABCOCK AND WILCOX. THE UNIT HAS A FABRIC FILTER FOR PARTICULATE MATTER CONTROL AND FLUE GAS EXITS A 600 FT STACK. OPERATION OF THE FGD SYSTEM COMMENCED IN JUNE 1984.
COLUMBUS & SOUTHERN OHIO ELEC CONESVILLE 5 NEW 405 MW (GROSS) 350 MW (ESC) COAL 4.50 %S BITUMINOUS LIME AIR CORRECTION DIVISION, UOP ENERGY CONSUMPTION: 1.7% STATUS 1 STARTUP 1/1977	CONESVILLE 5 OF COLUMBUS AND SOUTHERN OHIO ELECTRIC IS A DRY BOTTOM, PULVERIZED BITUMINOUS COAL (4.50% 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 ACID BRICK LINED STACK. THE POZ-O-TEC STABILIZED SLUDGE IS PUMPED INTO AN ON-SITE DIKED LANDFILL. THE SYSTEM OPERATES IN A CLOSED WATER LOOP.

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COLUMBUS & SOUTHERN OHIO ELEC CONESVILLE 6 NEW 405 MW (GROSS) 350 MW (ESC) COAL 4.50 %S BITUMINOUS LIME AIR CORRECTION DIVISION, UOP ENERGY CONSUMPTION: 1.7% STATUS 1 STARTUP 6/1978	CONESVILLE 6 OF COLUMBUS AND SOUTHERN OHIO ELECTRIC IS A DRY BOTTOM, PULVERIZED BITUMINOUS COAL (4.50% 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 ACID BRICK LINED STACK. THE POZ-O-TEC STABILIZED SLUDGE IS PUMPED INTO AN ON-SITE DIKED LANDFILL. THE SYSTEM OPERATES IN A CLOSED WATER LOOP.
COOPERATIVE POWER ASSOCIATION COAL CREEK 1 NEW 550 MW (GROSS) 327 MW (ESC) COAL 0.63 %S LIGNITE LIME/ALKALINE FLYASH COMBUSTION ENGINEERING ENERGY CONSUMPTION: 0.2% STATUS 1 STARTUP 7/1979	COAL CREEK 1 AND 2, LOCATED IN UNDERWOOD, NORTH DAKOTA 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 COUNTERCURRENT SPRAY TOWERS SUPPLIED BY COMBUSTION ENGINEERING. MIST ELIMINATION IS PROVIDED BY A BULK ENTRAINMENT SEPARATOR AND TWO CHEVRON MIST ELIMINATORS. A MINIMUM OF 40% BYPASS REHEAT IS PROVIDED BEFORE THE CLEANED GAS EXITS A 658 FT ACID BRICK LINED STACK. THE LIME/ALKALINE FLYASH SYSTEM DESIGN SO2 REMOVAL EFFICIENCY IS 90%. IT OPERATES IN AN OPEN WATER LOOP, AND THE FLYASH FIXATED SLUDGE IS DISPOSED OF IN A CLAY LINED POND. UNIT 1 OPERATIONS BEGAN IN JULY 1979.
COOPERATIVE POWER ASSOCIATION COAL CREEK 2 NEW 550 MW (GROSS) 327 MW (ESC) COAL 0.63 %S LIGNITE LIME/ALKALINE FLYASH COMBUSTION ENGINEERING ENERGY CONSUMPTION: 0.2% STATUS 1 STARTUP 7/1980	COAL CREEK 1 AND 2, LOCATED IN UNDERWOOD, NORTH DAKOTA 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 RFCEIVES 2,200,000 ACFM OF FLUE GAS AND EXHAUSTS IT TO FOUR COUNTERCURRENT SPRAY TOWERS SUPPLIED BY COMBUSTION ENGINEERING. MIST ELININATION IS PROVIDED BY A BULK ENTRAINMENT SEPARATOR AND TWO CHEVRON MIST ELIMINATORS. A MINIMUM OF 40% BYPASS REHEAT IS PROVIDED BEFORE THE CLEANED GAS EXITS A 658 FT ACID BRICK LINED STACK. THE LIME/ALKALINE FLYASH SYSTEM DESIGN SO2 REMOVAL EFFICIENCY IS 90%. IT OPERATES IN AN OPEN WATER LOOP, AND THE FLYASH STABILIZED SLUDGE IS DISPOSED OF IN A CLAY LINED POND. UNIT 2 COMMENCED OPERATIONS IN JULY, 1980.
DELMARVA POWER & LIGHT DELAWARE CITY 1 RETROFIT 28 MW (GROSS) 28 MW (ESC) COKE 7.00 %S BITUMINOUS WELLMAN LORD DAVY MCKEE ENERGY CONSUMPTION: 3.6% STATUS 1 STARTUP 5/1980	DELAWARE CITY 1, 2, AND 3 OF DELMARVA POWER AND LIGHT ARE THREE RETROFITTED COKE (7.0% S, 14,000 BTU/LB) FIRED BOILERS WHICH HAVE A STEAM CAPACITY OF 500K LB/HR EACH. THE BOILERS GENERATE STEAM AS WELL AS ELECTRICITY FOR GETTY REFINING AND MARKETING. EACH BOILER SUPPLIES 295,000 ACFM OF FLUE GAS TO A MECHANICAL COLLECTOR THEN TO A VENTURI PARTICLE SCRUBBER FOR PARTICULATE CONTROL. THE FLUE GAS THEN PASSES THROUGH A CHEVRON TYPE MIST ELIMINATOR TO A WET ESP FOR BOTH PARTICULATE AND ACID MIST REMOVAL. A FOUR STAGE WELLMAN-LORD SYSTEM, WHICH IS DESIGNED FOR 90% REMOVAL, IS USED FOR SO2 CONTROL. HOT AIR INJECTION REHEAT IS USED BEFORE THE GAS EXITS OUT A 500 FT STACK. THE EMISSION CONTROL SYSTEM IS SUPPLIED BY DAVY MCKEE. IT IS A CLOSED LOOP WATER SYSTEM. THE SYSEM BEGAN OPERATING IN MAY 1980.
DELMARVA POWER & LIGHT DELAWARE CITY 2 RETROFIT 28 MW (GROSS) 28 MW (ESC) COKE 7.00 %S BITUMINOUS WELLMAN LORD DAVY MCKEE ENERGY CONSUMPTION: 3.6% STATUS 1 STARTUP 5/1980	DELAWARE CITY 1, 2, AND 3 OF DELMARVA POWER AND LIGHT ARE THREE RETROFITTED COKE (7.0% S) FIRED BOILERS WHICH HAVE A STEAM CAPACITY OF 500K LB/HR EACH. THE BOILERS GENERATE STEAM AS WELL AS ELECTRICITY FOR GETTY REFINING AND MARKETING. EACH BOILER SUPPLIES 295,000 ACFM OF FLUE GAS TO A MECHANICAL COLLECTOR THEN TO A VENTURI PARTICLE SCRUBBER FOR PARTICULATE CONTROL. THE FLUE GAS THEN PASSES THROUGH A CHEVRON TYPE MIST ELIMINATOR TO A WET ESP FOR BOTH PARTICULATE AND ACID MIST REMOVAL. A FOUR STAGE WELLMAN-LORD SYSTEM DESIGNED FOR 90% REMOVAL, IS USED FOR SO2 CONTROL. HOT AIR INJECTION REHEAT IS USED BEFORE THE GAS EXITS OUT A 500 FT. STACK. THE EMISSION CONTROL SYSTEM IS SUPPLIED BY DAVY MCKEE. IT IS A CLOSED LOOP WATER SYSTEM. THE SYSTEM BECAME OPERATIONAL IN MAY 1980.
DELMARVA POWER & LIGHT DELAWARE CITY 3 RETROFIT 75 MW (GROSS) 75 MW (ESC) COKE 7.00 %S BITUMINOUS WELLMAN LORD DAVY MCKEE ENERGY CONSUMPTION: 5.3% STATUS 1 STARTUP 5/1980	DELAWARE CITY 1, 2, AND 3 OF DELMARVA POWER AND LIGHT ARE THREE RETROFITTED COKE (7.0% S) FIRED BOILERS WHICH HAVE A STEAM CAPACITY OF 500K LB/HR EACH. THE BOILERS GENERATE STEAM AS WELL AS ELECTRICITY FOR GETTY REFINING AND MARKETING. EACH BOILER SUPPLIES 295,000 ACFM OF FLUE GAS TO A MECHANICAL COLLECTOR THEN TO A VENTURI PARTICLE SCRUBBER FOR PARTICULATE CONTROL. THE FLUE GAS THEN PASSES THROUGH A CHEVRON TYPE MIST ELIMINATOR TO A WET ESP FOR BOTH PARTICULATE AND ACID MIST REMOVAL. A FOUR STAGE WELLMAN-LORD SYSTEM DESIGNED FOR 90% REMOVAL, IS USED FOR SO2 CONTROL. HOT AIR INJECTION REHEAT IS USED BEFORE THE GAS EXITS OUT A 500 FT. STACK. THE EMISSION CONTROL SYSTEM IS SUPPLIED BY DAVY MCKEE. IT IS A CLOSED LOOP WATER SYSTEM. THE SYSTEM BECAME OPERATIONAL IN MAY 1980.

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DESERET GEN & TRANS BONANZA 1 NEW 427 MW (GROSS) 427 MW (ESC) COAL 0.50 %S BITUMINOUS LIMESTONE COMBUSTION ENGINEERING ENERGY CONSUMPTION: 3.0% STATUS 1 STARTUP 12/1985	BONANZA (FORMERLY MOON LAKE) 1 IS A PULVERIZED COAL (.5% S, 10,500 BTU/L FIRED UNIT LOCATED IN VERNAL, UTAH. THE FGD SYSTEM WAS SUPPLIED BY COMBUSTION ENGINEERING. THE WET LIMESTONE SLURRY SYSTEM HAS A DESIGN SO2 REMOVAL EFFICIENCY OF 95%. THE SYSTEM FEATURES A BAGHOUSE SUPPLIED BY ECOLAIRE TO REMOVE 99.6% OF THE PARTICULATE MATTER THE UNIT OPERATES IN A CLOSED WATER LOOP WITH SLUDGE DISPOSAL ON-SITE IN A LANDFILL. INITIAL OPERATIONS COMMENCED IN DECEMBER 1985.
DESERET GEN & TRANS BONANZA 2 NEW 430 MW (GROSS) 430 MW (ESC) COAL 0.50 %S BITUMINOUS LIMESTONE VENDOR NOT SELECTED ENERGY CONSUMPTION: 3.0% STATUS 6 STARTUP 99/2050	BONANZA (FORMERLY MOON LAKE) 2 IS A PULVERIZED COAL (.5% S, 10,500 BTU/LB) FIRED UNIT PLANNED BY DESERET GENERATION & TRANS. COOP TO BE LOCATED IN VERNAL, UTAH. A WET LIMESTONE SCRUBBING SYSTEM WITH AN SO2 REMOVAL EFFICIENCY OF 95% WILL BE EMPLOYED FOR SO2 CONTROL. 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 DISPOSALON-SITE IN A LANDFILL. START-UP FOR THE UNIT HAS BEEN DEFERRED INDEFINITELY.
DINEH SERVICE COMANY DINEH 1 NEW 555 MW (GROSS) 555 MW (ESC) COAL 0.50 %S SUBBITUMINOUS LIME/SPRAY DRYING COMBUSTION ENGINEERING ENERGY CONSUMPTION: 2.5% STATUS 5 STARTUP 0/1998	PUBLIC SERVICE OF NEW MEXICO HAS PLANS FOR FOUR NEW UNITS, DINEH 1, 2, 3, AND 4 TO LOCATED IN BISTI, NEW MEXICO. THE PULVERIZED SUBBITUMINOUS COAL (9000 BTU/LB) FIRED UNITS WILL HAVE A GROSS MEGAWATT RATING OF 500. THE UTILITY IS CONSIDERING LIME/SPRAY DRYING FGD SYSTEMS FOR SO2 CONTROL AND FABRIC FILTERS FOR PARTICULATE CONTROL. EACH SYSTEM WILL OPERATE IN A CLOSED WATER LOOP MODE. THE FOUR UNITS ARE SCHEDULED TO COMMENCE OPERATIONS IN 1998, 1999, 2000, AND 2001 RESPECTIVELY.
DINEH SERVICE COMANY DINEH 2 NEW 555 MW (GROSS) 555 MW (ESC) COAL 0.50 %S SUBBITUMINOUS LIME/SPRAY DRYING COMBUSTION ENGINEERING ENERGY CONSUMPTION: 2.5% STATUS 6 STARTUP 0/1999	PUBLIC SERVICE OF NEW MEXICO HAS PLANS FOR FOUR NEW UNITS, DINEH 1, 2, 3, AND 4 TO LOCATED IN BISTI, NEW MEXICO. THE PULVERIZED SUBBITUMINOUS COAL (9000 BTU/LB) FIRED UNITS WILL HAVE A GROSS MEGAWATT RATING OF 500. THE UTILITY IS CONSIDERING LIME/SPRAY DRYING FGD SYSTEMS FOR SO2 CONTROL AND FABRIC FILTERS FOR PARTICULATE CONTROL. EACH SYSTEM WILL OPERATE IN A CLOSED WATER LOOP MODE. THE FOUR UNITS ARE SCHEDULED TO COMMENCE OPERATIONS IN 1998, 1999, 2000, AND 2001 RESPECTIVELY.
DINEH SERVICE COMANY DINEH 3 NEW 555 MW (GROSS) 555 MW (ESC) COAL 0.50 %S SUBBITUMINOUS LIME/SPRAY DRYING COMBUSTION ENGINEERING ENERGY CONSUMPTION: 2.5% STATUS 6 STARTUP 0/2000	PUBLIC SERVICE OF NEW MEXICO HAS PLANS FOR FOUR NEW UNITS, DINEH 1, 2, 3, AND 4 TO LOCATED IN BISTI, NEW MEXICO. THE PULVERIZED SUBBITUMINOUS COAL (9000 BTU/LB) FIRED UNITS WILL HAVE A GROSS MEGAWATT RATING OF 500. THE UTILITY IS CONSIDERING LIME/SPRAY DRYING FGD SYSTEMS FOR SO2 CONTROL AND FABRIC FILTERS FOR PARTICULATE CONTROL. EACH SYSTEM WILL OPERATE IN A CLOSED WATER LOOP MODE. THE FOUR UNITS ARE SCHEDULED TO COMMENCE OPERATIONS IN 1998, 1999, 2000, AND 2001 RESPECTIVELY.
DINEH SERVICE COMANY DINEH 4 NEW 555 MW (GROSS) 555 MW (ESC) COAL 0.50 %S SUBBITUMINOUS LIME/SPRAY DRYING COMBUSTION ENGINEERING ENERGY CONSUMPTION: 2.5% STATUS 6 STARTUP 0/2001	PUBLIC SERVICE OF NEW MEXICO HAS PLANS FOR FOUR NEW UNITS, DINEH 1, 2, 3, AND 4 TO LOCATED IN BISTI, NEW MEXICO. THE PULVERIZED SUBBITUMINOUS COAL (9000 BTU/LB) FIRED UNITS WILL HAVE A GROSS MEGAWATT RATING OF 500. THE UTILITY IS CONSIDERING LIME/SPRAY DRYING FGD SYSTEMS FOR SO2 CONTROL AND FABRIC FILTERS FOR PARTICULATE CONTROL. EACH SYSTEM WILL OPERATE IN A CLOSED WATER LOOP MODE. THE FOUR UNITS ARE SCHEDULED TO COMMENCE OPERATIONS IN 1998, 1999, 2000, AND 2001 RESPECTIVELY.

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UNIT IDENTIFICATION	ABSTRACT
DUQUESNE LIGHT ELRAMA 1-4 RETROFIT 510 MW (GROSS) 510 MW (ESC) COAL 2.05 %S BITUMINOUS LIME GE ENVIRONMENTAL SERVICES ENERGY CONSUMPTION: 2.0% STATUS 1 STARTUP 10/1975	ELRAMA 1-4 OF DUQUESNE LIGHT CONSISTS OF FOUR PULVERIZED COAL (2.05% S, 11,568 BTU/LB) FIRED UNITS LOCATED IN ELRAMA, PENNSYLVANIA. THE RETROFIT EMISSION CONTROL SYSTEM FOR EACH UNIT CONSISTS OF MECHANICAL COLLECTORS FOLLOWED BY ESP'S AND FIVE VARIABLE THROAT VENTURI LIME ABSORBER MODULES SUPPLIED BY GEESI, WHICH ARE DESIGNED TO REMOVE 83% OF THE SO2 FROM THE FLUE GAS. THE CLEANED GAS EXITS VIA A 398 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 MW (GROSS) 408 MW (ESC) COAL 2.05 %S BITUMINOUS LIME GE ENVIRONMENTAL SERVICES ENERGY CONSUMPTION: 3.4% STATUS 1 STARTUP 7/1973	THE PHILLIPS POWER STATION OF DUQUESNE LIGHT CONSISTS OF SIX DRY BOTTOM PULVERIZED COAL (2.05% S, 11568 BTU/LB) FIRED UNITS LOCATED IN SOUTH HEIGHTS, PENNSYLVANIA. PARTICULATE CONTROL IS ACCOMPLISHED BY SIX MECHANICAL COLLECTORS FOLLOWED BY SIX ESP'S (ONE/BOILER). ONE TWO STAGE AND THREE SINGLE STAGE VARIABLE THROAT VENTURI LIME FGD MODULES SUPPLIED BY GEESI ARE DESIGNED TO REMOVE 83% OF THE SO2 FROM THE FLUE GAS. THE CLEAN FLUE GAS PASSES THROUGH TWO CHEVRON MIST ELIMINATORS (EACH MODULE) AND EXITS VIA A 340 FT ACID BRICK LINED STACK. THE RETROFIT 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 J.K. SMITH 1 NEW 650 MW (GROSS) 650 MW (ESC) COAL 1.50 %S BITUMINOUS LIME BABCOCK & WILCOX ENERGY CONSUMPTION: 2.6% STATUS 3 STARTUP 0/2001	THE EAST KENTUCKY POWER COOP HAS PLANS TO BUILD A NEW UNIT, J.K. SMITH 1, IN WINCHESER, KENTUCKY. A CONTRACT WAS AWARDED TO BABCOCK & WILCOX FOR A WET LIME PROCESS TO CONTROL SO2 EMISSIONS. AN ESP WILL BE EMPLOYED FOR PARTICULATE REMOVAL AND THE SYSTEM WILL OPERATE IN A CLOSED WATER LOOP. INITIAL START-UP IS EXPECTED IN 2001.
EAST KENTUCKY POWER SPURLOCK 2 NEW 550 MW (GROSS) 550 MW (ESC) COAL 3.50 %S LIME THYSSEN/CEA ENERGY CONSUMPTION: 2.7% STATUS 1 STARTUP 12/1982	SPURLOCK 2 OF EAST KENTUCKY POWER COOPERATIVE IS A BALANCED DRAFT PULVERIZED COAL (3.5% S, 11,000 BTU/LB) FIRED UNIT LOCATED IN MAYSVILLE, KY. THE EMISSION CONTROL SYSTEM CONSISTS OF AN ESP FOLLOWED BY A THYSSEN/CEA LIME FGD SYSTEM (90% DESIGN SO2 REMOVAL EFFICIENCY). FLUE GAS FROM UNIT 1 IS USED TO REHEAT THE CLEANED GAS WHICH EXITS THROUGH AN 802 FT STACK. THE CLOSED WATER LOOP SYSTEM EMPLOYS A POZ-O-TEC SLUDGE STABILIZATION FACILITY. UNIT 2 OPERATIONS COMMENCED IN DECEMBER 1982.
GENERAL PUBLIC UTILITIES COAL 1 NEW 300 MW (GROSS) 300 MW (ESC) COAL 2.00 %S LIMESTONE VENDOR NOT SELECTED ENERGY CONSUMPTION: 2.3% STATUS 6 STARTUP 0/2005	GENERAL PUBLIC UTILITIES HAS PLANS FOR A 625 MW UNIT, COAL 1, TO BE LOCATED IN FORKED RIVER NEW JERSEY. THE PULVERIZED COAL (2.0% S, 13,800 BTU/LB) FIRED BABCOCK & WILCOX UNIT WILL HAVE A GROSS RATING OF 625 MW AND WILL UTILIZE A WET LIMESTONE FGD SYSTEM FOR CONTROL OF SO2 EMISSIONS. PARTICULATE MATTER WILL BE CONTROLLED WITH AN ESP. THE SYSTEM WILL OPERATE IN A CLOSED WATER LOOP MODE AND FLUE GAS WILL EXIT A 650 FT STACK. START-UP IS SCHEDULED FOR 2005.
GRAND HAVEN BRD OF LIGHT & PWR J.B. SIMS 3 NEW 65 MW (GROSS) 65 MW (ESC) COAL 2.75 %S BITUMINOUS LIME BABCOCK & WILCOX ENERGY CONSUMPTION: 4.6% STATUS 1 STARTUP 5/1983	J.B. SIMS 3 OF GRAND HAVEN BOARD OF LIGHT AND POWER IS A BITUMINOUS COAL (2.75% S, 11,000 BTU/LB) FIRED UNIT LOCATED IN GRAND HAVEN, MICHIGAN. THE BABCOCK & WILCOX EMISSION CONTROL SYSTEM CONSISTS OF TWO LIME SPRAY TOWERS WITH AN SO2 REMOVAL EFFICIENCY OF 90-95%. EACH TOWER IS EQUIPPED WITH A CHEVRON MIST ELIMINATOR FOLLOWED BY AN IN-LINE REHEATER. AN ESP IS EMPLOYED FOR PARTICULATE CONTROL AND FLUE GAS EXITS A 360 FT STACK. IT OPERATES IN A CLOSED WATER LOOP MODE AND THE SLUDGE IS DISPOSED OF IN AN OFF-SITE LANDFILL. INITIAL OPERATIONS OF THE FGD SYSTEM BEGAN IN MAY 1983.

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UNIT IDENTIFICATION	ABSTRACT
GRAND RIVER DAM AUTHORITY GRDA 2 NEW 575 MW (GROSS) 520 MW (ESC) COAL 0.95 %S SUBBITUMINOUS LIME/SPRAY DRYING FLAKT ENERGY CONSUMPTION: 3.5% STATUS 1 STARTUP 3/1985	GRDA 2 OF GRAND RIVER DAM AUTHORITY IS A 575 MW (GROSS) UNIT LOCATED IN PRYOR, OKLAHOMA. FLAKT SUPPLIED A TURNKEY LIME/SPRAY DRYING FGD SYSTEM CONSISTING OF FOUR SPRAY DRYERS WITH THREE ROTARY ATOMIZERS EACH FOLLOWED BY TWO ESP'S FOR PARTICULATE (FLY ASH AND REACTOR PRODUCT) REMOVAL. INITIAL OPERATIONS OF THE FGD SYSTEM BEGAN IN OCTOBER 1985.
HOOSIER ENERGY MEROM 1 NEW 490 MW (GROSS) 441 MW (ESC) COAL 3.50 %S BITUMINOUS LIMESTONE MITSUBISHI HEAVY INDUSTRIES ENERGY CONSUMPTION: 1.2% STATUS 1 STARTUP 8/1982	MEROM 1, OF HOOSIER ENERGY IS LOCATED IN MEROM, INDIANA. THIS PULVERIZED COAL (3.5% S) FIRED UNIT PRODUCES 866,000 ACFM OF FLUE GAS WHICH IS BEING CLEANED BY A COLD SIDE ESP UPSTREAM OF A MITSUBISHI LIMESTONE GRID TOWER ABSORBER (90% DESIGN SO2 REMOVAL). THE SYSTEM UTILIZES BYPASS REHEAT AND A 702 FOOT STACK. THE SLUDGE IS BEING FORCIBLY OXIDIZED AND LANDFILLED, AND THE SYSTEM OPERATES IN A CLOSED WATER LOOP MODE. UNIT 1 COMMENCED OPERATIONS IN AUGUST 1982.
HOOSIER ENERGY MEROM 2 NEW 490 MW (GROSS) 441 MW (ESC) COAL 3.50 %S BITUMINOUS LIMESTONE MITSUBISHI HEAVY INDUSTRIES ENERGY CONSUMPTION: 1.2% STATUS 1 STARTUP 12/1981	MEROM 2, OF HOOSIER ENERGY IS LOCATED IN MEROM, INDIANA. THIS PULVERIZED COAL (3.5% S) FIRED UNIT PRODUCES 866,000 ACFM OF FLUE GAS WHICH IS BEING CLEANED BY A COLD SIDE ESP UPSTREAM OF A MITSUBISHI LIMESTONE GRID TOWER ABSORBER (90% DESIGN SO2 REMOVAL). THE SYSTEM UTILIZES BYPASS REHEAT AND A 702 FOOT STACK. THE SLUDGE IS BEING FORCIBLY OXIDIZED AND LANDFILLED, AND THE SYSTEM OPERATES IN A CLOSED WATER LOOP MODE. UNIT 2 COMMENCED OPERATIONS IN DECEMBER 1981.
HOUSTON LIGHTING & POWER LIMESTONE 1 NEW 780 MW (GROSS) 780 MW (ESC) COAL 1.08 %S LIGNITE LIMESTONE COMBUSTION ENGINEERING ENERGY CONSUMPTION: 2.1% STATUS 1 STARTUP 10/1985	LIMESTONE 1 OF HOUSTON LIGHTING AND POWER CO IS LOCATED IN JEWITT TEXAS. THE PULVERIZED COAL (1.08% S, 6177 BTU/LB) FIRED BOILER UTILIZES A WET LIMESTONE SCRUBBING PROCESS FOR PRIMARY SO2 COLLECTION. A COLD SIDE ESP IS USED FOR PRIMARY PARTICLE CONTROL. THE SYSTEM OPERATES IN A CLOSED WATER LOOP MODE AND FLUE GAS EXITS THROUGH A 563 FT STACK. UNIT 1 COMMENCED OPERATIONS IN OCTOBER 1985.
HOUSTON LIGHTING & POWER LIMESTONE 2 NEW 780 MW (GROSS) 780 MW (ESC) COAL 1.08 %S LIMESTONE COMBUSTION ENGINEERING ENERGY CONSUMPTION: 2.1% STATUS 1 STARTUP 10/1986	LIMESTONE 2, OF THE HOUSTON LIGHTING AND POWER CO, IS LOCATED IN JEWITT, TEXAS. THE PULVERIZED COAL (1.08% S, 6177 BTU/LB) FIRED BOILER UTILIZES A WET LIMESTONE SCRUBBING PROCESS FOR PRIMARY SO2 COLLECTION. A COLD SIDE ESP IS USED FOR PRIMARY PARTICLE CONTROL. THE SYSTEM OPERATES IN A CLOSED WATER LOOP MODE AND FLUE GAS EXITS THROUGH A 563 FOOT STACK. UNIT 2 COMMENCED OPERATIONS IN OCTOBER 1986.
HOUSTON LIGHTING & POWER MALAKOFF 1 NEW 690 MW (GROSS) 690 MW (ESC) COAL 1.10 %S LIGNITE LIMESTONE GE ENVIRONMENTAL SERVICES ENERGY CONSUMPTION: 2.6% STATUS 3 STARTUP 0/1997	HOUSTON LIGHTING AND POWER HAS PLANS FOR TWO NEW UNITS, MALAKOFF 1 AND 2 TO BE LOCATED IN MALAKOFF, TEXAS. EACH PULVERIZED COAL (1.1% S, 6112 BTU/LB LIGNITE) FIRED BABCOCK & WILCOX BOILER WILL UTILIZE A WET LIMESTONE SCRUBBING PROCESS FOR SO2 CONTROL. A COLD SIDE ESP SUPPLIED BY WHEELABRATOR FRYE WILL CONTROL PARTICULATE MATTER. THE CLEANED FLUE GAS WILL EXIT THROUGH A 625 FOOT ACID RESISTANT BRICK LINED STACK. THE UTILITY HAS AWARDED A CONTRACT TO GE ENVIRONMENTAL SERVICES FOR INSTALLATION OF THE FGD SYSTEMS. UNIT 1 IS SCHEDULED TO COMMENCE OPERATIONS IN 1997.

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UNIT IDENTIFICATION	ABSTRACT
HOUSTON LIGHTING & POWER MALAKOFF 2 NEW 690 MW (GROSS) 690 MW (ESC) COAL 1.10 %S LIGNITE LIMESTONE GE ENVIRONMENTAL SERVICES ENERGY CONSUMPTION: 2.6% STATUS 3 STARTUP 0/1999	HOUSTON LIGHTING AND POWER HAS PLANS FOR TWO NEW UNITS, MALAKOFF 1 AND 2 TO BE LOCATED IN MALAKOFF, TEXAS. EACH PULVERIZED COAL (1.1% S, 6112 BTU/LB LIGNITE) FIRED BABCOCK & WILCOX BOILER WILL UTILIZE A WET LIMESTONE SCRUBBING PROCESS FOR SO2 CONTROL. A COLD SIDE ESP SUPPLIED BY WHEELABRATOR FRYE WILL CONTROL PARTICULATE MATTER. THE CLEANED FLUE GAS WILL EXIT THROUGH A 625 FOOT ACID RESISTANT BRICK LINED STACK. THE UTILITY HAS AWARDED A CONTRACT TO GE ENVIRONMENTAL SERVICES FOR INSTALLATION OF THE FGD SYSTEMS. UNIT 2 IS SCHEDULED TO COMMENCE OPERATIONS IN 1999.
HOUSTON LIGHTING & POWER W.A. PARISH 8 NEW 570 MW (GROSS) 467 MW (ESC) COAL 0.41 %S SUBBITUMINOUS LIMESTONE GE ENVIRONMENTAL SERVICES ENERGY CONSUMPTION: 1.1% STATUS 1 STARTUP 10/1982	W.A. PARISH 8 OF HOUSTON LIGHTING & POWER IS A PULVERIZED COAL (0.41% S, 8942 BTU/LB) FIRED UNIT LOCATED IN BOOTH, TEXAS. GEESI HAS SUPPLIED A LIMESTONE FGD SYSTEM THAT REMOVES 82% OF THE FLUE GAS SO2. FABRIC FILTER ARE EMPLOYED FOR PARTICULATE CONTROL AND REHEAT IS PROVIDED BY BYPASSING 18% OF THE CLEANED FLUE GAS. SLUDGE IS DEWATERED, BLENDED WITH FLYASH, A DISPOSED OF IN AN ON-SITE LANDFILL. THE SYSTEM OPERATES IN A CLOSED WATER LOOP MODE AND FLUE GAS EXITS THROUGH A 500 FT STACK. THE UNIT HAS BEEN OPERATINAL SINCE OCTOBER 1982.
INDIANAPOLIS POWER & LIGHT PATRIOT 1 NEW 650 MW (GROSS) 650 MW (ESC) COAL 3.50 %S LIMESTONE VENDOR NOT SELECTED ENERGY CONSUMPTION: 2.6% STATUS 6 STARTUP 99/2050	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 AND A LOCAL COAL WITH A SULFUR CONTENT OF 3.5%. START-UP OF ALL THREE UNITS HAS BEEN DEFERRED INDEFINITELY.
INDIANAPOLIS POWER & LIGHT PATRIOT 2 NEW 650 MW (GROSS) 650 MW (ESC) COAL 3.50 %S LIMESTONE VENDOR NOT SELECTED ENERGY CONSUMPTION: 2.6% STATUS 6 STARTUP 99/2050	INDIANAPOLIS POWER AND LIGHT HAS PLANS FOR THREE NEW UNITS, PATRIOT 1, 2, AND 3, TO BE LOCATED IN PATRIOT, INDIANA. THE UTILITY PLANS TO UTILIZE A LIMESTONE FGD PROCESS FOR EMISSION CONTROL AND A LOCAL COAL WITH A SULFUR CONTENT OF 3.5%. START-UP OF ALL THREE UNITS HAS BEEN DEFERRED INDEFINITELY.
INDIANAPOLIS POWER & LIGHT PATRIOT 3 NEW 650 MW (GROSS) 650 MW (ESC) COAL 3.50 %S LIMESTONE VENDOR NOT SELECTED ENERGY CONSUMPTION: 2.6% STATUS 6 STARTUP 99/2050	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 AND A LOCAL COAL WITH A SULFUR CONTENT OF 3.5%. START-UP OF ALL THREE UNITS HAS BEEN DEFERRED INDEFINITELY.
INDIANAPOLIS POWER & LIGHT PETERSBURG 3 NEW 532 MW (GROSS) 479 MW (ESC) COAL 3.25 %S BITUMINOUS LIMESTONE AIR CORRECTION DIVISION, UOP ENERGY CONSUMPTION: 2.4% STATUS 1 STARTUP 12/1977	PETERSBURG 3 OF INDIANAPOLIS POWER AND LIGHT IS LOCATED IN PETERSBURG, INDIANA, AND BURNS BITUMINOUS COAL (3.25% S, 10,750 BTU/LB). TWO COLD SIDE ESP'S ARE LOCATED UPSTREAM OF FOUR 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 RIGIFLAKE 4850 LINED STACK. STABILIZED SLUDGE IS DISPOSED OF IN AN ON-SITE POND, AND THE SYSTEM OPERATES IN A CLOSED WATER LOOP MODE. THE UNIT HAS BEEN OPERATIONAL SINCE DECEMBER 1977.

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UNIT IDENTIFICATION	ABSTRACT
INDIANAPOLIS POWER & LIGHT PETERSBURG 4 NEW 526 MW (GROSS) 473 MW (ESC) COAL 3.50 %S BITUMINOUS LIMESTONE RESEARCH-COTTRELL ENERGY CONSUMPTION: 2.1% STATUS 1 STARTUP 1/1986	PETERSBURG 4 OF INDIANAPOLIS POWER AND LIGHT IS A BITUMINOUS COAL (3.5% S 11,000 BTU/LB) FIRED UNIT LOCATED IN PETERSBURG, INDIANA. THE BOILER WAS SUPPLIED BY COMBUSTION ENGINEERING AND THE LIMESTONE FGD SYSTEM FOR THIS UNIT WAS SUPPLIED BY RESEARCH-COTTRELL. AS ESP IS EMPLOYED FOR PRIMARY PARTICULATE CONTROL. THE SYSTEM OPERATES IN A CLOSED WATER LOOP AND SLUDGE IS POZ-O-TEC STABLIZED BEFORE PONDING. THE UNIT COMMENCED OPERATIONS IN JANUARY 1986.
JACKSONVILLE ELEC AUTHORITY ST.JOHNS RIVER PWR PARK 1 NEW 674 MW (GROSS) 674 MW (ESC) COAL 2.50 %S BITUMINOUS LIMESTONE RESEARCH-COTTRELL ENERGY CONSUMPTION: 2.8% STATUS 1 STARTUP 12/1986	ST. JOHNS RIVER POWER PARK 1 OF JACKSONVILLE ELECTRIC AUTHORITY IS A PULVERIZED COAL (2 - 4% SULFUR) FIRED UNIT LOCATED IN EAST PORT, FLORIDA. RESEARCH-COTTRELL HAS SUPPIED A LIMESTONE FGD PROCESS AND AN ESP FOR EMISSION CONTROL. THE CLEANED FUE GAS EXITS THROUGH A 640 FOOT DOUBLE LINED SINGLE STACK. THE UNIT COMMENCED OPERATIONS IN DECEMBER 1986.
JACKSONVILLE ELEC AUTHORITY ST.JOHNS RIVER PWR PARK 2 NEW 612 MW (GROSS) 612 MW (ESC) COAL 2.50 %S BITUMINOUS LIMESTONE RESEARCH-COTTRELL ENERGY CONSUMPTION: 2.6% STATUS 2 STARTUP 3/1988	THE JACKSONVILLE ELECTRIC AUTHORITY HAS STARTED CONSTRUCTION ON A SECOND UNIT, ST. JOHNS RIVER POWER PARK 2, TO BE LOCATED IN EAST PORT, FLORIDA. THE UNIT WILL BURN PULVERIZED COAL (2-4% S) AND SUPPLY 2,500,000 ACFM TO A WET LIMESTONE FGD PROCESS AND AN ESP FOR EMISSION CONTROL. THE CLEANED FLUE GAS WILL EXIT THROUGH A 640 FOOT DOUBLE LINED SINGLE STACK. THE UTILITY HAS AWARDED A CONTRACT TO RESEARCH-COTTRELL FOR INSTALLATION OF THE CONTROL SYSTEMS. START-UP IS SCHEDULED FOR OCTOBER 1988.
KANSAS CITY POWER & LIGHT LA CYGNE 1 NEW 740 MW (GROSS) 740 MW (ESC) COAL 5.39 %S SUBBITUMINOUS LIMESTONE BABCOCK & WILCOX ENERGY CONSUMPTION: 3.2% STATUS 1 STARTUP 12/1972	LA CYGNE 1 IS A WET BOTTOM, CYCLONE-FIRED UNIT LOCATED IN LA CYGNE, KANSAS. THE UNIT BURNS SUBBITUMINOUS COAL (5.39% S, 9400 BTU/LB). THE EMISSION CONTROL SYSTEM CONSISTS OF EIGHT VARIABLE THROAT VENTURI/LIMESTONE SIEVE TRAY TOWER TRAINS SUPPLIED BY BABCOCK AND WILCOX EACH 80% (SO2 REMOVAL, DESIGN) EFFICIENT TRAIN IS FOLLOWED BY A COMBINATION SIEVE TRAY AND CHEVRON MIST ELIMINATOR, AND BOTH A DIRECT AND INDIRECT REHEATER. THE CLEANED GAS EXITS THROUGH A 700 FOOT STEEL LINED STACK. THE SYSTEM OPERATES IN AN OPEN WATER LOOP, AND THE SLUDGE IS DISPOSED IN AN UNLINED POND. OPERATIONS COMMENCED IN DECEMBER 1972.
KANSAS POWER & LIGHT JEFFREY 1 NEW 720 MW (GROSS) 540 MW (ESC) COAL 0.32 %S SUBBITUMINOUS LIMESTONE COMBUSTION ENGINEERING ENERGY CONSUMPTION: 2.5% STATUS 1 STARTUP 8/1978	KANSAS POWER & 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 SO2 REMOVAL EFFICIENCY IS 50% (INCLUDING A 30% BYPASS REHEAT). THE SYSTEM OPERATES IN A CLOSED WATER LOOP MODE AND FLUE GAS EXITS A 600 FOOT STACK. THE UNIT HAS BEEN OPERATIONAL SINCE AUGUST 1978.
KANSAS POWER & LIGHT JEFFREY 2 NEW 720 MW (GROSS) 540 MW (ESC) COAL 0.32 %S SUBBITUMINOUS LIMESTONE COMBUSTION ENGINEERING ENERGY CONSUMPTION: 2.5% STATUS 1 STARTUP 1/1980	UNIT 2, PRESENTLY OPERATING AT KANSAS POWER AND LIGHT'S JEFFREY ENERGY CENTER IN WAMEGO, KANSAS, BURNS 0.32% S PULVERIZED COAL (8125 BTU/LB). THIS UNIT'S EMISSION CONTROL SYSTEM CONSISTS OF A COLD SIDE ESP AND COMBUSTION ENGINEERING LIMESTONE SPRAY TOWERS. A 30% FLUE GAS BYPASS PROVIDES REHEAT OF THE CLEANED GAS BEFORE IT EXITS THROUGH A 600 FOOT STACK. THE SYSTEM OPERATES IN A CLOSED WATER LOOP MODE, AND THE SLUDGE IS STABILIZED WITH BOTTOM ASH AND PIPED TO AN ON-SITE CLAY LINED POND. INITIAL OPERATIONS COMMENCED IN JANUARY 1980.

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UNIT IDENTIFICATION	ABSTRACT
KANSAS POWER & LIGHT JEFFREY 3 NEW 720 MW (GROSS) 533 MW (ESC) COAL 0.32 %S SUBBITUMINOUS LIMESTONE COMBUSTION ENGINEERING ENERGY CONSUMPTION: 1.7% STATUS 1 STARTUP 5/1983	JEFFREY 3 OF KANSAS POWER & LIGHT IS A TANGENTIAL FIRED PULVERIZED COAL (.32% S, 8125 BTU/LB) UNIT LOCATED IN WAMEGO, KANSAS. EMISSIONS ARE CONTROLLED VIA A COLD SIDE ESP AND FOUR COMBUSTION ENGINEERING LIMESTONE SPRAY TOWERS. THE ABSORBERS OUTLET INTO A COMMON BYPASS DUCT (FOR CONTINUOUS REHEAT) THAT FEEDS THE 600 FOOT STACK. THE SYSTEM OPERATES IN A CLOSED WATER LOOP MODE AND SLUDGE IS STABILIZED WITH BOTTOM ASH BEFORE BEING PIPED TO AN ON-SITE CLAY LINED POND. INITIAL OPERATIONS COMMENCED IN MAY 1983.
KANSAS POWER & LIGHT LAWRENCE 4 RETROFIT 119 MW (GROSS) 119 MW (ESC) COAL 0.55 %S LIMESTONE COMBUSTION ENGINEERING ENERGY CONSUMPTION: 1.7% STATUS 1 STARTUP 1/1977	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 SO2 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 BOOST THE TEMPERATURE OF THE CLEANED GAS BY 20 DEG F BEFORE IT IS EXHAUSTED THROUGH A 200 FOOT STACK. THE SLUDGE IS DISPOSED IN AN UNLINED INTERIM POND, WHICH OVERFLOWS INTO A FINAL DISPOSAL POND. THE SYSTEM OPERATES IN CLOSED WATER LOOP.
KANSAS POWER & LIGHT LAWRENCE 5 RETROFIT 355 MW (GROSS) 355 MW (ESC) COAL 0.55 %S SUBBITUMINOUS LIMESTONE COMBUSTION ENGINEERING ENERGY CONSUMPTION: 2.8% STATUS 1 STARTUP 4/1978	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 SO2 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 BOOST THE TEMPERATURE OF THE CLEANED GAS BY 20 DEG F BEFORE IT IS EXHAUSTED THROUGH A 350 FOOT STACK. THE SLUDGE IS DISPOSED OF IN AN UNLINED INTERIM POND, WHICH OVERFLOWS INTO A FINAL DISPOSAL POND. THE SYSTEM OPERATES IN CLOSED WATER LOOP.
KENTUCKY UTILITIES GREEN RIVER 1-3 RETROFIT 60 MW (GROSS) 60 MW (ESC) COAL 2.23 %S BITUMINOUS LIME AMERICAN AIR FILTER ENERGY CONSUMPTION: 5.0% STATUS 1 STARTUP 9/1975	GREEN RIVER 1-3 OF KENTUCKY UTILITIES ARE THREE DRY BOTTOM PULVERIZED BITUMINOUS COAL (2.23% S, 11,250 BTU/LB) FIRED UNITS LOCATED IN CENTRAL CITY, KENTUCKY. THE BOILER SUPPLIES A TOTAL OF 360,000 ACFM OF FLUE GAS A VARIABLE THROAT VENTURI FOLLOWED BY AN AMERICAN AIR FILTER LIME MOBILE BED CONTACTOR (80% DESIGN SO2 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. THIS RETROFIT SYSTEM HAS BEN OPERATIONAL SINCE SEPTEMBER 1975.
LAKELAND UTILITIES MCINTOSH 3 NEW 364 MW (GROSS) 364 MW (ESC) COAL 2.56 %S BITUMINOUS LIMESTONE BABCOCK & WILCOX ENERGY CONSUMPTION: 1.9% STATUS 1 STARTUP 7/1982	MCINTOSH 3 OF LAKELAND UTILITIES IS A PULVERIZED BITUMINOUS COAL FIRED BOILER LOCATED IN LAKELAND, FLORIDA. BABCOCK AND WILCOX WAS AWARDED A CONTRACT TO SUPPLY AN 85% EFFICIENT (SO2) LIMESTONE FGD SYSTEM FOR THIS UNIT. THE EMISSION CONTROL SYSTEM CONSISTS OF A COLD SIDE ESP FOLLOWED BY TWO PARALLEL FGD MODULES AND A 250 FOOT ACID BRICK LINED STACK. THE SYSTEM OPERATES IN A CLOSED WATER LOOP WITH POZ-O-TEC BEING USED TO STABILIZE THE SLUDGE.
LOS ANGELES DEPT OF WTR & PWR INTERMOUNTAIN 1 NEW 841 MW (GROSS) 841 MW (ESC) COAL 0.79 %S SUBBITUMINOUS LIMESTONE GE ENVIRONMENTAL SERVICES ENERGY CONSUMPTION: 2.6% STATUS 1 STARTUP 2/1986	INTERMOUNTAIN 1 THE LOS ANGELES DEPARTMENT OF WATER AND POWER IS A NEW UNIT LOCATED IN DELTA, UTAH. THE 900 MW BOILER FIRES PULVERIZED SUBBITUMINOUS COAL (0.79% S, 10,200 BTU/LB) AND SUPPLIES 5,400,000 ACFM OF FLUE GAS TO A GEESI WET LIMESTONE SCRUBBING SYSTEM. FABRIC FILTERS ARE USED FOR PARTICULATE CONTROL. THE FLUE GAS PASSES THROUGH A CHEVRON TYPE MIST ELIMINATOR DESIGNED FOR 90% SO2 REMOVAL EFFICIENCY AND IS REHEATED BY IN-LINE HEAT EXCHANGER BEFORE EXITING A 710 FOOT STACK. THE SYSTEM OPERATES IN A CLOSED WATER LOOP MODE AND THE SLUDGE IS FLYASH STABILIZED BEFORE BEING DISPOSED OF ON SITE. UNIT 1 COMMENCED OPERATIONS IN FEBRUARY 1986.

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STATUS OF FGD SYSTEMS

UNIT IDENTIFICATION	ABSTRACT
LOS ANGELES DEPT OF WTR & PWR INTERMOUNTAIN 2 NEW 841 MW (GROSS) 841 MW (ESC) COAL 0.79 %S SUBBITUMINOUS LIMESTONE GE ENVIRONMENTAL SERVICES ENERGY CONSUMPTION: 2.6% STATUS 1 STARTUP 3/1987	THE LOS ANGELES DEPARTMENT OF WATER AND POWER HAS A SECOND BOILER, INTERMOUNTAIN 2, LOCATED IN DELTA, UTAH. THE 900 MW BOILER FIRES PULVERIZED SUBBITUMINOUS COAL (0.79% S, 10,200 BTU/LB) AND SUPPLIES 5,400,000 ACFM OF FLUE GAS TO A GEESI WET LIMESTONE SCRUBBING SYSTEM. FABRIC FILTERS ARE USED FOR PARTICULATE CONTROL. THE FLUE GAS PASSES THROUGH A CHEVRON-TYPE MIST ELIMINATOR DESIGNED FOR 90% SO2 REMOVAL EFFICIENCY AND ARE REHEATED BY IN-LINE HEAT EXCHANGERS BEFORE EXITING A 710 FT STACK. THE SYSTEM OPERATES IN A CLOSED WATER LOOP MODE AND THE SLUDGE IS FLYASH STABILIZED BEFORE BEING DISPOSED OF ON-SITE. UNIT 2 COMMENCED OPERATIONS IN MARCH 1987.
LOUISVILLE GAS & ELECTRIC CANE RUN 4 RETROFIT 170 MW (GROSS) 170 MW (ESC) COAL 3.87 %S BITUMINOUS LIME AMERICAN AIR FILTER ENERGY CONSUMPTION: 1.8% STATUS 1 STARTUP 8/1976	UNIT 4 AT LOUISVILLE GAS AND ELECTRIC'S CANE RUN STATION IS A PULVERIZED BITUMINOUS COAL (3.87% S, 11,300 BTU/LB) FIRED UNIT IN LOUISVILLE, KENTUCKY. AN ESP AND TWO AMERICAN AIR FILTER CARBIDE LIME MOBILE BED ABSORBER MODULES (85% DESIGN SO2 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 POZ-O-TEC FIXATED SLUDGE IS DISPOSED IN AN ON-SITE LANDFILL. THIS RETROFIT SYSTEM HAS BEEN OPERATIONAL SINCE AUGUST 1976.
LOUISVILLE GAS & ELECTRIC CANE RUN 5 RETROFIT 181 MW (GROSS) 181 MW (ESC) COAL 3.80 %S BITUMINOUS LIME COMBUSTION ENGINEERING ENERGY CONSUMPTION: 1.7% STATUS 1 STARTUP 12/1977	CANE RUN 5 OF LOUISVILLE GAS AND ELECTRIC IS A PULVERIZED BITUMINOUS COAL (3.8% S, 11,0000 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 BY TWO COMBUSTION ENGINEERING 85% EFFICIENCY (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. THE CLEANED FLUE GAS EXITS A 250 FT STACK. OPERATION OF THIS RETROFIT SYSTEM BEGAN IN DECEMBER 1977.
LOUISVILLE GAS & ELECTRIC CANE RUN 6 RETROFIT 260 MW (GROSS) 260 MW (ESC) COAL 4.80 %S BITUMINOUS DUAL ALKALI THYSSEN/CEA ENERGY CONSUMPTION: 1.2% STATUS 1 STARTUP 4/1979	LOUISVILLE GAS AND ELECTRIC'S CANE RUN 6 IS A 299-MW (GROSS) BITUMINOUS COAL (4.80% S, 11,000 BTU/LB) FIRED UNIT LOCATED IN LOUISVILLE, KENTUCKY. THYSSEN/CEA SUPPLIED A RETROFIT DUAL ALKALI DEMONSTRATION FGD SYSTEM FOR THIS UNIT. THE EMISSION CONTROL SYSTEM, DESIGNED TO REMOVE 95% OF THE FLUE GAS SO2, 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 CLOSED, AND THE SLUDGE IS DISPOSED IN AN ON-SITE LANDFILL.
LOUISVILLE GAS & ELECTRIC MILL CREEK 1 RETROFIT 321 MW (GROSS) 321 MW (ESC) COAL 3.75 %S BITUMINOUS LIME COMBUSTION ENGINEERING ENERGY CONSUMPTION: 1.2% STATUS 1 STARTUP 12/1980	MILL CREEK 1 OF LOUISVILLE GAS AND ELECTRIC IS LOCATED IN LOUISVILLE, KENTUCKY. A RETROFIT LIME FGD SYSTEM IS PRESENTLY OPERATING ON THIS PULVERIZED COAL (3.75% S, 11,500 BTU/LB) FIRED UNIT SUPPLIED BY COMBUSTION ENGINEERING. AN ESP IS EMPLOYED FOR PARTICULATE CONTROL AND THE CLEANED FLUE GAS EXITS A 600 FT STACK. THE SYSTEM CAN OPERATE IN AN OPEN OR CLOSED WATER LOOP MODE. OPERATIONS BEGAN IN DECEMBER 1980.
LOUISVILLE GAS & ELECTRIC MILL CREEK 2 RETROFIT 338 MW (GROSS) 338 MW (ESC) COAL 3.75 %S BITUMINOUS LIME COMBUSTION ENGINEERING ENERGY CONSUMPTION: 1.5% STATUS 1 STARTUP 12/1981	MILL CREEK 2 OF LOUISVILLE GAS AND ELECTRIC IS LOCATED IN LOUISVILLE, KENTUCKY. A RETROFIT LIME FGD SYSTEM IS PRESENTLY OPERATING ON THIS PULVERIZED COAL (3.75% S, 11,500 BTU/LB) FIRED UNIT SUPPLIED BY COMBUSTION ENGINEERING. AN ESP IS EMPLOYED FOR PARTICULATE CONTROL AND THE CLEANED FLUE GAS EXITS A 600 FT STACK. THE SYSTEM OPERATES IN A CLOSED WATER LO MODE. INITIAL START-UP TOOK PLACE IN DECEMBER 1981.

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UNIT IDENTIFICATION	ABSTRACT
LOUISVILLE GAS & ELECTRIC MILL CREEK 3 NEW 412 MW (GROSS) 412 MW (ESC) COAL 3.87 %S BITUMINOUS LIME AMERICAN AIR FILTER ENERGY CONSUMPTION: 1.2% STATUS 1 STARTUP 8/1978	LOUISVILLE GAS AND ELECTRIC'S MILL CREEK 3 IS A 3.87% S COAL (11,300 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 SO2 FROM THE FLUE GAS. AN ESP IS FOLLOWED BY FOUR MOBILE BED CONTACTORS AND A STEAM TUBE REHEATER. CLEANED FLUE GAS EXITS A 600 FT STACK. THE WATER LOOP IS OPEN AND THE LIME/FLYASH STABILIZED SLUDGE IS PONDED. THIS UNIT HAS BEEN OPERATIONAL SINCE AUGUST 1978.
LOUISVILLE GAS & ELECTRIC MILL CREEK 4 NEW 496 MW (GROSS) 496 MW (ESC) COAL 3.75 %S BITUMINOUS LIME AMERICAN AIR FILTER ENERGY CONSUMPTION: 2.4% STATUS 1 STARTUP 7/1982	MILL CREEK 4 OF LOUISVILLE GAS AND ELECTRIC IS A PULVERIZED BITUMINOUS COAL (3.75% S, 11,500 BTU/LB) FIRED UNIT LOCATED IN LOUISVILLE, KENTUCKY. THE EMISSION CONTROL SYSTEM CONSISTS OF AN ESP AND FOUR MOBILE BED CONTACTORS. THE LIME FGD SYSTEM FOR THIS UNIT WAS SUPPLIED BY AMERICAN AIR FILTER. THE SYSTEM'S WATER LOOP IS CLOSED AND THE SLUDGE IS STABILIZED WITH LIME AND FLYASH. STEAM TUBES PROVIDE REHEAT OF THE CLEANED GASES WHICH EXIT A 600 FT STACK. INITIAL START-UP WAS IN JULY 1982.
LOUISVILLE GAS & ELECTRIC TRIMBLE COUNTY 1 NEW 512 MW (GROSS) 512 MW (ESC) COAL 4.00 %S BITUMINOUS PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: 2.5% STATUS 3 STARTUP 12/1990	LOUISVILLE GAS AND ELECTRIC WILL BE INSTALLING AN FGD SYSTEM ON THE UTILITY'S PLANNED TRIMBLE COUNTY UNIT 1 STATION IN BEDFORD, KENTUCKY. COMBUSTION ENGINEERING HAS BEEN AWARDED A CONTRACT TO SUPPLY THE BOILER AND THE FGD SYSTEM. THE 575 MW(GROSS) UNIT WILL FIRE PULVERIZED BITUMINOU COAL (4.5% SULFUR, 10,000 BTU/LB). A WET LIMESTONE FGD SYSTEM UTILIZING 4 (1 SPARE) OPEN COUNTERCURRENT SPRAY TOWERS WILL CONTROL SO2 EMISSIONS AN ESP WILL PROVIDE PARTICULATE CONTROL. FORCED OXIDATION WILL BE UTILIZE FOR SLUDGE CONTROL. UNIT 1 IS SCHEDULED TO START-UP IN 1991.
LOWER COLORADO RIVER AUTH FAYETTE POWER PROJECT 3 NEW 451 MW (GROSS) 451 MW (ESC) LIGNITE 1.70 %S LIMESTONE COMBUSTION ENGINEERING ENERGY CONSUMPTION: 2.7% STATUS 2 STARTUP 3/1988	LOWER COLORADO RIVER AUTHORITY HAS STARTED CONSTRUCTION ON A 451 MW UNIT, FAYETTE POWER PROJECT 3, IN LA GRANGE, TEXAS. THE LIGNITE (1.7% S, 4300 BTU/LB) FIRED BOILER WILL UTILIZE A WET LIMESTONE SCRUBBING SYSTEM DESIGNED TO REMOVE 90% SO2. AN ESP SUPPLIED BY FLAKT WILL CONTROL PARTICLE EMISSIONS AND THE CLEANED FLUE GAS WILL EXIT THROUGH A 535 FOOT ACID BRICK LINED STACK. SLUDGE WILL BE FORCIBLY OXIDIZED BEFORE BEING DISPOSED IN AN ON-SITE LANDFILL. OPERATIONS ARE SCHEDULED TO COMMENCE IN 1988.
LOWER COLORADO RIVER AUTH FAYETTE POWER PROJECT 4 NEW 451 MW (GROSS) 451 MW (ESC) LIGNITE 1.70 %S LIMESTONE VENDOR NOT SELECTED ENERGY CONSUMPTION: 2.7% STATUS 6 STARTUP 99/2050	LOWER COLORADO RIVER AUTHORITY HAS PLANS FOR A 451 MW UNIT, FAYETTE POWER PROJECT 4, TO BE LOCATED IN LA GRANGE, TEXAS. THE LIGNITE (1.7% S, 4300 BTU/LB) FIRED BOILER WILL UTILIZE A WET LIMESTONE SCRUBBING SYSTEM DESIGNED TO REMOVE 90% SO2. AN ESP WILL CONTROL PARTICLE EMISSIONS AND THE CLEANED FLUE GAS WILL EXIT THROUGH A 535 FOOT ACID BRICK LINED STACK. SLUDGE WILL BE FORCE OXIDIZED BEFORE BEING DISPOSED IN AN ON-SITE LANDFILL. START-UP FOR UNIT4 HAS BEEN DEFERED INDEFINITELY.
MARQUETTE BOARD OF LIGHT & PWR SHIRAS 3 NEW 44 MW (GROSS) 44 MW (ESC) COAL 0.30 %S SUBBITUMINOUS LIME/SPRAY DRYING GE ENVIRONMENTAL SERVICES ENERGY CONSUMPTION: 2.3% STATUS 1 STARTUP 3/1983	SHIRAS 3 OF THE MARQUETTE BOARD OF LIGHT AND POWER IS A PULVERIZED SUBBITUMINOUS COAL (.3% S, 8654 BTU/LB) FIRED BOILER LOCATED IN MARQUETTE, MICHIGAN. GE ENVIRONMENTAL SERVICES HAS SUPPLIED A LIME/SPRAY DRYING PROCESS TO CONTROL EMISSIONS. FABRIC FILTERS WITH 99.8% REMOVAL EFFICIENCY CONTROL PARTICULATE MATTER AND THE CLEANED FLUE GAS EXITS A 350 FT STACK. THE FGD WASTE IS DISPOSED AT AN OFF-SITE LANDFILL. OPERATIONS COMMENCED IN MARCH 1983.

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UNIT IDENTIFICATION	ABSTRACT
MICHIGAN SO CENTRAL PWR AGENCY ENDICOTT 1 NEW 55 MW (GROSS) 55 MW (ESC) COAL 2.25 %S BITUMINOUS LIMESTONE BABCOCK & WILCOX ENERGY CONSUMPTION: 1.8% STATUS 1 STARTUP 5/1983	THE ENDICOTT 1 UNIT OF MICHIGAN SOUTH CENTRAL POWER AGENCY IS A PULVERIZED COAL FIRED BOILER LOCATED IN LICHTFIELD, MICHIGAN. THE EMISSION CONTROL SYSTEM CONSISTS OF A HOT SIDE ESP AND A BABCOCK & WILCOX LIMESTONE SPRAY TOWER. THE SPRAY TOWER MIST ELIMINATOR IS FOLLOWED BY AN IN-LINE REHEATER AND A 250 FOOT STACK. THE SYSTEM OPERATES IN A CLOSED WATER LOOP AND SLUDGE IS DISPOSED AT AN OFF-SITE LANDFILL. OPERATIONS COMMENCED IN MAY 1983.
MINNESOTA POWER & LIGHT CLAY BOSWELL 4 NEW 554 MW (GROSS) 475 MW (ESC) COAL 0.94 %S SUBBITUMINOUS LIME/ALKALINE FLYASH PEABODY PROCESS SYSTEMS ENERGY CONSUMPTION: 1.3% STATUS 1 STARTUP 2/1980	CLAY BOSWELL 4 OF MINNESOTA POWER AND LIGHT IS A SUBBITUMINOUS COAL (0.9 S, 8287 BTU/LB) FIRED UNIT LOCATED IN COHASSET, MINNESOTA. PEABODY PROCESS SYSTEMS HAS SUPPLIED A LIME/ALKALINE FLYASH SYSTEM WHICH IS DESIGNED TO REMOVE 84.6% OF THE SO2 IN THE FLUE GAS. PARTICULATE MATTER AND ADDITIONAL SO2 CONTROL IS ACHIEVED WITH VENTURI SCRUBBERS (ONE HOT SIDE ESP CONTROLS PARTICULATE MATTER IN THE BYPASS FLUE GAS STREAM). MIST ELIMINATION IS PROVIDED BY A SIEVE TRAY FOLLOWED BY A SPIN VANE CHEVRON, AND REHEAT IS SUPPLIED BY BYPASSING 5% OF THE FLUE GAS. THE SYSTEM OPERATES IN A CLOSED WATER LOOP MODE, SLUDGE IS DISPOSED IN A LINED POND AND FLUE GAS EXITS A 600 FT STACK. OPERATIONS COMMENCED IN FEBRUARY 1980.
MINNKOTA POWER MILTON R. YOUNG 2 NEW 440 MW (GROSS) 374 MW (ESC) COAL 0.60 %S LIGNITE LIME/ALKALINE FLYASH THYSSEN/CEA ENERGY CONSUMPTION: 1.6% STATUS 1 STARTUP 9/1977	MINNKOTA POWER COOPERATIVE'S MILTON R. YOUNG 2 IS A CYCLONE FIRED LIGNITE (0.60%S, 6500 BTU/LB) BOILER LOCATED IN CENTER, NORTH DAKOTA. THE BOILER PRODUCES 2,021,400 ACFM OF FLUE GAS, HALF OF WHICH IS CLEANED BY TWO ESP'S AND TWO THYSSEN/CEA LIME/ALKALINE FYLASH SPRAY TOWERS (75% DESIGN SO2 REMOVAL EFFICIENCY). THE CLEANED GAS PASSES THROUGH A CHEVRON MIST ELIMINATOR BEFORE IT JOINS A 15% BYPASS REHEAT (HOT UNSCRUBBED GAS), AND EXITS A 550 FOOT STACK. THE WATER LOOP IS CLOSED, AND THE SLUDGE IS TRUCKED TO AN OFF-SITE MINEFILL. OPERATIONS BEGAN IN 1977.
MONONGAHELA POWER PLEASANTS 1 NEW 684 MW (GROSS) 547 MW (ESC) COAL 3.00 %S BITUMINOUS LIME BABCOCK & WILCOX ENERGY CONSUMPTION: 2.9% STATUS 1 STARTUP 12/1978	MONONGAHELA POWER PLEASANTS 1 IS A BITUMINOUS COAL (3.00% S, 12,500 BTU/LB) FIRED BOILER IN WILLOW ISLAND, WEST VIRGINIA. BABCOCK AND WILCOX SUPPLIED A LIME FGD SYSTEM DESIGNED TO REMOVE 90% OF THE FLUE GAS SO2 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 1000 FOOT PLACITE LINED-STACK. THE SYSTEM OPERATES IN A CLOSED WATER LOOP. THE FGD SYSTEM ON THIS UNIT HAS BEEN OPERATIONAL SINCE DECEMBER 1978.
MONONGAHELA POWER PLEASANTS 2 NEW 684 MW (GROSS) 547 MW (ESC) COAL 3.00 %S BITUMINOUS LIME BABCOCK & WILCOX ENERGY CONSUMPTION: 2.9% STATUS 1 STARTUP 10/1980	MONONGAHELA POWER PLEASANTS 2 IS A BITUMINOUS COAL (3.00 %S, 12,500 BTU/LB) FIRED BOILER LOCATED IN WILLOW ISLAND, WEST VIRGINIA. BABCOCK AND WILCOX SUPPLIED A LIME FGD SYSTEM DESIGNED TO REMOVE 90% OF THE BOILER FLUE GAS SO2. THE EMISSION CONTROL SYSTEM ON THIS UNIT 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 1000 FOOT ACID BRICK STACK. THE SYSTEM OPERATES IN A CLOSED WATER LOOP. THE FGD SYSTEM OPERATION COMMENCED IN OCTOBER 1980.
MONTANA POWER COLSTRIP 1 NEW 358 MW (GROSS) 358 MW (ESC) COAL 0.78 %S SUBBITUMINOUS LIME/ALKALINE FLYASH THYSSEN/CEA ENERGY CONSUMPTION: 3.4% STATUS 1 STARTUP 9/1975	COLSTRIP 1 OF MONTANA POWER IS A 360-MW (GROSS) SUBBITUMINOUS COAL (0.78% S, 8843 BTU/LB) FIRED UNIT LOCATED IN COLSTRIP, MONTANA. THYSSEN/CEA SUPPLIED A LIME/ALKALINE FLYASH FGD SYSTEM CONSISTING OF THREE VENTURI SCRUBBER/SPRAY TOWER ABSORBER MODULES. THE TOWERS ARE FOLLOWED BY HORIZONTAL CHEVRON MIST ELIMINATORS, A STEAM TUBE REHEATER, AND A 503 FOOT STACK. THE UNSTABILIZED SLUDGE IS DISPOSED IN AN ON-SITE LINED POND THE WATER LOOP IS CLOSED. OPERATIONS INITIALLY BEGAN IN SEPTEMBER 1975.

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UNIT IDENTIFICATION	ABSTRACT
MONTANA POWER COLSTRIP 2 NEW 358 MW (GROSS) 358 MW (ESC) COAL 0.78 %S SUBBITUMINOUS LIME/ALKALINE FLYASH THYSSEN/CEA ENERGY CONSUMPTION: 3.4% STATUS 1 STARTUP 5/1976	COLSTRIP 2 OF MONTANA POWER IS A 360-MW (GROSS) SUBBITUMINOUS COAL (0.78% S, 8843 BTU/LB) FIRED UNIT LOCATED IN COLSTRIP, MONTANA. THYSSEN/CEA 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 503 FOOT STACK. THE UNSTABILIZED SLUDGE IS DISPOSED IN AN ON-SITE LINED POND. THE WATER LOOP IS CLOSED. OPERATIONS INITIALLY BEGAN IN MAY 1976.
MONTANA POWER COLSTRIP 3 NEW 778 MW (GROSS) 778 MW (ESC) COAL 0.70 %S LIME/ALKALINE FLYASH BECHTEL/MONTANA POWER ENERGY CONSUMPTION: 3.9% STATUS 1 STARTUP 10/1983	MONTANA POWER'S COLSTRIP 3 IS A LOW SULFUR COAL (0.7% S, 8500 BTU/LB) FIRED UNIT LOCATED IN COLSTRIP, MONTANA. A LIME/ALKALINE FLY-ASH FGD SYSTEM SUPPLIED BY BECHTEL/MONTANA POWER CONTROLS SO2 EMISSIONS AT THIS UNIT. PARTICLE SCRUBBERS ARE EMPLOYED FOR THE CONTROL OF PARTICULATE MATTER AND THE SYSTEM OPERATES IN A CLOSED WATER LOOP MODE. FLUE GAS EXITS A 692 FT STACK. START-UP COMMENCED IN OCTOBER 1983.
MONTANA POWER COLSTRIP 4 NEW 778 MW (GROSS) 778 MW (ESC) COAL 0.70 %S LIME/ALKALINE FLYASH BECHTEL/MONTANA POWER ENERGY CONSUMPTION: 3.9% STATUS 1 STARTUP 12/1985	MONTANA POWER'S COLSTRIP 4 IS A LOW SULFUR COAL (0.7% S, 8500 BTU/LB) FIRED UNIT LOCATED IN COLSTRIP, MONTANA. A LIME/ALKALINE FLY-ASH FGD SYSTEM SUPPLIED BY BECHTEL/MONTANA POWER CONTROLS SO2 EMISSIONS AT THIS UNIT. PARTICLE SCRUBBERS ARE EMPLOYED FOR THE CONTROL OF PARTICULATE MATTER AND THE SYSTEM OPERATES IN A CLOSED WATER LOOP MODE. FLUE GAS EXITS A 692 FT STACK. START-UP COMMENCED IN DECEMBER 1985.
MONTANA-DAKOTA UTILITIES COYOTE 1 NEW 427 MW (GROSS) 427 MW (ESC) COAL 0.87 %S LIGNITE SODIUM CARBONATE/SPRAY DRYING WHEELABRATOR-FRYE/R.I. ENERGY CONSUMPTION: 1.2% STATUS 1 STARTUP 4/1981	COYOTE 1 IS A CYCLONE FIRED PULVERIZED LIGNITE (0.87% S, 7050 BTU/LB) BOILER OPERATING IN BEULAH, NORTH DAKOTA. THIS UNIT IS JOINTLY OWNED BY FIVE UTILITIES, WITH MONTANA-DAKOTA UTILITIES BEING THE MAJOR OWNER AND CONSTRUCTOR. A SODIUM CARBONATE DRY FGD SYSTEM DESIGNED TO REMOVE 70% OF THE SO2 WAS SUPPLIED BY WHEELABRATOR-FRYE AND ROCKWELL INTERNATIONAL. THE SPRAY DRYER/BAGHOUSE SYSTEM COMMENCED OPERATION IN APRIL 1981.
MUSCATINE POWER & WATER MUSCATINE 9 NEW 172 MW (GROSS) 172 MW (ESC) COAL 3.21 %S BITUMINOUS LIMESTONE RESEARCH-COTTRELL ENERGY CONSUMPTION: 4.7% STATUS 1 STARTUP 4/1983	MUSCATINE 9 IS A PULVERIZED BITUMINOUS COAL (3.21% S, 11,220 BTU/LB) FIRED UNIT LOCATED IN MUSCATINE, IOWA. RESEARCH-COTTRELL SUPPLIED A LIMESTONE SCRUBBING SYSTEM FOR EMISSION CONTROL. THE FGD SYSTEM FEATURES AN ESP, TWO 100% CAPACITY ABSORBER TOWERS, STEAM COIL REHEAT, A CLOSED WATER LOOP FORCED OXIDATION OF THE SLUDGE BEFORE LANDFILL AND A 300 FOOT STACK. THE DESIGN SO2 REMOVAL EFFICIENCY IS 94%. OPERATIONS INITIALLY BEGAN IN APRIL 1983.
NEVADA POWER HARRY ALLEN 1 NEW 290 MW (GROSS) 290 MW (ESC) COAL ***** %S PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: 2.8% STATUS 6 STARTUP 0/1997	NEVADA POWER'S HARRY ALLEN 1 IS A PLANNED COAL FIRED UNIT TO BE LOCATED 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 1997.

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NEVADA POWER HARRY ALLEN 2 NEW 290 MW (GROSS) 290 MW (ESC) COAL ***** %S PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: 2.8% STATUS 6 STARTUP 0/1999	NEVADA POWER'S HARRY ALLEN 2 IS A PLANNED COAL FIRED UNIT TO BE LOCATED 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 1999.
NEVADA POWER HARRY ALLEN 3 NEW 290 MW (GROSS) 290 MW (ESC) COAL ***** %S PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: 2.8% STATUS 6 STARTUP 0/2001	NEVADA POWER'S HARRY ALLEN 3 IS A PLANNED COAL FIRED UNIT TO BE LOCATED 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 2001.
NEVADA POWER HARRY ALLEN 4 NEW 290 MW (GROSS) 290 MW (ESC) COAL ***** %S PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: 2.8% STATUS 6 STARTUP 0/2003	NEVADA POWER'S HARRY ALLEN 4 IS A PLANNED COAL FIRED UNIT TO BE LOCATED 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 2003.
NEVADA POWER REID GARDNER 1 RETROFIT 125 MW (GROSS) 125 MW (ESC) COAL 0.50 %S BITUMINOUS SODIUM CARBONATE THYSSEN/CEA ENERGY CONSUMPTION: 5.6% STATUS 1 STARTUP 3/1974	REID GARDNER 1 IS A 125-MW (GROSS) WET BOTTOM LOW SULFUR COAL (0.5% S, 12,450 BTU/LB) FIRED UNIT OWNED BY NEVADA POWER, LOCATED IN MOAPA, NEVADA. THE THYSSEN/CEA SODIUM CARBONATE-BASED (TRONA) SCRUBBING SYSTEM CONSISTS OF ONE MODULE CONTAINING TWIN VARIABLE THROAT VENTURIS FOLLOWED BY A SEPARATOR IN SERIES WITH A SINGLE STAGE PEFORATED PLATE WASHTOWER. PRIMARY PARTICULATE CONTROL IS PROVIDED BY UPSTREAM MULTICLONES. A RADIAL VANE MIST ELIMINATOR PRECEDES AN INDIRECT STEAM COIL REHEATER AND A 200 FOOT STACK. THE SYSTEM OPERATES IN A CLOSED 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 MARCH 1974.
NEVADA POWER REID GARDNER 2 RETROFIT 125 MW (GROSS) 125 MW (ESC) COAL 0.50 %S BITUMINOUS SODIUM CARBONATE THYSSEN/CEA ENERGY CONSUMPTION: 5.6% STATUS 1 STARTUP 4/1974	REID GARDNER 2 IS A 125-MW (GROSS) WET BOTTOM LOW SULFUR COAL (0.5% S, 12,450 BTU/LB) FIRED UNIT OWNED BY NEVADA POWER, LOCATED IN MOAPA, NEVADA. THE THYSSEN/CEA SODIUM CARBONATE-BASED (TRONA) SCRUBBING SYSTEM CONSISTS OF ONE MODULE CONTAINING TWIN VARIABLE THROAT VENTURIS FOLLOWED BY A SEPARATOR IN SERIES WITH A SINGLE STAGE PEFORATED PLATE WASHTOWER. PRIMARY PARTICULATE CONTROL IS PROVIDED BY UPSTREAM MULTICLONES. A RADIAL VANE MIST ELIMINATOR PRECEDES AN INDIRECT STEAM COIL REHEATER AND A 200 FOOT STACK. THE SYSTEM OPERATES IN A CLOSED 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.
NEVADA POWER REID GARDNER 3 NEW 125 MW (GROSS) 125 MW (ESC) COAL 0.50 %S BITUMINOUS SODIUM CARBONATE THYSSEN/CEA ENERGY CONSUMPTION: 5.6% STATUS 1 STARTUP 6/1976	REID GARDNER 3 IS A 125-MW (GROSS) WET BOTTOM LOW SULFUR BITUMINOUS COAL (0.5% S, 12,450 BTU/LB) FIRED FOSTER WHEELER UNIT LOCATED IN MOAPA, NEVADA. THE THYSSEN/CEA SODIUM CARBONATE-BASED (TRONA) SCRUBBING SYSTEM CONSISTS OF ONE MODULE CONTAINING TWIN VARIABLE THROAT VENTURIS FOLLOWED BY A SEPARATOR IN SERIES WITH A SINGLE STAGE PERFORATED PLATE WASHTOWER. PRIMARY PARTICULATE CONTROL IS PROVIDED BY UPSTREAM MULTICLONES. A RADIAL VANE MIST ELIMINATOR PRECEDES AN INDIRECT STEAM COIL REHEATER AND A 200 FOOT STACK. THE SYSTEM OPERATES IN A CLOSED 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 JUNE 1976.

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UNIT IDENTIFICATION	ABSTRACT
NEVADA POWER REID GARDNER 4 NEW 285 MW (GROSS) 242 MW (ESC) COAL 0.75 %S SODIUM CARBONATE THYSSEN/CEA ENERGY CONSUMPTION: 4.9% STATUS 1 STARTUP 6/1983	REID GARDNER 4 IS A 295 MW (GROSS) LOW SULFUR COAL (0.75% S, 11,500 BTU/LB) FIRED UNIT LOCATED IN MOAPA, NEVADA. THE EMISSION CONTROL SYSTEM CONSISTS OF A THYSSEN/CEA SODIUM CARBONATE FGD SYSTEM FOR SO2 CONTROL. A BAGHOUSE PRECEDES THE FGD SYSTEM FOR PARTICULATE MATTER CONTROL. THE SYSTEM OPERATES IN AN OPEN WATER LOOP MODE AND FLUE GAS EXITS A 500 FT STACK. OPERATIONS COMMENCED IN JUNE 1983.
NEW YORK STATE ELEC & GAS SOMERSET 1 NEW 680 MW (GROSS) 680 MW (ESC) COAL 2.50 %S BITUMINOUS LIMESTONE PEABODY PROCESS SYSTEMS ENERGY CONSUMPTION: 2.4% STATUS 1 STARTUP 7/1984	THE NEW YORK STATE ELECTRIC & GAS CORP. IS OPERATING A PULVERIZED BITUMINOUS COAL (2.2% S, 12,000 BTU/LB) FIRED BOILER SUPPLIED BY BABCOCK & WILCOX, IN SOMERSET, NEW YORK WHICH GENERATES A FLUE GAS FLOW OF 2,862,000 ACFM. A COLD SIDE ESP WITH A DESIGN EFFICIENCY OF 99.7% PROVIDES THE PRIMARY PARTICULATE REMOVAL. PEABODY PROCESS SYSTEMS SUPPLIED A LIMESTONE FGD SYSTEM WITH A DESIGN REMOVAL EFFICIENCY OF 90% FOR SO2 CONTROL. THE SYSTEM OPERATES IN A CLOSED WATER LOOP MODE AND FLUE GAS PASSES THROUGH IN-LINE STEAM REHEATER INTO A 450 FT STACK. THE SLUDGE IS DEWATERED AND STABILIZED BEFORE ON-SITE LANDFILLED. OPERATIONS COMMENCED IN JULY 1984.
NORTHERN INDIANA PUB SERVICE R.M. SCHAHFER 17 NEW 379 MW (GROSS) 379 MW (ESC) COAL 3.20 %S BITUMINOUS DUAL ALKALI FMC ENERGY CONSUMPTION: 0.5% STATUS 1 STARTUP 4/1983	R.M. SCHAHFER 17 OF NORTHERN INDIANA PUBLIC SERVICE IS A 391 MW (GROSS) COAL (3.2% S, 10,900 BTU/LB) FIRED UNIT LOCATED IN WHEATFIELD, INDIANA. THE FMC EMISSION CONTROL SYSTEM CONSISTS OF AN ESP FOLLOWED BY FOUR DUAL ALKALI WET ABSORBERS. THE CLEANED FLUE GAS IS REHEATED AND EXITS VIA A 500 FOOT STACK. INITIAL OPERATIONS COMMENCED IN APRIL 1983.
NORTHERN INDIANA PUB SERVICE R.M. SCHAHFER 18 NEW 376 MW (GROSS) 376 MW (ESC) COAL 3.20 %S BITUMINOUS DUAL ALKALI FMC ENERGY CONSUMPTION: 0.5% STATUS 1 STARTUP 12/1985	R.M. SCHAHFER 18 OF NORTHERN INDIANA PUBLIC SERVICE IS A 391 MW (GROSS) COAL (3.2% S, 10,900 BTU/LB) FIRED UNIT LOCATED IN WHEATFIELD, INDIANA. THE FMC EMISSION CONTROL SYSTEM CONSISTS OF AN ESP FOLLOWED BY FOUR DUAL ALKALI WET ABSORBERS. THE CLEANED FLUE GAS IS REHEATED AND EXITS VIA A 500 FOOT STACK. INITIAL OPERATIONS COMMENCED IN DECEMBER 1985.
NORTHERN STATES POWER RIVERSIDE 6-7 RETROFIT 150 MW (GROSS) 150 MW (ESC) COAL 1.20 %S SUBBITUMINOUS LIME/SPRAY DRYING JOY MFG/NIRO ATOMIZER ENERGY CONSUMPTION: 2.7% STATUS 1 STARTUP 11/1980	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 340,000 ACFM AT 350 F. CURRENTLY, A DEMONSTRATION LIME/SPRAY DRYING FGD SYSTEM THAT IS CAPABLE OF TREATING THE FLUE GAS FROM BOTH BOILERS IS BEING TESTED AT THIS UNIT. THE SYSTEM WAS SUPPLIED BY NIRO ATOMIZER/JOY MANUFACTURING AND CONSISTS OF A SPRAY DRYER FOLLOWED BY A BAGHOUSE. THE CLEAN FLUE GAS IS VENTED TO TWO 275 FT CONCRETE STACKS WITH FIRE BRICK LINERS. SPENT ABSORBENT IS BEING DISPOSED OF IN AN OFF-SITE LANDFILL. OPERATIONS COMMENCED IN NOVEMBER 1980.
NORTHERN STATES POWER SHERBURNE CO. 1 NEW 750 MW (GROSS) 750 MW (ESC) COAL 0.80 %S SUBBITUMINOUS LIMESTONE/ALKALINE FLYASH COMBUSTION ENGINEERING ENERGY CONSUMPTION: 4.0% STATUS 1 STARTUP 3/1976	NORTHERN STATES POWER'S SHERBURNE CO. 1 IS A BALANCED DRAFT PULVERIZED SUBBITUMINOUS COAL (0.80% S, 8400 BTU/LB) FIRED BOILER IN BECKER, MINNESOTA. A 50% EFFICIENT (DESIGN) LIMESTONE/ALKALINE FLYASH FGD SYSTEM SUPPLIED BY COMBUSTION ENGINEERING HAS BEEN OPERATION ON THIS UNIT SINCE MARCH 1976. TWELVE VARIABLE THROAT ROD DECK VENTURI/MARBLE BED ABSORBER TRAINS ARE FOLLOWED BY ONE CHEVRON MIST ELIMINATOR/TRAIN AN IN-LINE HOT WATER REHEATER, AND A 650 FOOT COR-TEN LINED STACK. THE SLUDGE IS FORCIBLY OXIDIZED AND DISPOSED IN A CLAY LINED SETTLING POND. THE WATER LOOP IS OPEN.

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UNIT IDENTIFICATION	ABSTRACT
NORTHERN STATES POWER SHERBURNE CO. 2 NEW 750 MW (GROSS) 750 MW (ESC) COAL 0.80 %S SUBBITUMINOUS LIMESTONE/ALKALINE FLYASH COMBUSTION ENGINEERING ENERGY CONSUMPTION: 4.0% STATUS 1 STARTUP 3/1977	NORTHERN STATES POWER'S SHERBURNE CO. 2 IS A BALANCED DRAFT PULVERIZED SUBBITUMINOUS COAL (0.80% S, 8400 BTU/LB) FIRED BOILER IN BECKER, MINNESOTA. A 50% EFFICIENT (DESIGN) LIMESTONE/ALKALINE FLYASH FGD SYSTEM SUPPLIED BY COMBUSTION ENGINEERING HAS BEEN OPERATION ON THIS UNIT SINCE MARCH 1977. TWELVE VARIABLE THROAT ROD DECK VENTURI/MARBLE BED ABSORBER TRAINS ARE FOLLOWED BY ONE CHEVRON MIST ELIMINATOR/TRAIN AN IN-LINE HOT WATER REHEATER, AND A 650 FOOT COR-TEN LINED STACK. THE SLUDGE IS FORCIBLY OXIDIZED AND DISPOSED IN A CLAY LINED SETTLING POND. THE WATER LOOP IS OPEN.
NORTHERN STATES POWER SHERBURNE CO. 3 NEW 850 MW (GROSS) 801 MW (ESC) COAL 1.00 %S SUBBITUMINOUS LIME/SPRAY DRYING JOY MFG/NIRO ATOMIZER ENERGY CONSUMPTION: 4.0% STATUS 1 STARTUP 7/1987	NORTHERN STATES POWER'S SHERBURNE CO. 3 IS A 800 MW (NET) PULVERIZED COAL (1.0% S, 8700 BTU/LB) FIRED BOILER LOCATED ADJACENT TO THE SHERBURNE CO. 1 AND 2 UNITS IN BECKER, MINNESOTA. A JOY MFG/NIRO ATOMIZER LIMESPRAY DRYING SYSTEM IS USED TO CONTROL SO2 EMISSIONS. FABRIC FILTERS ARE EMPLOYED FOR PARTICLE CONTROL. THE SYSTEM OPERATES IN A CLOSED WATER LOOP MODE. OPERATIONS COMMENCED IN JULY 1987.
ORLANDO UTILITIES COMMISSION C.H. STANTON 1 NEW 460 MW (GROSS) 460 MW (ESC) COAL 0.80 %S LIMESTONE COMBUSTION ENGINEERING ENERGY CONSUMPTION: 2.6% STATUS 1 STARTUP 5/1987	ORLANDO UTILITIES COMMISSION HAS A 465 MW (GROSS), COAL FIRED UNIT, C.H. STANTON 1, NEAR ORLANDO, FLORIDA. THE UTILITY CONTROLS PARTICLE MATTER VIA AN ESP. SO2 EMISSIONS ARE CONTROLLED WITH A WET LIMESTONE FGD SYSTEM HAVING A REMOVAL EFFICIENCY OF 90%. THE LIMESTONE FGD SYSTEM WAS SUPPLIED BY COMBUSTION ENGINEERING. OPERATIONS COMMENCED IN MAY 1987.
OXFORD ENERGY CO. STERLING 1 NEW 30 MW (GROSS) 30 MW (ESC) TIRES 1.75 %S PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 5 STARTUP 6/1990	OXFORD ENERGY CO. HAS PLANS FOR A NEW UNIT STERLING 1, TO BE LOCATED IN STERLING, CONNETICUT. THIS TIRE BURNING UNIT WILL BE A 30 MW COGENERATION FACILITY CAPABLE OF BURNING 1600 TIRES/HOUR. THIS UNIT WILL UTILIZE AN FGD SYSTEM FOR SO2 CONTROL AND A FABRIC FILTER FOR PARTICULATE CONTROL. CONSTRUCTION OF THIS UNIT IS SCHEDULED TO BEGIN IN DECEMBER, 1988. STARTUP IS SCHEDULED FOR MID-1990.
OXFORD ENERGY CO. WESTLEY 1 NEW 14 MW (GROSS) 14 MW (ESC) TIRES 1.75 %S N/A LIME GE ENVIRONMENTAL SER VICES ENERGY CONSUMPTION: ****% STATUS 1 STARTUP 10/1987	WESTLEY 1, OPERATED BY OXFORD ENERGY, IS A 14 MW (GROSS) UNIT LOCATED IN WESTLEY, CALIFORNIA. WASTE TIRES ARE USED AS A FUEL AT THIS COGENERATION FACILITY WHICH SELLS ELECTRICITY TO PACIFIC GAS AND ELECTRIC. THE FACILITY USES A GE ENVIROMENTAL SERVICES WET LIME SCRUBBER FOR 95.6% SO2 REMOVAL AND A FABRIC FILTER FOR 99.9% PARTICULATE REMOVAL. THE UNIT BURNS 800 TIRES/HOUR WITH AN AVERAGE SO2 CONTENT OF 1.75%. INITIAL STARTUP BEGAN IN OCTOBER 1987.
PACIFIC POWER & LIGHT DAVE JOHNSTON 4 RETROFIT 330 MW (GROSS) 330 MW (ESC) COAL 0.50 %S SUBBITUMINOUS LIME/WET INJECTION GE ENVIRONMENTAL SERVICES ENERGY CONSUMPTION: 0.9% STATUS 1 STARTUP 2/1985	DAVE JOHNSTON 4, OF PACIFIC POWER AND LIGHT, IS A 330 MW COAL FIRED UNIT IN GLENROCK, WYOMING. THE UNIT WAS ORIGINALLY EQUIPPED WITH A SCRUBBER FOR PARTICULATE CONTROL. IN 1985, THE UTILITY BEGAN HYDRATED LIME INJECTION IN THE DUCTWORK 10 FEET PRIOR TO THE SCRUBBER INLET FOR SO2 CONTROL. DESIGN REMOVAL EFFICIENCY OF THIS SYSTEM IS 60% WHICH SHOULD MEET THE STATE REGULATION OF 0.5 LB/MM BTU.

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UNIT IDENTIFICATION	ABSTRACT
PACIFIC POWER & LIGHT JIM BRIDGER 1 RETROFIT 508 MW (GROSS) 508 MW (ESC) COAL 0.56 %S SUBBITUMINOUS SODIUM CARBONATE BABCOCK & WILCOX ENERGY CONSUMPTION: 0.2% STATUS 3 STARTUP 0/1990	PACIFIC POWER AND LIGHT'S JIM BRIDGER 1 IS A DRY BOTTOM PULVERIZED SUBBITUMINOUS COAL (0.56%S, 9300 BTU/LB) FIRED BOILER SUPPLIED BY COMBUSTION ENGINEERING AND LOCATED IN ROCK SPRINGS, WYOMING. THE UTILITY HAS AWARDED A CONTRACT TO BABCOCK & WILCOX FOR A RETROFIT WET SODIUM CARBONATE FGD SYSTEM, WHICH TREATS 2,700,000 ACFM OF FLUE GAS. A COLD-SIDE ESP IS CURRENTLY IN OPERATION FOR PRIMARY PARTICULATE CONTROL. THE FGD SYSTEM WILL OPERATE IN A CLOSED WATER LOOP MODE AND FLUE GAS WILL EXIT A 500 FT STACK. START-UP IS SCHEDULED FOR 1990.
PACIFIC POWER & LIGHT JIM BRIDGER 2 RETROFIT 508 MW (GROSS) 508 MW (ESC) COAL 0.56 %S SUBBITUMINOUS SODIUM CARBONATE BABCOCK & WILCOX ENERGY CONSUMPTION: 0.2% STATUS 1 STARTUP 6/1986	PACIFIC POWER AND LIGHT'S JIM BRIDGER 2 IS A DRY BOTTOM PULVERIZED SUBBITUMINOUS COAL (0.56% S, 9300 BTU/LB) FIRED BOILER SUPPLIED BY COMBUSTION ENGINEERING AND LOCATED IN ROCK SPRINGS, WYOMING. BABCOCK & WILCOX SUPPLIED A RETROFIT WET SODIUM CARBONATE FGD SYSTEM, WHICH TREATS 2,700,000 ACFM OF FLUE GAS. AN EXISTING COLD-SIDE ESP IS USED FOR PRIMARY PARTICULATE CONTROL. THE FGD SYSTEM OPERATES IN A CLOSED WATER LOOP AND EXITS VIA A 500 FT STACK. INITIAL START-UP COMMENCED IN JUNE 1986.
PACIFIC POWER & LIGHT JIM BRIDGER 3 RETROFIT 508 MW (GROSS) 508 MW (ESC) COAL 0.56 %S SUBBITUMINOUS SODIUM CARBONATE BABCOCK & WILCOX ENERGY CONSUMPTION: 0.2% STATUS 2 STARTUP 0/1988	PACIFIC POWER AND LIGHT'S JIM BRIDGER 3 IS A DRY BOTTOM PULVERIZED SUBBITUMINOUS COAL (0.56%S, 9300 BTU/LB.) FIRED BOILER SUPPLIED BY COMBUSTION ENGINEERING AND LOCATED IN ROCK SPRINGS, WYOMING. THE UTILITY IS CURRENTLY CONSTRUCTING A BABCOCK & WILCOX RETROFIT WET SODIUM CARBONATE FGD SYSTEM WHICH WILL TREAT 2,700,000 ACFM OF FLUE GAS. A COLD-SIDE ESP IS CURRENTLY IN OPERATION FOR PRIMARY PARTICULATE CONTROL. THE FGD SYSTEM WILL OPERATE IN A CLOSED WATER LOOP MODE AND FLUE GAS WILL EXIT A 500 FT STACK. INITIAL START-UP IS SCHEDULED FOR 1988.
PACIFIC POWER & LIGHT JIM BRIDGER 4 NEW 508 MW (GROSS) 508 MW (ESC) COAL 0.56 %S SUBBITUMINOUS SODIUM CARBONATE AIR CORRECTION DIVISION, UOP ENERGY CONSUMPTION: 0.2% STATUS 1 STARTUP 9/1979	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 AND FLUE GAS EXITS A 500 FT STACK. A SYSTEM CHECK OUT WAS CONDUCTED IN JULY 1979 AND OPERATIONS BEGAN IN SEPTEMBER 1979.
PACIFIC POWER & LIGHT WYODAK 1 RETROFIT 320 MW (GROSS) 320 MW (ESC) COAL 0.55 %S SUBBITUMINOUS LIME/SPRAY DRYING JOY MFG/NIRO ATOMIZER ENERGY CONSUMPTION: 2.5% STATUS 1 STARTUP 9/1986	PACIFIC POWER AND LIGHT HAS A RETOFIT JOY\NIRO LIME SPRAY DRYING FGD SYSTEM WITH RECYCLE ASH ON WYODAK 1, A 330 MW GROSS SUBBITUMINOUS COAL FIRED UNIT. THE UNIT IS LOCATED IN JOLIET, WYOMING AND IS A MINE MOUTH PLANT. THE UNIT STARTED UP IN 1978 AND THE FGD SYSTEM COMMENCED OPERATIONS IN SEPTEMBER 1986.
PENNSYLVANIA POWER BRUCE MANSFIELD 1 NEW 835 MW (GROSS) 835 MW (ESC) COAL 3.50 %S BITUMINOUS LIME GE ENVIRONMENTAL SERVICES ENERGY CONSUMPTION: 4.2% STATUS 1 STARTUP 12/1975	BRUCE MANSFIELD 1 OF PENNSYLVANIA POWER IS A SUPERCRITICAL, BALANCED DRAFT BOILER FIRING PULVERIZED COAL (3.5% S, 12,000 BTU/LB) IN SHIPPINGPORT, PENNSYLVANIA. A GEESI THIOSORBIC LIME FGD SYSTEM WAS DESIGNED TO REMOVE FLYASH AND SO2 (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 (INCLUDED IN ORIGINAL DESIGN BUT LATER REMOVED FROM SERVICE) AND A 950 FOOT FLAKEGLASS STACK SHARED BY UNITS 1 AND 2. THE WATER LOOP IS OPEN, AND THE CALCILOX FIXED SLUDGE IS DISPOSED IN AN OFF-SITE POND. THIS SYSTEM HAS BEEN OPERATIONAL SINCE DECEMBER 1975.

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UNIT IDENTIFICATION	ABSTRACT
PENNSYLVANIA POWER BRUCE MANSFIELD 2 NEW 835 MW (GROSS) 835 MW (ESC) COAL 3.50 %S BITUMINOUS LIME GE ENVIRONMENTAL SERVICES ENERGY CONSUMPTION: 4.2% STATUS 1 STARTUP 7/1977	BRUCE MANSFIELD 2 OF PENNSYLVANIA POWER IS A SUPERCRITICAL, BALANCED DRAFT BOILER FIRING PULVERIZED COAL (3.5% S, 12,000 BTU/LB) IN SHIPPINGPORT, PENNSYLVANIA. A GEESI THIOSORBIC LIME FGD SYSTEM WAS DESIGNED TO REMOVE FLYASH AND SO2 (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 (INCLUDED IN ORIGINAL DESIGN BUT LATER REMOVED FROM SERVICE) AND A 950 FOOT FLAKEGLASS STACK SHARED BY UNITS 1 AND 2. THE WATER LOOP IS OPEN, AND THE CALCILOX FIXED SLUDGE IS DISPOSED IN AN OFF-SITE POND. THIS SYSTEM HAS BEEN OPERATIONAL SINCE JULY 1977.
PENNSYLVANIA POWER BRUCE MANSFIELD 3 NEW 835 MW (GROSS) 835 MW (ESC) COAL 4.30 %S BITUMINOUS LIME M.W. KELLOGG ENERGY CONSUMPTION: 3.0% STATUS 1 STARTUP 6/1980	BRUCE MANSFIELD 3 OF PENNSYLVANIA POWER IS A SUPERCRITICAL PULVERIZED COAL (4.3% S, 12,000 BTU/LB) FIRED BOILER LOCATED IN SHIPPINGPORT, PENNSYLVANIA. FOUR ESP'S TREAT 3,308,000 ACFM OF FLUE GAS, FOLLOWED BY FIVE (ONE SPARE) M. W. KELLOGG THIOSORBIC LIME ABSORBERS WHICH REMOVE 92.2% OF THE SO2. THE CLEANED GAS PASSES THROUGH CHEVRON MIST ELIMINATORS AND DIRECT COMBUSTION REHEATERS BEFORE DISCHARGE THROUGH A 600 FOOT INCONEL 625 STACK FLUE. THE SYSTEM OPERATES IN AN OPEN WATER LOOP MODE AND FLYASH STABILIZED SLUDGE IS PIPED TO AN OFF-SITE LANDFILL. OPERATIONS COMMENCED IN JUNE 1980.
PHILADELPHIA ELECTRIC CROMBY 1 RETROFIT 188 MW (GROSS) 176 MW (ESC) COAL 2.00 %S MAGNESIUM OXIDE UNITED ENGINEERS ENERGY CONSUMPTION: 3.7% STATUS 1 STARTUP 10/1982	PHILADELPHIA ELECTRIC HAS RETROFITTED AN FGD SYSTEM ON ONE OF THE TWO 2.0% SULFUR COAL FIRED BOILERS AT CROMBY STATION IN PHOENIXVILLE, PENNSYLVANIA. THE MAGNESIUM OXIDE SYSTEM WAS SUPPLIED BY UNITED ENGINEERS. FABRIC FILTERS AND PARTICLE SCRUBBERS ARE EMPLOYED FOR PARTTICULATE CONTROL. THE SYSTEM BECAME OPERATIONAL IN OCTOBER 1982.
PHILADELPHIA ELECTRIC EDDYSTONE 1 RETROFIT 354 MW (GROSS) 354 MW (ESC) COAL 2.00 %S MAGNESIUM OXIDE UNITED ENGINEERS ENERGY CONSUMPTION: 6.8% STATUS 1 STARTUP 9/1982	UNIT 1 OF PHILADELPHIA ELECTRIC'S EDDYSTONE, PENNSYLVANIA STATION IS A BITUMINOUS COAL (2.0% S, 13,600 BTU/LB) FIRED UNIT WHICH USES ESP'S, MECHANICAL COLLECTORS, AND THREE PARTICLE SCRUBBERS (TWO ROD DECK SPRAY TOWERS AND ONE VENTURI) FOR PRIMARY PARTICLE CONTROL. THE UNIT 1 FGD SYSTEM FOLLOWS THE TWO ROD DECK SPRAY TOWERS. UNITED ENGINEERS SUPPLIED A MAGNESIUM OXIDE FGD SYSTEM FOR SO2 EMISSION CONTROL SIMILAR TO THE MAGNESIUM OXIDE PROTOTYPE SYSTEM THAT WAS PREVIOUSLY OPERATED AT THIS UNIT. THE SYSTEM OPERATES IN AN OPEN WATER LOOP MODE. OPERATIN OF THE FGD SYSTEM COMMENCED IN SEPTEMBER 1982.
PHILADELPHIA ELECTRIC EDDYSTONE 2 RETROFIT 354 MW (GROSS) 354 MW (ESC) COAL 2.00 %S MAGNESIUM OXIDE UNITED ENGINEERS ENERGY CONSUMPTION: 4.8% STATUS 1 STARTUP 11/1982	EDDYSTONE 2 OF PHILADELPHIA ELECTRIC IS A 2.0% SULFUR COAL FIRED BOILER LOCATED IN EDDYSTONE, PENNSYLVANIA. THE PLANT'S GENERATING CAPACITY IS 334 MW. UNITED ENGINEERS HAS SUPPLIED A MAGNESIUM OXIDE FGD SYSTEM FOR EMISSION CONTROL AND PARTICLE SCRUBBERS ARE EMPLOYED FOR PARTICULATE REMOVAL. OPERATIONS COMMENCED IN NOVEMBER 1982.
PLAINS ELECTRIC G & T PLAINS ESCALANTE 1 NEW 233 MW (GROSS) 233 MW (ESC) COAL 0.80 %S SUBBITUMINOUS LIMESTONE COMBUSTION ENGINEERING ENERGY CONSUMPTION: 3.9% STATUS 1 STARTUP 11/1984	PLAINS ESCALANTE 1 OF PLAINS ELECTRIC G & T IS A PULVERIZED SUBBITUMINOUS COAL (.80% S) FIRED UNIT LOCATED IN PREWITT, NEW MEXICO. THE 233 MW BOILER SUPPLIED BY COMBUSTION ENGINEERING USES A WET LIMESTONE SCRUBBING PROCESS (ALSO SUPPLIED BY COMBUSTION ENGINEERING) FOR SO2 CONTROL. THREE OPEN COUNTERCURRENT SPRAY TOWERS (1 SPRAY) PROVIDE AN SO2 REMOVAL EFFICIENCY OF 75%. A FABRIC FILTER SUPPLIED BY GE ENVIRONMENTAL SERVICES PROVIDES PRIMARY PARTICLE CONTROL. SLUDGE IS MIXED WITH FLYASH AND DISPOSED OF IN AN ON-SITE LANDFILL. OPERATION COMMENCED IN NOVEMBER 1984.

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UNIT IDENTIFICATION	ABSTRACT
PLATTE RIVER POWER AUTHORITY RAWHIDE 1 NEW 278 MW (GROSS) 278 MW (ESC) COAL 0.34 %S BITUMINOUS LIME/SPRAY DRYING JOY MFG/NIRO ATOMIZER ENERGY CONSUMPTION: 4.3% STATUS 1 STARTUP 12/1983	RAWHIDE 1, OF THE PLATTE RIVER POWER AUTHORITY, IS LOCATED IN WELLINGTON, COLORADO. THE 279 MW PULVERIZED COAL (0.34% S, 8500 BTU/LB) FIRED BOILER WAS SUPPLIED BY COMBUSTION ENGINEERING. JOY MANUFACTURING/NIRO ATOMIZER SUPPLYED A DRY LIME SCRUBBING SYSTEM FOR SO2 CONTROL AND FABRIC FILTERS ARE EMPLOYED FOR PARTICULATE REMOVAL. THE SYSTEM OPERATES IN A CLOSED WATER LOOP MODE AND SLUDGE IS DISPOSED OF IN A LANDFILL. FLUE GAS EXITS A 505 FT STACK. THE UNIT COMMENCED INITIAL OPERATIONS IN DECEMBER 1983.
PUBLIC SERVICE INDIANA GIBSON 5 NEW 667 MW (GROSS) 667 MW (ESC) COAL 3.30 %S LIMESTONE M.W. KELLOGG ENERGY CONSUMPTION: 2.5% STATUS 1 STARTUP 10/1982	GIBSON 5 OF PUBLIC SERVICE OF INDIANA IS A 3.3% SULFUR COAL FIRED UNIT LOCATED IN PRINCETON, INDIANA. THE SYSTEM SUPPLIER, M.W. KELLOG, HAS INSTALLED A LIMESTONE FGD SYSTEM CONSISTING OF FOUR KELLOGG-WEIR ABSORBER-REACTOR MODULES. THE SYSTEM USES KELLOGG'S PROPRIETARY MAGNESIUM-PROMOTED LIMESTONE. ESP'S ARE EMPLOYED FOR PARTICULATE CONTROL AND FLUE GAS EXITS A 500 FT STACK. THE SYSTEM OPERATES IN A CLOSED WATER LOOP MODE. OPERATINS COMMENCED IN OCTOBER 1982.
PUBLIC SERVICE OF COLORADO CHEROKEE 4 RETROFIT 375 MW (GROSS) 350 MW (ESC) COAL 0.65 %S BITUMINOUS SODIUM BICARBONATE PUBLIC SERVICE OF COLORADO ENERGY CONSUMPTION: 6.7% STATUS 2 STARTUP 4/1989	CHEROKEE 4 OF PUBLIC SERVICE COMPANY OF COLORADO IS A PULVERIZED COAL (0.65% S, 10,100 BTU/LB) FIRED UNIT IN DENVER, COLORADO. THE UNIT WAS ORIGINALLY EQUIPPED WITH AN ESP FOLLOWED BY A WET PACKED TOWER PARTICLE SCRUBBER FOR PRIMARY PARTICULATE CONTROL. THIS EQUIPMENT IS CURRENTLY BEING REPLACED WITH A GEESI SUPPLIED FABRIC FILTER PROCEDED BY A DRY SODIUM BICARBONATE INJECTION SYSTEM DESIGNED BY THE UTILITY FOR PARTICULATE AND SO2 CONTROL. THE RETROFIT DRY INJECTION SYSTEM WILL MEET THE EPA REQUIRED 20% SO2 REDUCTION LEVEL EQUIVALENCY ON BOTH UNITS 1 AND 4. OPERATION IS SCHEDULED TO COMMENCE IN APRIL 1989.
PUBLIC SERVICE OF COLORADO PAWNEE 2 NEW 500 MW (GROSS) 500 MW (ESC) 0.35 %S TRONA/DRY INJECTION VENDOR NOT SELECTED ENERGY CONSUMPTION: 2.6% STATUS 6 STARTUP 0/1994	PUBLIC SERVICE COMPANY OF COLORADO HAS PLANS FOR A NEW UNIT, PAWNEE 2, TO BE LOCATED NEAR RUSH, COLORADO. THE 500 MW (GROSS) BABCOCK & WILCOX BOILER WILL FIRE SUBBITUMINOUS COAL (8290 BTU/LB, .35% S). FABRIC FILTERS WILL BE UTILIZED FOR PARTICULATE REMOVAL AND SO2 EMISSIONS WILL BE CONTROLLED THROUGH INJECTION OF DRY TRONA. THE TRONA WILL BE PULVERIZED AND BLOWN INTO THE DUCTWORK UPSTREAM OF THE BAGHOUSE FOR CONTACT WITH FLUE GAS ON THE DUCT AND BAGHOUSE SURFACES. FLUE GAS WILL EXIT A 450 FOOT STACK. INITIAL START UP IS SCHEDULED FOR 1994.
PUBLIC SERVICE OF NEW MEXICO SAN JUAN 1 RETROFIT 361 MW (GROSS) 361 MW (ESC) COAL 0.80 %S SUBBITUMINOUS WELLMAN LORD DAVY MCKEE ENERGY CONSUMPTION: 4.4% STATUS 1 STARTUP 4/1978	SAN JUAN 1 OF PUBLIC SERVICE OF NEW MEXICO IN WATERFLOW, NEW MEXICO IS A COAL (0.8% S, 9000 BTU/LB) FIRED BOILER WHICH SUPPLIES 1,319,000 ACFM OF FLUE GAS TO A RETROFIT WELLMAN LORD FGD SYSTEM BY DAVY MCKEE. THE EMISSION CONTROL SYSTEM, OPERATIONAL SINCE APRIL 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 SO2. AN INDIRECT HOT AIR REHEATER PRECEDES A 400 FT BRICK LINED STACK. ACCORDING TO THE ORIGINAL DESIGN, THE SYSTEM EMPLOYED THE ALLIED CHEMICAL PROCESS FOR ELEMENTAL SULFUR RECOVERY. THE SYSTEM HAS SINCE BEEN MODIFIED TO PRODUCE SULFURIC ACID. THE WATER LOOP IS CLOSED.
PUBLIC SERVICE OF NEW MEXICO SAN JUAN 2 RETROFIT 350 MW (GROSS) 350 MW (ESC) COAL 0.80 %S SUBBITUMINOUS WELLMAN LORD DAVY MCKEE ENERGY CONSUMPTION: 4.6% STATUS 1 STARTUP 8/1978	SAN JUAN 2 OF PUBLIC SERVICE OF NEW MEXICO IN WATERFLOW, NEW MEXICO IS A COAL (0.8% S, 9000 BTU/LB) FIRED BOILER WHICH SUPPLIES 1,319,000 ACFM OF FLUE GAS TO A RETROFIT WELLMAN LORD FGD SYSTEM BY DAVY MCKEE. THE EMISSION CONTROL SYSTEM, OPERATIONAL SINCE AUGUST 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 SO2. AN INDIRECT HOT AIR REHEATER PRECEDES A 400 FT BRICK LINED STACK. ACCORDING TO THE ORIGINAL DESIGN, THE SYSTEM EMPLOYED THE ALLIED CHEMICAL PROCESS FOR ELEMENTAL SULFUR RECOVERY. THE SYSTEM HAS SINCE BEEN MODIFIED TO PRODUCE SULFURIC ACID. THE WATER LOOP IS CLOSED.

SECTION 2
STATUS OF FGD SYSTEMS

UNIT IDENTIFICATION	ABSTRACT
PUBLIC SERVICE OF NEW MEXICO SAN JUAN 3 NEW 544 MW (GROSS) 544 MW (ESC) COAL 0.80 %S SUBBITUMINOUS WELLMAN LORD DAVY MCKEE ENERGY CONSUMPTION: 3.5% STATUS 1 STARTUP 12/1979	SAN JUAN 3 IS A COAL (0.8% S, 9000 BTU/LB) FIRED UNIT OF THE PUBLIC SERVICE OF NEW MEXICO AND IS LOCATED IN WATERFLOW, NEW MEXICO. THE FGD SYSTEM, SUPPLIED BY DAVY MCKEE UTILIZES THE WELLMAN LORD SO2 RECOVERY RECOVERY PROCESS AND SULFURIC ACID IS PRODUCED AS THE END PRODUCT. FIVE (ONE SPARE) VENTURI SCRUBBER/SPRAY TOWER ABSORBER (90% DESIGN SO2 REMOVAL TRAINS FOLLOW A HOT SIDE ESP AND FLUE GAS EXITS A 400 FT STACK. 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.
PUBLIC SERVICE OF NEW MEXICO SAN JUAN 4 NEW 544 MW (GROSS) 544 MW (ESC) COAL 0.80 %S SUBBITUMINOUS WELLMAN LORD DAVY MCKEE ENERGY CONSUMPTION: 3.5% STATUS 1 STARTUP 5/1982	SAN JUAN 4 IS A COAL (0.8% S, 8100 BTU/LB) FIRED UNIT OF THE PUBLIC SERVICE OF NEW MEXICO LOCATED IN WATERFLOW, NEW MEXICO. THE FGD SYSTEM, WHICH WAS SUPPLIED BY DAVY MCKEE, UTILIZES THE WELLMAN LORD SO2 RECOVERY PROCESS AND SULFURIC ACID IS PRODUCED AS THE END PRODUCT. FIVE (ONE SPARE) VENTURI SCRUBBER/SPRAY TOWER ABSORBER (90% DESIGN SO2 REMOVAL) TRAINS FOLLOW A HOT SIDE ESP AND FLUE GAS EXITS A 400 FT STACK. AN INDIRECT HOT AIR REHEATER BOOSTS THE GAS TEMPERATURE 50 DEG F. THE SYSTEM OPERAES WATER LOOP MODE. THE SYSTEM COMMENCED OPERATIONS IN MAY 1982.
SALT RIVER PROJECT CORONADO 1 NEW 400 MW (GROSS) 320 MW (ESC) COAL 0.55 %S SUBBITUMINOUS LIMESTONE M.W. KELLOGG ENERGY CONSUMPTION: 1.3% STATUS 1 STARTUP 11/1979	SALT RIVER PROJECT'S CORONADO 1 IS A DRY BOTTOM PULVERIZED SUBBITUMINOUS COAL (0.55% S, 10,800 BTU/LB) FIRED BOILER LOCATED IN ST. JOHNS, ARIZONA. M. W. KELLOGG SUPPLIED THE TWO LIMESTONE HORIZONTAL WEIR SPRAY TOWERS WHICH REMOVE 82.5% OF THE SO2 FROM THE FLUE GAS PASSED THROUGH THEM. PARTICLE SCRUBBERS AND ESP'S ARE EMPLOYED FOR PARTICULATE REMOVAL AND VERTICAL HEIL MIST ELIMINATORS PRECEDE A 500 FT STACK. A MINIMUM OF 20% BYPASS PROVIDES REHEAT. THE WATER LOOP IS OPEN, AND THE UNSTABILIZED SLUDGE IS DISPOSED OF IN AN UNLINED POND. START-UP WAS IN NOVEMBER 1979.
SALT RIVER PROJECT CORONADO 2 NEW 400 MW (GROSS) 320 MW (ESC) COAL 0.55 %S SUBBITUMINOUS LIMESTONE M.W. KELLOGG ENERGY CONSUMPTION: 1.3% STATUS 1 STARTUP 7/1980	SALT RIVER PROJECT'S CORONADO 2 IS A DRY BOTTOM PULVERIZED SUBBITUMINOUS COAL (0.55% S, 10,800 BTU/LB) FIRED BOILER LOCATED IN ST. JOHNS, ARIZONA. M. W. KELLOGG SUPPLIED TWO LIMESTONE HORIZONTAL WEIR SPRAY TOWERS WHICH REMOVE 82.5% OF THE SO2 FROM THE FLUE GAS PASSED THROUGH THEM. PARTICLE SCRUBBERS AND ESP'S ARE EMPLOYED FOR PARTICULATE REMOVAL AND VERTICAL HEIL MIST ELIMINATORS PRECEDE A 500 FT STACK. A MINIMUM OF 20% BYPASS PROVIDES REHEAT. THE WATER LOOP IS OPEN, AND THE UNSTABILIZED SLUDGE IS DISPOSED OF IN AN UNLINED POND. START-UP WAS IN JULY 1980.
SALT RIVER PROJECT CORONADO 3 NEW 400 MW (GROSS) 320 MW (ESC) COAL 0.60 %S SUBBITUMINOUS LIMESTONE SRP/M. W. KELLOGG ENERGY CONSUMPTION: 3.8% STATUS 2 STARTUP 0/1991	SALT RIVER PROJECT HAS STARTED CONSTRUCTION ON CORONADO 3, A DRY BOTTOM PULVERIZED SUBBITUMINOUS COAL (.60%S, 8300 BTU /LB) FIRED UNIT PLANNED BY SALT RIVER PROJECT TO BE LOCATED IN ST. JOHNS, ARIZONA. THE UTILITY WILL UTILIZE TWO HORIZONTAL LIMESTONE SPRAY TOWERS FOR SO2 CONTROL AND FABRIC FILTERS FOR PARTICULATE REMOVAL. THE SYSTEM WILL HAVE A 20% BYPASS REHEAT, AN OPEN WATER LOOP, A 200 FT STACK AND THE SLUDGE WILL BE PONDED. SCHEDULED OPERATIONS ARE PLANNED TO BEGIN IN 1991.
SAN ANTONIO PUBLIC SERVICE CALAVERAS 5 NEW 535 MW (GROSS) 535 MW (ESC) LIGNITE 0.35 %S SUBBITUMINOUS LIMESTONE VENDOR NOT SELECTED ENERGY CONSUMPTION: 2.8% STATUS 5 STARTUP 5/1992	SAN ANTONIO PUBLIC SERVICE HAS PLANS FOR TWO NEW UNITS, CALAVERAS 1 AND 2, TO BE LOCATED NEAR SAN ANTONIO, TEXAS. THE PULVERIZED SUBBITUMINOUS COAL FIRED UNITS WILL HAVE A GROSS MEGAWATT RATING OF 500 EACH AND WILL UTILIZE A LIMESTONE FGD SYSTEM. THE TWO UNITS ARE SCHEDULED TO COMMENCE OPERATIONS IN 1992 AND 1997 RESPECTIVELY.

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UNIT IDENTIFICATION	ABSTRACT
SAN ANTONIO PUBLIC SERVICE CALAVERAS 6 NEW 535 MW (GROSS) 535 MW (ESC) LIGNITE 0.35 %S SUBBITUMINOUS LIMESTONE VENDOR NOT SELECTED ENERGY CONSUMPTION: 2.8% STATUS 5 STARTUP 5/1997	SAN ANTONIO PUBLIC SERVICE HAS PLANS FOR TWO NEW UNITS, CALAVERAS 1 AND 2, TO BE LOCATED NEAR SAN ANTONIO, TEXAS. THE PULVERIZED SUBBITUMINOUS COAL FIRED UNITS WILL HAVE A GROSS MEGAWATT RATING OF 500 EACH AND WILL UTILIZE A LIMESTONE FGD SYSTEM. THE TWO UNITS ARE SCHEDULED TO COMMENCE OPERATIONS IN 1992 AND 1997 RESPECTIVELY.
SAN MIGUEL ELECTRIC SAN MIGUEL 1 NEW 410 MW (GROSS) 410 MW (ESC) COAL 2.39 %S LIGNITE LIMESTONE BABCOCK & WILCOX ENERGY CONSUMPTION: 3.2% STATUS 1 STARTUP 8/1981	SAN MIGUEL 1 OF THE SAN MIGUEL ELECTRIC COOP IS A LIGNITE (2.39% S, 5000 BTU/LB) FIRED RADIANT BOILER LOCATED IN SAN MIGUEL, TEXAS. THE EMISSION CONTROL SYSTEM ON THIS UNIT CONSISTS OF A COLD SIDE ESP FOLLOWED BY FOUR BABCOCK AND WILCOX 86% EFFICIENT LIMESTONE TRAY TOWERS. CHEVRON MIST ELIMINATORS PRECEDE AN IN-LINE REHEATER AND A 450 FT ACID BRICK LINED STACK. THE SYSTEM OPERATES IN A CLOSED WATER LOOP MODE. WASTE SLUURY IS DEWATERED, MIXED WITH FLYASH AND DISPOSED OF IN AN OFF-SITE LANDFILL. OPERATIONS COMMENCED IN AUGUST 1981.
SEMINOLE ELECTRIC SEMINOLE 1 NEW 650 MW (GROSS) 650 MW (ESC) COAL 3.00 %S BITUMINOUS LIMESTONE PEABODY PROCESS SYSTEMS ENERGY CONSUMPTION: 2.5% STATUS 1 STARTUP 5/1983	SEMINOLE 1 OF SEMINOLE ELECTRIC IS A PULVERIZED COAL (2.75% S, 11,700 BTU/LB) UNIT LOCATED IN PALATKA, FLORIDA. THE EMISSION CONTROL SYSTEM CONSISTS OF RESEARCH-COTTRELL ESP'S WITH 99.6% REMOVAL EFFICIENCY AND A PEABODY PROCESS LIMESTONE FGD SYSTEM DESIGNED TO REMOVE 86% OF THE SO2. AN ADDITIONAL 4% SO2 REMOVAL IS ACHIEVED THROUGH COAL WASHING. THE CLEANED FLUE GAS EXITS THROUGH A 675 FOOT ACID BRICK LINED STACK AND SLUDGE DISPOSAL IS HANDLED VIA THE POZ-O-TEC CONVERSION SYSTEM. START-UP COMMENCED IN MAY 1983.
SEMINOLE ELECTRIC SEMINOLE 2 NEW 650 MW (GROSS) 650 MW (ESC) COAL 3.00 %S BITUMINOUS LIMESTONE PEABODY PROCESS SYSTEMS ENERGY CONSUMPTION: 2.5% STATUS 1 STARTUP 9/1984	SEMINOLE 2 OF SEMINOLE ELECTRIC IS A PULVERIZED COAL (2.75% S, 11,700 BTU/LB) UNIT LOCATED IN PALATKA, FLORIDA. THE EMISSION CONTROL SYSTEM CONSISTS OF RESEARCH-COTTRELL ESP'S WITH 99.6% REMOVAL EFFICIENCY AND A PEABODY PROCESS LIMESTONE FGD SYSTEM DESIGNED TO REMOVE 86% OF THE SO2. AN ADDITIONAL 4% SO2 REMOVAL IS ACHIEVED THROUGH COAL WASHING. THE CLEANED FLUE GAS EXITS THROUGH A 675 FOOT ACID BRICK LINED STACK AND SLUDGE DISPOSAL IS HANDLED VIA THE POZ-O-TEC CONVERSION SYSTEM. START-UP COMMENCED IN SEPTEMBER 1984.
SIERRA PACIFIC POWER NORTH VALMY 2 NEW 288 MW (GROSS) 288 MW (ESC) COAL 0.50 %S LIME/SPRAY DRYING ROCKWELL INTERNATIONAL ENERGY CONSUMPTION: 0.3% STATUS 1 STARTUP 5/1985	NORTH VALMY 2 OF PACIFIC POWER IS A 276 MW UNIT LOCATED IN VALMY, NEVADA. THE FOSTER WHEELER PULVERIZED COAL (.5% S) FIRED BOILER AT THE NORTH VALMY 2 STATION UTILIZES A LIME/SPRAY DRYING FGD SYSTEM SUPPLIED BY ROCKWELL INTERNATIONAL FOR SO2 CONTROL. A FABRIC FILTER CONTROLS EMISSIONS AND FLUE GAS EXISTS VIA A 500 FOOT STACK. THE UNIT COMMENCED OPERATIONS IN MAY 1985.
SIERRA PACIFIC POWER THOUSAND SPRINGS 1 NEW 250 MW (GROSS) 250 MW (ESC) COAL ***** %S PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: 2.4% STATUS 6 STARTUP 99/2050	SIERRA PACIFIC POWER HAS PLANS FOR THREE NEW UNITS, THOUSAND SPRINGS 1, 2, AND 3 TO BE LOCATED IN WELLS, NEVADA. THE UNITS WILL HAVE A GROSS MEGAWATT RATING OF 250 EACH AND WILL UTILIZE AN FGD SYSTEM FOR CONTROL OF SO2 EMISSIONS. UNITS 1, 2 AND 3 ARE SCHEDULED TO START UP IN 1990, 1995 AND 1999 RESPECTIVELY. START-UP HAS BEEN DEFERRED INDEFINITELY.

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UNIT IDENTIFICATION	ABSTRACT
SIERRA PACIFIC POWER THOUSAND SPRINGS 2 NEW 250 MW (GROSS) 250 MW (ESC) COAL ***** %S PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: 2.4% STATUS 6 STARTUP 99/2050	SIERRA PACIFIC POWER HAS PLANS FOR THREE NEW UNITS, THOUSAND SPRINGS 1, 2, AND 3 TO BE LOCATED IN WELLS, NEVADA. THE UNITS WILL HAVE A GROSS MEGAWATT RATING OF 250 EACH AND WILL UTILIZE AN FGD SYSTEM FOR CONTROL OF SO2 EMISSIONS. UNITS 1, 2 AND 3 ARE SCHEDULED TO START UP IN 1990, 1995 AND 1999 RESPECTIVELY. START-UP HAS BEEN DEFERRED INDEFINITELY.
SIERRA PACIFIC POWER THOUSAND SPRINGS 3 NEW 250 MW (GROSS) 250 MW (ESC) COAL ***** %S PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: 2.4% STATUS 6 STARTUP 99/2050	SIERRA PACIFIC POWER HAS PLANS FOR THREE NEW UNITS, THOUSAND SPRINGS 1, 2, AND 3 TO BE LOCATED IN WELLS, NEVADA. THE UNITS WILL HAVE A GROSS MEGAWATT RATING OF 250 EACH AND WILL UTILIZE AN FGD SYSTEM FOR CONTROL OF SO2 EMISSIONS. UNITS 1, 2 AND 3 ARE SCHEDULED TO START UP IN 1990, 1995 AND 1999 RESPECTIVELY. START-UP HAS BEEN DEFERRED INDEFINITELY.
SIKESTON BRD OF MUNICIPAL UTIL SIKESTON 1 NEW 235 MW (GROSS) 235 MW (ESC) COAL 2.80 %S BITUMINOUS LIMESTONE BABCOCK & WILCOX ENERGY CONSUMPTION: 1.7% STATUS 1 STARTUP 6/1981	THE SIKESTON BOARD OF MUNICIPAL UTILITIES' SIKESTON 1 IS A PULVERIZED COAL (2.8% S, 11,340 BTU/LB) FIRED BOILER LOCATED IN SIKESTON, MISSOURI. BABCOCK AND WILCOX SUPPLIED THE EMISSION CONTROL SYSTEM CONSISTING OF TWO ESP'S AND THREE 50% CAPACITY LIMESTONE VENTURI FGD MODULES. THE CLEANED GAS PASSES 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 MODE IS OPEN, AND THE SLUDGE IS PONDED. THE SYSTEM STARTED OPERATIONS IN JUNE 1981.
SOUTH CAROLINA PUBLIC SERVICE CROSS 1 NEW 510 MW (GROSS) 450 MW (ESC) COAL 1.80 %S BITUMINOUS LIMESTONE PEABODY PROCESS SYSTEMS ENERGY CONSUMPTION: ****% STATUS 3 STARTUP 99/2050	SOUTH CAROLINA PUBLIC SERVICE HAS PLANS TO CONSTRUCT A NEW UNIT, CROSS 1, TO BE LOCATED IN CROSS, SOUTH CAROLINA. THE 450 MW BOILER WILL FIRE COAL (1.8% S, 11,200 BTU/LB). THE UTILITY HAS SIGNED A CONTRACT WITH PEABODY PROCESS SYSTEMS FOR THE INSTALLATION OF A WET LIMESTONE SCRUBBING SYSTEM TO CONTROL SO2 EMISSIONS. A COLD SIDE ESP WILL CONTROL PARTICLE EMISSIONS AND THE CLEANED FLUE GAS WILL EXIT A 600 FOOT STACK. THE SYSTEM WILL OPERATE IN A CLOSED WATER LOOP MODE. START-UP HAS BEEN DEFERRED INDEFINITELY.
SOUTH CAROLINA PUBLIC SERVICE CROSS 2 NEW 510 MW (GROSS) 510 MW (ESC) COAL 1.80 %S BITUMINOUS LIMESTONE PEABODY PROCESS SYSTEMS ENERGY CONSUMPTION: 2.4% STATUS 1 STARTUP 10/1983	SOUTH CAROLINA PUBLIC SERVICE HAS ANNOUNCED THE INITIAL START-UP OF CROSS 2, LOCATED IN CROSS, SOUTH CAROLINA. THE 450 MW BOILER FIRES 1.8% S, 11,200 BTU/LB COAL. A WET LIMESTONE SCRUBBING SYSTEM SUPPLIED BY PEABODY PROCESS SYSTEMS CONTROLS SO2 EMISSIONS AND PARTICULATE MATTER IS CONTROLLED VIA A COLD SIDE ESP. THE CLEANED FLUE GAS EXITS A 600 FT STACK AND THE SYSTEM OPERATES IN A CLOSED WATER LOOP MODE. INITIAL START-UP COMMENCED IN OCTOBER 1983.
SOUTH CAROLINA PUBLIC SERVICE PEE DEE 1 NEW 550 MW (GROSS) 550 MW (ESC) COAL ***** %S LIMESTONE VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 6 STARTUP 0/2005	SOUTH CAROLINA PUBLIC SERVICE HAS TENTATIVE PLANS FOR TWO NEW UNITS, PEE DEE 1 AND 2, TO BE LOCATED NEAR FLORENCE, SOUTH CAROLINA. THE COAL FIRED UNITS WILL HAVE A GROSS MEGAWATT RATING OF 550 EACH AND WILL UTILIZE A WET LIMESTONE FGD SYSTEM. THE TWO UNITS ARE SCHEDULED TO COMMENCE OPERATIONS SOMETIME AFTER THE YEAR 2000.

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UNIT IDENTIFICATION	ABSTRACT
SOUTH CAROLINA PUBLIC SERVICE PEE DEE 2 NEW 550 MW (GROSS) 550 MW (ESC) COAL ***** %S LIMESTONE VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 6 STARTUP 0/2006	SOUTH CAROLINA PUBLIC SERVICE HAS TENTATIVE PLANS FOR TWO NEW UNITS, PEE DEE 1 AND 2, TO BE LOCATED NEAR FLORENCE, SOUTH CAROLINA. THE COAL FIRED UNITS WILL HAVE A GROSS MEGAWATT RATING OF 550 EACH AND WILL UTILIZE A WET LIMESTONE FGD SYSTEM. THE TWO UNITS ARE SCHEDULED TO COMMENCE OPERATIONS SOMETIME AFTER THE YEAR 2000.
SOUTH CAROLINA PUBLIC SERVICE WINYAH 2 NEW 315 MW (GROSS) 158 MW (ESC) COAL 1.00 %S BITUMINOUS LIMESTONE BABCOCK & WILCOX ENERGY CONSUMPTION: 1.0% STATUS 1 STARTUP 7/1977	WINYAH 2 OF SOUTH CAROLINA PUBLIC SERVICE IS A PULVERIZED BITUMINOUS COAL (1.00% 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 45% OF THE SO2 FROM THE BOILER FLUE GAS (50% GAS BYPASSES SCRUBBER) MAKE UP THE EMISSION CONTROL SYSTEM ON THIS UNIT. THE SYSTEM OPERATES IN AN OPEN WATER LOOP, THE SLUDGE IS DISPOSED IN AN UNLINED POND AND FLUE GAS EXITS A 400 FT STACK. OPERATIONS COMMENCED IN JULY 1977.
SOUTH CAROLINA PUBLIC SERVICE WINYAH 3 NEW 315 MW (GROSS) 315 MW (ESC) COAL 1.00 %S BITUMINOUS LIMESTONE BABCOCK & WILCOX ENERGY CONSUMPTION: 2.2% STATUS 1 STARTUP 7/1980	WINYAH 3 OF SOUTH CAROLINA PUBLIC SERVICE IS A DRY BOTTOM BOILER WHICH FIRES 1.0% SULFUR COAL (11,500 BTU/LB) AND IS LOCATED IN GEORGETOWN, SOUTH CAROLINA. AN ESP PRECEDES A BABCOCK AND WILCOX LIMESTONE FGD SYSTEM AND AN INDIRECT STEAM REHEATER. THE SYSTEM OPERATES IN A CLOSED WATERLOOP MODE AND FLUE GAS EXITS A 400 FT STACK. OPERATIONS COMMENCED IN JULY 1980.
SOUTH CAROLINA PUBLIC SERVICE WINYAH 4 NEW 315 MW (GROSS) 315 MW (ESC) COAL 1.70 %S BITUMINOUS LIMESTONE AMERICAN AIR FILTER ENERGY CONSUMPTION: 2.2% STATUS 1 STARTUP 7/1981	SOUTH CAROLINA PUBLIC SERVICE'S WINYAH 4 IS A BITUMINOUS COAL (1.70% S, 11,500 BTU/LB) FIRED UNIT LOCATED IN GEORGETOWN, SOUTH CAROLINA. TWO AMERICAN AIR FILTER LIMESTONE SLURRY SPRAY TOWERS FOLLOW AN ESP. THE TEMPERATURE OF THE CLEANED GAS IS RAISED BY AN INDIRECT STEAM REHEATER. THE SYSTEM OPERATES IN A CLOSED WATER LOOP MODE. INITIAL OPERATIONS COMMENCED IN JULY 1981.
SOUTH MISSISSIPPI ELEC PWR R.D. MORROW, SR. 1 NEW 215 MW (GROSS) 133 MW (ESC) COAL 1.64 %S BITUMINOUS LIMESTONE ENVIRONEERING, RILEY STOKER ENERGY CONSUMPTION: 2.8% STATUS 1 STARTUP 8/1978	R.D. MORROW 1 OF SOUTHERN MISSISSIPPI ELEC. IS A PULVERIZED COAL (1.64% S, 12,250 BTU/LB) FIRED UNIT IN PURVIS, MISSISSIPPI. THE EMISSION CONTROL SYSTEM FOR THIS UNIT CONSISTS OF A HOT SIDE ESP FOLLOWED BY A LIMESTONE VENTRI-ROD ABSORBER SUPPLIED BY RILEY STOKER/ENVIRONEERING. AFTER THE CLEANED GAS PASSES THROUGH A VERTICAL CHEVRON MIST ELIMINATOR, IT IS JOINED BY A 38% BYPASS REHEAT BEFORE IT IS DISCHARGED THROUGH A 400 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 1978.
SOUTH MISSISSIPPI ELEC PWR R.D. MORROW, SR. 2 NEW 215 MW (GROSS) 133 MW (ESC) COAL 1.64 %S BITUMINOUS LIMESTONE ENVIRONEERING, RILEY STOKER ENERGY CONSUMPTION: 2.8% STATUS 1 STARTUP 6/1979	R.D. MORROW 2 OF SOUTHERN MISSISSIPPI ELEC. IS A PULVERIZED COAL (1.64% S, 12,250 BTU/LB) FIRED UNIT IN PURVIS, MISSISSIPPI. THE EMISSION CONTROL SYSTEM FOR THIS UNIT CONSISTS OF A HOT SIDE ESP FOLLOWED BY A LIMESTONE VENTRI-ROD ABSORBER SUPPLIED BY RILEY STOKER/ENVIRONEERING. AFTER THE CLEANED GAS PASSES THROUGH A VERTICAL CHEVRON MIST ELIMINATOR, IT IS JOINED BY A 38% BYPASS REHEAT BEFORE IT IS DISCHARGED THROUGH A 400 FOOT STACK SHARED BY UNITS 1 AND 2 (EACH UNIT HAS ITS OWN ACID BRICK LINE DFLUE). 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 1979.

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UNIT IDENTIFICATION	ABSTRACT
SOUTHERN ILLINOIS POWER MARION 4 NEW 184 MW (GROSS) 184 MW (ESC) COAL/REFUS 3.75 %S BITUMINOUS LIMESTONE BABCOCK & WILCOX ENERGY CONSUMPTION: 2.2% STATUS 1 STARTUP 4/1979	UNIT 4 AT SOUTHERN ILLINOIS POWER COOP'S MARION STATION IN MARION, ILLINOIS IS A CYCLONE FIRED COAL (3.75% S, 11000 BTU/LB) UNIT WHICH IS SERVED BY A 89.4% EFFICIENT (DESIGN) LIMESTONE FGD SYSTEM SUPPLIED BY BABCOCK AND WILCOX. TWO SPRAY TOWERS AND A 400 FT BRICK LINED STACK ARE DOWNSTREAM OF AN ESP IN THIS SYSTEM. THE WATER LOOP IS CLOSED, AND THE FLYASH STABILIZED SLUDGE IS DEWATERED AND LANDFILLED. THE SYSTEM BECAME OPERATIONAL DURING APRIL 1979.
SOUTHERN INDIANA GAS & ELEC A.B. BROWN 1 NEW 265 MW (GROSS) 225 MW (ESC) COAL 3.35 %S BITUMINOUS DUAL ALKALI FMC ENERGY CONSUMPTION: 0.8% STATUS 1 STARTUP 3/1979	SOUTHERN INDIANA GAS AND ELECTRIC'S A.B.BROWN 1 IS A DRY BOTTOM PULVERIZED COAL (3.35% S, 11,100 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 1979.
SOUTHERN INDIANA GAS & ELEC A.B. BROWN 2 NEW 265 MW (GROSS) 265 MW (ESC) COAL 3.35 %S BITUMINOUS DUAL ALKALI FMC ENERGY CONSUMPTION: 0.8% STATUS 1 STARTUP 2/1986	SOUTHERN INDIANA GAS AND ELECTRIC HAS A NEW UNIT, A. B. BROWN 2, LOCATED IN WEST FRANKLIN, INDIANA. THE 265-MW UNIT, SUPPLIED BY BABCOCK & WILCOX FIRES BITUMINOUS COAL (3.35% S, 11,100 BTU/LB). A COLD SIDE ESP PROVIDES PRIMARY PARTICULATE MATTER CONTROL AND A DUAL ALKALI FGD SYSTEM SUPPLIED BY FMC PROVIDES FOR SO2 CONTROL. THE FLUE GAS EXITS THROUGH A 498 FOOT STACK. THE SYSTEM OPERATES IN A CLOSED WATER LOOP MODE AND THE SLUDGE IS DISPOSED OF IN AN ON-SITE LANDFILL. OPERATIONS COMMENCED IN FEBRUARY 1986.
SOUTHWESTERN ELECTRIC POWER DOLET HILLS 1 NEW 720 MW (GROSS) 720 MW (ESC) COAL 0.70 %S LIGNITE LIMESTONE AIR CORRECTION DIVISION, UOP ENERGY CONSUMPTION: 2.5% STATUS 1 STARTUP 12/1985	DOLET HILLS 1 OF SOUTHWESTERN ELECTRIC POWER IS A 720 MW LIGNITE (0.7% S, 7100 BTU/LB) FIRED BOILER LOCATED IN MANSFIELD, LOUISIANA. THE EMISSION CONTROL SYSTEM CONSISTS OF AN ESP FOR PARTICULATE CONTROL AND A WET LIMESTONE FGD SYSTEM FOR SO2 CONTROL. THE FLUE GAS EXITS THROUGH A 525 FOOT STACK AND THE SYSTEM OPERATES IN A CLOSED WATER LOOP MODE. INITIAL START-UP IS SCHEDULED FOR DECEMBER 1985.
SOUTHWESTERN ELECTRIC POWER HENRY W. PIRKEY 1 NEW 720 MW (GROSS) 720 MW (ESC) COAL 0.80 %S LIGNITE LIMESTONE AIR CORRECTION DIVISION, UOP ENERGY CONSUMPTION: 2.5% STATUS 1 STARTUP 12/1984	HENRY W. PIRKEY 1 OF SOUTHWESTERN ELECTRIC POWER IS A WET BOTTOM LIGNITE (0.8% S, 6300 BTU/LB) FIRED UNIT LOCATED IN HALLSVILLE, TEXAS. THE AIR CORRECTION DIVISION OF UOP SUPPLIED FOUR LIMESTONE SPRAY TOWERS DESIGNED TO REMOVE 99% OF THE FLUE GAS SO2. A COLD SIDE ESP PROVIDES PRIMARY PARTICULATE CONTROL. ABSORBER TOWER MIST ELIMINATION IS PROVIDED BY TWO CHEVRONS. THE CLEANED FLUE GAS EXITS VIA A WET 525 FT. STACK LINED WITH ACID RESISTANT BRICK. SLUDGE GENERATED BY THIS CLOSED LOOP SYSTEM IS POZ-O-TEC FIXATED. OPERATIONS COMMENCED IN DECEMBER 1984.
SOUTHWESTERN ELECTRIC POWER WALKER CO. 1 NEW 720 MW (GROSS) 720 MW (ESC) COAL 1.49 %S LIGNITE PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: 2.6% STATUS 6 STARTUP 0/2004	WALKER COUNTY 1 OF SOUTHWESTERN ELECTRIC POWER IS A PLANNED 720 MW (GROSS) LIGNITE (1.49% S) FIRED BOILER TO BE LOCATED IN HUNTSVILLE, TEXAS. THE UTILITY IS PRESENTLY CONSIDERING BOTH WET LIMESTONE AND DRY SCRUBBING AS THE POSSIBLE EMISSION CONTROL STRATEGY WITH A DESIGN SO2 REMOVAL EFFICIENCY OF 90%. COMMERCIAL START-UP IS SCHEDULED FOR APRIL 2004.

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UNIT IDENTIFICATION	ABSTRACT
SOUTHWESTERN ELECTRIC POWER WALKER CO. 2 NEW 720 MW (GROSS) 720 MW (ESC) COAL 1.49 %S LIGNITE PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: 2.6% STATUS 6 STARTUP 0/2004	WALKER COUNTY 2 OF SOUTHWESTERN ELECTRIC POWER IS A PLANNED 720 MW (GROSS) LIGNITE (1.49% S) FIRED BOILER TO BE LOCATED IN HUNTSVILLE, TEXAS. THE UTILITY IS PRESENTLY CONSIDERING BOTH WET LIMESTONE AND DRY SCRUBBING AS THE POSSIBLE EMISSION CONTROL STRATEGY WITH A DESIGN SO2 REMOVAL EFFICIENCY OF 90%. COMMERCIAL START-UP IS SCHEDULED FOR APRIL 2004.
SOUTHWESTERN PUBLIC SERVICE SOUTH PLAINS 1 NEW 572 MW (GROSS) 572 MW (ESC) COAL ***** %S PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: 2.4% STATUS 6 STARTUP 99/2050	SOUTHWESTERN PUBLIC SERVICE HAS PLANS FOR A 572 MW (GROSS) UNIT, SOUTH PLAINS 1 TO BE LOCATED NEAR IDALOO TEXAS IN LUBOCK COUNTY. THE UNIT WILL BURN LOW SULFUR WESTERN COAL AND WILL UTILIZE AN FGD SYSTEM FOR CONTROL SO2 EMISSIONS. START-UP HAS BEEN DEFERRED INDEFINITELY.
SPRINGFIELD WATER, LIGHT & PWR DALLMAN 3 NEW 192 MW (GROSS) 192 MW (ESC) COAL 1 '50 3.05 %S BITUMINOUS LIMESTONE RESEARCH-COTTRELL ENERGY CONSUMPTION: 1.6% STATUS 1 STARTUP 10/1980	DALLMAN 3 OF SPRINGFIELD WATER, LIGHT, AND POWER IS A PULVERIZED COAL (3.05% S, 11,369 BTU/LB) FIRED BOILER LOCATED IN SPRINGFIELD, ILLINOIS. RESEARCH COTTRELL SUPPLIED A LIMESTONE FGD SYSTEM DESIGNED TO REMOVE 95% OF THE SO2 FROM 850,000 ACFM OF BOILER FLUE GAS. A HOT SIDE ESP PRECEDES TWO PACKED TOWER ABSORBERS, ONE HORIZONTAL CHEVRON PER MODULE, AND A 500 FOOT ACID BRICK LINED STACK. NO REHEAT IS PROVIDED. THE SYSTEM OPERATES IN A CLOSED WATER LOOP MODE AND SLUDGE IS DISPOSED OF IN A LANDFILL. FGD OPERATIONS COMMENCED IN OCTOBER 1980.
SUNFLOWER ELECTRIC HOLCOMB 1 NEW 319 MW (GROSS) 319 MW (ESC) COAL 0.34 %S SUBBITUMINOUS LIME/SPRAY DRYING JOY MFG/NIRO ATOMIZER ENERGY CONSUMPTION: 5.6% STATUS 1 STARTUP 7/1983	SUNFLOWER ELECTRIC COOP'S HOLCOMB 1 STATION IS A 347 MW UNIT LOCATED IN HOLCOMB, KANSAS. THE PULVERIZED COAL (0.47% S, 8065 BTU/LB) FIRED BABCOCK AND WILCOX BOILER UTILIZES A JOY MANUFACTURING/NIRO ATOMIZER LIME/SPRAY DRYING PROCESS FOR SO2 CONTROL. A FABRIC FILTER IS UTILIZED FOR PRIMARY PARTICULATE CONTROL AND THE FLUE GAS EXITS A 475 FT STACK. INITIAL START-UP OF THE FGD SYSTEM COMMENCED IN JULY 1983.
TAMPA ELECTRIC BIG BEND 4 NEW 455 MW (GROSS) 455 MW (ESC) COAL 3.50 %S LIMESTONE RESEARCH-COTTRELL ENERGY CONSUMPTION: 3.5% STATUS 1 STARTUP 12/1984	UNIT 4 AT TAMPA ELECTRIC'S BIG BEND STATION, LOCATED IN TAMPA, FLORIDA, IS A DRY BOTTOM PULVERIZED COAL (3.50% S, 10,495 BTU/LB) FIRED UNIT. RESEARCH-COTTRELL SUPPLIED A LIMESTONE SCRUBBING PROCESS DESIGNED TO REMOVE 90% OF THE FLUE GAS SO2 AN INDIRECT HOT AIR REHEATER IS INCLUDED. A COLD SIDE ESP IS UTILIZED FOR PRIMARY PARTICULATE CONTROL. THE SYSTEM OPERATES IN A CLOSED WATER LOOP MODE AND PRODUCES GYPSUM AS A SALEABLE BYPRODUCT. THE CLEANED FLUE GAS EXITS VIA A 490 FT. CONCRETE LINED STACK INITIAL FGD OPERATIONS COMMENCED IN DECEMBER 1984.
TENNESSEE VALLEY AUTHORITY PARADISE 1 RETROFIT 704 MW (GROSS) 704 MW (ESC) COAL 3.20 %S BITUMINOUS LIMESTONE GE ENVIRONMENTAL SERVICES ENERGY CONSUMPTION: 2.6% STATUS 1 STARTUP 5/1983	PARADISE 1 OF TVA IS A 3.2% SULFUR COAL FIRED UNIT LOCATED IN PARADISE, KENTUCKY. A CONTRACT WAS AWARDED TO GEESI FOR AN 84.2% EFFICIENT LIMESTONE FGD SYSTEM TO BE RETROFITTED ON THIS BOILER. THE FGD SYSTEM CONSISTS OF SIX VENTURI SCRUBBERS AND VENTURI ABSORBER TRAINS PRECEDED BY AN ESP. INLET FLUE GAS IS USED TO HEAT GLYCOL, WHICH IN TURN IS USED TO REHEAT THE OUTLET FLUE GAS. UNTREATED SLUDGE IS PUMPED DIRECTLY TO A POND FOR DISPOSAL. THE SYSTEM OPERATES IN A CLOSED WATER LOOP MODE AND FLUE GAS EXITS A 600 FT STACK. OPERATIONS COMMENCED IN MAY 1983.

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STATUS OF FGD SYSTEMS

UNIT IDENTIFICATION	ABSTRACT
TENNESSEE VALLEY AUTHORITY PARADISE 2 RETROFIT 704 MW (GROSS) 704 MW (ESC) COAL 3.20 %S BITUMINOUS LIMESTONE GE ENVIRONMENTAL SERVICES ENERGY CONSUMPTION: 2.6% STATUS 1 STARTUP 7/1983	PARADISE 2 OF TVA IS A 3.2% S COAL FIRED LOCATED UNIT IN PARADISE, KENTUCKY. A CONTRACT WAS AWARDED TO GEESI FOR AN 84.2% EFFICIENT LIMESTONE FGD SYSTEM RETROFITTED ON THIS BOILER. SIX VENTURI SCRUBBERS AND VENTURI ABSORBER TRAINS FOLLOW AN ESP. INLET FLUE GAS IS USED TO HEAT GLYCOL, WHICH IN TURN IS USED TO REHEAT THE OUTLET FLUE GAS. UNTREATED SLUDGE IS PUMPED DIRECTLY TO A POND FOR DISPOSAL. THE SYSTEM OPERATES IN A CLOSED WATER LOOP MODE AND FLUE GAS EXITS A 600 FOOT STACK. OPERATIONS COMMENCED IN JULY 1983.
TENNESSEE VALLEY AUTHORITY SHAWNEE 9 10 MW (GROSS) 10 MW (ESC) COAL 4.00 %S LIME/SPRAY DRYING EPRI/TVA/ONTARIO HYDRO ENERGY CONSUMPTION: ****% STATUS 1 STARTUP 3/1987	SHAWNEE #9, LOCATED IN PADUCAH, KENTUCKY, HAS A 10 MW PILOT SCALE SPRAY DRYING FGD SYSTEM FOR SO2 REMOVAL CONTROL. EPRI AND ONTARIO HYDRO ARE COSPONSORING THE PROJECT TO DETERMINE THE FEASIBILITY OF RETROFITTING SPRAY DRYER UNITS ON EXISTING UNITS. OPERATION BEGAN IN MARCH 1987 AND IS EXPECTED TO LAST THROUGH 1989.
TENNESSEE VALLEY AUTHORITY WIDOWS CREEK 7 RETROFIT 575 MW (GROSS) 575 MW (ESC) COAL 3.70 %S BITUMINOUS LIMESTONE COMBUSTION ENGINEERING ENERGY CONSUMPTION: 2.3% STATUS 1 STARTUP 3/1981	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 SUPPLIED A LIMESTONE VENTRI ROD SCRUBBER/SPRAY TOWER ABSORBER FGD SYSTEM ON THIS UNIT. AN ESP PRECEDES THE SCRUBBING TRAIN, AND A COMBINATION OF A BULK ENTRAINMENT SEPERATOR, TWO CHEVRON MIST ELIMINATORS AND A FINNED TUBE REHEATER FOLLOW THE SYSTEM. A FORCED OXIDATION SYSTEM IS EMPLOYED FOR SLUDGE TREATMENT. OPERATIONS COMMENCED IN MARCH 1981.
TENNESSEE VALLEY AUTHORITY WIDOWS CREEK 8 RETROFIT 550 MW (GROSS) 550 MW (ESC) COAL 3.30 %S BITUMINOUS LIMESTONE TENNESSEE VALLEY AUTHORITY ENERGY CONSUMPTION: 4.7% STATUS 1 STARTUP 5/1977	WIDOWS CREEK 8 OF TVA IS A BALANCED DRAFT, TANGENTIALLY FIRED COAL (3.30 S, 11,810 BTU/LB) BOILER IN STEVENSON, 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. THE SYSTEM OPERATES IN A CLOSED WATER LOOP AND FLUE GAS EXITS A 500 FT STACK. A FORCED OXIDATION SYSTEM IS EMPLOYED FOR SLUDGE TREATMENT.
TEXAS MUNICIPAL POWER AGENCY GIBBONS CREEK 1 NEW 443 MW (GROSS) 400 MW (ESC) COAL 1.06 %S LIGNITE LIMESTONE COMBUSTION ENGINEERING ENERGY CONSUMPTION: 1.4% STATUS 1 STARTUP 11/1982	GIBBONS CREEK 1 OF THE TEXAS MUNICIPAL POWER AGENCY IS A DRY BOTTOM PULVERIZED LIGNITE (1.06% S, 4860 BTU/LB) FIRED UNIT LOCATED IN CARLOS, TEXAS. THE EMISSION CONTROL SYSTEM CONSISTS OF A COLD SIDE ESP FOLLOWED BY THREE 50% CAPACITY LIMESTONE SPRAY TOWERS. THE COMBUSTION ENGINEERING FGD SYSTEM INCLUDES A CHEVRON MIST ELIMINATOR AND A STEAM COIL REHEATER. CLEANED FLUE GAS IS DISCHARGED THROUGH A 465 FT ACID BRICK LINED STACK. THE WATER LOOP IS OPEN AND THE POZ-O-TTEC STABILIZED SLUDGE IS USED AS STRIP MINE LANDFILL. OPERATIONS COMMENCED IN NOVEMBER 1982.
TEXAS UTILITIES FOREST GROVE 1 NEW 750 MW (GROSS) 750 MW (ESC) COAL 0.80 %S LIGNITE LIMESTONE WHEELABRATOR AIR POLTN. CNTRL. ENERGY CONSUMPTION: 2.5% STATUS 3 STARTUP 0/1997	TEXAS UTILITIES IS PLANNING A LIGNITE (0.8% S, 7000 BTU/LB) FIRED BOILER, FOREST GROVE 1, WHICH WILL BE LOCATED IN ATHENS, TEXAS. A CONTRACT HAS BEEN AWARDED TO WHEELABRATOR AIR POLLUTION CONTROL FOR A WET LIMESTONE FGD SYSTEM AT THIS UNIT. TWO ESP'S WILL PROVIDE PRIMARY PARTICULATE CONTROL AND NO STACK GAS REHEAT IS PLANNED. START-UP IS SCHEDULED FOR 1993.

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UNIT IDENTIFICATION	ABSTRACT
TEXAS UTILITIES MARTIN LAKE 1 NEW 793 MW (GROSS) 595 MW (ESC) COAL 0.90 %S LIGNITE LIMESTONE RESEARCH-COTTRELL ENERGY CONSUMPTION: 1.3% STATUS 1 STARTUP 4/1977	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 MODE AND FLUE GAS EXITS A 450 FT STACK. INITIAL OPERATIONS COMMENCED IN APRIL 1977.
TEXAS UTILITIES MARTIN LAKE 2 NEW 793 MW (GROSS) 595 MW (ESC) COAL 0.90 %S LIGNITE LIMESTONE RESEARCH-COTTRELL ENERGY CONSUMPTION: 1.3% STATUS 1 STARTUP 5/1978	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 MODE AND FLUE GAS EXITS A 450 FT STACK. INITIAL OPERATIONS COMMENCED IN MAY 1978.
TEXAS UTILITIES MARTIN LAKE 3 NEW 793 MW (GROSS) 595 MW (ESC) COAL 0.90 %S LIGNITE LIMESTONE RESEARCH-COTTRELL ENERGY CONSUMPTION: 1.3% STATUS 1 STARTUP 2/1979	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 MODE AND FLUE GAS EXITS A 450 FT STACK. INITIAL OPERATIONS COMMENCED IN FEBRUARY 1979.
TEXAS UTILITIES MONTICELLO 3 NEW 793 MW (GROSS) 793 MW (ESC) COAL 0.50 %S LIGNITE LIMESTONE GE ENVIRONMENTAL SERVICES ENERGY CONSUMPTION: 1.9% STATUS 1 STARTUP 5/1978	MONTICELLO 3 OF TEXAS UTILITIES IS A LIGNITE (.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 GEESI 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. THE CLEANED FLUE GAS FROM THIS UNIT EXITS A 600 FT STACK. INITIAL START-UP OCCURRED IN MAY 1978.
TEXAS UTILITIES SANDOW 4 NEW 595 MW (GROSS) 405 MW (ESC) COAL 1.60 %S LIGNITE LIMESTONE COMBUSTION ENGINEERING ENERGY CONSUMPTION: 2.4% STATUS 1 STARTUP 12/1980	SANDOW 4 IS A PULVERIZED 1.6% SULFUR LIGNITE FIRED BOILER OF TEXAS POWER AND LIGHT LOCATED IN ROCKDALE, TEXAS. COMBUSTION ENGINEERING SUPPLIED THREE LIMESTONE SPRAY TOWERS FOR THIS UNIT. A COLD SIDE ESP PROVIDES PRIMARY PARTICULATE CONTROL. A 30% BYPASS IS EMPLOYED TO PROVIDE REHEAT, AND THE OVERALL SO2 REMOVAL EFFICIENCY IS 75%. THE SYSTEM OPERATES IN A CLOSED WATER LOOP, AND THE SLUDGE IS PONDED. OPERATIONS COMMENCED IN DECEMBER 1980.
TEXAS UTILITIES TWIN OAK 1 NEW 750 MW (GROSS) 750 MW (ESC) COAL 0.70 %S LIGNITE LIMESTONE GE ENVIRONMENTAL SERVICES ENERGY CONSUMPTION: 2.5% STATUS 3 STARTUP 0/1994	TWIN OAK 1 IS A 750 MW (GROSS) LIGNITE (.7% S) FIRED BOILER PLANNED BY TEXAS POWER AND LIGHT AND ALCOA FOR LOCATION IN BREMOND, TEXAS. A CONTRACT HAS BEEN AWARDED TO GE ENVIRONMENTAL SERVICES FOR A LIMESTONE FGD SYSTEM WITH A DESIGN SO2 REMOVAL EFFICIENCY OF 70%. ESP'S WILL CONTROL PARTICULATE MATTER AND THE SYSTEM WILL OPERATE IN A CLOSED WATER LOOP MODE. START-UP IS SCHEDULED FOR AUGUST 1994.

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UNIT IDENTIFICATION	ABSTRACT
TEXAS UTILITIES TWIN OAK 2 NEW 750 MW (GROSS) 750 MW (ESC) COAL 0.70 %S LIGNITE LIMESTONE GE ENVIRONMENTAL SERVICES ENERGY CONSUMPTION: 2.5% STATUS 3 STARTUP 0/1995	TWIN OAK 2 IS A 750 MW (GROSS) LIGNITE (.7% S) FIRED BOILER PLANNED BY TEXAS POWER AND LIGHT AND ALCOA FOR LOCATION IN BREMOND, TEXAS. A CONTRACT HAS BEEN AWARDED TO GE ENVIRONMENTAL SERVICES FOR A LIMESTONE FGD SYSTEM WITH A DESIGN SO2 REMOVAL EFFICIENCY OF 70%. ESP'S WILL CONTROL PARTICULATE MATTER AND THE SYSTEM WILL OPERATE IN A CLOSED WATER LOOP MODE. START-UP IS SCHEDULED FOR AUGUST 1995.
UNITED POWER ASSOCIATION STANTON 10 NEW 60 MW (GROSS) 50 MW (ESC) COAL 0.77 %S LIGNITE LIME/SPRAY DRYING RESEARCH-COTTRELL ENERGY CONSUMPTION: 1.7% STATUS 1 STARTUP 7/1982	STANTON 10 OF THE UNITED POWER ASSOCIATION IS A PULVERIZED COAL (0.77% S, 7000 BTU/LB) FIRED UNIT LOCATED IN STANTON, NORTH DAKOTA. THE LIME/SPRAY DRYING SYSTEM, SUPPLIED BY RESEARCH-COTTRELL, CONSISTS OF A SPRAY DRYER FOLLOWED BY A FABRIC FILTER FOR SO2 & PARTICULATE REMOVAL. KOMLINE AND SANDERSON, THE SUBCONTRACTOR TO RESEARCH-COTTRELL, SUPPLIED THE ROTARY ATOMIZER AND ASSOCIATED EQUIPMENT FOR THE REACTOR VESSEL. THE SYSTEM OPERATES IN AN OPEN LOOP MODE WITH SLUDGE DISPOSED IN A CLAY LINED SETTLING POND. THE CLEANED FLUE GAS EXITS A 254 FT STACK. OPERATIONS COMMENCED IN JULY 1982.
UTAH POWER & LIGHT HUNTER 1 NEW 430 MW (GROSS) 369 MW (ESC) COAL 0.52 %S BITUMINOUS LIME GE ENVIRONMENTAL SERVICES ENERGY CONSUMPTION: 1.6% STATUS 1 STARTUP 3/1979	HUNTER 1 OF UTAH POWER AND LIGHT IS A COAL (0.52% S, 11,500 BTU/LB) FIRED UNIT IN CASTLEDALE, UTAH. GEESI SUPPLIED A PEBBLE LIME WET SCRUBBING SYSTEM WHICH BECAME OPERATIONAL IN MARCH 1979. THE 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 CLEANED FLUE GAS EXITS A 600 FT STACK. THE SLUDGE IS FLYASH STABILIZED AND DISPOSED ON-SITE.
UTAH POWER & LIGHT HUNTER 2 NEW 430 MW (GROSS) 369 MW (ESC) COAL 0.52 %S BITUMINOUS LIME GE ENVIRONMENTAL SERVICES ENERGY CONSUMPTION: 1.6% STATUS 1 STARTUP 6/1980	UTAH POWER AND LIGHT'S HUNTER 2 IS A COAL (0.52% S, 11,500 BTU/LB) FIRED UNIT LOCATED IN CASTLEDALE, UTAH. FOR EMISSION CONTROL, GEESI SUPPLIED 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 PARTICLE CONTROL, AND A BYPASS SYSTEM PROVIDES STACK GAS REHEAT. THE SLUDGE IS FLYASH STABILIZED AND DISPOSED OF ON-SITE. START-UP OF BOTH THE BOILER AND FGD SYSTEM TOOK PLACE IN JUNE 1980.
UTAH POWER & LIGHT HUNTER 3 NEW 424 MW (GROSS) 424 MW (ESC) COAL 0.55 %S BITUMINOUS LIMESTONE GE ENVIRONMENTAL SERVICES ENERGY CONSUMPTION: 2.6% STATUS 1 STARTUP 4/1983	HUNTER 3 OF UTAH POWER AND LIGHT IS A PULVERIZED COAL (0.55% S, 12500 BTU/LB) FIRED UNIT LOCATED IN CASTLE DALE, UTAH. A LIMESTONE NONREGENERABLE FGD UNIT WAS SUPPLIED BY GEESI FOR SO2 CONTROL AND ESP'S ARE EMPLOYED FOR PARTICULATE REMOVAL. THE SYSTEM OPERATES IN A CLOSED WATER LOOP MODE AND FLUE GAS EXITS A 600 FT STACK. INITIAL OPERATIONS COMMENCED IN APRIL 1983.
UTAH POWER & LIGHT HUNTINGTON 1 NEW 426 MW (GROSS) 361 MW (ESC) COAL 0.43 %S BITUMINOUS LIME GE ENVIRONMENTAL SERVICES ENERGY CONSUMPTION: 1.4% STATUS 1 STARTUP 5/1978	HUNTINGTON 1 OF UTAH POWER IS A TANGENTIALLY FIRED PULVERIZED COAL (0.43 S, 11,650 BTU/LB) BOILER IN HUNTINGTON, UTAH. A COLD SIDE ESP TREATS 1,742,000 ACFM OF FLUE GAS AND IS FOLLOWED BY A GEESI 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 1978.

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UNIT IDENTIFICATION	ABSTRACT
UTAH POWER & LIGHT NAUGHTON 3 RETROFIT 346 MW (GROSS) 346 MW (ESC) COAL 0.55 %S SUBBITUMINOUS SODIUM CARBONATE AIR CORRECTION DIVISION, UOP ENERGY CONSUMPTION: 1.4% STATUS 1 STARTUP 9/1981	NAUGHTON 3 OF UTAH POWER AND LIGHT IS A PULVERIZED COAL (.55% S, 9500 BTU/LB) FIRED BOILER LOCATED IN KEMMERER, WYOMING. THE BOILER SUPPLIES 1,500,000 ACFM OF FLUE GAS TO AN ESP FOR PARTICULATE MATTER CONTROL. THE UNIT WAS RETROFITTED WITH A UOP WET SODA ASH FGD SYSTEM FOR SO2 CONTROL. THE FGD SYSTEM IS DESIGNED TO REMOVE 70% OF THE SO2 BEFORE THE FLUE GAS EXITS OUT A 475 FOOT STACK. INITIAL START-UP TOOK PLACE IN SEPTEMBER 1981.
WASHINGTON WATER POWER CRESTON COAL 1 NEW 570 MW (GROSS) 570 MW (ESC) COAL ***** %S UNKNOWN LIMESTONE VENDOR NOT SELECTED ENERGY CONSUMPTION: 3.5% STATUS 6 STARTUP 99/2050	WASHINGTON WATER POWER HAS PLANS FOR A NEW UNIT, CRESTON COAL 1, TO BE LOCATED IN CRESTON, WASHINGTON. THE COAL FIRED BOILER WILL HAVE A GROSS GENERATING CAPACITY OF 570 MW AND WILL UTILIZE A WET LIMESTONE FGD SYSTEM FOR CONTROL OF SO2 EMISSIONS.
WASHINGTON WATER POWER CRESTON COAL 2 NEW 570 MW (GROSS) 570 MW (ESC) COAL ***** %S UNKNOWN LIMESTONE VENDOR NOT SELECTED ENERGY CONSUMPTION: 3.5% STATUS 6 STARTUP 99/2050	WASHINGTON WATER POWER HAS PLANS FOR A NEW UNIT, CRESTON 2, TO BE LOCATED IN CRESTON, WASHINGTON. THE COAL FIRED BOILER WILL HAVE A GROSS GENERATING CAPACITY OF 570 MW AND WILL USE A WET LIMESTONE FGD SYSTEM FOR CONTROL OF SO2 EMISSIONS. START-UP FOR THE UNIT HAS BEEN DEFERRED INDEFINITELY.
WASHINGTON WATER POWER CRESTON COAL 3 NEW 570 MW (GROSS) 570 MW (ESC) COAL ***** %S UNKNOWN LIMESTONE VENDOR NOT SELECTED ENERGY CONSUMPTION: 3.5% STATUS 6 STARTUP 99/2050	WASHINGTON WATER POWER HAS PLANS FOR A NEW UNIT, CRESTON 3, TO BE LOCATED IN CRESTON, WASHINGTON. THE COAL FIRED BOILER WILL HAVE A GROSS GENERATING CAPACITY OF 570 MW AND WILL USE A WET LIMESTONE FGD SYSTEM FOR CONTROL OF SO2 EMISSIONS.
WASHINGTON WATER POWER CRESTON COAL 4 NEW 570 MW (GROSS) 570 MW (ESC) COAL ***** %S UNKNOWN LIMESTONE VENDOR NOT SELECTED ENERGY CONSUMPTION: 3.5% STATUS 6 STARTUP 99/2050	WASHINGTON WATER POWER HAS PLANS FOR A NEW UNIT, CRESTON 4, TO BE LOCATED IN CRESTON, WASHINGTON. THE COAL FIRED BOILER WILL HAVE A GROSS GENERATING CAPACITY OF 570 MW AND WILL USE A WET LIMESTONE FGD SYSTEM FOR CONTROL OF SO2 EMISSIONS.
WEST PENN POWER MITCHELL 3 RETROFIT 296 MW (GROSS) 296 MW (ESC) COAL 2.80 %S BITUMINOUS LIME GE ENVIRONMENTAL SERVICES ENERGY CONSUMPTION: 1.0% STATUS 1 STARTUP 8/1982	UNIT 3 AT ALLEGHENY POWER SYSTEM'S MITCHELL POWER STATION IN COURTNEY, PENNSYLVANIA IS A COAL (2.8% S, 12,520 BTU/LB) FIRED BOILER. GEESI HAS INSTALLED A LIME SCRUBBING PROCESS WITH AN SO2 REMOVAL EFFICIENCY OF 95% PARTICULATE MATTER IS CONTROLLED WITH ESP'S. OPERATIONS COMMENCED IN AUGUST 1982.

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STATUS OF FGD SYSTEMS

UNIT IDENTIFICATION	ABSTRACT
WEST TEXAS UTILITIES OKLAUNION 1 NEW 720 MW (GROSS) 504 MW (ESC) COAL 0.34 %S SUBBITUMINOUS LIMESTONE GE ENVIRONMENTAL SERVICES ENERGY CONSUMPTION: 0.3% STATUS 1 STARTUP 11/1986	WEST TEXAS UTILITIES HAS A PULVERIZED SUBBITUMINOUS COAL (.34% S,8227 BTU/LB) FIRED BOILER LOCATED NEAR OKLAUNION, TEXAS. THE FOSTER WHEELER BOILER SUPPLIES 2,382,679 ACFM OF FLUE GAS TO A WET LIMESTONE FGD SYSTEM SUPPLIED BY GE ENVIRONMENTAL FOR CONTROL OF SO2 EMISSIONS (70% DESIGN REMOVAL EFFICIENCY). LODGE-COTTRELL SUPPLIED A RIGID FRAME COLD SIDE ESP FOR PARTICULATE CONTROL. THE SYSTEM OPERATES IN A CLOSED WATER LOOP MODE AND FLUE GAS EXITS THROUGH A 453 FOOT ACID BRICK LINED STACK. INITIAL OPERATIONS COMMENCED IN NOVEMBER 1986.
WEST TEXAS UTILITIES OKLAUNION 2 NEW 720 MW (GROSS) 504 MW (ESC) COAL 0.34 %S SUBBITUMINOUS PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: 0.3% STATUS 6 STARTUP 99/2050	WEST TEXAS UTILITIES HAS PLANS TO BUILD A SECOND COAL (.34 S, 8227 BTU/LB) FIRED BOILER TO BE LOCATED NEAR OKLAUNION, TEXAS. THE UTILITY WILL INCLUDE A FGD SYSTEM FOR SO2 CONTROL FROM THE 720 MW UNIT. LODGE-COTTRELL WILL SUPPLY A RIGID FRAME COLD SIDE ESP FOR CONTROL OF PARTICULATE MATTER. THE SYSTEM WILL OPERATE IN A CLOSED WATER LOOP MODE. START-UP OF UNIT 2 HAS BEEN DEFERRED INDEFINITELY.
WHITE PINE COUNTY WHITE PINE PWR PROJ. 1 NEW 820 MW (GROSS) 820 MW (ESC) COAL 0.60 %S PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: 2.6% STATUS 6 STARTUP 3/1994	WHITE PINE COUNTY HAS PLANS FOR TWO NEW UNITS, WHITE PINE POWER PROJECT 1 AND 2 TO BE LOCATED NEAR ELY, NEVADA. THE PULVERIZED COAL (10,530 BTU/LB, 0.6% S) FIRED UNITS WILL HAVE A GROSS MEGAWATT RATING OF 820 EACH AND WILL UTILIZE A SPRAY DRYING FGD SYSTEM FOR CONTROL OF SO2 EMISSIONS. FABRIC FILTERS WILL BE EMPLOYED FOR PARTICULATE CONTROL. UNITS 1 AND 2 ARE SCHEDULED TO COMMENCE OPERATIONS IN 1994 AND 1995 RESPECTIVELY.
WHITE PINE COUNTY WHITE PINE PWR PROJ. 2 NEW 820 MW (GROSS) 820 MW (ESC) COAL 0.60 %S PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: 2.6% STATUS 6 STARTUP 3/1995	WHITE PINE COUNTY HAS PLANS FOR TWO NEW UNITS, WHITE PINE POWER PROJECT 1 AND 2 TO BE LOCATED NEAR ELY, NEVADA. THE PULVERIZED COAL (10,530 BTU/LB, 0.6% S) FIRED UNITS WILL HAVE A GROSS MEGAWATT RATING OF 820 EACH AND WILL UTILIZE A SPRAY DRYING FGD SYSTEM FOR CONTROL OF SO2 EMISSIONS. FABRIC FILTERS WILL BE EMPLOYED FOR PARTICULATE CONTROL. UNITS 1 AND 2 ARE SCHEDULED TO COMMENCE OPERATIONS IN 1994 AND 1995 RESPECTIVELY.

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

SECTION 3

SUMMARY OF FGD SYSTEMS BY COMPANY

COMPANY NAME	TOTAL		STATUS: OPERATIONAL		CONSTRUCTION		CONTRACT AWARDED		PLANNED	
	NO.	MW	NO.	MW	NO.	MW	NO.	MW	NO.	MW
ALABAMA ELECTRIC	2	358.	2	358.	0	0.	0	0.	0	0.
ALAMITO CO	3	1080.	1	360.	1	360.	0	0.	1	360.
APPLIED ENERGY SERVICE	2	291.	2	291.	0	0.	0	0.	0	0.
ARIZONA ELECTRIC POWER	2	196.	2	196.	0	0.	0	0.	0	0.
ARIZONA PUBLIC SERVICE	9	2600.	8	2465.	0	0.	0	0.	1	135.
ASSOCIATED ELECTRIC	1	615.	1	615.	0	0.	0	0.	0	0.
ATLANTIC CITY ELECTRIC	1	330.	0	0.	0	0.	0	0.	1	330.
BASIN ELECTRIC POWER	6	3340.	5	2780.	0	0.	0	0.	1	560.
BIG RIVERS ELECTRIC	3	932.	3	932.	0	0.	0	0.	0	0.
CENTRAL ILLINOIS LIGHT	1	396.	1	396.	0	0.	0	0.	0	0.
CENTRAL ILLINOIS PUBLIC SERV	1	590.	1	590.	0	0.	0	0.	0	0.
CENTRAL POWER & LIGHT	1	720.	0	0.	0	0.	1	720.	0	0.
CINCINNATI GAS & ELECTRIC	2	2032.	1	643.	1	1389.	0	0.	0	0.
CITY UTILITIES OF SPRINGFIELD	1	195.	1	195.	0	0.	0	0.	0	0.
COGENTRIX	2	110.	0	0.	0	0.	0	0.	2	110.
COLORADO SPRINGS DEPT. OF PUBL	1	250.	0	0.	0	0.	0	0.	1	250.
COLORADO UTE ELECTRIC	3	1127.	3	1127.	0	0.	0	0.	0	0.
COLUMBUS & SOUTHERN OHIO ELEC	2	700.	2	700.	0	0.	0	0.	0	0.
COOPERATIVE POWER ASSOCIATION	2	654.	2	654.	0	0.	0	0.	0	0.
DELMARVA POWER & LIGHT	3	131.	3	131.	0	0.	0	0.	0	0.
DESERET GEN & TRANS	2	857.	1	427.	0	0.	0	0.	1	430.
DINEH SERVICE COMANY	4	2220.	0	0.	0	0.	0	0.	4	2220.
DUQUESNE LIGHT	2	918.	2	918.	0	0.	0	0.	0	0.
EAST KENTUCKY POWER	2	1200.	1	550.	0	0.	1	650.	0	0.
GENERAL PUBLIC UTILITIES	1	300.	0	0.	0	0.	0	0.	1	300.
GRAND HAVEN BRD OF LIGHT & PWR	1	65.	1	65.	0	0.	0	0.	0	0.
GRAND RIVER DAM AUTHORITY	1	520.	1	520.	0	0.	0	0.	0	0.
HOOSIER ENERGY	2	882.	2	882.	0	0.	0	0.	0	0.
HOUSTON LIGHTING & POWER	5	3407.	3	2027.	0	0.	2	1380.	0	0.
INDIANAPOLIS POWER & LIGHT	5	2902.	2	952.	0	0.	0	0.	3	1950.
JACKSONVILLE ELEC AUTHORITY	2	1286.	1	674.	1	612.	0	0.	0	0.
KANSAS CITY POWER & LIGHT	1	740.	1	740.	0	0.	0	0.	0	0.
KANSAS POWER & LIGHT	5	2087.	5	2087.	0	0.	0	0.	0	0.
KENTUCKY UTILITIES	1	60.	1	60.	0	0.	0	0.	0	0.
LAKELAND UTILITIES	1	364.	1	364.	0	0.	0	0.	0	0.
LOS ANGELES DEPT OF WTR & PWR	2	1682.	2	1682.	0	0.	0	0.	0	0.
LOUISVILLE GAS & ELECTRIC	8	2690.	7	2178.	0	0.	1	512.	0	0.
LOWER COLORADO RIVER AUTH	2	902.	0	0.	1	451.	0	0.	1	451.
MARQUETTE BOARD OF LIGHT & PWR	1	44.	1	44.	0	0.	0	0.	0	0.
MICHIGAN SO CENTRAL PWR AGENCY	1	55.	1	55.	0	0.	0	0.	0	0.
MINNESOTA POWER & LIGHT	1	475.	1	475.	0	0.	0	0.	0	0.
MINNKOTA POWER	1	374.	1	374.	0	0.	0	0.	0	0.
MONONGAHELA POWER	2	1094.	2	1094.	0	0.	0	0.	0	0.
MONTANA POWER	4	2272.	4	2272.	0	0.	0	0.	0	0.
MONTANA-DAKOTA UTILITIES	1	427.	1	427.	0	0.	0	0.	0	0.
MUSCATINE POWER & WATER	1	172.	1	172.	0	0.	0	0.	0	0.
NEVADA POWER	8	1777.	4	617.	0	0.	0	0.	4	1160.
NEW YORK STATE ELEC & GAS	1	680.	1	680.	0	0.	0	0.	0	0.
NORTHERN INDIANA PUB SERVICE	2	755.	2	755.	0	0.	0	0.	0	0.
NORTHERN STATES POWER	4	2451.	4	2451.	0	0.	0	0.	0	0.
ORLANDO UTILITIES COMMISSION	1	460.	1	460.	0	0.	0	0.	0	0.
OXFORD ENERGY CO.	2	44.	1	14.	0	0.	0	0.	1	30.
PACIFIC POWER & LIGHT	6	2682.	4	1666.	1	508.	1	508.	0	0.
PENNSYLVANIA POWER	3	2505.	3	2505.	0	0.	0	0.	0	0.
PHILADELPHIA ELECTRIC	3	884.	3	884.	0	0.	0	0.	0	0.
PLAINS ELECTRIC G & T	1	233.	1	233.	0	0.	0	0.	0	0.
PLATTE RIVER POWER AUTHORITY	1	278.	1	278.	0	0.	0	0.	0	0.
PUBLIC SERVICE INDIANA	1	667.	1	667.	0	0.	0	0.	0	0.
PUBLIC SERVICE OF COLORADO	2	850.	0	0.	1	350.	0	0.	1	500.
PUBLIC SERVICE OF NEW MEXICO	4	1799.	4	1799.	0	0.	0	0.	0	0.

NOTE - PLANNED STATUS INCLUDES LETTER OF INTENT SIGNED, REQUESTING/EVALUATING BIDS, AND CONSIDERING ONLY FGD SYSTEMS

SECTION 3
SUMMARY OF FGD SYSTEMS BY COMPANY

	TOTAL		STATUS							
			OPERATIONAL		CONSTRUCTION		CONTRACT AWARDED		PLANNED	
COMPANY NAME	NO.	MW	NO.	MW	NO.	MW	NO.	MW	NO.	MW
SALT RIVER PROJECT	3	960.	2	640.	1	320.	0	0.	0	0.
SAN ANTONIO PUBLIC SERVICE	2	1070.	0	0.	0	0.	0	0.	2	1070.
SAN MIGUEL ELECTRIC	1	410.	1	410.	0	0.	0	0.	0	0.
SEMINOLE ELECTRIC	2	1300.	2	1300.	0	0.	0	0.	0	0.
SIERRA PACIFIC POWER	4	1038.	1	288.	0	0.	0	0.	3	750.
SIKESTON BRD OF MUNICIPAL UTIL	1	235.	1	235.	0	0.	0	0.	0	0.
SOUTH CAROLINA PUBLIC SERVICE	7	2848.	4	1298.	0	0.	1	450.	2	1100.
SOUTH MISSISSIPPI ELEC PWR	2	266.	2	266.	0	0.	0	0.	0	0.
SOUTHERN ILLINOIS POWER	1	184.	1	184.	0	0.	0	0.	0	0.
SOUTHERN INDIANA GAS & ELEC	2	490.	2	490.	0	0.	0	0.	0	0.
SOUTHWESTERN ELECTRIC POWER	4	2880.	2	1440.	0	0.	0	0.	2	1440.
SOUTHWESTERN PUBLIC SERVICE	1	572.	0	0.	0	0.	0	0.	1	572.
SPRINGFIELD WATER, LIGHT & PWR	1	192.	1	192.	0	0.	0	0.	0	0.
SUNFLOWER ELECTRIC	1	319.	1	319.	0	0.	0	0.	0	0.
TAMPA ELECTRIC	1	455.	1	455.	0	0.	0	0.	0	0.
TENNESSEE VALLEY AUTHORITY	5	2543.	5	2543.	0	0.	0	0.	0	0.
TEXAS MUNICIPAL POWER AGENCY	1	400.	1	400.	0	0.	0	0.	0	0.
TEXAS UTILITIES	8	5233.	5	2983.	0	0.	3	2250.	0	0.
UNITED POWER ASSOCIATION	1	50.	1	50.	0	0.	0	0.	0	0.
UTAH POWER & LIGHT	5	1869.	5	1869.	0	0.	0	0.	0	0.
WASHINGTON WATER POWER	4	2280.	0	0.	0	0.	0	0.	4	2280.
WEST PENN POWER	1	296.	1	296.	0	0.	0	0.	0	0.
WEST TEXAS UTILITIES	2	1008.	1	504.	0	0.	0	0.	1	504.
WHITE PINE COUNTY	2	1640.	0	0.	0	0.	0	0.	2	1640.
TOTALS	208	89245.	151	60643.	7	3990.	10	6470.	40	18142.

NOTE - PLANNED STATUS INCLUDES LETTER OF INTENT SIGNED, REQUESTING/EVALUATING BIDS, AND CONSIDERING ONLY FGD SYSTEMS

SECTION 4
SUMMARY OF FGD SYSTEMS BY SYSTEM SUPPLIER

SYSTEM SUPPLIER/PROCESS	TOTAL NO.	TOTAL MW	STATUS: OPERATIONAL NO.	OPERATIONAL MW	CONSTRUCTION NO.	CONSTRUCTION MW	CONTRACT AWARDED NO.	CONTRACT AWARDED MW
AIR CORRECTION DIVISION, UOP								
LIME	2	700.	2	700.	0	0.	0	0.
LIMESTONE	4	2114.	4	2114.	0	0.	0	0.
SODIUM CARBONATE	2	854.	2	854.	0	0.	0	0.
TOTAL -	8	3668.	8	3668.	0	0.	0	0.
AMERICAN AIR FILTER								
LIME	6	1630.	6	1630.	0	0.	0	0.
LIMESTONE	1	315.	1	315.	0	0.	0	0.
TOTAL -	7	1945.	7	1945.	0	0.	0	0.
BABCOCK & WILCOX								
LIME	8	5177.	6	3138.	1	1389.	1	650.
LIME/SPRAY DRYING	2	1027.	2	1027.	0	0.	0	0.
LIMESTONE	9	2626.	9	2626.	0	0.	0	0.
SODIUM CARBONATE	3	1524.	1	508.	1	508.	1	508.
TOTAL -	22	10354.	18	7299.	2	1897.	2	1158.
BECHTEL/MONTANA POWER								
LIME/ALKALINE FLYASH	2	1556.	2	1556.	0	0.	0	0.
TOTAL -	2	1556.	2	1556.	0	0.	0	0.
COMBUSTION ENGINEERING								
LIME	3	840.	3	840.	0	0.	0	0.
LIME/ALKALINE FLYASH	2	654.	2	654.	0	0.	0	0.
LIMESTONE	14	6598.	13	6147.	1	451.	0	0.
LIMESTONE/ALKALINE FLYASH	2	1500.	2	1500.	0	0.	0	0.
TOTAL -	21	9592.	20	9141.	1	451.	0	0.
DAVY MCKEE								
WELLMAN LORD	7	1930.	7	1930.	0	0.	0	0.
TOTAL -	7	1930.	7	1930.	0	0.	0	0.
ENVIRONEERING, RILEY STOKER								
LIMESTONE	3	662.	3	662.	0	0.	0	0.
TOTAL -	3	662.	3	662.	0	0.	0	0.
EPRI/TVA/ONTARIO HYDRO								
LIME/SPRAY DRYING	1	10.	1	10.	0	0.	0	0.
TOTAL -	1	10.	1	10.	0	0.	0	0.
FLAKT								
LIME/SPRAY DRYING	1	520.	1	520.	0	0.	0	0.
TOTAL -	1	520.	1	520.	0	0.	0	0.
FMC								
DUAL ALKALI	4	1245.	4	1245.	0	0.	0	0.
LIME	1	126.	1	126.	0	0.	0	0.
TOTAL -	5	1371.	5	1371.	0	0.	0	0.
GE ENVIRONMENTAL SER VICES								
LIME	1	14.	1	14.	0	0.	0	0.
TOTAL -	1	14.	1	14.	0	0.	0	0.
GE ENVIRONMENTAL SERVICES								
DUAL ALKALI	1	590.	1	590.	0	0.	0	0.
LIME	8	3983.	8	3983.	0	0.	0	0.
LIME/ALKALINE FLYASH	3	616.	3	616.	0	0.	0	0.
LIME/SPRAY DRYING	1	44.	1	44.	0	0.	0	0.

SECTION 4
SUMMARY OF FGD SYSTEMS BY SYSTEM SUPPLIER

	TOTAL		STATUS: OPERATIONAL		CONSTRUCTION		CONTRACT AWARDED	
SYSTEM SUPPLIER/PROCESS	NO.	MW	NO.	MW	NO.	MW	NO.	MW
LIME/WET INJECTION	1	330.	1	330.	0	0.	0	0.
LIMESTONE	12	8158.	8	5278.	0	0.	4	2880.
TOTAL -	26	13721.	22	10841.	0	0.	4	2880.
JOY MFG/NIRO ATOMIZER								
LIME/SPRAY DRYING	10	4288.	8	3208.	1	360.	1	720.
TOTAL -	10	4288.	8	3208.	1	360.	1	720.
M.W. KELLOGG								
LIME	1	835.	1	835.	0	0.	0	0.
LIMESTONE	5	2362.	5	2362.	0	0.	0	0.
TOTAL -	6	3197.	6	3197.	0	0.	0	0.
MITSUBISHI HEAVY INDUSTRIES								
LIMESTONE	2	882.	2	882.	0	0.	0	0.
TOTAL -	2	882.	2	882.	0	0.	0	0.
PEABODY PROCESS SYSTEMS								
LIME/ALKALINE FLYASH	1	475.	1	475.	0	0.	0	0.
LIMESTONE	9	3998.	8	3548.	0	0.	1	450.
TOTAL -	10	4473.	9	4023.	0	0.	1	450.
PUBLIC SERVICE OF COLORADO								
SODIUM BICARBONATE	1	350.	0	0.	1	350.	0	0.
TOTAL -	1	350.	0	0.	1	350.	0	0.
RESEARCH-COTTRELL								
LIME/SPRAY DRYING	1	50.	1	50.	0	0.	0	0.
LIMESTONE	16	6272.	15	5660.	1	612.	0	0.
TOTAL -	17	6322.	16	5710.	1	612.	0	0.
ROCKWELL INTERNATIONAL								
LIME/SPRAY DRYING	1	288.	1	288.	0	0.	0	0.
TOTAL -	1	288.	1	288.	0	0.	0	0.
SRP/M. W. KELLOGG								
LIMESTONE	1	320.	0	0.	1	320.	0	0.
TOTAL -	1	320.	0	0.	1	320.	0	0.
TENNESSEE VALLEY AUTHORITY								
LIMESTONE	1	550.	1	550.	0	0.	0	0.
TOTAL -	1	550.	1	550.	0	0.	0	0.
THYSSEN/CEA								
DUAL ALKALI	1	260.	1	260.	0	0.	0	0.
LIME	1	550.	1	550.	0	0.	0	0.
LIME/ALKALINE FLYASH	3	1090.	3	1090.	0	0.	0	0.
SODIUM CARBONATE	4	617.	4	617.	0	0.	0	0.
TOTAL -	9	2517.	9	2517.	0	0.	0	0.
UNITED ENGINEERS								
MAGNESIUM OXIDE	3	884.	3	884.	0	0.	0	0.
TOTAL -	3	884.	3	884.	0	0.	0	0.
VENDOR NOT SELECTED								
PROCESS NOT SELECTED	1	512.	0	0.	0	0.	1	512.
TOTAL -	1	512.	0	0.	0	0.	1	512.

SECTION 4
SUMMARY OF FGD SYSTEMS BY SYSTEM SUPPLIER

	TOTAL		STATUS: OPERATIONAL		CONSTRUCTION		CONTRACT AWARDED	
SYSTEM SUPPLIER/PROCESS	NO.	MW	NO.	MW	NO.	MW	NO.	MW
WHEELABRATOR AIR POLTN. CNTRL.								
LIMESTONE	1	750.	0	0.	0	0.	1	750.
TOTAL -	1	750.	0	0.	0	0.	1	750.
WHEELABRATOR-FRYE/R.I.								
SODIUM CARBONATE/SPRAY DRYING	1	427.	1	427.	0	0.	0	0.
TOTAL -	1	427.	1	427.	0	0.	0	0.
TOTAL -	168	71103.	151	60643.	7	3990.	10	6470.

SECTION 5
SUMMARY OF FGD SYSTEMS BY PROCESS

	TOTAL		STATUS: OPERATIONAL		CONSTRUCTION		CONTRACT AWARDED		PLANNED	
PROCESS	NO.	MW	NO.	MW	NO.	MW	NO.	MW	NO.	MW
LIME	1	14.	1	14.	0	0.	0	0.	0	0.
LIMESTONE	5	1862.	3	792.	0	0.	0	0.	2	1070.
MAGNESIUM OXIDE	3	884.	3	884.	0	0.	0	0.	0	0.
WELLMAN LORD	7	1930.	7	1930.	0	0.	0	0.	0	0.
SUBTOTAL - SALEABLE PRODUCT	16	4690.	14	3620.	0	0.	0	0.	2	1070.
DUAL ALKALI	6	2095.	6	2095.	0	0.	0	0.	0	0.
LIME	30	13841.	28	11802.	1	1389.	1	650.	0	0.
LIME/ALKALINE FLYASH	11	4391.	11	4391.	0	0.	0	0.	0	0.
LIME/SPRAY DRYING	24	9117.	15	5147.	1	360.	1	720.	7	2890.
LIME/WET INJECTION	1	330.	1	330.	0	0.	0	0.	0	0.
LIMESTONE	84	39376.	66	29352.	3	1383.	6	4080.	9	4561.
LIMESTONE/ALKALINE FLYASH	2	1500.	2	1500.	0	0.	0	0.	0	0.
PROCESS NOT SELECTED	4	2402.	0	0.	0	0.	1	512.	3	1890.
SODIUM BICARBONATE	1	350.	0	0.	1	350.	0	0.	0	0.
SODIUM CARBONATE	9	2995.	7	1979.	1	508.	1	508.	0	0.
SODIUM CARBONATE/SPRAY DRYING	1	427.	1	427.	0	0.	0	0.	0	0.
TRONA/DRY INJECTION	1	500.	0	0.	0	0.	0	0.	1	500.
SUBTOTAL - THROWAWAY PRODUCT	174	77324.	137	57023.	7	3990.	10	6470.	20	9841.
TOTALS	190	82014.	151	60643.	7	3990.	10	6470.	22	10911.
SALEABLE PRODUCT PROCESS % OF TOTAL MW		6		6		0		0		10

NOTE: 18 UNITS ARE UNDECIDED (WITH RESPECT TO SALEABLE/THROWAWAY PRODUCT) AND ARE NOT INCLUDED IN THIS TABLE. THE 4 UNITS LISTED AS PROCESS NOT SELECTED ABOVE ARE PLANNED THROWAWAY PRODUCT FGD SYSTEMS; HOWEVER A SPECIFIC PROCESS HAS NOT YET BEEN CHOSEN.

SECTION 6
SUMMARY OF OPERATIONAL FGD SYSTEMS BY PROCESS AND UNIT

PROCESS/ UNIT NAME	UNIT NO.	CAPACITY MW	INITIAL STARTUP	COMMERCIAL STARTUP
DUAL ALKALI				
A.B. BROWN	1	225	3/1979	4/1979
A.B. BROWN	2	265	2/1986	2/1986
CANE RUN	6	260	4/1979	4/1979
NEWTON	1	590	9/1979	12/1979
R.M. SCHAHFER	17	379	4/1983	6/1983
R.M. SCHAHFER	18	376	12/1985	6/1986
		2095.		
LIME				
BEAVER VALLEY	1	126	8/1980	0/ 0
BRUCE MANSFIELD	1	835	12/1975	6/1976
BRUCE MANSFIELD	2	835	7/1977	10/1977
BRUCE MANSFIELD	3	835	6/1980	10/1980
CANE RUN	4	170	8/1976	8/1977
CANE RUN	5	181	12/1977	7/1978
CONESVILLE	5	350	1/1977	2/1977
CONESVILLE	6	350	6/1978	7/1978
EAST BEND	2	643	3/1981	3/1981
ELRAMA	1-4	510	10/1975	10/1975
FOUR CORNERS	4	668	10/1984	1/1985
FOUR CORNERS	5	668	10/1984	1/1985
GREEN	1	250	12/1979	12/1979
GREEN	2	242	11/1980	12/1980
GREEN RIVER	1-3	60	9/1975	6/1976
HUNTER	1	369	3/1979	5/1979
HUNTER	2	369	6/1980	6/1980
HUNTINGTON	1	361	5/1978	5/1978
J.B. SIMS	3	65	5/1983	8/1983
MILL CREEK	1	321	12/1980	4/1981
MILL CREEK	2	338	12/1981	4/1982
MILL CREEK	3	412	8/1978	3/1979
MILL CREEK	4	496	7/1982	10/1982
MITCHELL	3	296	8/1982	9/1982
PHILLIPS	1-6	408	7/1973	6/1974
PLEASANTS	1	547	12/1978	12/1980
PLEASANTS	2	547	10/1980	12/1980
SPURLOCK	2	550	12/1982	4/1983
WESTLEY	1	14	10/1987	10/1987
		11816.		
LIME/ALKALINE FLYASH				
CLAY BOSWELL	4	475	2/1980	4/1980
COAL CREEK	1	327	7/1979	8/1979
COAL CREEK	2	327	7/1980	9/1980
COLSTRIP	1	358	9/1975	11/1975
COLSTRIP	2	358	5/1976	10/1976
COLSTRIP	3	778	10/1983	1/1984
COLSTRIP	4	778	12/1985	4/1986
FOUR CORNERS	1	186	11/1979	11/1979
FOUR CORNERS	2	186	11/1979	11/1979
FOUR CORNERS	3	244	11/1979	11/1979
MILTON R. YOUNG	2	374	9/1977	6/1978
		4391.		
LIME/SPRAY DRYING				
ANTELOPE VALLEY	1	490	5/1983	7/1984
ANTELOPE VALLEY	2	490	10/1985	6/1986

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SECTION 6
SUMMARY OF OPERATIONAL FGD SYSTEMS BY PROCESS AND UNIT

PROCESS/ UNIT NAME	UNIT NO.	CAPACITY MW	INITIAL STARTUP	COMMERCIAL STARTUP
CRAIG	3	427	6/1984	2/1985
GRDA	2	520	3/1985	10/1985
HOLCOMB	1	319	7/1983	8/1983
LARAMIE RIVER	3	600	11/1982	11/1982
NORTH VALMY	2	288	5/1985	8/1985
RAWHIDE	1	278	12/1983	12/1984
RIVERSIDE	6-7	150	11/1980	12/1980
SHAWNEE	9	10	3/1987	0/ 0
SHERBURNE CO.	3	801	7/1987	1/1988
SHIRAS	3	44	3/1983	4/1983
SPRINGERVILLE	1	360	2/1985	6/1985
STANTON	10	50	7/1982	11/1982
WYODAK	1	320	9/1986	12/1986
		5147.		
LIME/WET INJECTION				
DAVE JOHNSTON	4	330	2/1985	2/1985
		330.		
LIMESTONE				
APACHE	2	98	8/1978	1/1979
APACHE	3	98	6/1979	6/1979
BIG BEND	4	455	12/1984	2/1985
BONANZA	1	427	12/1985	5/1986
C.H. STANTON	1	460	5/1987	0/ 0
CHOLLA	1	126	10/1973	12/1973
CHOLLA	2	250	4/1978	6/1978
CHOLLA	4	137	3/1981	6/1981
CORONADO	1	320	11/1979	12/1979
CORONADO	2	320	7/1980	10/1981
CRAIG	1	350	10/1980	12/1980
CRAIG	2	350	12/1979	5/1980
CROSS	2	510	10/1983	5/1984
D.B. WILSON	1	440	9/1984	9/1984
DALLMAN	3	192	10/1980	1/1981
DEEPWATER	1	165	3/1986	6/1986
DOLET HILLS	1	720	12/1985	0/1986
DUCK CREEK	1	396	7/1976	8/1978
ENDICOTT	1	55	5/1983	5/1983
GIBBONS CREEK	1	400	11/1982	10/1983
GIBSON	5	667	10/1982	3/1983
HENRY W. PIRKEY	1	720	12/1984	1/1985
HUNTER	3	424	4/1983	6/1983
INTERMOUNTAIN	1	841	2/1986	6/1986
INTERMOUNTAIN	2	841	3/1987	7/1987
JEFFREY	1	540	8/1978	8/1978
JEFFREY	2	540	1/1980	5/1980
JEFFREY	3	533	5/1983	5/1983
LA CYGNE	1	740	12/1972	6/1973
LARAMIE RIVER	1	600	7/1980	7/1980
LARAMIE RIVER	2	600	7/1981	7/1986
LAWRENCE	4	119	1/1977	1/1977
LAWRENCE	5	355	4/1978	4/1978
LIMESTONE	1	780	10/1985	12/1986
LIMESTONE	2	780	10/1986	12/1986
MARION	4	184	4/1979	6/1979
MARTIN LAKE	1	595	4/1977	10/1977
MARTIN LAKE	2	595	5/1978	5/1978
MARTIN LAKE	3	595	2/1979	2/1979
MCINTOSH	3	364	7/1982	9/1982

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SECTION 6
SUMMARY OF OPERATIONAL FGD SYSTEMS BY PROCESS AND UNIT

PROCESS/ UNIT NAME	UNIT NO.	CAPACITY MW	INITIAL STARTUP	COMMERCIAL STARTUP
MEROM	1	441	8/1982	8/1982
MEROM	2	441	12/1981	2/1982
MONTICELLO	3	793	5/1978	10/1978
MUSCATINE	9	172	4/1983	8/1983
OKLAUNION	1	504	11/1986	12/1986
PARADISE	1	704	5/1983	7/1983
PARADISE	2	704	7/1983	12/1983
PETERSBURG	3	479	12/1977	4/1986
PETERSBURG	4	473	1/1986	3/1986
PLAINS ESCALANTE	1	233	11/1984	12/1984
R.D. MORROW, SR.	1	133	8/1978	8/1978
R.D. MORROW, SR.	2	133	6/1979	6/1979
SAN MIGUEL	1	410	8/1981	10/1981
SANDOW	4	405	12/1980	1/1981
SEMINOLE	1	650	5/1983	2/1984
SEMINOLE	2	650	9/1984	1/1985
SIKESTON	1	235	6/1981	9/1981
SOMERSET	1	680	7/1984	8/1984
SOUTHWEST	1	195	4/1977	9/1977
ST.JOHNS RIVER PWR PARK	1	674	12/1986	3/1987
THOMAS HILL	3	615	10/1982	12/1982
TOMBIGBEE	2	179	9/1978	9/1978
TOMBIGBEE	3	179	6/1979	6/1979
W.A. PARISH	8	467	10/1982	12/1982
WIDOWS CREEK	7	575	3/1981	9/1981
WIDOWS CREEK	8	550	5/1977	1/1978
WINYAH	2	158	7/1977	7/1977
WINYAH	3	315	7/1980	7/1980
WINYAH	4	315	7/1981	9/1981
		30144.		
LIMESTONE/ALKALINE FLYASH				
SHERBURNE CO.	1	750	3/1976	5/1976
SHERBURNE CO.	2	750	3/1977	4/1977
		1500.		
MAGNESIUM OXIDE				
CROMBY	1	176	10/1982	1/1983
EDDYSTONE	1	354	9/1982	12/1982
EDDYSTONE	2	354	11/1982	12/1982
		884.		
SODIUM CARBONATE				
JIM BRIDGER	2	508	6/1986	9/1986
JIM BRIDGER	4	508	9/1979	2/1980
NAUGHTON	3	346	9/1981	12/1981
REID GARDNER	1	125	3/1974	4/1974
REID GARDNER	2	125	4/1974	4/1974
REID GARDNER	3	125	6/1976	7/1976
REID GARDNER	4	242	6/1983	7/1983
		1979.		
SODIUM CARBONATE/SPRAY DRYING				
COYOTE	1	427	4/1981	5/1981
		427.		

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SECTION 6
SUMMARY OF OPERATIONAL FGD SYSTEMS BY PROCESS AND UNIT

PROCESS/ UNIT NAME	UNIT NO.	CAPACITY MW	INITIAL STARTUP	COMMERCIAL STARTUP
WELLMAN LORD				
DELAWARE CITY	1	28	5/1980	5/1980
DELAWARE CITY	2	28	5/1980	5/1980
DELAWARE CITY	3	75	5/1980	5/1980
SAN JUAN	1	361	4/1978	4/1978
SAN JUAN	2	350	8/1978	8/1978
SAN JUAN	3	544	12/1979	12/1979
SAN JUAN	4	544	5/1982	7/1982
		1930.		
TOTAL		60643.		

SECTION 7
SUMMARY OF END-PRODUCT DISPOSAL PRACTICES FOR OPERATIONAL FGD SYSTEMS

PROCESS/ UNIT NAME	UNIT NO	THROWAWAY		BYPRODUCT	
		LANDFILL	POND	TYPE	DISPOSITION
DUAL ALKALI					
A.B. BROWN	1	UNSTABILIZED		NONE	N/A
A.B. BROWN	2	UNSTABILIZED		NONE	N/A
CANE RUN	6	FIXATION		NONE	N/A
NEWTON	1	FIXATION		NONE	N/A
R.M. SCHAHFER	17	STABILIZATION		NONE	N/A
R.M. SCHAHFER	18	STABILIZATION		NONE	N/A
LIME					
BEAVER VALLEY	1	STABILIZATION			
BRUCE MANSFIELD	1		FIXATION	NONE	N/A
BRUCE MANSFIELD	2		FIXATION	NONE	N/A
BRUCE MANSFIELD	3		FIXATION	NONE	N/A
CANE RUN	4	FIXATION		NONE	N/A
CANE RUN	5	FIXATION		NONE	N/A
CONESVILLE	5	FIXATION		NONE	N/A
CONESVILLE	6	FIXATION		NONE	N/A
EAST BEND	2	FIXATION		NONE	N/A
ELRAMA	1-4	FIXATION		NONE	N/A
FOUR CORNERS	4	FIXATION		NONE	N/A
FOUR CORNERS	5	FIXATION		NONE	N/A
GREEN	1	FIXATION		NONE	N/A
GREEN	2	FIXATION		NONE	N/A
GREEN RIVER	1-3		UNSTABILIZED	NONE	N/A
HUNTER	1	STABILIZATION		NONE	N/A
HUNTER	2	STABILIZATION		NONE	N/A
HUNTINGTON	1	STABILIZATION		NONE	N/A
JIM BRIDGER	4		UNSTABILIZED	NONE	N/A
J.B. SIMS	3	FORCED-OX		GYPSUM	MARKETED
MILL CREEK	1	FIXATION		NONE	N/A
MILL CREEK	2	FIXATION		NONE	N/A
MILL CREEK	3	FIXATION		NONE	N/A
MILL CREEK	4	FIXATION		NONE	N/A
MITCHELL	3	FIXATION		NONE	N/A
PHILLIPS	1-6	FIXATION		NONE	N/A
PLEASANTS	1		FIXATION	NONE	N/A
PLEASANTS	2		FIXATION	NONE	N/A
SPURLOCK	2	FIXATION		NONE	N/A
WESTLEY	1			FLYASH/OTHER	METAL RECOVERY PLANT
LIME/ALKALINE FLYASH					
CLAY BOSWELL	4		UNSTABILIZED	NONE	N/A
COAL CREEK	1		UNSTABILIZED	NONE	N/A
COAL CREEK	2		UNSTABILIZED	NONE	N/A
COLSTRIP	1		UNSTABILIZED	NONE	N/A
COLSTRIP	2		UNSTABILIZED	NONE	N/A
COLSTRIP	3		FORCED-OX	NONE	N/A
COLSTRIP	4		FORCED-OX	NONE	N/A
FOUR CORNERS	1		UNSTABILIZED	NONE	N/A
FOUR CORNERS	2		UNSTABILIZED	NONE	N/A
FOUR CORNERS	3		UNSTABILIZED	NONE	N/A
MILTON R. YOUNG	2	UNSTABILIZED		NONE	N/A
LIME/SPRAY DRYING					
ANTELOPE VALLEY	1	UNSTABILIZED		NONE	N/A
ANTELOPE VALLEY	2	UNSTABILIZED		NONE	N/A
CRAIG	3	UNSTABILIZED		NONE	N/A
GRDA	2	UNSTABILIZED		NONE	N/A
HOLCOMB	1	UNSTABILIZED		NONE	N/A
LARAMIE RIVER	3	UNSTABILIZED		NONE	N/A
NORTH VALMY	2	UNSTABILIZED		NONE	N/A
RAWHIDE	1	UNSTABILIZED		NONE	N/A
RIVERSIDE	6-7	UNSTABILIZED		NONE	N/A

SECTION 7
SUMMARY OF END-PRODUCT DISPOSAL PRACTICES FOR OPERATIONAL FGD SYSTEMS

PROCESS/ UNIT NAME	UNIT NO	THROWAWAY LANDFILL	THROWAWAY POND	BYPRODUCT TYPE	BYPRODUCT DISPOSITION
SHAWNEE	9	UNSTABILIZED		NONE	N/A
SHERBURNE CO.	3	UNSTABILIZED		NONE	N/A
SHIRAS	3	UNSTABILIZED		NONE	N/A
SPRINGERVILLE	1	UNSTABILIZED		NONE	N/A
STANTON	10	UNSTABILIZED		NONE	N/A
WYODAK	1	UNSTABILIZED		NONE	N/A
LIME/WET INJECTION					
DAVE JOHNSTON	4				
LIMESTONE					
APACHE	2		UNSTABILIZED	NONE	N/A
APACHE	3		UNSTABILIZED	NONE	N/A
BIG BEND	4	FORCED-OX		GYPSUM	N/A
BONANZA	1	UNSTABILIZED		NONE	N/A
C.H. STANTON	1	FIXATION		NONE	N/A
CHOLLA	1		UNSTABILIZED	NONE	N/A
CHOLLA	2		UNSTABILIZED	NONE	N/A
CHOLLA	4		UNSTABILIZED	NONE	N/A
CORONADO	1		UNSTABILIZED	NONE	N/A
CORONADO	2		UNSTABILIZED	NONE	N/A
CRAIG	1	UNSTABILIZED		NONE	N/A
CRAIG	2	UNSTABILIZED		NONE	N/A
CROSS	2	FIXATION		NONE	N/A
D.B. WILSON	1	FORCED-OX		NONE	N/A
DALLMAN	3	FORCED-OX		NONE	N/A
DEEPWATER	1			GYPSUM	MARKETED
DOLET HILLS	1	FIXATION		NONE	N/A
DUCK CREEK	1		UNSTABILIZED	NONE	N/A
ENDICOTT	1	FORCED-OX		NONE	N/A
GIBBONS CREEK	1	FIXATION		NONE	N/A
GIBSON	5	FIXATION		NONE	N/A
HENRY W. PIRKEY	1	FIXATION		NONE	N/A
HUNTER	3	STABILIZATION		NONE	N/A
INTERMOUNTAIN	1	FIXATION		NONE	N/A
INTERMOUNTAIN	2	FIXATION		NONE	N/A
JEFFREY	1		FORCED-OX	NONE	N/A
JEFFREY	2		FORCED-OX	NONE	N/A
JEFFREY	3		FORCED-OX	NONE	N/A
LA CYGNE	1		UNSTABILIZED	NONE	N/A
LARAMIE RIVER	1	FORCED-OX		NONE	N/A
LARAMIE RIVER	2	FORCED-OX		NONE	N/A
LAWRENCE	4		FORCED-OX	NONE	N/A
LAWRENCE	5		FORCED-OX	NONE	N/A
LIMESTONE	1	FIXATION		NONE	N/A
LIMESTONE	2	FIXATION		NONE	N/A
MARION	4	STABILIZATION		NONE	N/A
MARTIN LAKE	1	FORCED-OX/STABILIZATION		GYPSUM	MARKETED
MARTIN LAKE	2	FORCED-OX/STABILIZATION		GYPSUM	MARKETED
MARTIN LAKE	3	FORCED-OX/STABILIZATION		GYPSUM	MARKETED
MCINTOSH	3	FIXATION		NONE	N/A
MEROM	1	FORCED-OX		NONE	N/A
MEROM	2	FORCED-OX		NONE	N/A
MONTICELLO	3		UNSTABILIZED	NONE	N/A
MUSCATINE	9	FORCED-OX		NONE	N/A
OKLAUNION	1		UNSTABILIZED	NONE	N/A
PARADISE	1	FORCED-OX		NONE	N/A
PARADISE	2	FORCED-OX		NONE	N/A
PETERSBURG	3	FIXATION		NONE	N/A
PETERSBURG	4	FIXATION		NONE	N/A
PLAINS ESCALANTE	1	STABILIZATION		NONE	N/A
R.D. MORROW, SR.	1	FIXATION		NONE	N/A
R.D. MORROW, SR.	2	FIXATION		NONE	N/A
SAN MIGUEL	1	STABILIZATION		NONE	N/A
SANDOW	4		FORCED-OX	NONE	N/A

SECTION 7
SUMMARY OF END-PRODUCT DISPOSAL PRACTICES FOR OPERATIONAL FGD SYSTEMS

PROCESS/ UNIT NAME	UNIT NO	THROWAWAY		BYPRODUCT	
		LANDFILL	POND	TYPE	DISPOSITION
SEMINOLE	1	FORCED-OX		GYPSUM	MARKETED
SEMINOLE	2	FIXATION		NONE	N/A
SIKESTON	1		UNSTABILIZED	NONE	N/A
SOMERSET	1	STABILIZATION		NONE	N/A
SOUTHWEST	1	STABILIZATION		NONE	N/A
ST.JOHNS RIVER PWR PARK	1	FORCED-OX		GYPSUM	MARKETED
THOMAS HILL	3	FORCED-OX		NONE	N/A
TOMBIGBEE	2		UNSTABILIZED	NONE	N/A
TOMBIGBEE	3		UNSTABILIZED	NONE	N/A
W.A. PARISH	8	STABILIZATION		NONE	N/A
WIDOWS CREEK	7		FORCED-OX	NONE	N/A
WIDOWS CREEK	8		FORCED-OX	NONE	N/A
WINYAH	2		UNSTABILIZED	NONE	N/A
WINYAH	3		UNSTABILIZED	NONE	N/A
WINYAH	4		UNSTABILIZED	NONE	N/A
LIMESTONE/ALKALINE FLYASH					
SHERBURNE CO.	1		FORCED-OX	NONE	N/A
SHERBURNE CO.	2		FORCED-OX	NONE	N/A
MAGNESIUM OXIDE					
CROMBY	1			SULFURIC ACID	MARKETED
EDDYSTONE	1			SULFURIC ACID	MARKETED
EDDYSTONE	2			SULFURIC ACID	MARKETED
SODIUM CARBONATE					
JIM BRIDGER	2		UNSTABILIZED	NONE	N/A
JIM BRIDGER	4		UNSTABILIZED	NONE	N/A
NAUGHTON	3		UNSTABILIZED	NONE	N/A
REID GARDNER	1		UNSTABILIZED	NONE	N/A
REID GARDNER	2		UNSTABILIZED	NONE	N/A
REID GARDNER	3		UNSTABILIZED	NONE	N/A
REID GARDNER	4		UNSTABILIZED	NONE	N/A
SODIUM CARBONATE/SPRAY DRYING					
COYOTE	1	UNSTABILIZED		NONE	N/A
WELLMAN LORD					
DELAWARE CITY	1			SULFURIC ACID	MARKETED
DELAWARE CITY	2			SULFURIC ACID	MARKETED
DELAWARE CITY	3			SULFURIC ACID	MARKETED
SAN JUAN	1			SULFURIC ACID	MARKETED
SAN JUAN	2			SULFURIC ACID	MARKETED
SAN JUAN	3			SULFURIC ACID	MARKETED
SAN JUAN	4			SULFURIC ACID	MARKETED

SECTION 8
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 TOMBIGBEE	2	NEW	179	LIMESTONE PEABODY PROCESS SYSTEMS	9/1978
ALABAMA ELECTRIC TOMBIGBEE	3	NEW	179	LIMESTONE PEABODY PROCESS SYSTEMS	6/1979
ALAMITO CO SPRINGERVILLE	1	NEW	360	LIME/SPRAY DRYING JOY MFG/NIRO ATOMIZER	2/1985
APPLIED ENERGY SERVICE BEAVER VALLEY	1	RETROFIT	126	LIME FMC	8/1980
APPLIED ENERGY SERVICE DEEPWATER	1	NEW	165	LIMESTONE BABCOCK & WILCOX	3/1986
ARIZONA ELECTRIC POWER APACHE	2	NEW	98	LIMESTONE RESEARCH-COTTRELL	8/1978
ARIZONA ELECTRIC POWER APACHE	3	NEW	98	LIMESTONE RESEARCH-COTTRELL	6/1979
ARIZONA PUBLIC SERVICE CHOLLA	1	RETROFIT	126	LIMESTONE RESEARCH-COTTRELL	10/1973
ARIZONA PUBLIC SERVICE CHOLLA	2	NEW	250	LIMESTONE RESEARCH-COTTRELL	4/1978
ARIZONA PUBLIC SERVICE CHOLLA	4	NEW	137	LIMESTONE RESEARCH-COTTRELL	3/1981
ARIZONA PUBLIC SERVICE FOUR CORNERS	1	RETROFIT	186	LIME/ALKALINE FLYASH GE ENVIRONMENTAL SERVICES	11/1979
ARIZONA PUBLIC SERVICE FOUR CORNERS	2	RETROFIT	186	LIME/ALKALINE FLYASH GE ENVIRONMENTAL SERVICES	11/1979
ARIZONA PUBLIC SERVICE FOUR CORNERS	3	RETROFIT	244	LIME/ALKALINE FLYASH GE ENVIRONMENTAL SERVICES	11/1979
ARIZONA PUBLIC SERVICE FOUR CORNERS	4	RETROFIT	668	LIME BABCOCK & WILCOX	10/1984
ARIZONA PUBLIC SERVICE FOUR CORNERS	5	RETROFIT	668	LIME BABCOCK & WILCOX	10/1984
ASSOCIATED ELECTRIC THOMAS HILL	3	NEW	615	LIMESTONE M.W. KELLOGG	10/1982
BASIN ELECTRIC POWER ANTELOPE VALLEY	1	NEW	490	LIME/SPRAY DRYING JOY MFG/NIRO ATOMIZER	5/1983
BASIN ELECTRIC POWER ANTELOPE VALLEY	2	NEW	490	LIME/SPRAY DRYING JOY MFG/NIRO ATOMIZER	10/1985
BASIN ELECTRIC POWER LARAMIE RIVER	1	NEW	600	LIMESTONE RESEARCH-COTTRELL	7/1980
BASIN ELECTRIC POWER LARAMIE RIVER	2	NEW	600	LIMESTONE RESEARCH-COTTRELL	7/1981
BASIN ELECTRIC POWER LARAMIE RIVER	3	NEW	600	LIME/SPRAY DRYING BABCOCK & WILCOX	11/1982
BIG RIVERS ELECTRIC D.B. WILSON	1	NEW	440	LIMESTONE M.W. KELLOGG	9/1984
BIG RIVERS ELECTRIC GREEN	1	NEW	250	LIME AMERICAN AIR FILTER	12/1979

SECTION 8
SUMMARY OF FGD SYSTEMS IN OPERATION

COMPANY NAME/ UNIT NAME	UNIT NO.	NEW OR RETROFIT	CAPACITY MW	PROCESS/ SYSTEM SUPPLIER	START-UP DATE
BIG RIVERS ELECTRIC GREEN	2	NEW	242	LIME AMERICAN AIR FILTER	11/1980
CENTRAL ILLINOIS LIGHT DUCK CREEK	1	NEW	396	LIMESTONE ENVIRONEERING, RILEY STOKER	7/1976
CENTRAL ILLINOIS PUBLIC SERV NEWTON	1	NEW	590	DUAL ALKALI GE ENVIRONMENTAL SERVICES	9/1979
CINCINNATI GAS & ELECTRIC EAST BEND	2	NEW	643	LIME BABCOCK & WILCOX	3/1981
CITY UTILITIES OF SPRINGFIELD SOUTHWEST	1	NEW	195	LIMESTONE AIR CORRECTION DIVISION, UOP	4/1977
COLORADO UTE ELECTRIC CRAIG	1	NEW	350	LIMESTONE PEABODY PROCESS SYSTEMS	10/1980
COLORADO UTE ELECTRIC CRAIG	2	NEW	350	LIMESTONE PEABODY PROCESS SYSTEMS	12/1979
COLORADO UTE ELECTRIC CRAIG	3	NEW	427	LIME/SPRAY DRYING BABCOCK & WILCOX	6/1984
COLUMBUS & SOUTHERN OHIO ELEC CONESVILLE	5	NEW	350	LIME AIR CORRECTION DIVISION, UOP	1/1977
COLUMBUS & SOUTHERN OHIO ELEC CONESVILLE	6	NEW	350	LIME AIR CORRECTION DIVISION, UOP	6/1978
COOPERATIVE POWER ASSOCIATION COAL CREEK	1	NEW	327	LIME/ALKALINE FLYASH COMBUSTION ENGINEERING	7/1979
COOPERATIVE POWER ASSOCIATION COAL CREEK	2	NEW	327	LIME/ALKALINE FLYASH COMBUSTION ENGINEERING	7/1980
DELMARVA POWER & LIGHT DELAWARE CITY	1	RETROFIT	28	WELLMAN LORD DAVY MCKEE	5/1980
DELMARVA POWER & LIGHT DELAWARE CITY	2	RETROFIT	28	WELLMAN LORD DAVY MCKEE	5/1980
DELMARVA POWER & LIGHT DELAWARE CITY	3	RETROFIT	75	WELLMAN LORD DAVY MCKEE	5/1980
DESERET GEN & TRANS BONANZA	1	NEW	427	LIMESTONE COMBUSTION ENGINEERING	12/1985
DUQUESNE LIGHT ELRAMA	1-4	RETROFIT	510	LIME GE ENVIRONMENTAL SERVICES	10/1975
DUQUESNE LIGHT PHILLIPS	1-6	RETROFIT	408	LIME GE ENVIRONMENTAL SERVICES	7/1973
EAST KENTUCKY POWER SPURLOCK	2	NEW	550	LIME THYSSEN/CEA	12/1982
GRAND HAVEN BRD OF LIGHT & PWR J.B. SIMS	3	NEW	65	LIME BABCOCK & WILCOX	5/1983
GRAND RIVER DAM AUTHORITY GRDA	2	NEW	520	LIME/SPRAY DRYING FLAKT	3/1985
HOOSIER ENERGY MEROM	1	NEW	441	LIMESTONE MITSUBISHI HEAVY INDUSTRIES	8/1982
HOOSIER ENERGY MEROM	2	NEW	441	LIMESTONE MITSUBISHI HEAVY INDUSTRIES	12/1981

SECTION 8
SUMMARY OF FGD SYSTEMS IN OPERATION

COMPANY NAME/ UNIT NAME	UNIT NO.	NEW OR RETROFIT	CAPACITY MW	PROCESS/ SYSTEM SUPPLIER	START-UP DATE
HOUSTON LIGHTING & POWER LIMESTONE	1	NEW	780	LIMESTONE COMBUSTION ENGINEERING	10/1985
HOUSTON LIGHTING & POWER LIMESTONE	2	NEW	780	LIMESTONE COMBUSTION ENGINEERING	10/1986
HOUSTON LIGHTING & POWER W.A. PARISH	8	NEW	467	LIMESTONE GE ENVIRONMENTAL SERVICES	10/1982
INDIANAPOLIS POWER & LIGHT PETERSBURG	3	NEW	479	LIMESTONE AIR CORRECTION DIVISION, UOP	12/1977
INDIANAPOLIS POWER & LIGHT PETERSBURG	4	NEW	473	LIMESTONE RESEARCH-COTTRELL	1/1986
JACKSONVILLE ELEC AUTHORITY ST.JOHNS RIVER PWR PARK1		NEW	674	LIMESTONE RESEARCH-COTTRELL	12/1986
KANSAS CITY POWER & LIGHT LA CYGNE	1	NEW	740	LIMESTONE BABCOCK & WILCOX	12/1972
KANSAS POWER & LIGHT JEFFREY	1	NEW	540	LIMESTONE COMBUSTION ENGINEERING	8/1978
KANSAS POWER & LIGHT JEFFREY	2	NEW	540	LIMESTONE COMBUSTION ENGINEERING	1/1980
KANSAS POWER & LIGHT JEFFREY	3	NEW	533	LIMESTONE COMBUSTION ENGINEERING	5/1983
KANSAS POWER & LIGHT LAWRENCE	4	RETROFIT	119	LIMESTONE COMBUSTION ENGINEERING	1/1977
KANSAS POWER & LIGHT LAWRENCE	5	RETROFIT	355	LIMESTONE COMBUSTION ENGINEERING	4/1978
KENTUCKY UTILITIES GREEN RIVER	1-3	RETROFIT	60	LIME AMERICAN AIR FILTER	9/1975
LAKELAND UTILITIES MCINTOSH	3	NEW	364	LIMESTONE BABCOCK & WILCOX	7/1982
LOS ANGELES DEPT OF WTR & PWR INTERMOUNTAIN	1	NEW	841	LIMESTONE GE ENVIRONMENTAL SERVICES	2/1986
LOS ANGELES DEPT OF WTR & PWR INTERMOUNTAIN	2	NEW	841	LIMESTONE GE ENVIRONMENTAL SERVICES	3/1987
LOUISVILLE GAS & ELECTRIC CANE RUN	4	RETROFIT	170	LIME AMERICAN AIR FILTER	8/1976
LOUISVILLE GAS & ELECTRIC CANE RUN	5	RETROFIT	181	LIME COMBUSTION ENGINEERING	12/1977
LOUISVILLE GAS & ELECTRIC CANE RUN	6	RETROFIT	260	DUAL ALKALI THYSSEN/CEA	4/1979
LOUISVILLE GAS & ELECTRIC MILL CREEK	1	RETROFIT	321	LIME COMBUSTION ENGINEERING	12/1980
LOUISVILLE GAS & ELECTRIC MILL CREEK	2	RETROFIT	338	LIME COMBUSTION ENGINEERING	12/1981
LOUISVILLE GAS & ELECTRIC MILL CREEK	3	NEW	412	LIME AMERICAN AIR FILTER	8/1978
LOUISVILLE GAS & ELECTRIC MILL CREEK	4	NEW	496	LIME AMERICAN AIR FILTER	7/1982

SECTION 8
SUMMARY OF FGD SYSTEMS IN OPERATION

COMPANY NAME/ UNIT NAME	UNIT NO.	NEW OR RETROFIT	CAPACITY MW	PROCESS/ SYSTEM SUPPLIER	START-UP DATE
MARQUETTE BOARD OF LIGHT & PWR SHIRAS	3	NEW	44	LIME/SPRAY DRYING GE ENVIRONMENTAL SERVICES	3/1983
MICHIGAN SO CENTRAL PWR AGENCY ENDICOTT	1	NEW	55	LIMESTONE BABCOCK & WILCOX	5/1983
MINNESOTA POWER & LIGHT CLAY BOSWELL	4	NEW	475	LIME/ALKALINE FLYASH PEABODY PROCESS SYSTEMS	2/1980
MINNKOTA POWER MILTON R. YOUNG	2	NEW	374	LIME/ALKALINE FLYASH THYSSEN/CEA	9/1977
MONONGAHELA POWER PLEASANTS	1	NEW	547	LIME BABCOCK & WILCOX	12/1978
MONONGAHELA POWER PLEASANTS	2	NEW	547	LIME BABCOCK & WILCOX	10/1980
MONTANA POWER COLSTRIP	1	NEW	358	LIME/ALKALINE FLYASH THYSSEN/CEA	9/1975
MONTANA POWER COLSTRIP	2	NEW	358	LIME/ALKALINE FLYASH THYSSEN/CEA	5/1976
MONTANA POWER COLSTRIP	3	NEW	778	LIME/ALKALINE FLYASH BECHTEL/MONTANA POWER	10/1983
MONTANA POWER COLSTRIP	4	NEW	778	LIME/ALKALINE FLYASH BECHTEL/MONTANA POWER	12/1985
MONTANA-DAKOTA UTILITIES COYOTE	1	NEW	427	SODIUM CARBONATE/SPRAY DRYING WHEELABRATOR-FRYE/R.I.	4/1981
MUSCATINE POWER & WATER MUSCATINE	9	NEW	172	LIMESTONE RESEARCH-COTTRELL	4/1983
NEVADA POWER REID GARDNER	1	RETROFIT	125	SODIUM CARBONATE THYSSEN/CEA	3/1974
NEVADA POWER REID GARDNER	2	RETROFIT	125	SODIUM CARBONATE THYSSEN/CEA	4/1974
NEVADA POWER REID GARDNER	3	NEW	125	SODIUM CARBONATE THYSSEN/CEA	6/1976
NEVADA POWER REID GARDNER	4	NEW	242	SODIUM CARBONATE THYSSEN/CEA	6/1983
NEW YORK STATE ELEC & GAS SOMERSET	1	NEW	680	LIMESTONE PEABODY PROCESS SYSTEMS	7/1984
NORTHERN INDIANA PUB SERVICE R.M. SCHAHFER	17	NEW	379	DUAL ALKALI FMC	4/1983
NORTHERN INDIANA PUB SERVICE R.M. SCHAHFER	18	NEW	376	DUAL ALKALI FMC	12/1985
NORTHERN STATES POWER RIVERSIDE	6-7	RETROFIT	150	LIME/SPRAY DRYING JOY MFG/NIRO ATOMIZER	11/1980
NORTHERN STATES POWER SHERBURNE CO.	1	NEW	750	LIMESTONE/ALKALINE FLYASH COMBUSTION ENGINEERING	3/1976
NORTHERN STATES POWER SHERBURNE CO.	2	NEW	750	LIMESTONE/ALKALINE FLYASH COMBUSTION ENGINEERING	3/1977
NORTHERN STATES POWER SHERBURNE CO.	3	NEW	801	LIME/SPRAY DRYING JOY MFG/NIRO ATOMIZER	7/1987

SECTION 8
SUMMARY OF FGD SYSTEMS IN OPERATION

COMPANY NAME/ UNIT NAME	UNIT NO.	NEW OR RETROFIT	CAPACITY MW	PROCESS/ SYSTEM SUPPLIER	START-UP DATE
ORLANDO UTILITIES COMMISSION C.H. STANTON	1	NEW	460	LIMESTONE COMBUSTION ENGINEERING	5/1987
OXFORD ENERGY CO. WESTLEY	1	NEW	14	LIME GE ENVIRONMENTAL SER VICES	10/1987
PACIFIC POWER & LIGHT DAVE JOHNSTON	4	RETROFIT	330	LIME/WET INJECTION GE ENVIRONMENTAL SERVICES	2/1985
PACIFIC POWER & LIGHT JIM BRIDGER	2	RETROFIT	508	SODIUM CARBONATE BABCOCK & WILCOX	6/1986
PACIFIC POWER & LIGHT JIM BRIDGER	4	NEW	508	SODIUM CARBONATE AIR CORRECTION DIVISION, UOP	9/1979
PACIFIC POWER & LIGHT WYODAK	1	RETROFIT	320	LIME/SPRAY DRYING JOY MFG/NIRO ATOMIZER	9/1986
PENNSYLVANIA POWER BRUCE MANSFIELD	1	NEW	835	LIME GE ENVIRONMENTAL SERVICES	12/1975
PENNSYLVANIA POWER BRUCE MANSFIELD	2	NEW	835	LIME GE ENVIRONMENTAL SERVICES	7/1977
PENNSYLVANIA POWER BRUCE MANSFIELD	3	NEW	835	LIME M.W. KELLOGG	6/1980
PHILADELPHIA ELECTRIC CROMBY	1	RETROFIT	176	MAGNESIUM OXIDE UNITED ENGINEERS	10/1982
PHILADELPHIA ELECTRIC EDDYSTONE	1	RETROFIT	354	MAGNESIUM OXIDE UNITED ENGINEERS	9/1982
PHILADELPHIA ELECTRIC EDDYSTONE	2	RETROFIT	354	MAGNESIUM OXIDE UNITED ENGINEERS	11/1982
PLAINS ELECTRIC G & T PLAINS ESCALANTE	1	NEW	233	LIMESTONE COMBUSTION ENGINEERING	11/1984
PLATTE RIVER POWER AUTHORITY RAWHIDE	1	NEW	278	LIME/SPRAY DRYING JOY MFG/NIRO ATOMIZER	12/1983
PUBLIC SERVICE INDIANA GIBSON	5	NEW	667	LIMESTONE M.W. KELLOGG	10/1982
PUBLIC SERVICE OF NEW MEXICO SAN JUAN	1	RETROFIT	361	WELLMAN LORD DAVY MCKEE	4/1978
PUBLIC SERVICE OF NEW MEXICO SAN JUAN	2	RETROFIT	350	WELLMAN LORD DAVY MCKEE	8/1978
PUBLIC SERVICE OF NEW MEXICO SAN JUAN	3	NEW	544	WELLMAN LORD DAVY MCKEE	12/1979
PUBLIC SERVICE OF NEW MEXICO SAN JUAN	4	NEW	544	WELLMAN LORD DAVY MCKEE	5/1982
SALT RIVER PROJECT CORONADO	1	NEW	320	LIMESTONE M.W. KELLOGG	11/1979
SALT RIVER PROJECT CORONADO	2	NEW	320	LIMESTONE M.W. KELLOGG	7/1980
SAN MIGUEL ELECTRIC SAN MIGUEL	1	NEW	410	LIMESTONE BABCOCK & WILCOX	8/1981
SEMINOLE ELECTRIC SEMINOLE	1	NEW	650	LIMESTONE PEABODY PROCESS SYSTEMS	5/1983

SECTION 8
SUMMARY OF FGD SYSTEMS IN OPERATION

COMPANY NAME/ UNIT NAME	UNIT NO.	NEW OR RETROFIT	CAPACITY MW	PROCESS/ SYSTEM SUPPLIER	START-UP DATE
SEMINOLE ELECTRIC SEMINOLE	2	NEW	650	LIMESTONE PEABODY PROCESS SYSTEMS	9/1984
SIERRA PACIFIC POWER NORTH VALMY	2	NEW	288	LIME/SPRAY DRYING ROCKWELL INTERNATIONAL	5/1985
SIKESTON BRD OF MUNICIPAL UTIL SIKESTON	1	NEW	235	LIMESTONE BABCOCK & WILCOX	6/1981
SOUTH CAROLINA PUBLIC SERVICE CROSS	2	NEW	510	LIMESTONE PEABODY PROCESS SYSTEMS	10/1983
SOUTH CAROLINA PUBLIC SERVICE WINYAH	2	NEW	158	LIMESTONE BABCOCK & WILCOX	7/1977
SOUTH CAROLINA PUBLIC SERVICE WINYAH	3	NEW	315	LIMESTONE BABCOCK & WILCOX	7/1980
SOUTH CAROLINA PUBLIC SERVICE WINYAH	4	NEW	315	LIMESTONE AMERICAN AIR FILTER	7/1981
SOUTH MISSISSIPPI ELEC PWR R.D. MORROW, SR.	1	NEW	133	LIMESTONE ENVIRONEERING, RILEY STOKER	8/1978
SOUTH MISSISSIPPI ELEC PWR R.D. MORROW, SR.	2	NEW	133	LIMESTONE ENVIRONEERING, RILEY STOKER	6/1979
SOUTHERN ILLINOIS POWER MARION	4	NEW	184	LIMESTONE BABCOCK & WILCOX	4/1979
SOUTHERN INDIANA GAS & ELEC A.B. BROWN	1	NEW	225	DUAL ALKALI FMC	3/1979
SOUTHERN INDIANA GAS & ELEC A.B. BROWN	2	NEW	265	DUAL ALKALI FMC	2/1986
SOUTHWESTERN ELECTRIC POWER DOLET HILLS	1	NEW	720	LIMESTONE AIR CORRECTION DIVISION, UOP	12/1985
SOUTHWESTERN ELECTRIC POWER HENRY W. PIRKEY	1	NEW	720	LIMESTONE AIR CORRECTION DIVISION, UOP	12/1984
SPRINGFIELD WATER, LIGHT & PWR DALLMAN	3	NEW	192	LIMESTONE RESEARCH-COTTRELL	10/1980
SUNFLOWER ELECTRIC HOLCOMB	1	NEW	319	LIME/SPRAY DRYING JOY MFG/NIRO ATOMIZER	7/1983
TAMPA ELECTRIC BIG BEND	4	NEW	455	LIMESTONE RESEARCH-COTTRELL	12/1984
TENNESSEE VALLEY AUTHORITY PARADISE	1	RETROFIT	704	LIMESTONE GE ENVIRONMENTAL SERVICES	5/1983
TENNESSEE VALLEY AUTHORITY PARADISE	2	RETROFIT	704	LIMESTONE GE ENVIRONMENTAL SERVICES	7/1983
TENNESSEE VALLEY AUTHORITY SHAWNEE	9		10	LIME/SPRAY DRYING EPRI/TVA/ONTARIO HYDRO	3/1987
TENNESSEE VALLEY AUTHORITY WIDOWS CREEK	7	RETROFIT	575	LIMESTONE COMBUSTION ENGINEERING	3/1981
TENNESSEE VALLEY AUTHORITY WIDOWS CREEK	8	RETROFIT	550	LIMESTONE TENNESSEE VALLEY AUTHORITY	5/1977
TEXAS MUNICIPAL POWER AGENCY GIBBONS CREEK	1	NEW	400	LIMESTONE COMBUSTION ENGINEERING	11/1982

SECTION 8
SUMMARY OF FGD SYSTEMS IN OPERATION

COMPANY NAME/ UNIT NAME	UNIT NO.	NEW OR RETROFIT	CAPACITY MW	PROCESS/ SYSTEM SUPPLIER	START-UP DATE
TEXAS UTILITIES MARTIN LAKE	1	NEW	595	LIMESTONE RESEARCH-COTTRELL	4/1977
TEXAS UTILITIES MARTIN LAKE	2	NEW	595	LIMESTONE RESEARCH-COTTRELL	5/1978
TEXAS UTILITIES MARTIN LAKE	3	NEW	595	LIMESTONE RESEARCH-COTTRELL	2/1979
TEXAS UTILITIES MONTICELLO	3	NEW	793	LIMESTONE GE ENVIRONMENTAL SERVICES	5/1978
TEXAS UTILITIES SANDOW	4	NEW	405	LIMESTONE COMBUSTION ENGINEERING	12/1980
UNITED POWER ASSOCIATION STANTON	10	NEW	50	LIME/SPRAY DRYING RESEARCH-COTTRELL	7/1982
UTAH POWER & LIGHT HUNTER	1	NEW	369	LIME GE ENVIRONMENTAL SERVICES	3/1979
UTAH POWER & LIGHT HUNTER	2	NEW	369	LIME GE ENVIRONMENTAL SERVICES	6/1980
UTAH POWER & LIGHT HUNTER	3	NEW	424	LIMESTONE GE ENVIRONMENTAL SERVICES	4/1983
UTAH POWER & LIGHT HUNTINGTON	1	NEW	361	LIME GE ENVIRONMENTAL SERVICES	5/1978
UTAH POWER & LIGHT NAUGHTON	3	RETROFIT	346	SODIUM CARBONATE AIR CORRECTION DIVISION, UOP	9/1981
WEST PENN POWER MITCHELL	3	RETROFIT	296	LIME GE ENVIRONMENTAL SERVICES	8/1982
WEST TEXAS UTILITIES OKLAUNION	1	NEW	504	LIMESTONE GE ENVIRONMENTAL SERVICES	11/1986
TOTAL			60643.		

SECTION 9
SUMMARY OF FGD SYSTEMS UNDER CONSTRUCTION

COMPANY NAME/ UNIT NAME	UNIT NO.	NEW OR RETROFIT	CAPACITY MW	PROCESS/ SYSTEM SUPPLIER	START-UP DATE
ALAMITO CO SPRINGERVILLE	2	NEW	360	LIME/SPRAY DRYING JOY MFG/NIRO ATOMIZER	6/1989
CINCINNATI GAS & ELECTRIC ZIMMER	1	NEW	1389	LIME BABCOCK & WILCOX	6/1991
JACKSONVILLE ELEC AUTHORITY ST.JOHNS RIVER PWR PARK	2	NEW	612	LIMESTONE RESEARCH-COTTRELL	3/1988
LOWER COLORADO RIVER AUTH FAYETTE POWER PROJECT	3	NEW	451	LIMESTONE COMBUSTION ENGINEERING	3/1988
PACIFIC POWER & LIGHT JIM BRIDGER	3	RETROFIT	508	SODIUM CARBONATE BABCOCK & WILCOX	0/1988
PUBLIC SERVICE OF COLORADO CHEROKEE	4	RETROFIT	350	SODIUM BICARBONATE PUBLIC SERVICE OF COLORADO	4/1989
SALT RIVER PROJECT CORONADO	3	NEW	320	LIMESTONE SRP/M. W. KELLOGG	0/1991
TOTAL			3990.		

SECTION 10
SUMMARY OF CONTRACT AWARDED FGD SYSTEMS

COMPANY NAME/ UNIT NAME	UNIT NO.	NEW OR RETROFIT	CAPACITY MW	PROCESS/ SYSTEM SUPPLIER	START-UP DATE
CENTRAL POWER & LIGHT COLETO CREEK	2	NEW	720	LIME/SPRAY DRYING JOY MFG/NIRO ATOMIZER	0/2003
EAST KENTUCKY POWER J.K. SMITH	1	NEW	650	LIME BABCOCK & WILCOX	0/2001
HOUSTON LIGHTING & POWER MALAKOFF	1	NEW	690	LIMESTONE GE ENVIRONMENTAL SERVICES	0/1997
HOUSTON LIGHTING & POWER MALAKOFF	2	NEW	690	LIMESTONE GE ENVIRONMENTAL SERVICES	0/1999
LOUISVILLE GAS & ELECTRIC TRIMBLE COUNTY	1	NEW	512	PROCESS NOT SELECTED VENDOR NOT SELECTED	12/1990
PACIFIC POWER & LIGHT JIM BRIDGER	1	RETROFIT	508	SODIUM CARBONATE BABCOCK & WILCOX	0/1990
SOUTH CAROLINA PUBLIC SERVICE CROSS	1	NEW	450	LIMESTONE PEABODY PROCESS SYSTEMS	99/2050
TEXAS UTILITIES FOREST GROVE	1	NEW	750	LIMESTONE WHEELABRATOR AIR POLTN. CNTRL.	0/1997
TEXAS UTILITIES TWIN OAK	1	NEW	750	LIMESTONE GE ENVIRONMENTAL SERVICES	0/1994
TEXAS UTILITIES TWIN OAK	2	NEW	750	LIMESTONE GE ENVIRONMENTAL SERVICES	0/1995
TOTAL			6470.		

SECTION 11
SUMMARY OF PLANNED FGD SYSTEMS

COMPANY NAME/ UNIT NAME	UNIT NO.	NEW OR RETROFIT	CAPACITY MW	PROCESS/ SYSTEM SUPPLIER	START-UP DATE
REQUESTING/EVALUATING BIDS					
COGENTRIX ADRIAN	1	NEW	55	LIME/SPRAY DRYING VENDOR NOT SELECTED	7/1990
COGENTRIX OTSEGO	1	NEW	55	LIME/SPRAY DRYING VENDOR NOT SELECTED	7/1990
DINEH SERVICE COMANY DINEH	1	NEW	555	LIME/SPRAY DRYING COMBUSTION ENGINEERING	0/1998
OXFORD ENERGY CO. STERLING	1	NEW	30	PROCESS NOT SELECTED VENDOR NOT SELECTED	6/1990
SAN ANTONIO PUBLIC SERVICE CALAVERAS	5	NEW	535	LIMESTONE VENDOR NOT SELECTED	5/1992
SAN ANTONIO PUBLIC SERVICE CALAVERAS	6	NEW	535	LIMESTONE VENDOR NOT SELECTED	5/1997
TOTAL			1765.		
CONSIDERING FGD SYSTEMS					
ALAMITO CO SPRINGERVILLE	3	NEW	360	PROCESS NOT SELECTED VENDOR NOT SELECTED	0/1991
ARIZONA PUBLIC SERVICE CHOLLA	5	NEW	135	PROCESS NOT SELECTED VENDOR NOT SELECTED	99/2050
ATLANTIC CITY ELECTRIC CUMBERLAND	1	NEW	330	LIMESTONE VENDOR NOT SELECTED	99/2050
BASIN ELECTRIC POWER ANTELOPE VALLEY	3	NEW	560	LIME/SPRAY DRYING VENDOR NOT SELECTED	99/2050
COLORADO SPRINGS DEPT. OF PUBL R.D. NIXON	2	NEW	250	PROCESS NOT SELECTED VENDOR NOT SELECTED	4/1995
DESERET GEN & TRANS BONANZA	2	NEW	430	LIMESTONE VENDOR NOT SELECTED	99/2050
DINEH SERVICE COMANY DINEH	2	NEW	555	LIME/SPRAY DRYING COMBUSTION ENGINEERING	0/1999
DINEH SERVICE COMANY DINEH	3	NEW	555	LIME/SPRAY DRYING COMBUSTION ENGINEERING	0/2000
DINEH SERVICE COMANY DINEH	4	NEW	555	LIME/SPRAY DRYING COMBUSTION ENGINEERING	0/2001
GENERAL PUBLIC UTILITIES COAL	1	NEW	300	LIMESTONE VENDOR NOT SELECTED	0/2005
INDIANAPOLIS POWER & LIGHT PATRIOT	1	NEW	650	LIMESTONE VENDOR NOT SELECTED	99/2050
INDIANAPOLIS POWER & LIGHT PATRIOT	2	NEW	650	LIMESTONE VENDOR NOT SELECTED	99/2050
INDIANAPOLIS POWER & LIGHT PATRIOT	3	NEW	650	LIMESTONE VENDOR NOT SELECTED	99/2050
LOWER COLORADO RIVER AUTH FAYETTE POWER PROJECT	4	NEW	451	LIMESTONE VENDOR NOT SELECTED	99/2050

SECTION 11
SUMMARY OF PLANNED FGD SYSTEMS

COMPANY NAME/ UNIT NAME	UNIT NO.	NEW OR RETROFIT	CAPACITY MW	PROCESS/ SYSTEM SUPPLIER	START-UP DATE
NEVADA POWER HARRY ALLEN	1	NEW	290	PROCESS NOT SELECTED VENDOR NOT SELECTED	0/1997
NEVADA POWER HARRY ALLEN	2	NEW	290	PROCESS NOT SELECTED VENDOR NOT SELECTED	0/1999
NEVADA POWER HARRY ALLEN	3	NEW	290	PROCESS NOT SELECTED VENDOR NOT SELECTED	0/2001
NEVADA POWER HARRY ALLEN	4	NEW	290	PROCESS NOT SELECTED VENDOR NOT SELECTED	0/2003
PUBLIC SERVICE OF COLORADO PAWNEE	2	NEW	500	TRONA/DRY INJECTION VENDOR NOT SELECTED	0/1994
SIERRA PACIFIC POWER THOUSAND SPRINGS	1	NEW	250	PROCESS NOT SELECTED VENDOR NOT SELECTED	99/2050
SIERRA PACIFIC POWER THOUSAND SPRINGS	2	NEW	250	PROCESS NOT SELECTED VENDOR NOT SELECTED	99/2050
SIERRA PACIFIC POWER THOUSAND SPRINGS	3	NEW	250	PROCESS NOT SELECTED VENDOR NOT SELECTED	99/2050
SOUTH CAROLINA PUBLIC SERVICE PEE DEE	1	NEW	550	LIMESTONE VENDOR NOT SELECTED	0/2005
SOUTH CAROLINA PUBLIC SERVICE PEE DEE	2	NEW	550	LIMESTONE VENDOR NOT SELECTED	0/2006
SOUTHWESTERN ELECTRIC POWER WALKER CO.	1	NEW	720	PROCESS NOT SELECTED VENDOR NOT SELECTED	0/2004
SOUTHWESTERN ELECTRIC POWER WALKER CO.	2	NEW	720	PROCESS NOT SELECTED VENDOR NOT SELECTED	0/2004
SOUTHWESTERN PUBLIC SERVICE SOUTH PLAINS	1	NEW	572	PROCESS NOT SELECTED VENDOR NOT SELECTED	99/2050
WASHINGTON WATER POWER CRESTON COAL	1	NEW	570	LIMESTONE VENDOR NOT SELECTED	99/2050
WASHINGTON WATER POWER CRESTON COAL	2	NEW	570	LIMESTONE VENDOR NOT SELECTED	99/2050
WASHINGTON WATER POWER CRESTON COAL	3	NEW	570	LIMESTONE VENDOR NOT SELECTED	99/2050
WASHINGTON WATER POWER CRESTON COAL	4	NEW	570	LIMESTONE VENDOR NOT SELECTED	99/2050
WEST TEXAS UTILITIES OKLAUNION	2	NEW	504	PROCESS NOT SELECTED VENDOR NOT SELECTED	99/2050
WHITE PINE COUNTY WHITE PINE PWR PROJ.	1	NEW	820	PROCESS NOT SELECTED VENDOR NOT SELECTED	3/1994
WHITE PINE COUNTY WHITE PINE PWR PROJ.	2	NEW	820	PROCESS NOT SELECTED VENDOR NOT SELECTED	3/1995
TOTAL			16377.		

SECTION 12
TOTAL FGD UNITS AND CAPACITY (MW) INSTALLED BY YEAR

YEAR	NEW ON LINE NO.	NEW ON LINE MW	TERMINATED NO.	TERMINATED MW	TOTAL ON LINE NO.	TOTAL ON LINE MW
1968	1	140.	0	0.	1	140.
1969	0	0.	1	140.	0	0.
1971	1	80.	0	0.	1	80.
1972	9	1264.	0	0.	10	1344.
1973	5	861.	1	10.	14	2195.
1974	4	586.	3	340.	15	2441.
1975	9	2190.	5	628.	19	4003.
1976	7	2669.	4	1014.	22	5658.
1977	11	4586.	2	215.	31	10029.
1978	15	5347.	0	0.	46	15376.
1979	19	5608.	2	143.	63	20841.
1980	21	6715.	0	0.	84	27556.
1981	11	4467.	1	20.	94	32003.
1982	17	6574.	7	825.	104	37752.
1983	16	6347.	1	100.	119	43999.
1984	9	4941.	2	172.	126	48768.
1985	10	5069.	0	0.	136	53837.
1986	9	4530.	0	0.	145	58367.
1987	5	2126.	0	0.	150	60493.
1988	4	1721.	0	0.	154	62214.
1989	2	710.	0	0.	156	62924.
1990	5	1160.	0	0.	161	64084.
1991	3	2069.	0	0.	164	66153.
1992	1	535.	0	0.	165	66688.
1994	3	2070.	0	0.	168	68758.
1995	3	1820.	0	0.	171	70578.
1997	4	2265.	0	0.	175	72843.
1998	1	555.	0	0.	176	73398.
1999	3	1535.	0	0.	179	74933.
2000	1	555.	0	0.	180	75488.
2001	3	1495.	0	0.	183	76983.
2003	2	1010.	0	0.	185	77993.
2004	2	1440.	0	0.	187	79433.
2005	2	850.	0	0.	189	80283.
2006	1	550.	0	0.	190	80833.
2050	18	8412.	0	0.	208	89245.

APPENDIX A

DEFINITIONS

DEFINITIONS

Boiler Commercial Service Date	Date when boiler and auxiliary equipment (including FGD system for new boilers) has met initial supplier guarantees and begins to contribute electrical power to the power grid.
Byproduct Nature	The nature (e.g. elemental sulfur, sulfuric acid) and disposition (e.g. stockpile on site, marketed) of the end product by systems that generate a saleable product.
Commercial Service Date (FGD System)	Date when the FGD system successfully completes compliance testing and the utility is satisfied that the system meets supplier contractual guarantees.
Company Name	Name of corporation as it appears in Electrical World - Directory of Electrical Utilities, McGraw-Hill - Current Edition - as space permits.
Disposal	Disposal method for throwaway product systems producing sludge including: interim and final disposal sites and disposal type (minefill, landfill, etc.) as well as disposal location and site capacity.
Efficiency:	
Total Unit Design Particle Removal Efficiency	The actual percentage of particulate matter removed by the emission control system (mechanical collectors, ESP, or fabric filter and FGD) from the untreated flue gas.
Total Unit SO_2 Design Removal Efficiency	The actual percentage of SO_2 removed from the flue gas by the FGD system.

FGD Viability Indexes

Several parameters have been developed to quantify the viability of FGD system technology. Various terms such as "availability," "reliability," "operability," and "utilization" are used to accurately represent the operation of any FGD system during a given period. The above-mentioned parameters are defined below and discussed briefly. The objectives of this discussion are to make the reader aware that several different definitions are being used and to select appropriate parameters that can be used for reporting purposes so that reasonably consistent comparisons can be made.

Availability Index

Hours the FGD system is available for operation (whether operated or not) divided by hours in period, expressed as a percentage. This parameter tends to overestimate the viability of the FGD system because it does not penalize for election not to operate the system when it could have been operated. Boiler downtime may tend to increase the magnitude of the parameter because FGD failures generally cannot occur during such periods.

Reliability Index

Hours the FGD system was operated divided by the hours the FGD system was called upon to operate, expressed as a percentage. This parameter has been developed in order not to penalize the FGD system for elected outages, e.g., periods when the FGD system could have been run but was not run because of chemical shortages, lack of manpower, short duration boiler operations, etc. The main problem in using this

	formula is the concise determination whether or not the system was "called upon to operate" during a given time period. In addition, an undefined value can result when the FGD system is not called upon to operate for a given period (e.g., turbine or boiler outage when FGD system is available).
FGD Operability Index	Hours the FGD system was operated divided by boiler operating hours in period, expressed as a percentage. This parameter indicates the degree to which the FGD system is actually used, relative to boiler operating time. The parameter is penalized when options are exercised not to use the FGD system in periods when the system is operable. In addition, an undefined value can result when neither the boiler nor the FGD system is operated for a given period (e.g., turbine or boiler outage when FGD system is available).
FGD Utilization Index	Hours that the FGD system operated divided by total hours in period. This parameter is a relative stress factor for the FGD system. It is not a complete measure of FGD system viability because the parameter can be strongly influenced by conditions that are external to the FGD system (e.g., infrequent boiler operation will lower the value of the parameter although the FGD system may be highly dependable in its particular application).
End Product	
Sludge	The SO_2 removed from the flue gas is not recovered in a usable or marketable form and resulting sulfur-bearing waste

	products must be disposed in an environmentally acceptable fashion.
Recoverable Byproduct	The SO_2 removed from the flue gas is recovered in a usable or marketable form (e.g., sulfur, sulfuric acid, gypsum, ammonium sulfate, sodium sulfate).
Energy Consumption, %	The percentage of gross unit electrical generating capacity consumed by the FGD system, as defined by the following equation: [Net MW w/o FGD - Net MW w/FGD]/ [Gross unit rating]
Equivalent Scrubbed Capacity (ESC)	The effective scrubbed flue gas in equivalent MW based on the percent of flue gas scrubbed by the FGD system.
FGD Status:	
Category 1	Operational - FGD system is in service removing SO_2.
Category 2	Under construction - ground has been broken for installation of FGD system, but FGD system has not become operational.
Category 3	Planned, Contract Awarded - contract has been signed for purchase of FGD system but ground has not been broken for installation.
Cateogry 4	Planned, Letter of Intent Signed - letter of intent has been signed, but legal contract for purchase has not been awarded.
Category 5	Planned, Requesting/Evaluating Bids - bid requests have been released but no letter of intent or contract has been issued.

Category 6	Considering only FGD Systems - an FGD system is proposed as a means to meet an SO_2 regulation.
Category 7	Considering an FGD system as well as alternative methods.
Category 8	Nonoperational - FGD system has been operated in the past but has been shut down permanently or for an extended indefinite period of time.
Fuel Firing Rate - TPH	Boiler fuel firing rate in terms of tons per hour at maximum continuous load.
Initial Start-Up (FGD System)	Date when flue gas first passes through any component of the FGD system (or is scheduled to do so).
NA	Not available - early status - information not known at this time.
N/A	Not applicable.
NR	Not reported - the information is known but for one reason or another has not been reported by the utility.
New	FGD unit and boiler were designed at the same time or space for addition of an FGD unit was reserved when boiler was constructed.
Plant Name	Unit identification as it appears in Electrical World - Directory of Electrical Utilities, McGraw-Hill - Current Edition - or as indicated by utility representative for installations in planning stages.
Process Additives	A chemical compound or element which is added to the process or normally found with the main process reagent in small

	quantities (e.g., Mg, adipic acid) to promote improved process operation (e.g., scale reduction, increased SO_2 removal efficiency).
Process Type	Company name if process is patented. Generic name if several companies have similar processes (e.g., Lime, Limestone, Wellman Lord, Thoroughbred 121).
Regulatory Class	A. Unit(s) subject to standard(s) more stringent than NSPS (6/79). B. Unit(s) subject to Federal New Source Performance Standards (NSPS) promulgated in June 1979. C. Unit(s) subject to standard(s) more stringent than NSPS (12/71), but not more stringent than NSPS (6/79). D. Unit(s) subject to Federal New Source Performance Standards (NSPS) promulgated in December 1971. E. Unit(s) subject to standard(s) equal to or less stringent than NSPS (12/71).
Retrofit	FGD unit will be/was added to an existing boiler not specifically designed to accommodate FGD unit.
SO_2 Removal Mode	The manner in which the SO_2 from the flue gas is collected, e.g., wet scrubbing, spray drying, dry adsorption.
Spare Capacity Index - %	The summation of the individual component capacities (%) minus 100%.

Spare Component Index	The equipment spare capacity index (%) divided by the individual component capacity (%).
System Supplier	A firm that fabricates and supplies flue gas desulfurization systems.
Total Controlled Capacity (TCC)	The gross rating (MW) of a unit brought into compliance with FGD, regardless of the percent of flue gas treated at the facility. In the case of prototype and demonstration FGD systems, this figure will be identical to the Equivalent Scrubbed Capacity rather than the gross unit rating if the system is not meant to bring the facility into compliance with SO_2 emission standards.
Unit Rating	
Gross	Operational - Maximum continuous gross generation capacity in MW; Preoperational - maximum continuous design generation capacity in MW.
Net w/FGD	Gross unit rating less the energy required to operate ancillary station equipment, inclusive of emission control systems.
Net w/o FGD	Gross unit rating less the energy required to operate ancillary station equipment, exclusive of emission control systems.

APPENDIX B

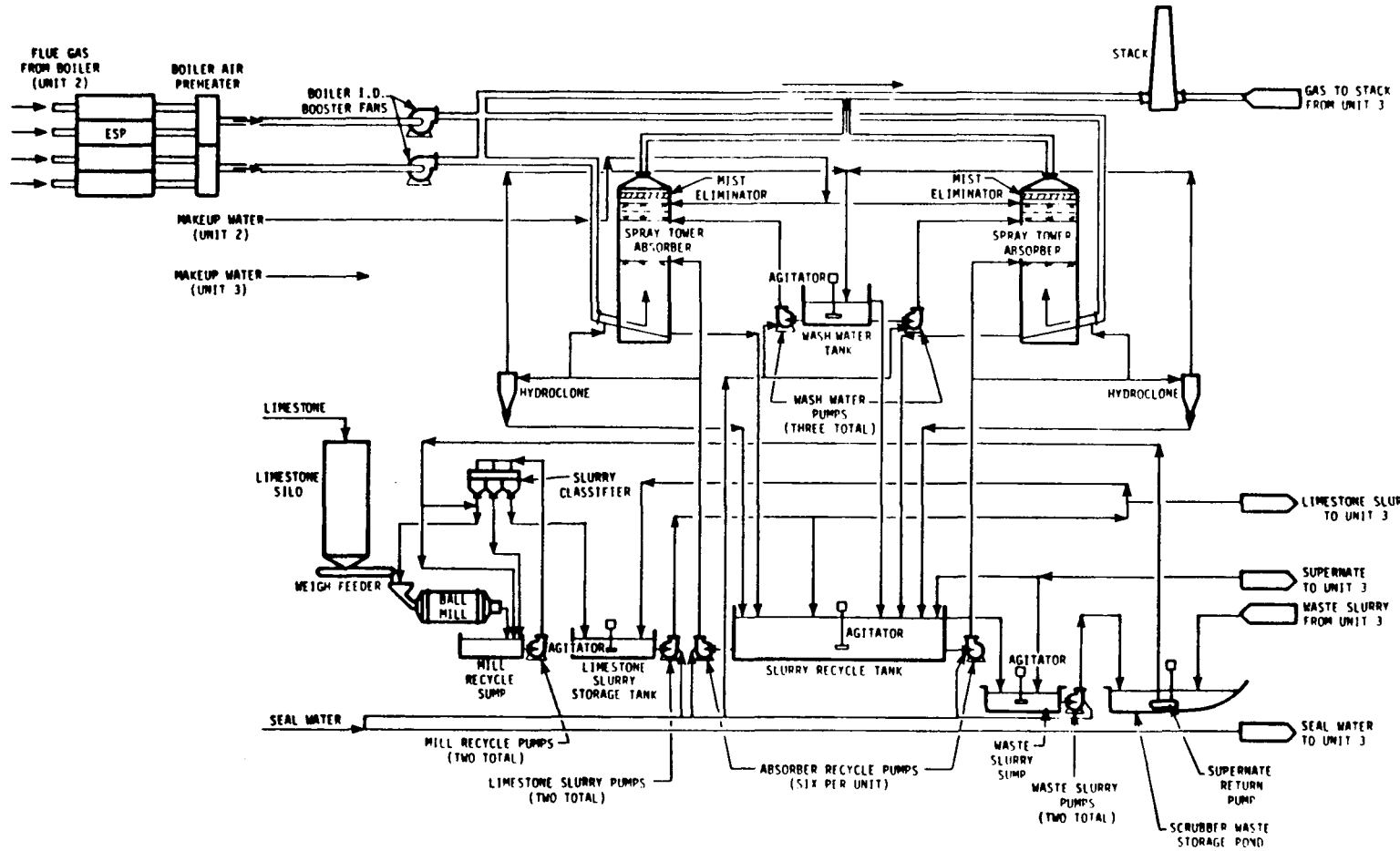
TABLE OF UNIT NOTATION

TABLE OF UNIT NOTATION

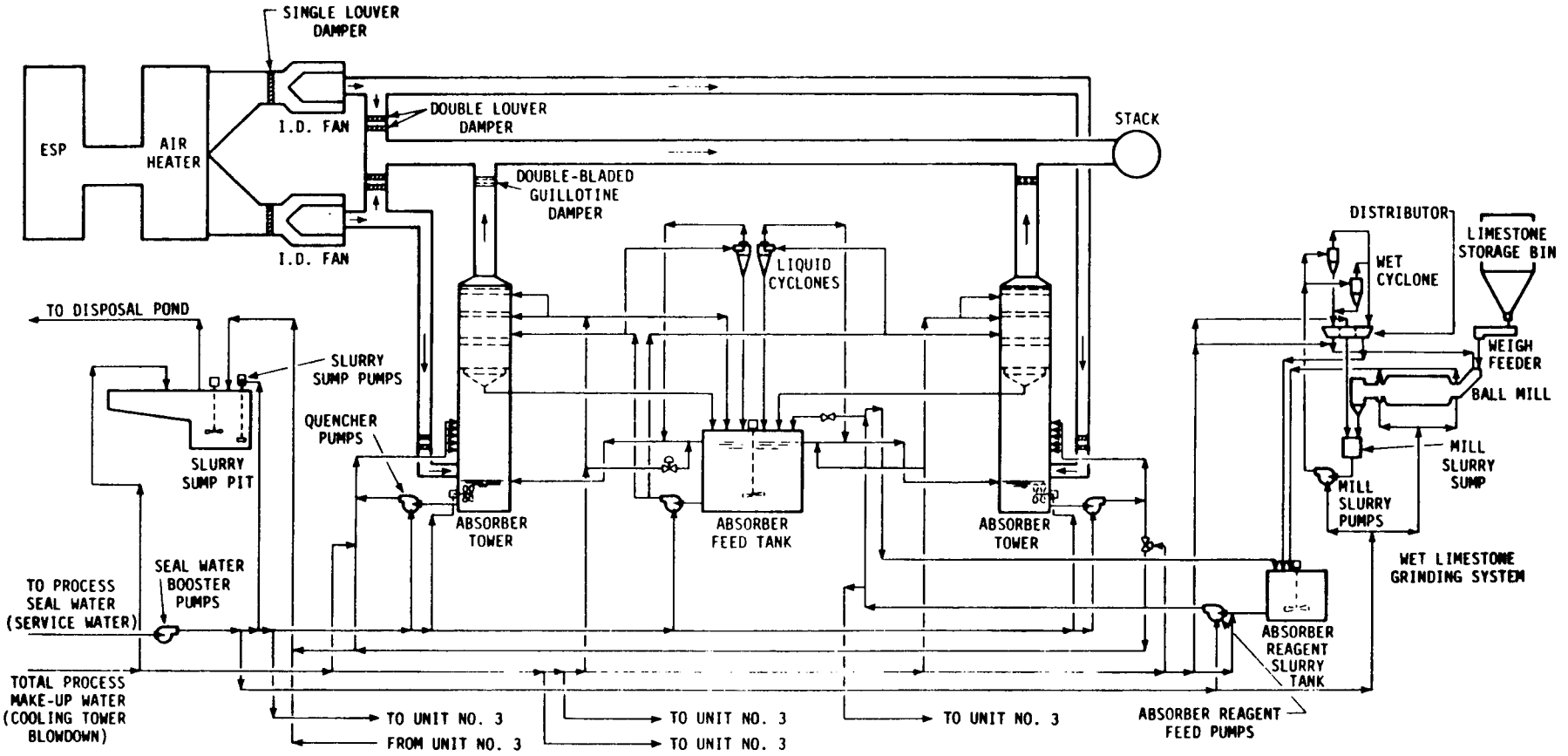
Classification	English Unit	Symbol	Survey Report Notation	ASTM/SI Unit	Symbol	Survey Report Notation
Area	Acre	acre	ACRE	Square meter	m^2	SQ.M
	Square foot	ft^2	SQ.FT	Square meter	m^2	SQ.M
Concentration	Grains per standard cubic foot	gr/scf	GR/SCF	Grams per cubic meter	g/m^3	G/CU.M
	Parts per million	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_2O	IN. H_2O	Kilopascal	kPa	KPA
Temperature	Degree Fahrenheit	°F	F	Degree Celsius	°C	C
Volume	Cubic feet	ft^3	CU.F	Cubic meter	m^3	CU.M
	Acre-feet	Acre-ft	ACRE-FT	Cubic meter	m^3	CU.M

APPENDIX C

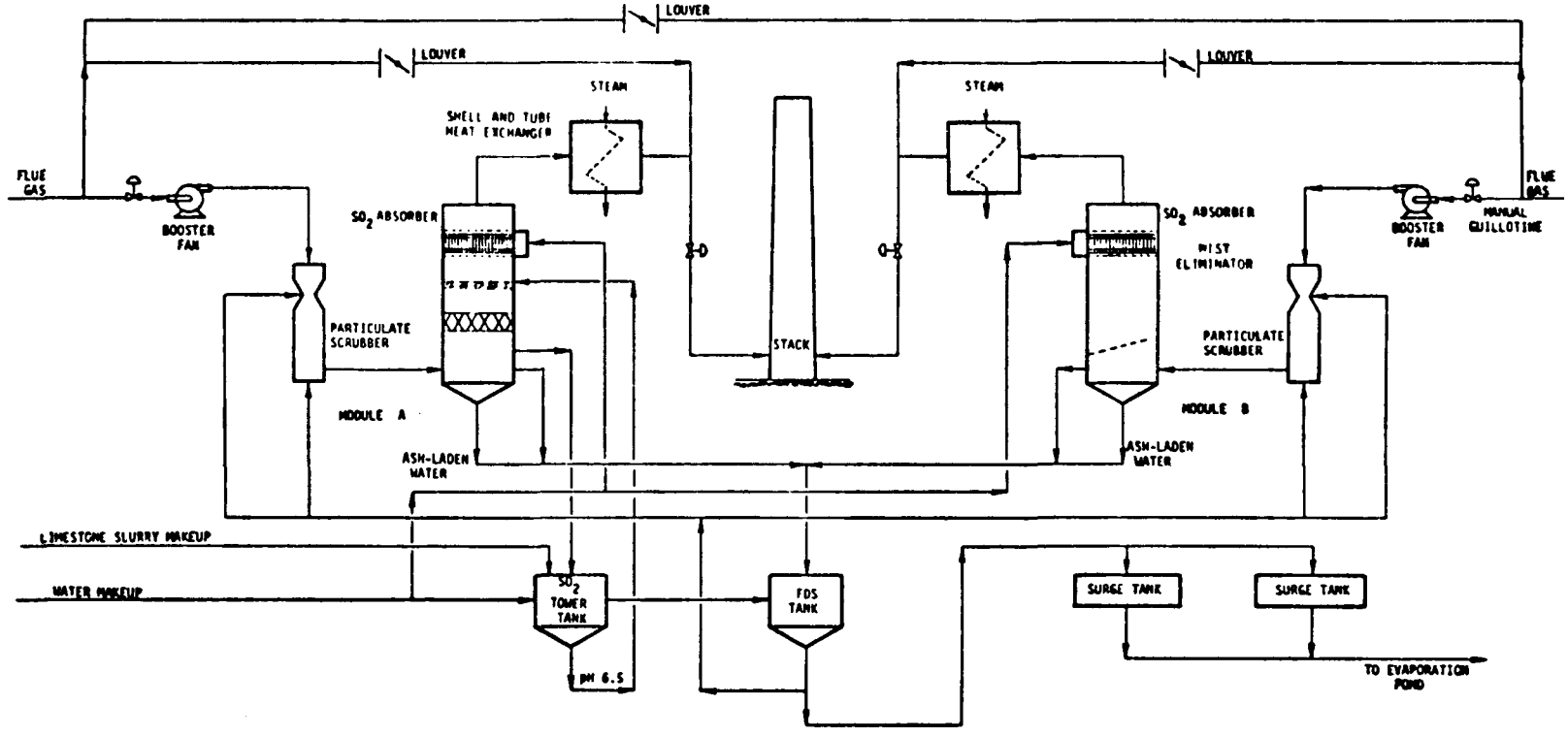
FGD PROCESS FLOW DIAGRAMS



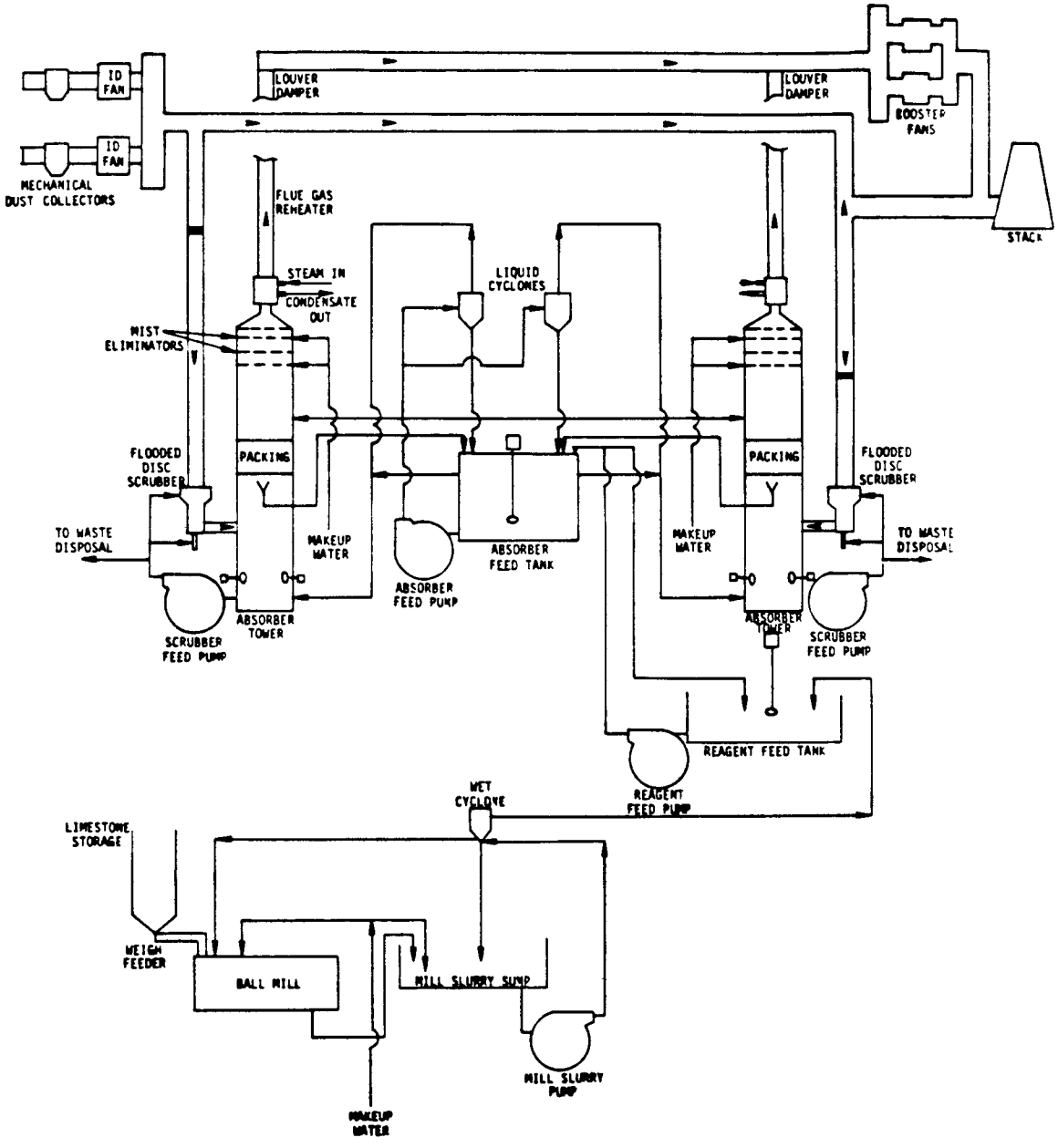
Alabama Electric,
Simplified Process Flow Diagram for Tombigbee 2 and 3



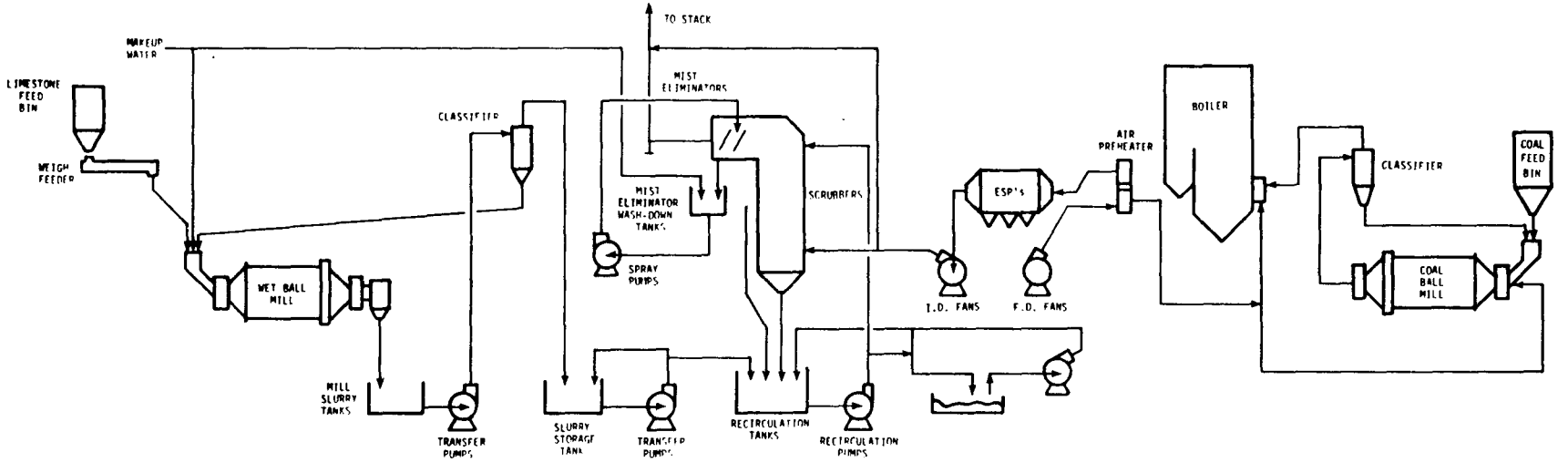
Arizona Electric Power Coop, Apache 2 and 3
Process Flow Diagram



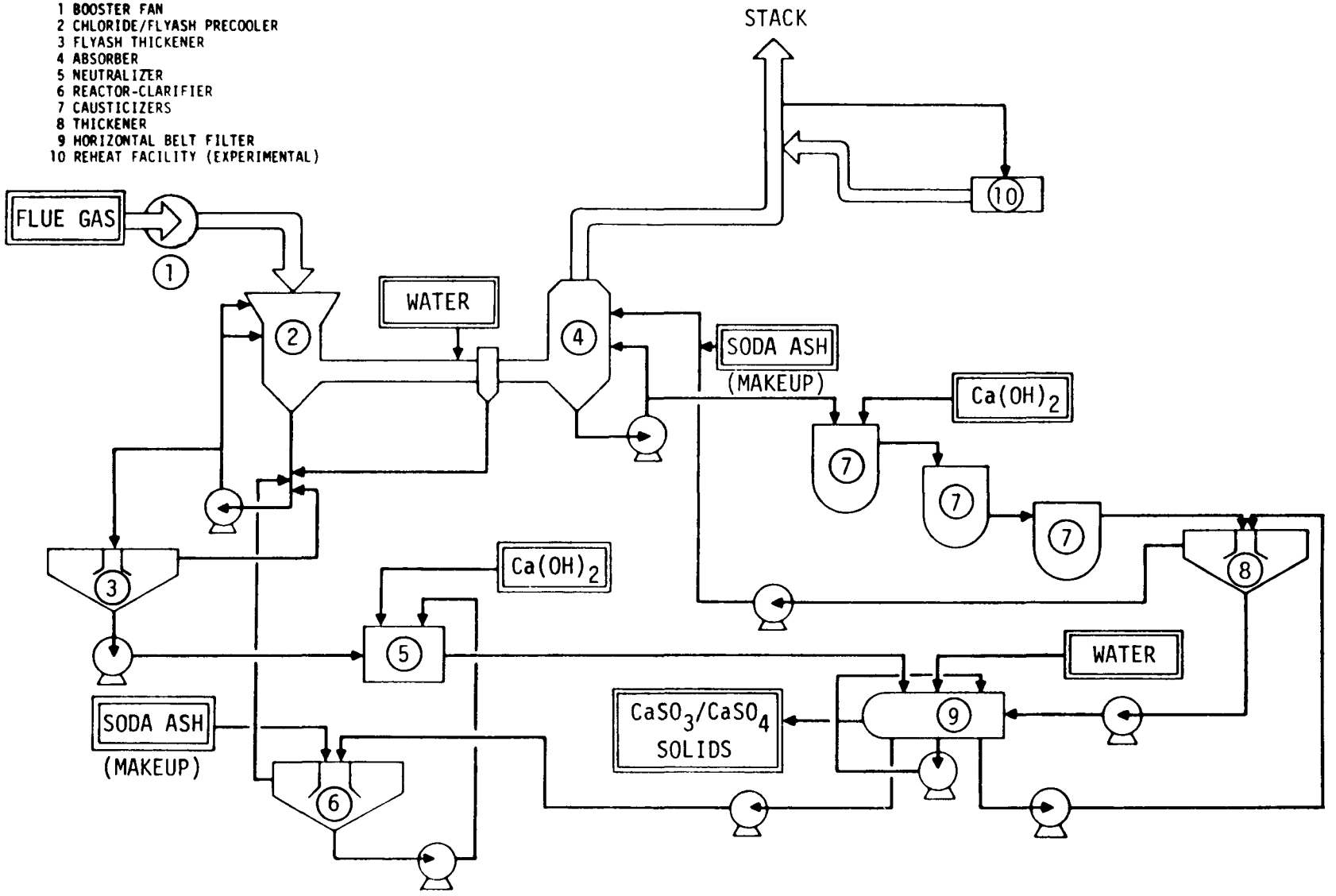
Arizona Public Service, Cholla 1:
Simplified Process Flow Diagram



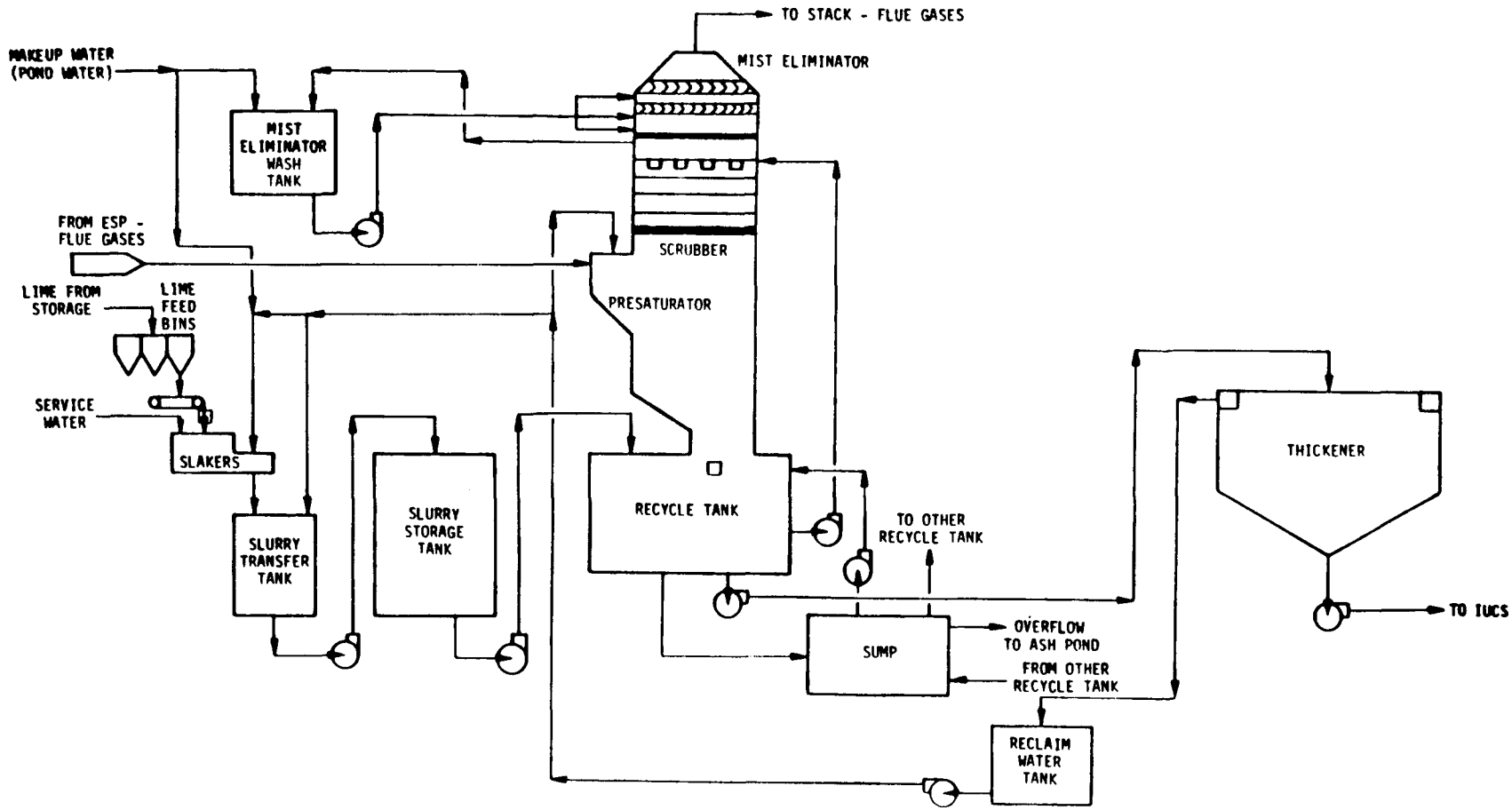
Arizona Public Service, Cholla 2:
Simplified Process Flow Diagram



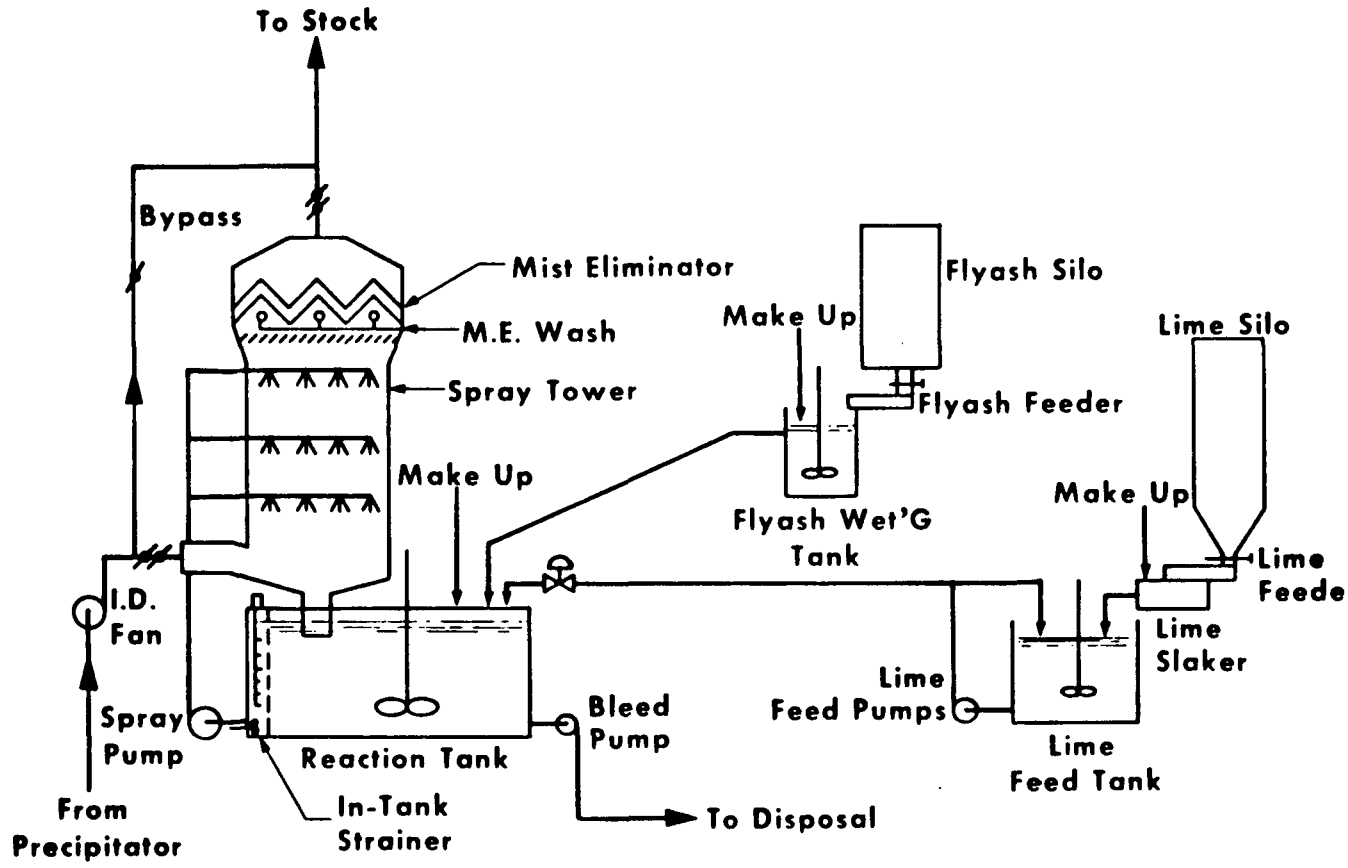
Central Illinois Light,
Simplified Process Flow Diagram of Duck Creek 1
Power Plant and Emission Control System



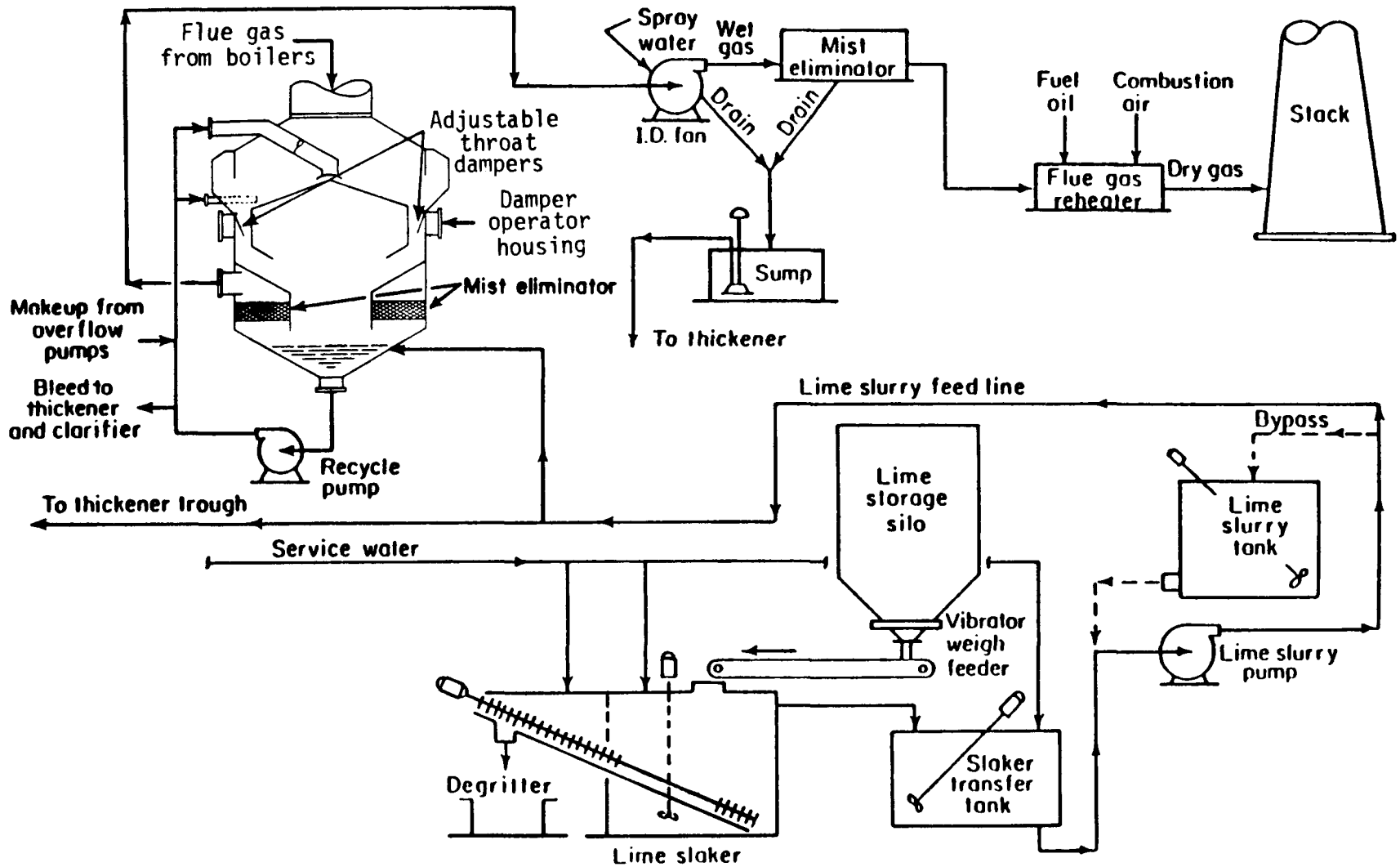
Central Illinois Public Service, Newton 1:
Simplified Process Flow Diagram Showing One of Four Absorbers



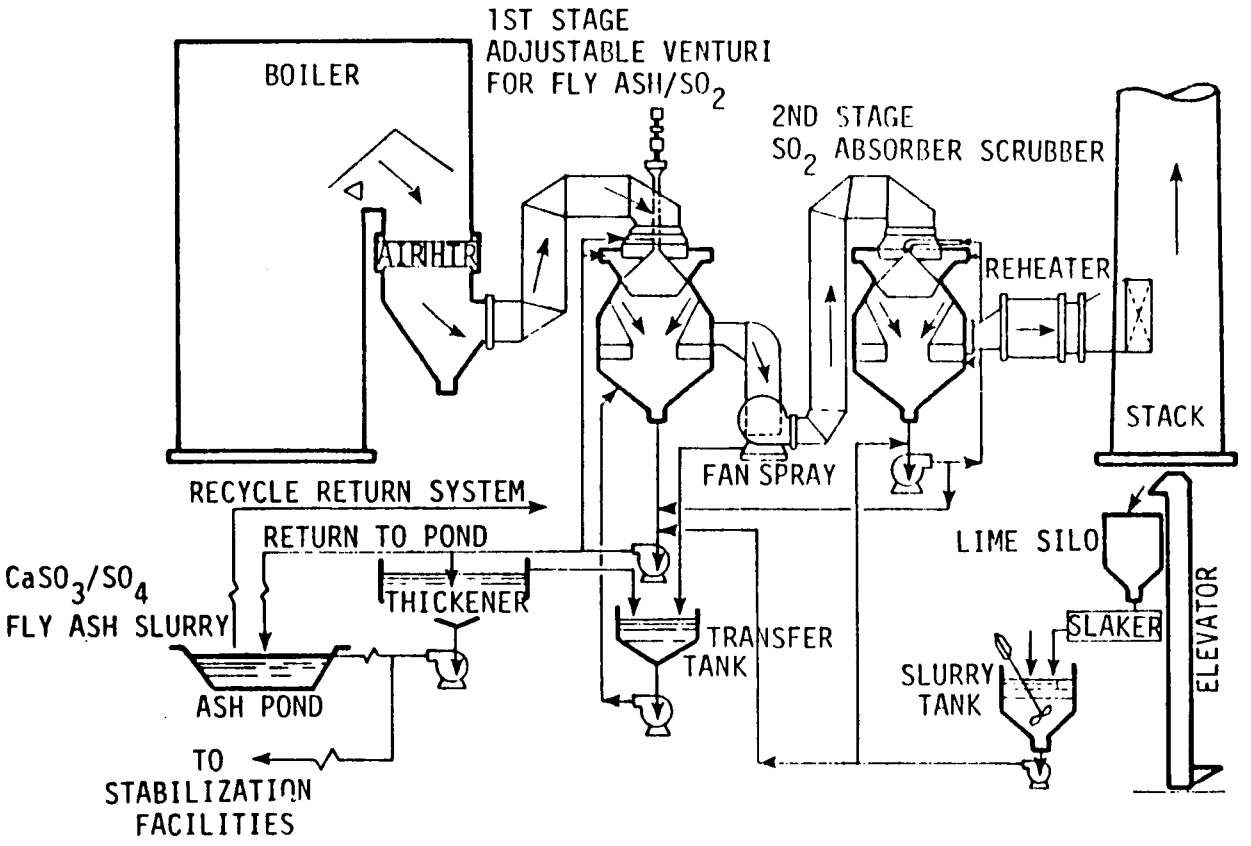
Columbus and Southern Ohio Electric, Conesville 5 and 6:
Simplified Process Flow Diagram for a Given Module



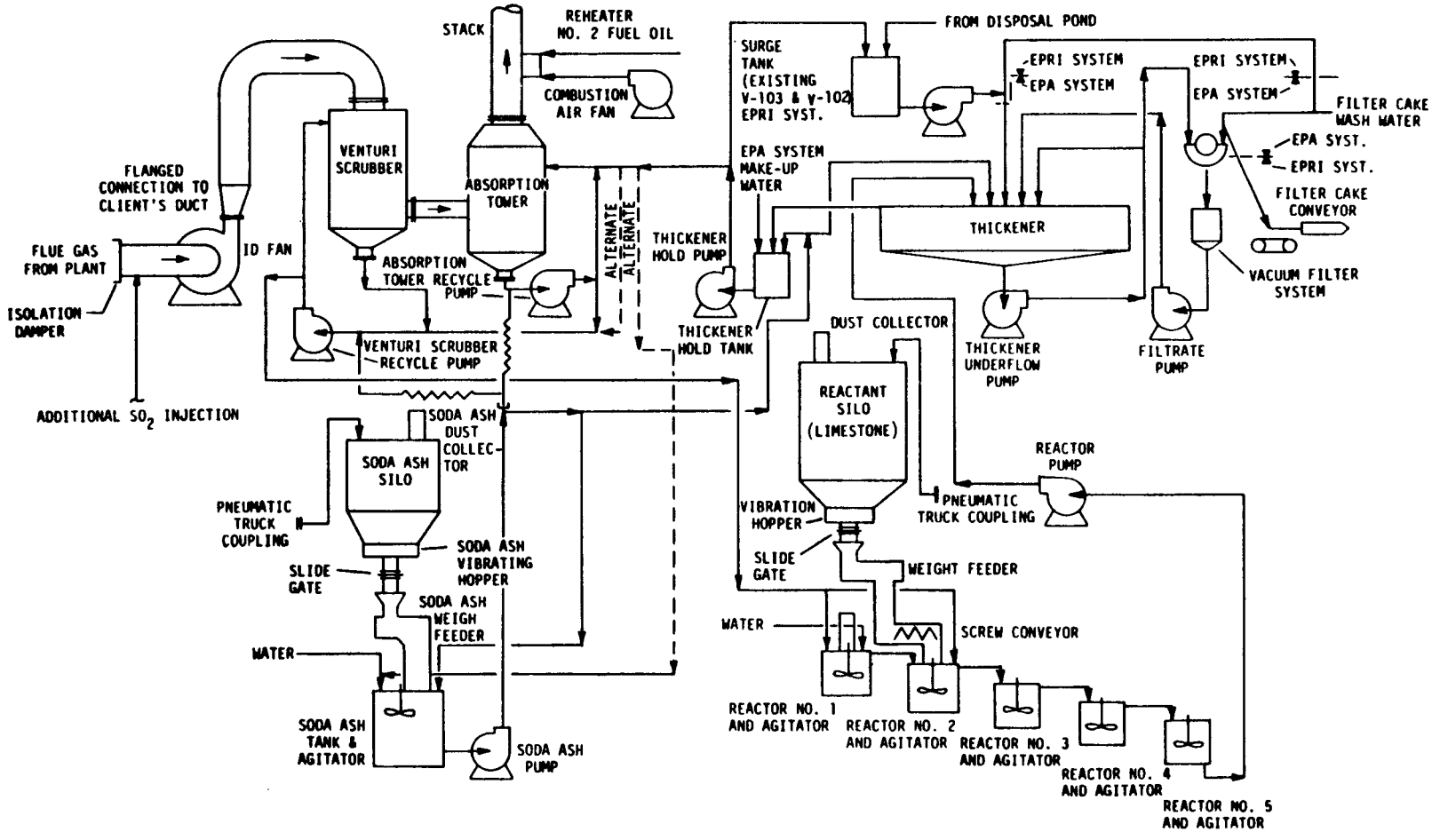
Cooperative Power Association, Coal Creek 1 and 2:
Simplified Process Flow Diagram



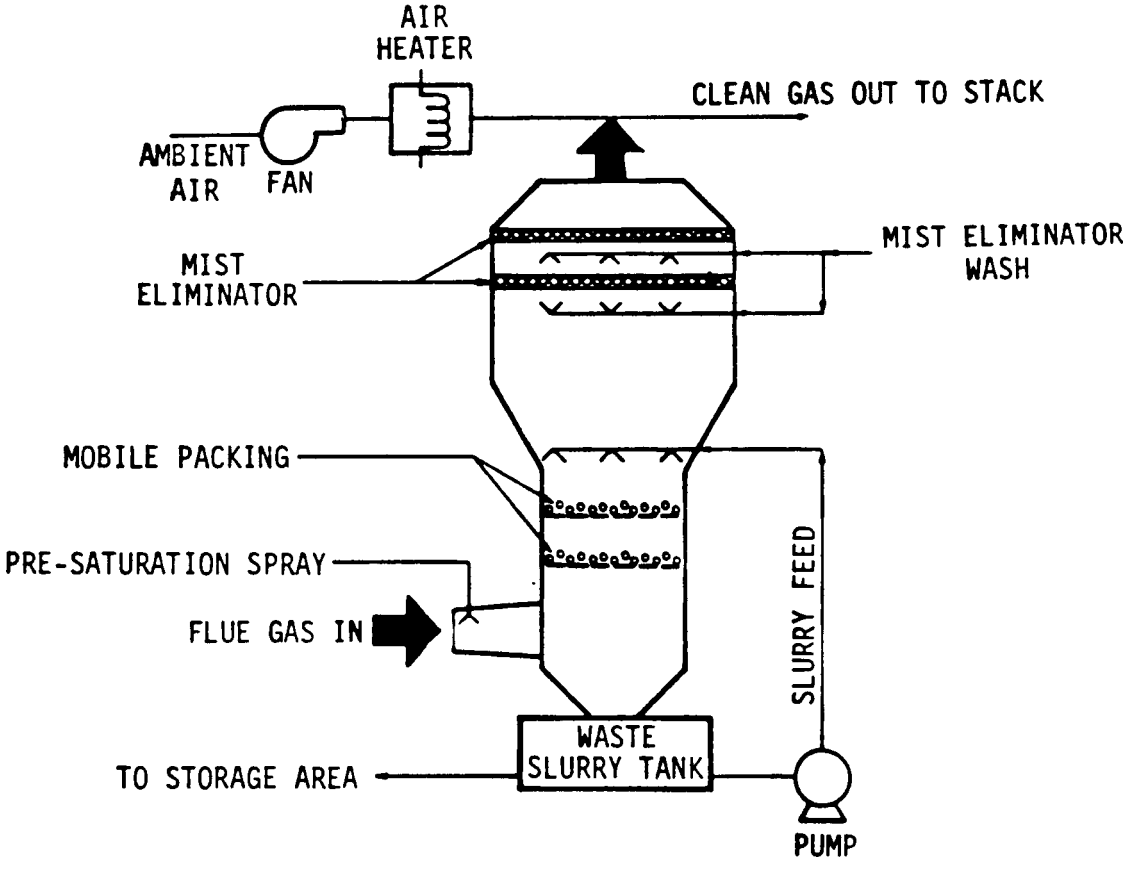
Duquesne Light, Elrama 1-4: Simplified Process Flow Diagram



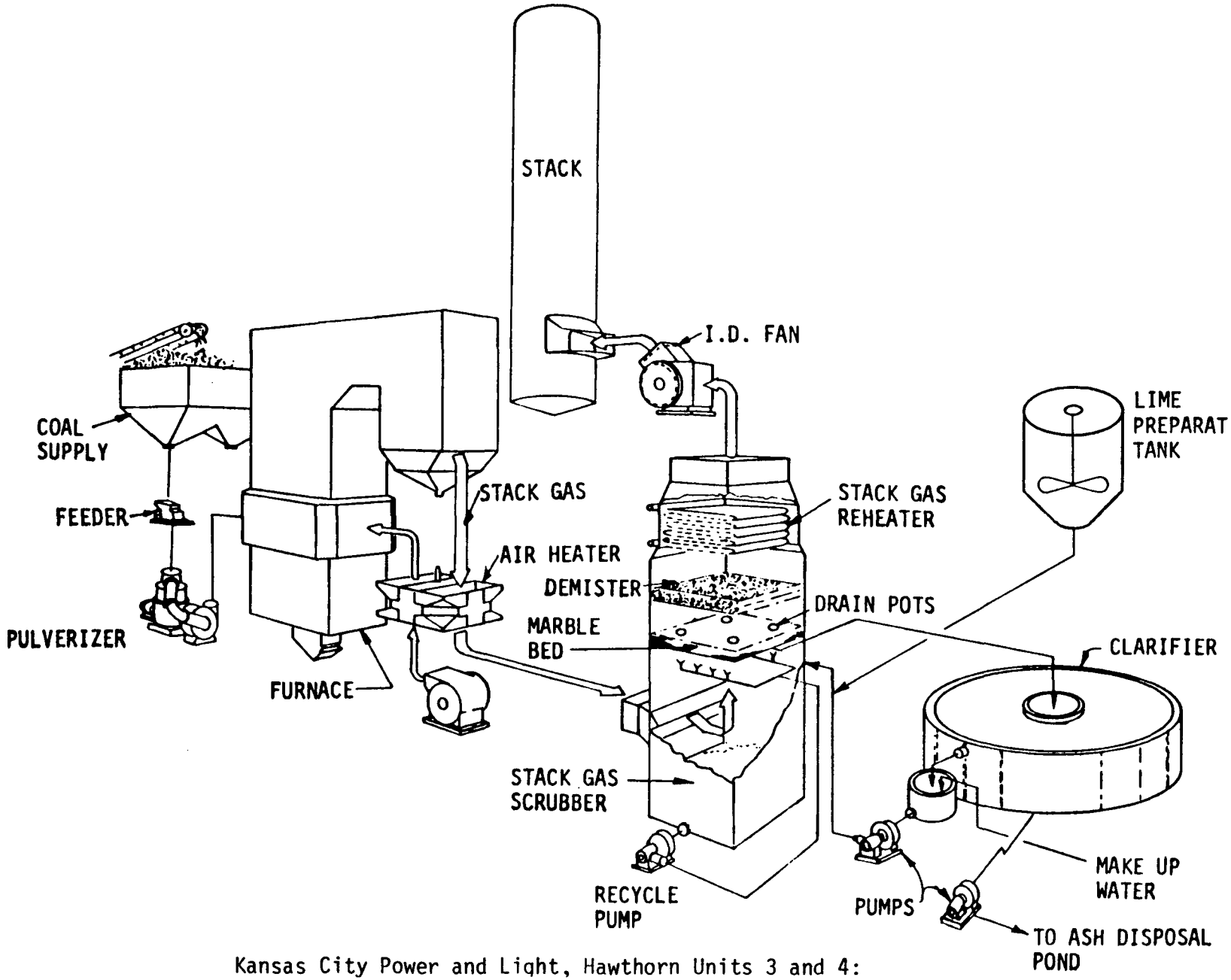
Duquesne Light, F. R. Phillips FGD System:
General Diagram.



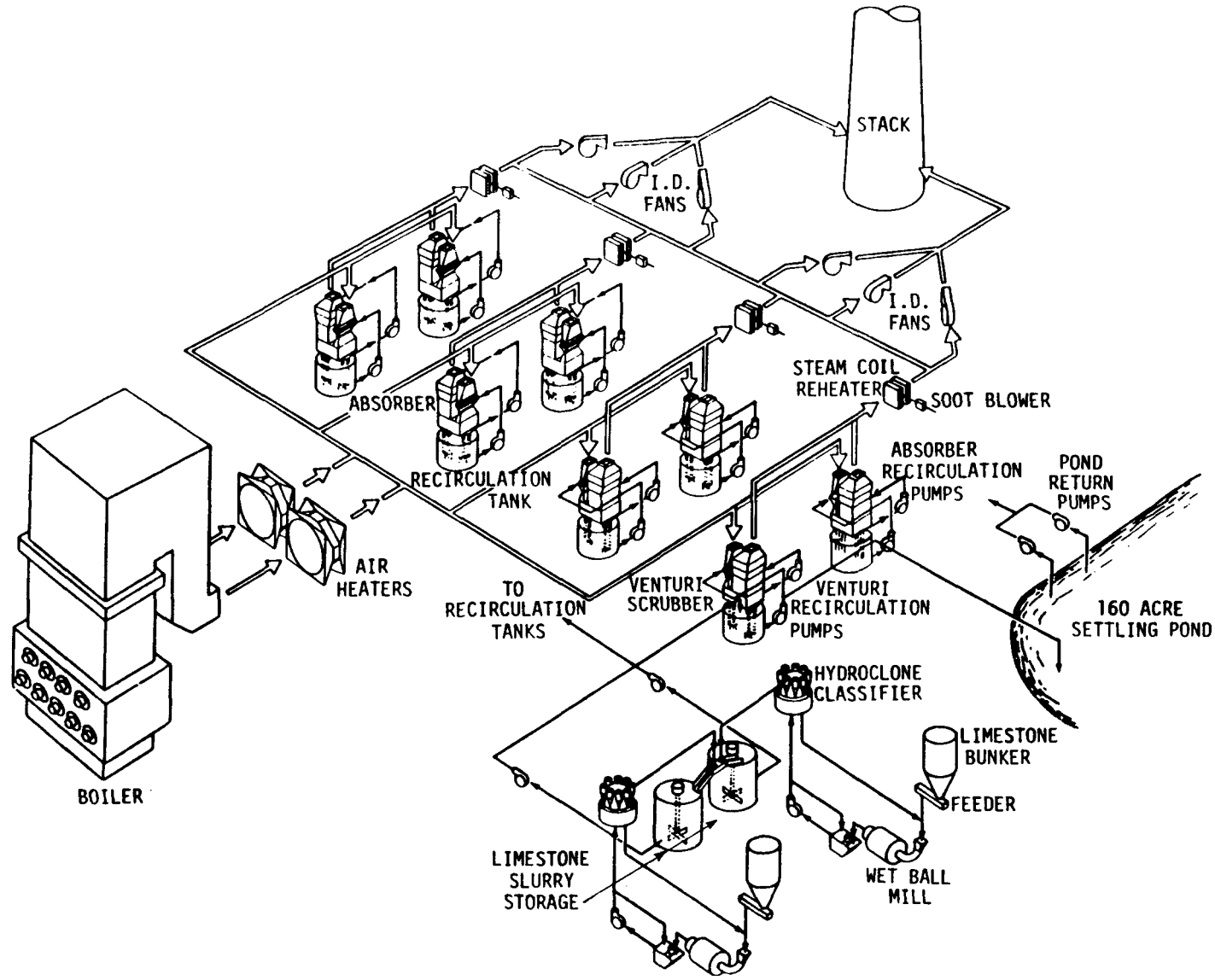
Gulf Power, Scholz 1:
Simplified Process Flow Diagram of the Demonstration
Soda Ash/Limestone Dual Alkali Process



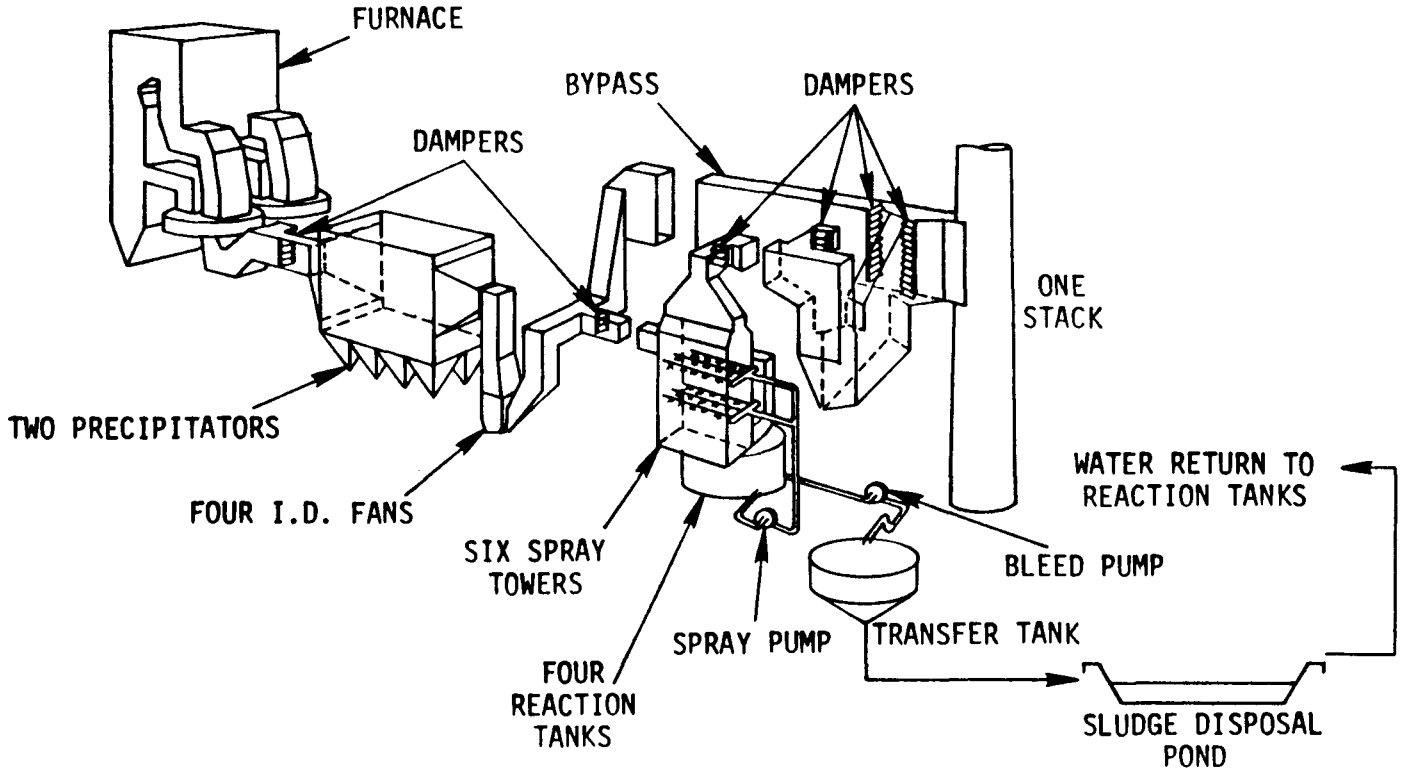
Indianapolis Power and Light, Petersburg 3:
Simplified Process Flow Diagram for One of Four Absorbers



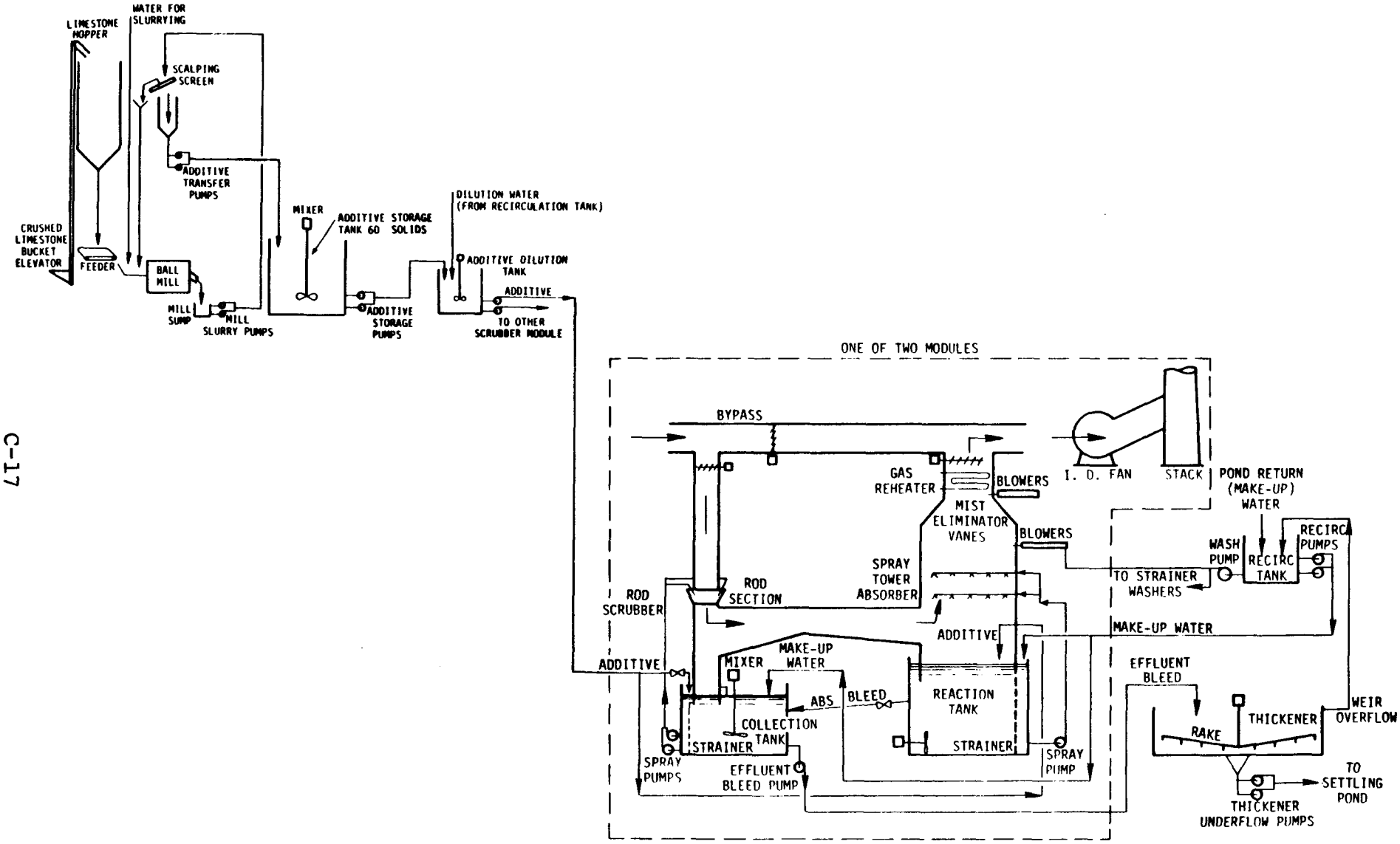
Kansas City Power and Light, Hawthorn Units 3 and 4:
Simplified Process Flow Diagram of the Lime Scrubbing Process



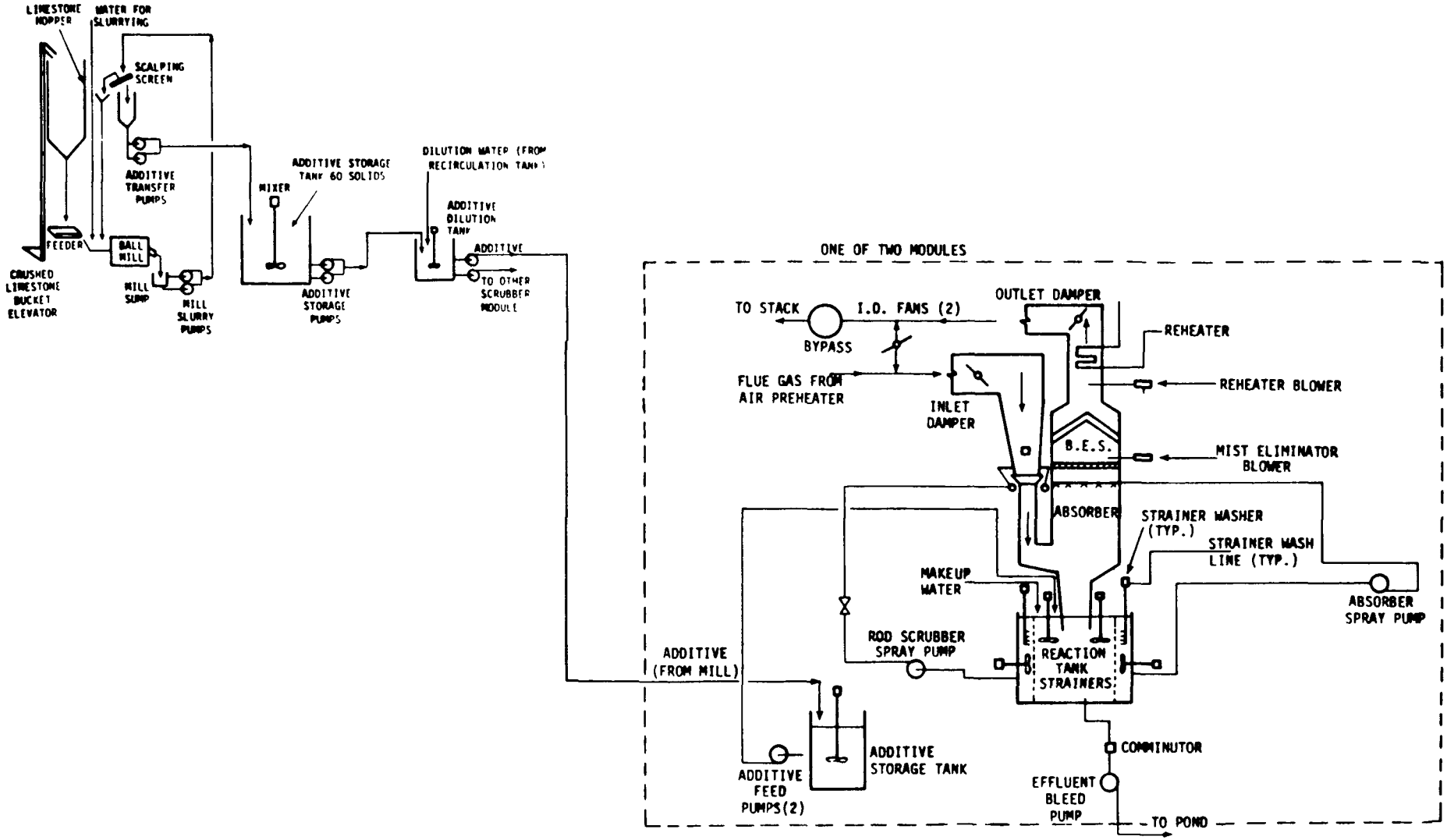
Kansas City Power and Light,
LaCygne 1 FGD System: General Diagram



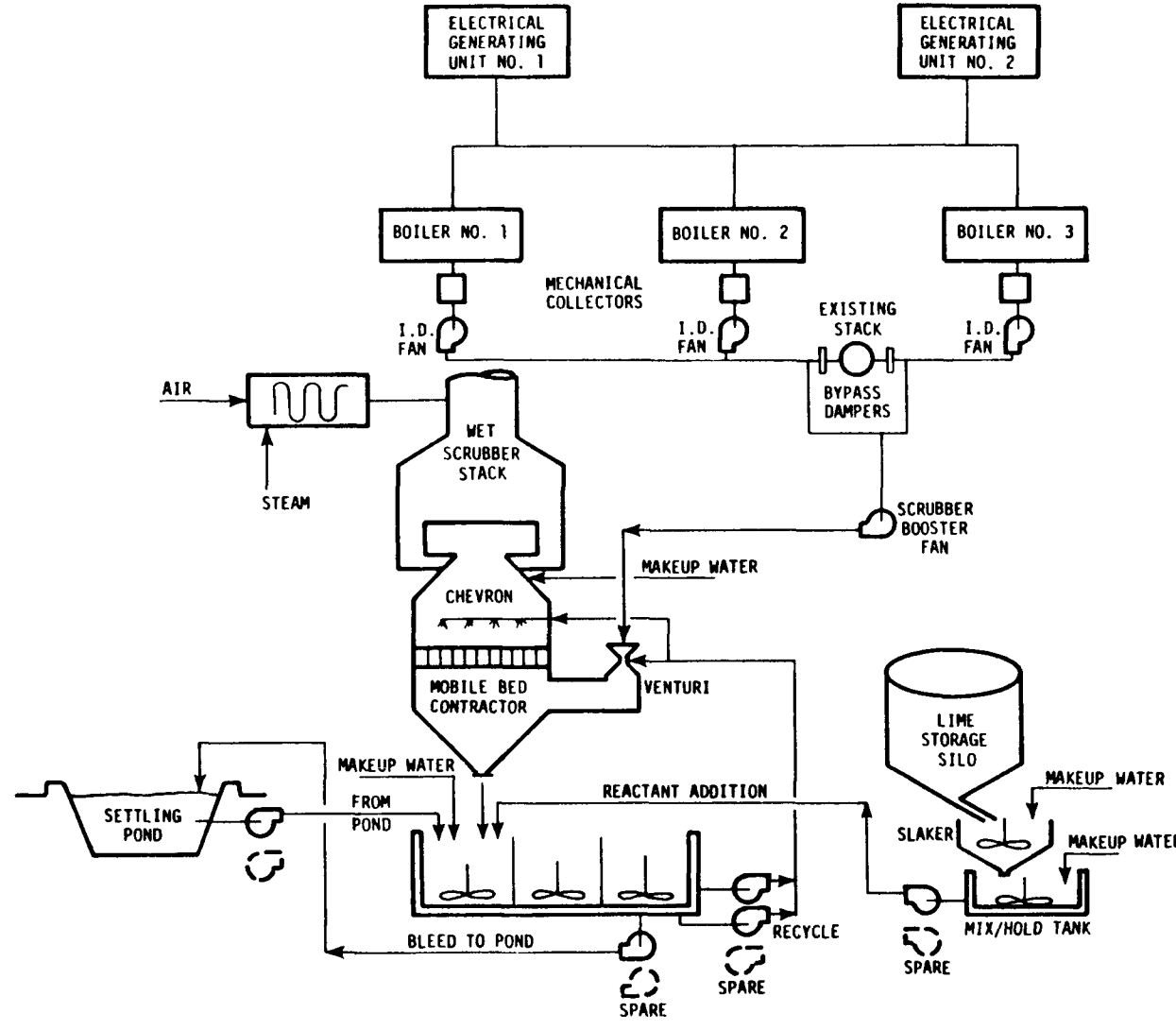
Kansas Power and Light,
Schematic of Jeffrey Steam Generator and Emission Control Equipment



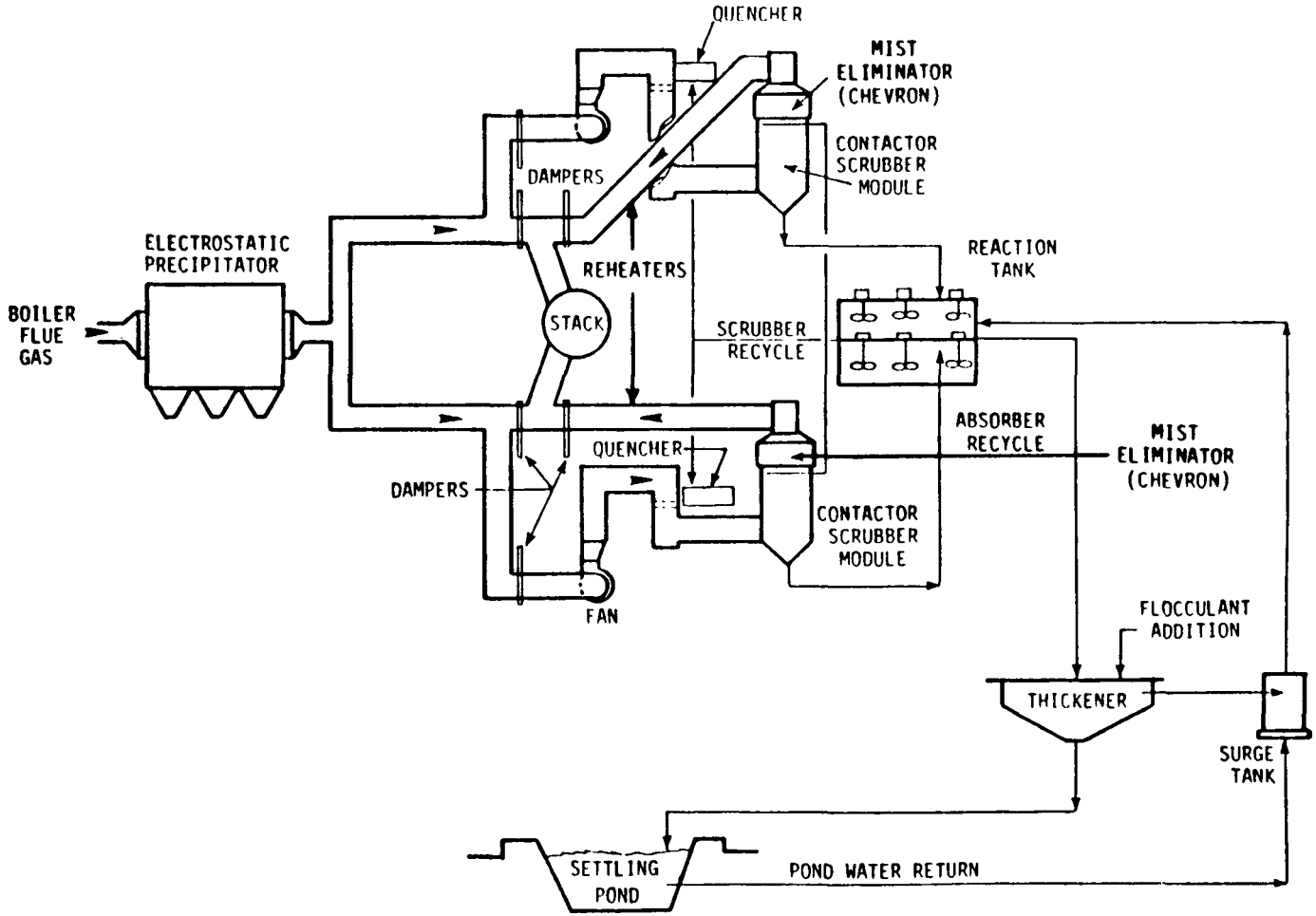
Kansas Power and Light,
Lawrence 4 Operational FGD System:
Simplified Process Flow Diagram



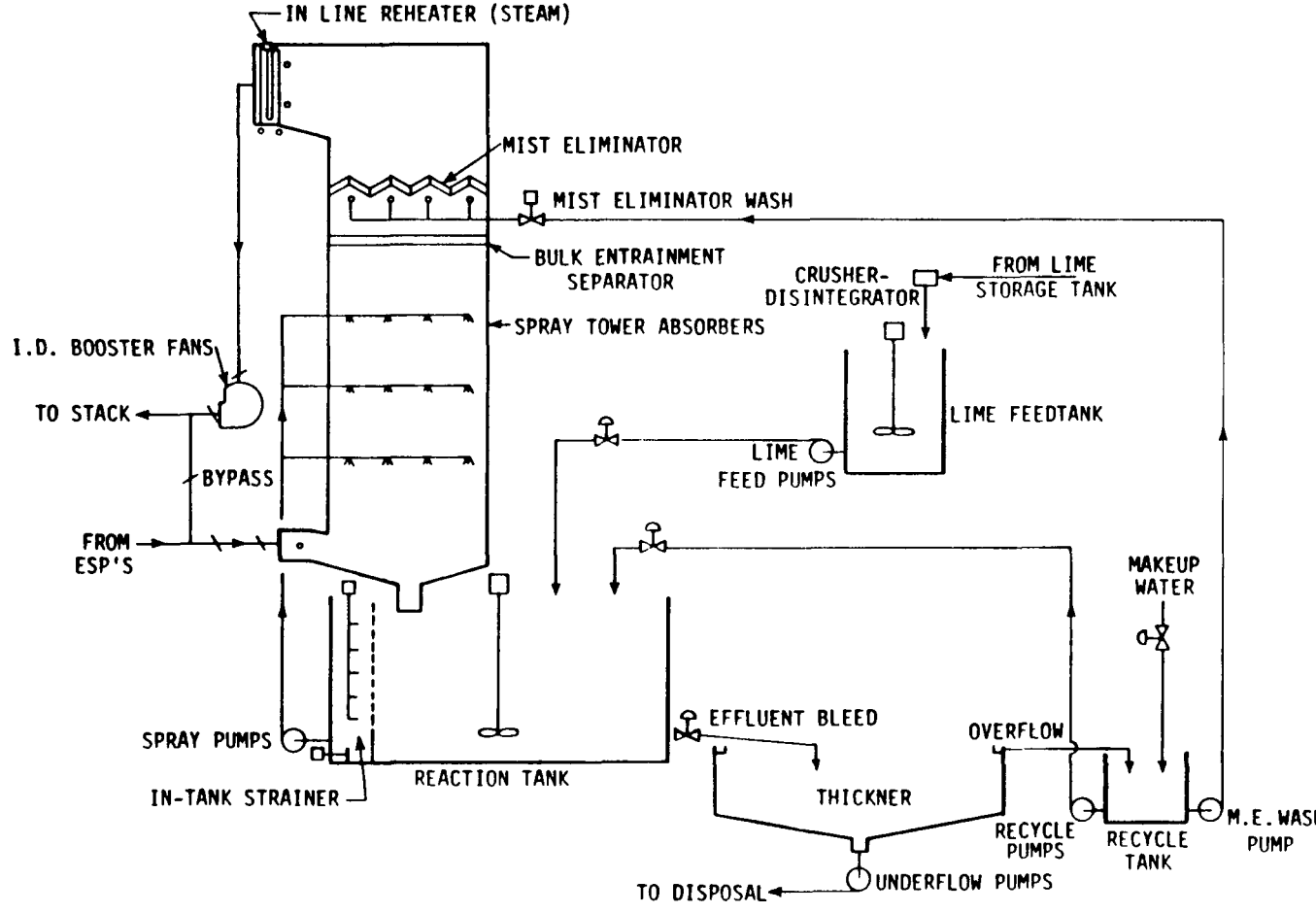
Kansas Power and Light,
Lawrence 5 Operational FGD System:
Simplified Process Flow Diagram



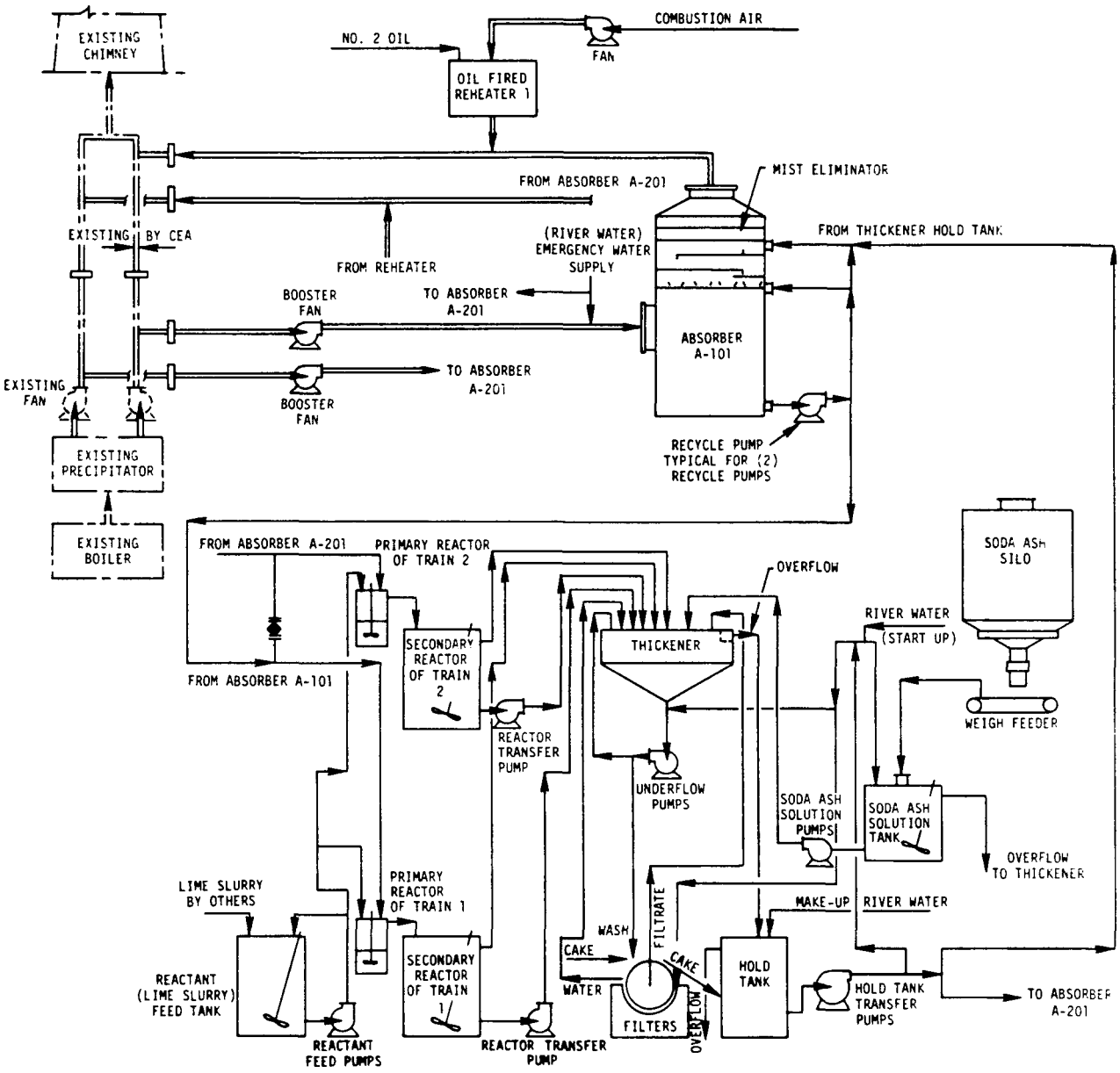
Kentucky Utilities,
Green River FGD System: General Process Diagram



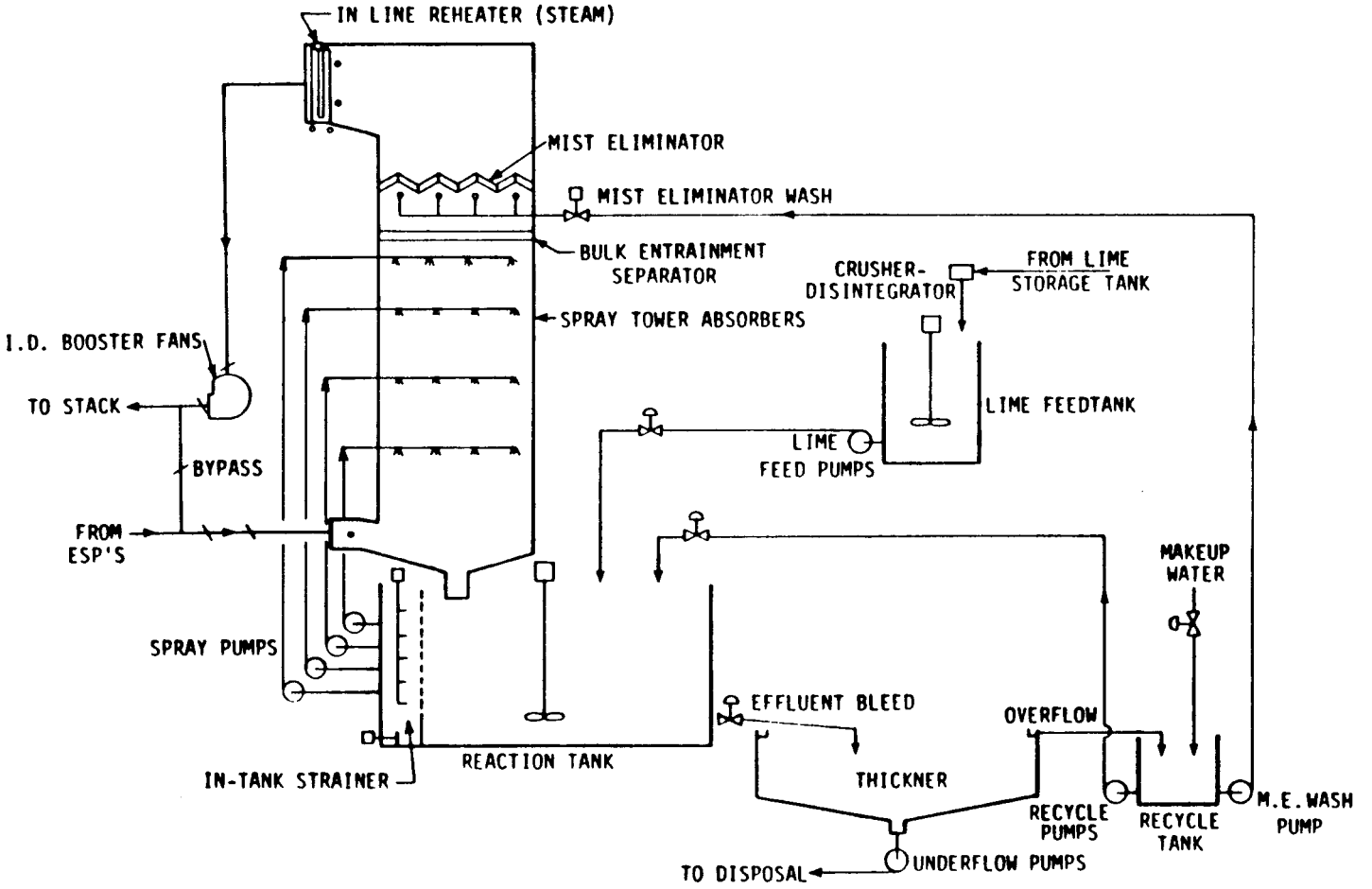
Louisville Gas and Electric, Cane Run 4
FGD System: Simplified Process Flow Diagram



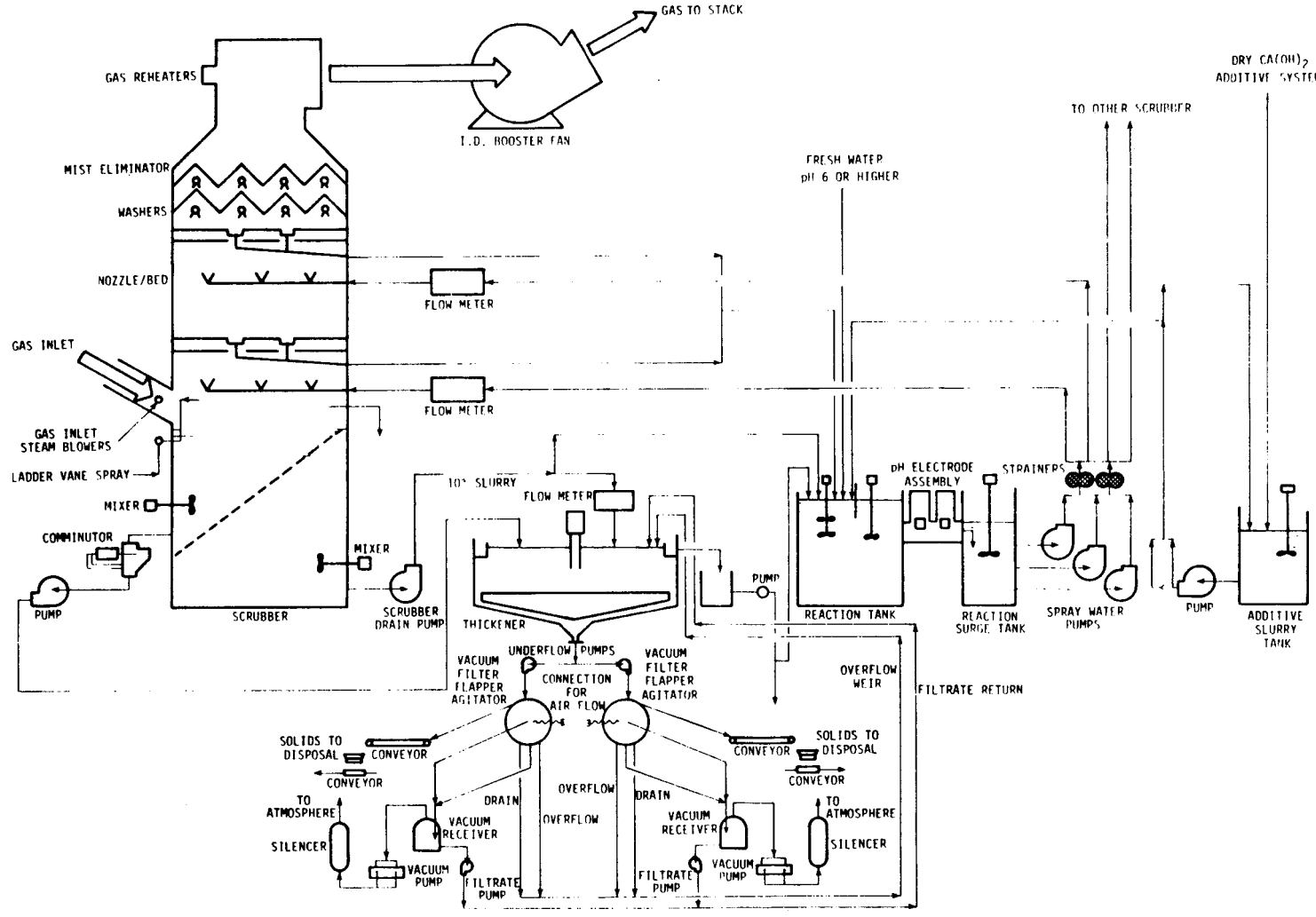
Louisville Gas and Electric, Cane Run 5
FGD System: Simplified Process Flow Diagram



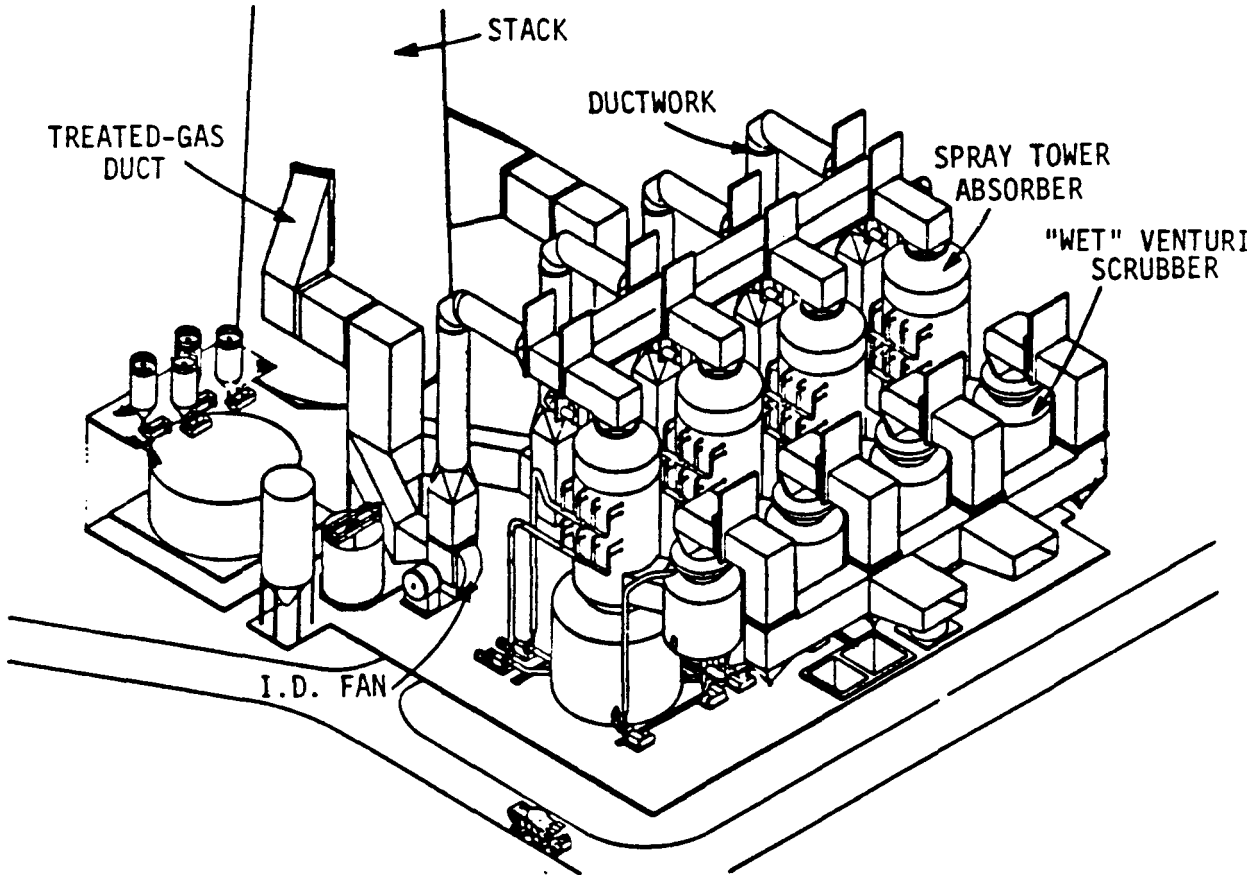
Louisville Gas and Electric, Cane Run 6
Dual Alkali FGD System: Simplified Process Flow Diagram



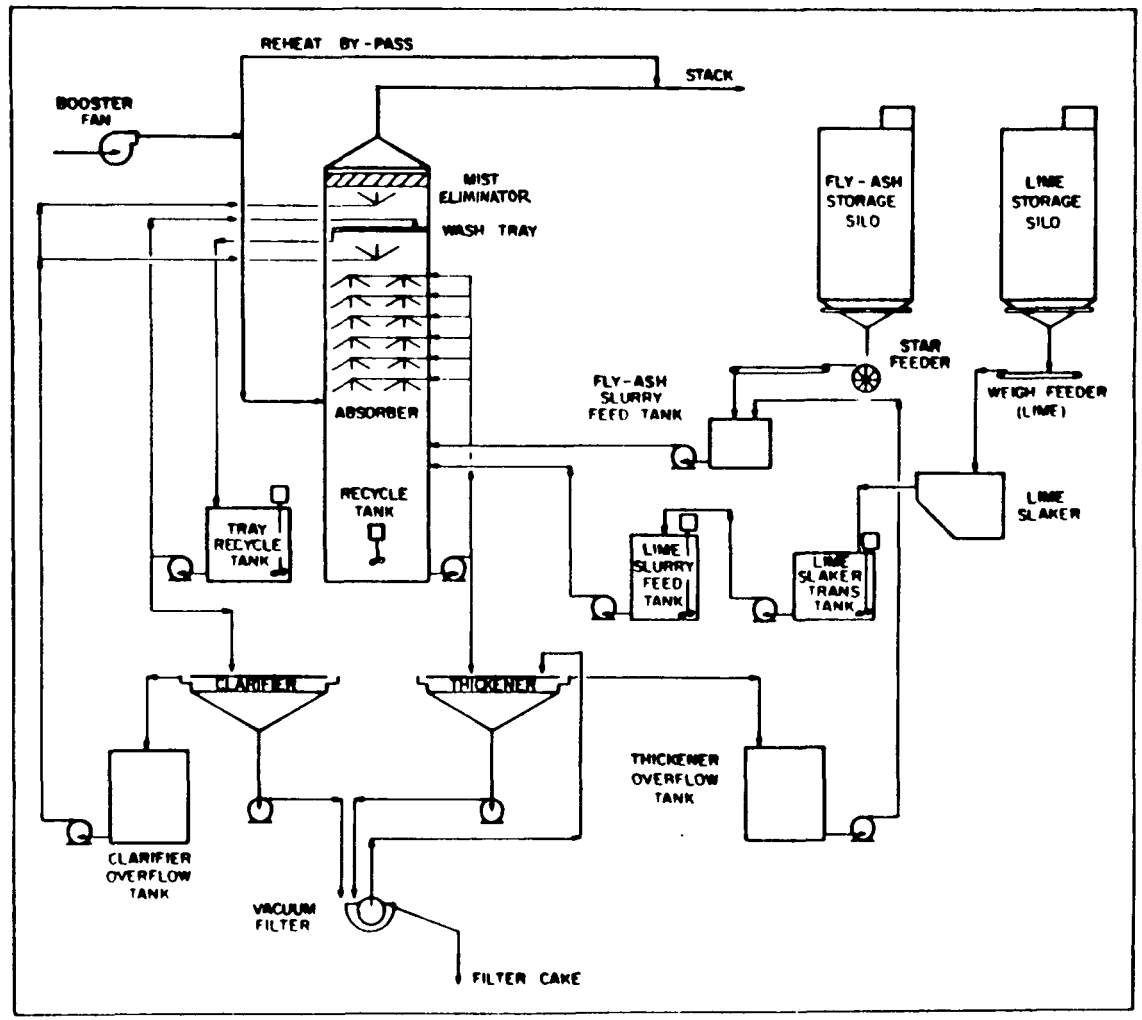
Louisville Gas and Electric,
Mill Creek 1 and 2 FGD System:
Simplified Process Flow Diagram



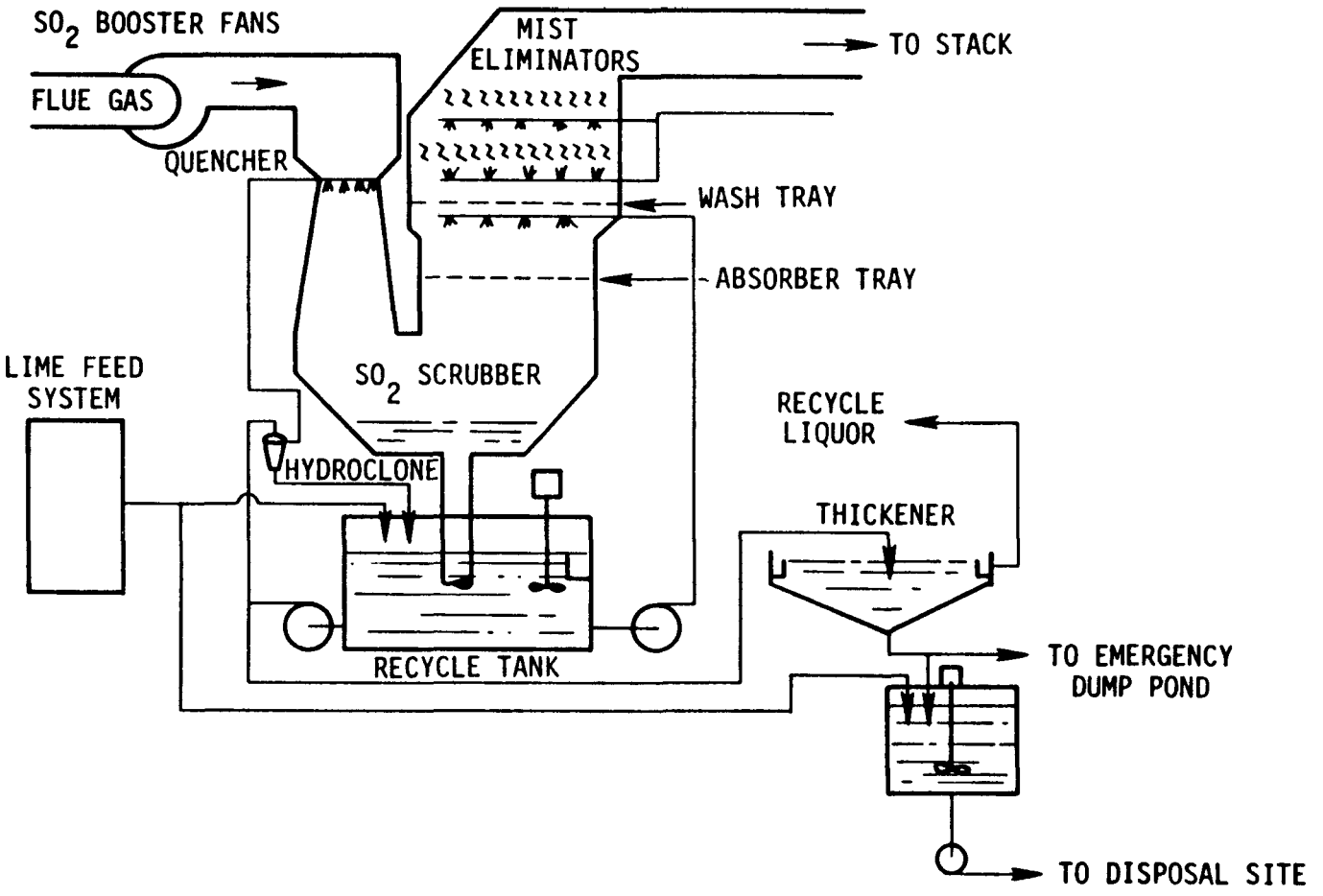
Louisville Gas and Electric,
Paddys Run 6 FGD System:
Simplified Process Flow Diagram



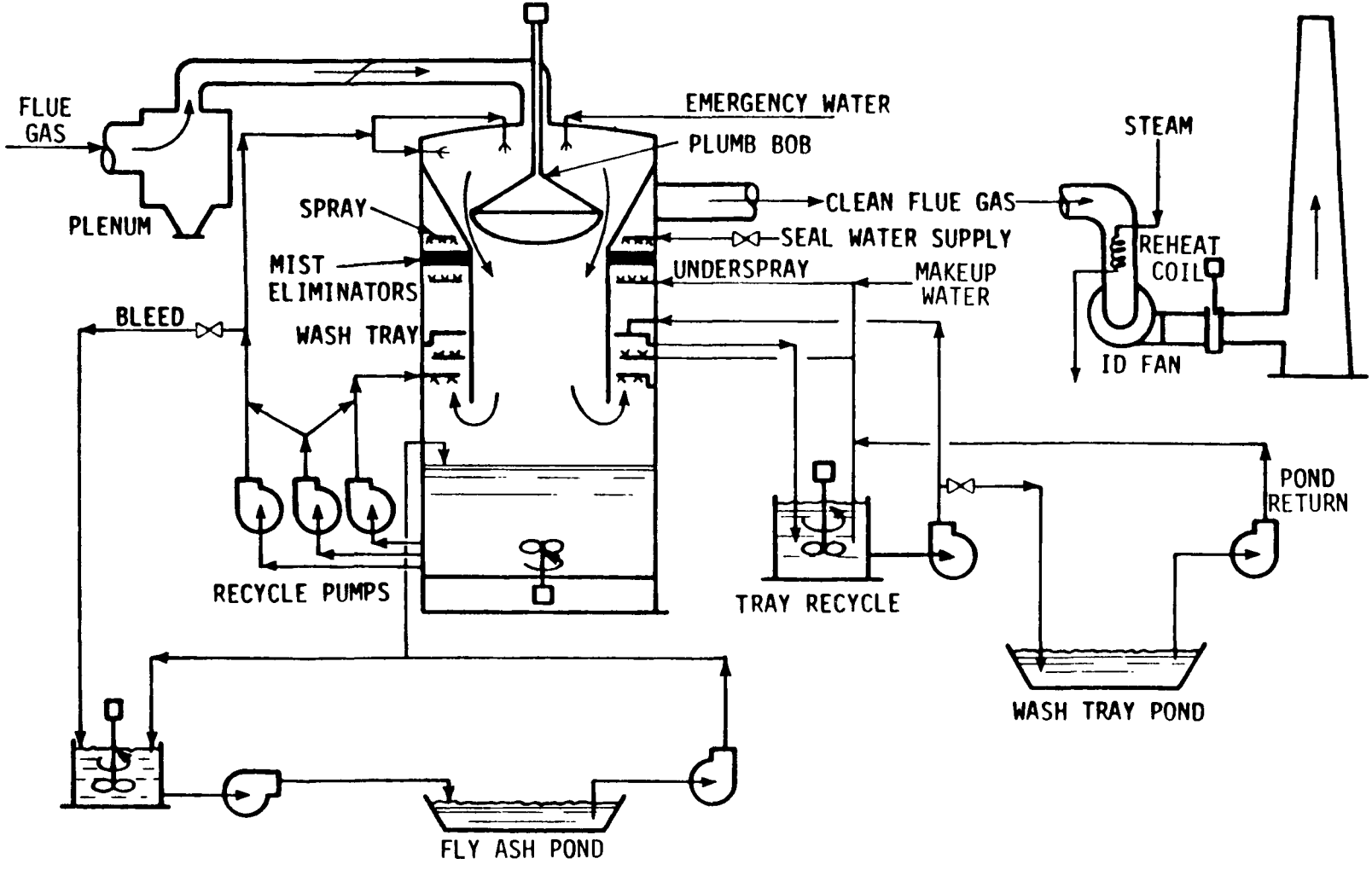
Minnesota Power and Light, Clay Boswell 4:
General Diagram



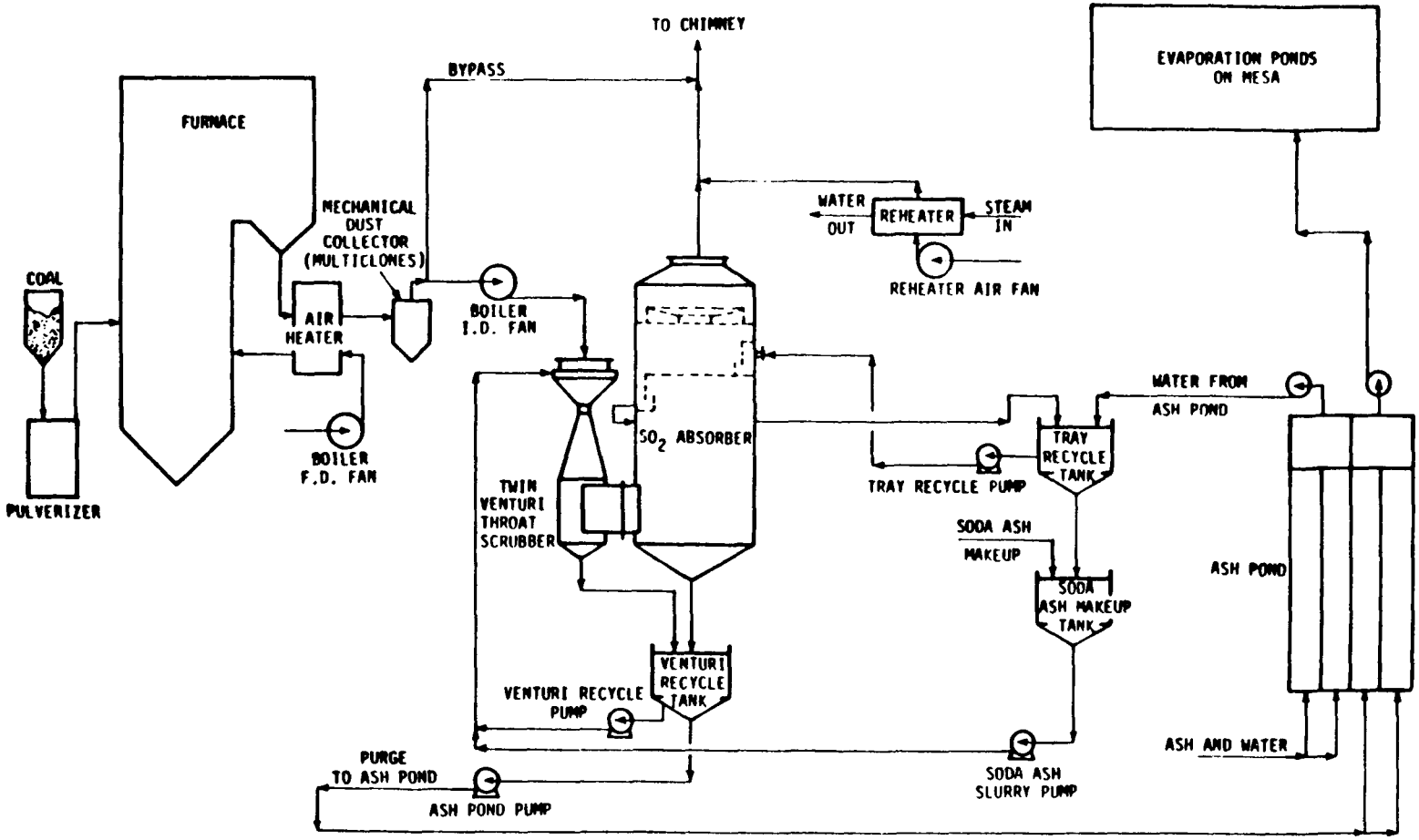
Minnkota Power Cooperative, Milton R. Young 2:
Simplified Process Flow Diagram for One of Two Absorbers



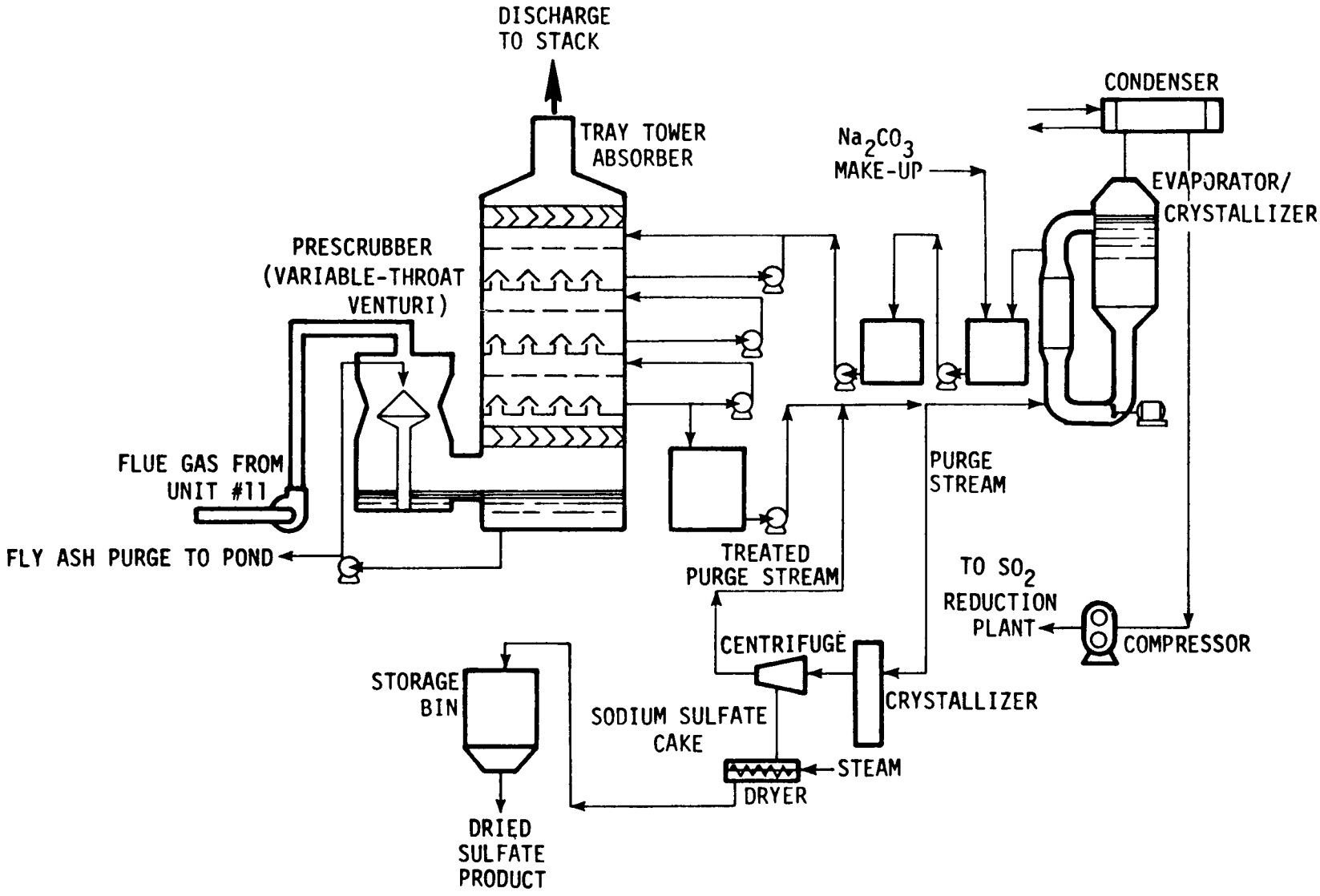
Monongahela Power, Pleasants 1 and 2:
Simplified Process Flow Diagram for One of Four Modules for Either Unit



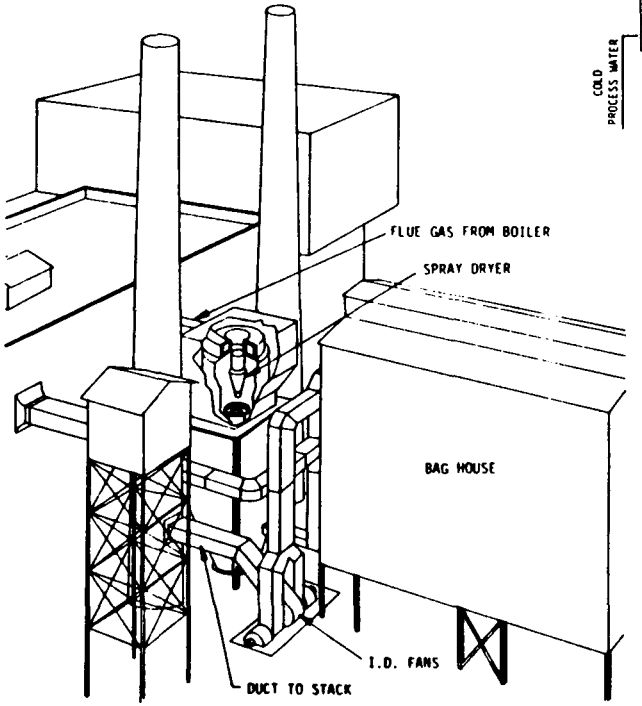
Montana Power, Colstrip 1 and 2:
Process diagram of a given FGD module.



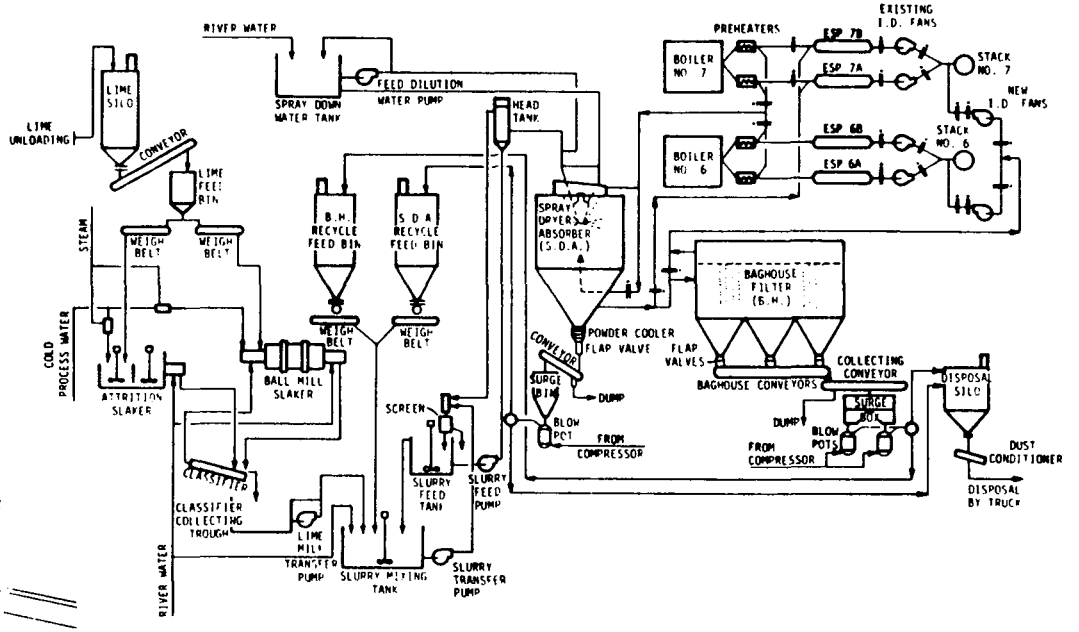
Nevada Power, Reid Gardner 1,2 and 3:
Process diagram of a given FGD system.



Northern Indiana Public Service,
D. H. Mitchell 11 Wellman Lord/Allied System:
General Process Diagram.

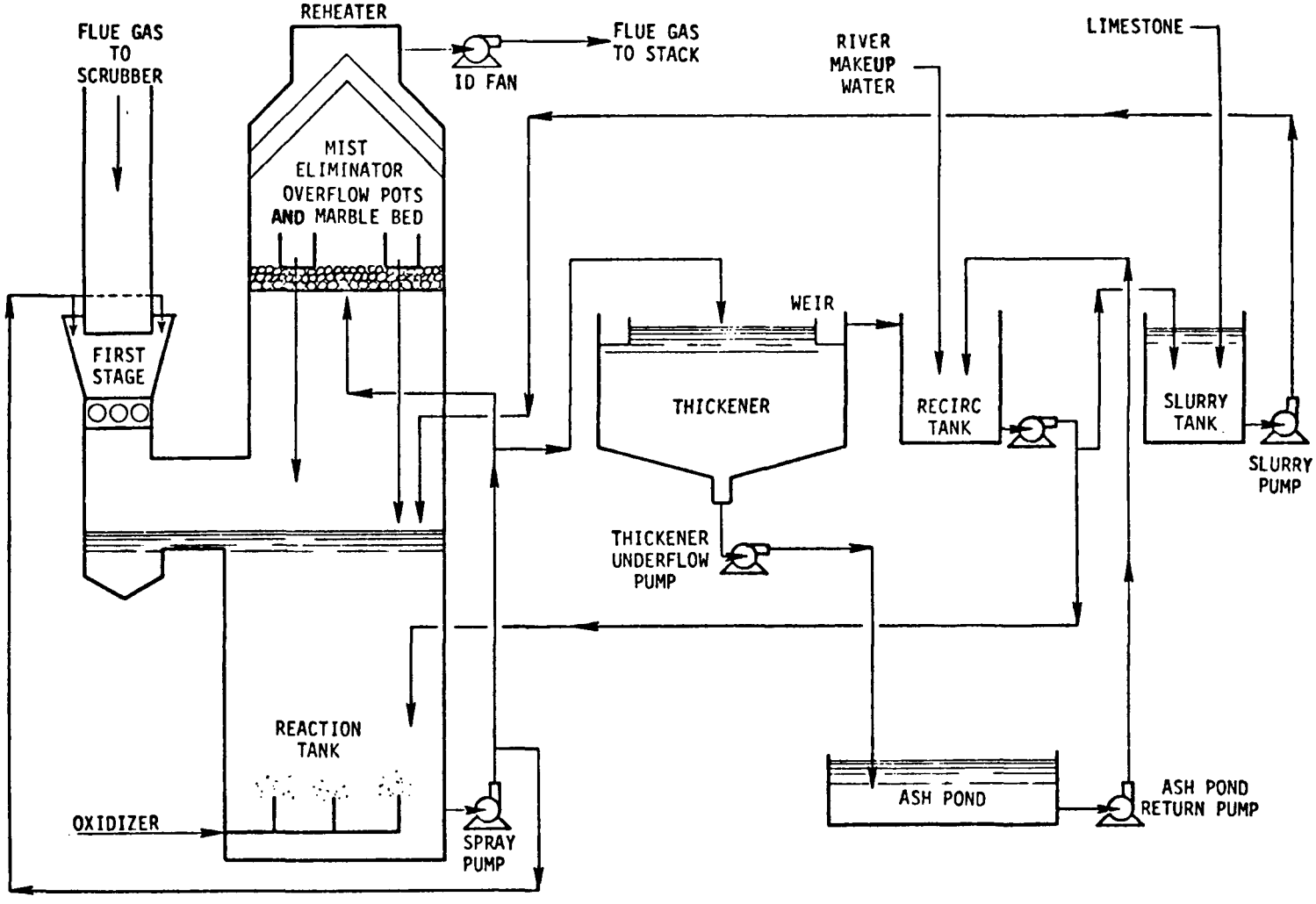


Spray Dryer Cutaway View

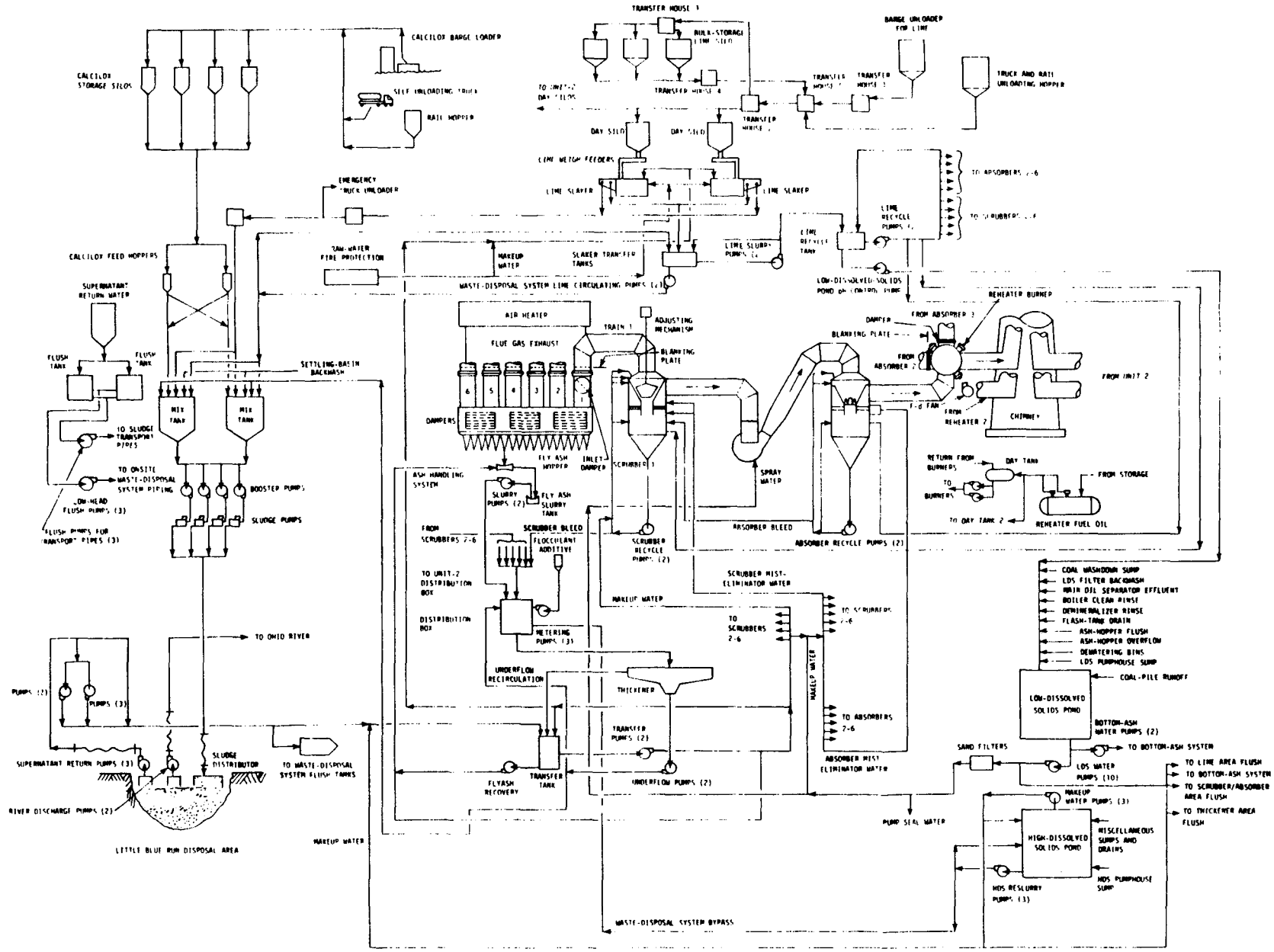


Simplified Process Flow Diagram

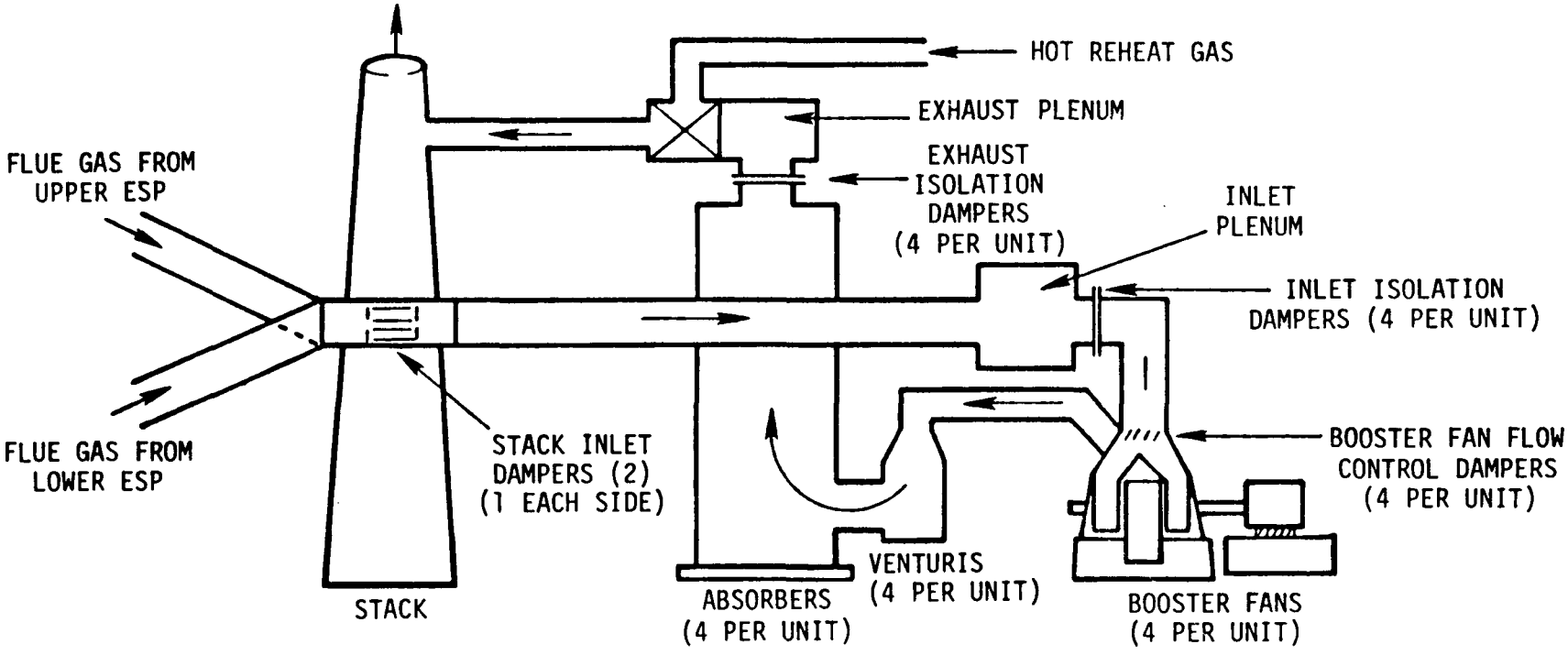
Northern States Power, Riverside 6,7: FGD System Flow Diagrams



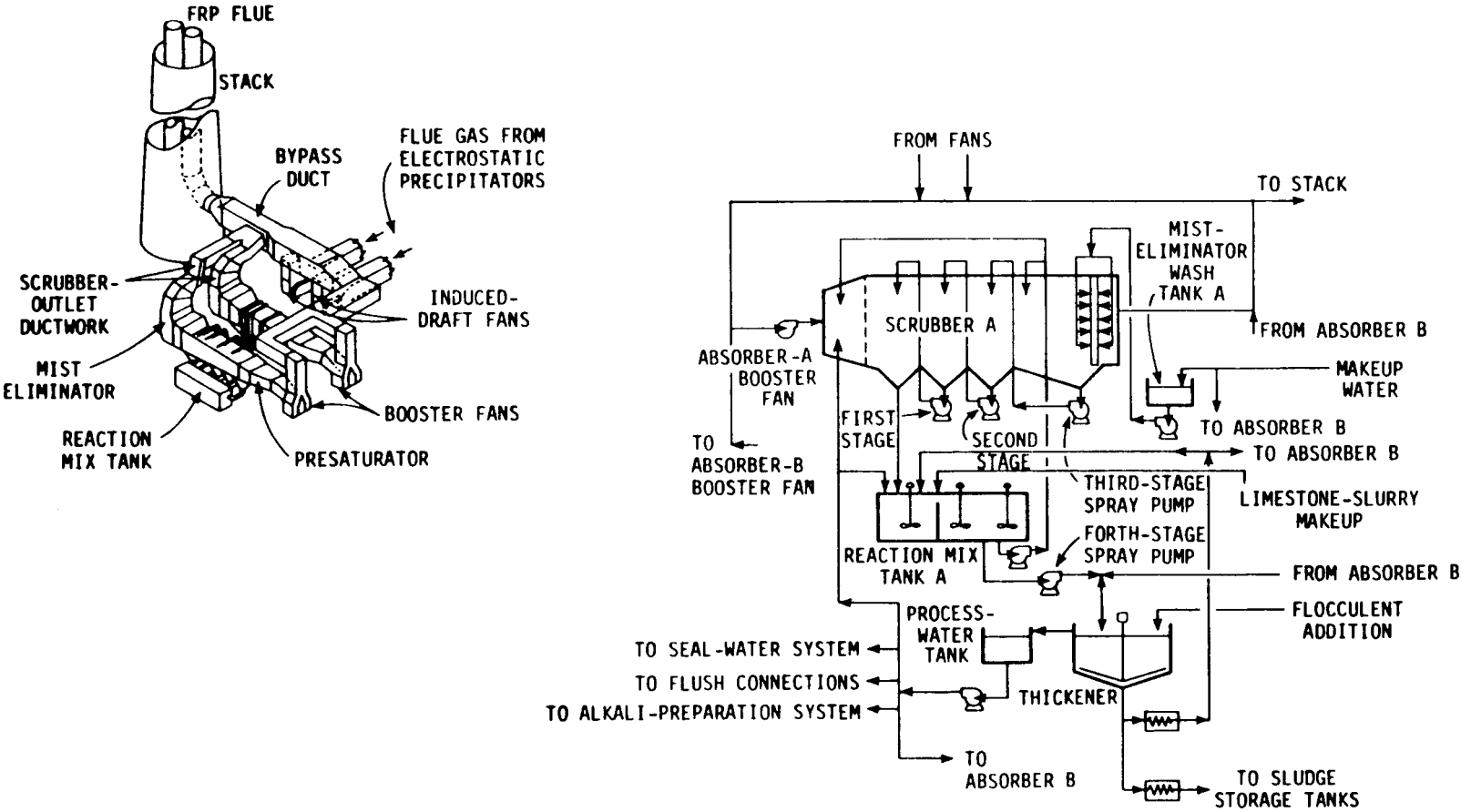
Northern States Power, Sherburne 1 and 2 FGD System:
Simplified Process Flow Diagram



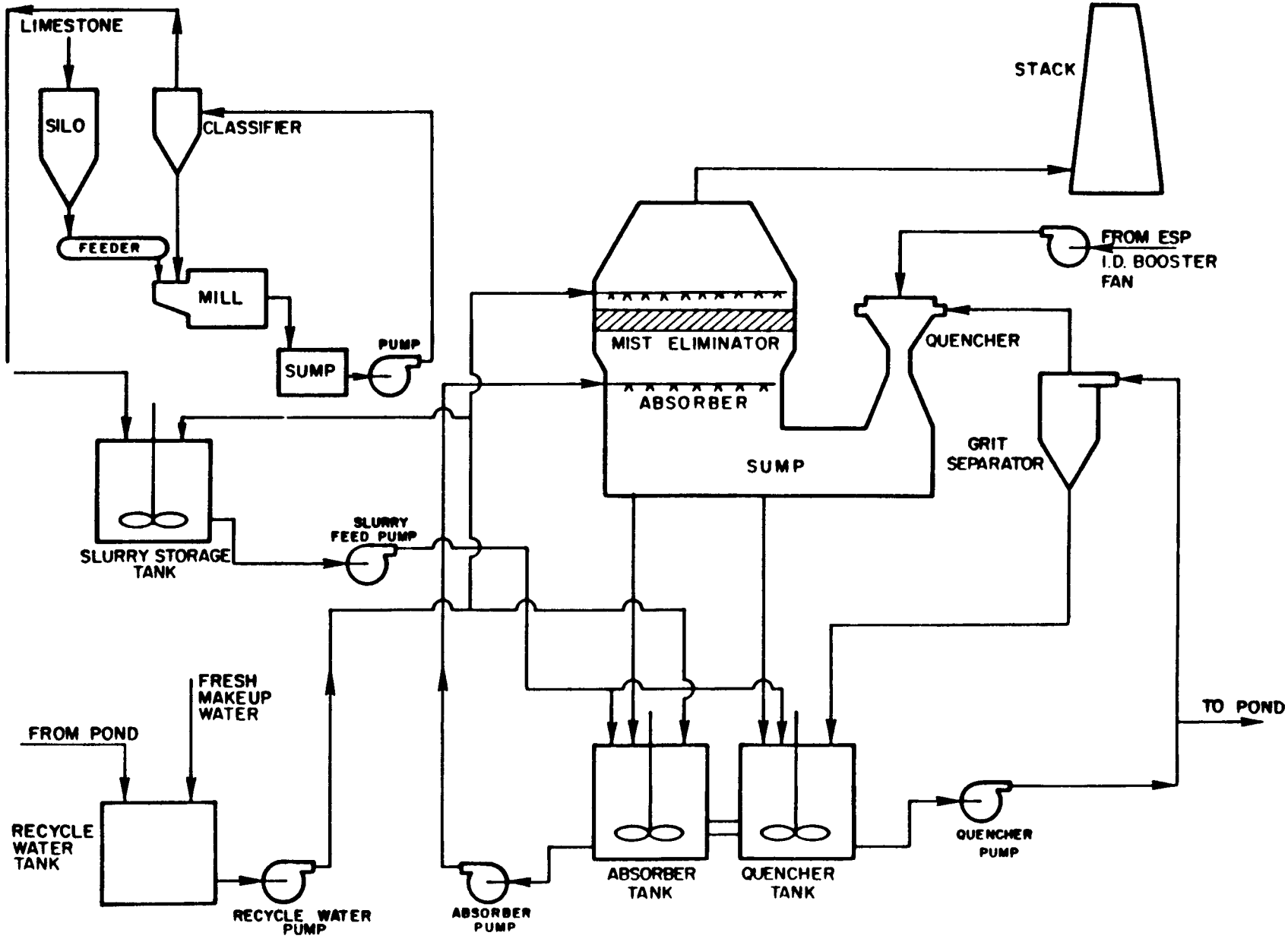
Pennsylvania Power, Bruce Mansfield FGD System:
Process Flow Diagram for Unit 1 or 2



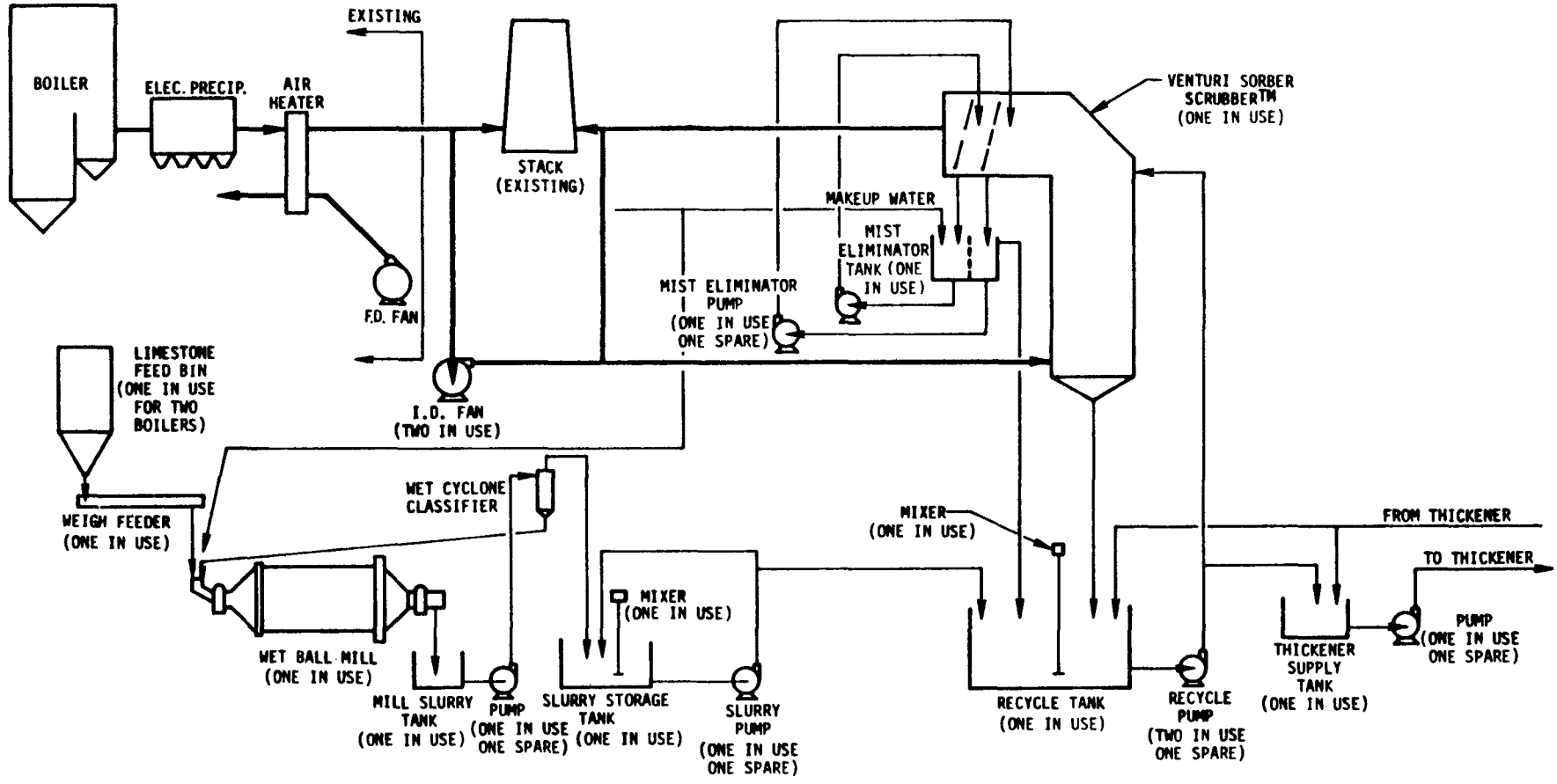
Public Service of New Mexico, San Juan 1, 2, 3, and 4
FGD System Flue Gas Flow Path



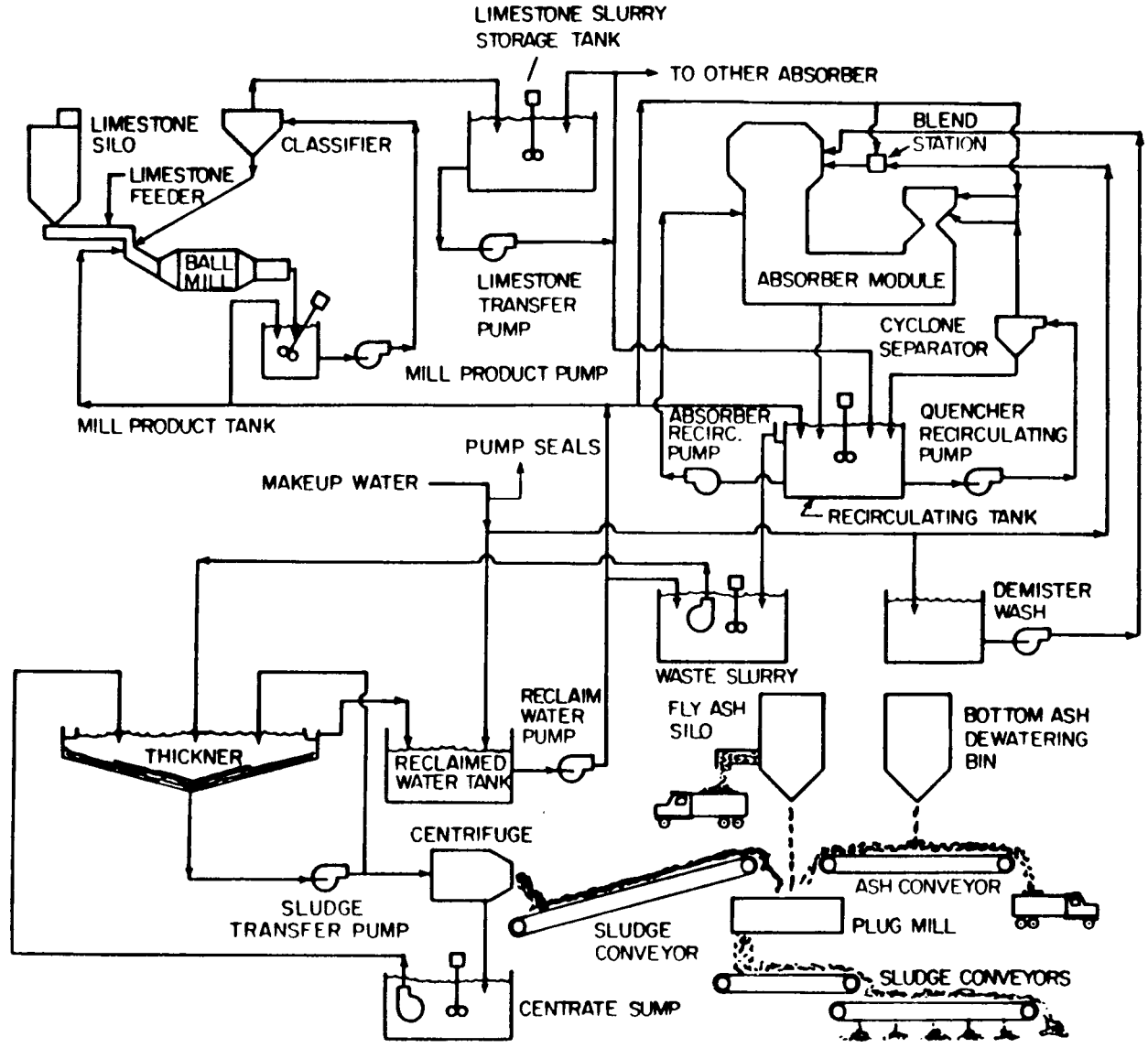
Salt River Project, Coronado 1 and 2 FGD System:
Simplified Process Flow Diagram



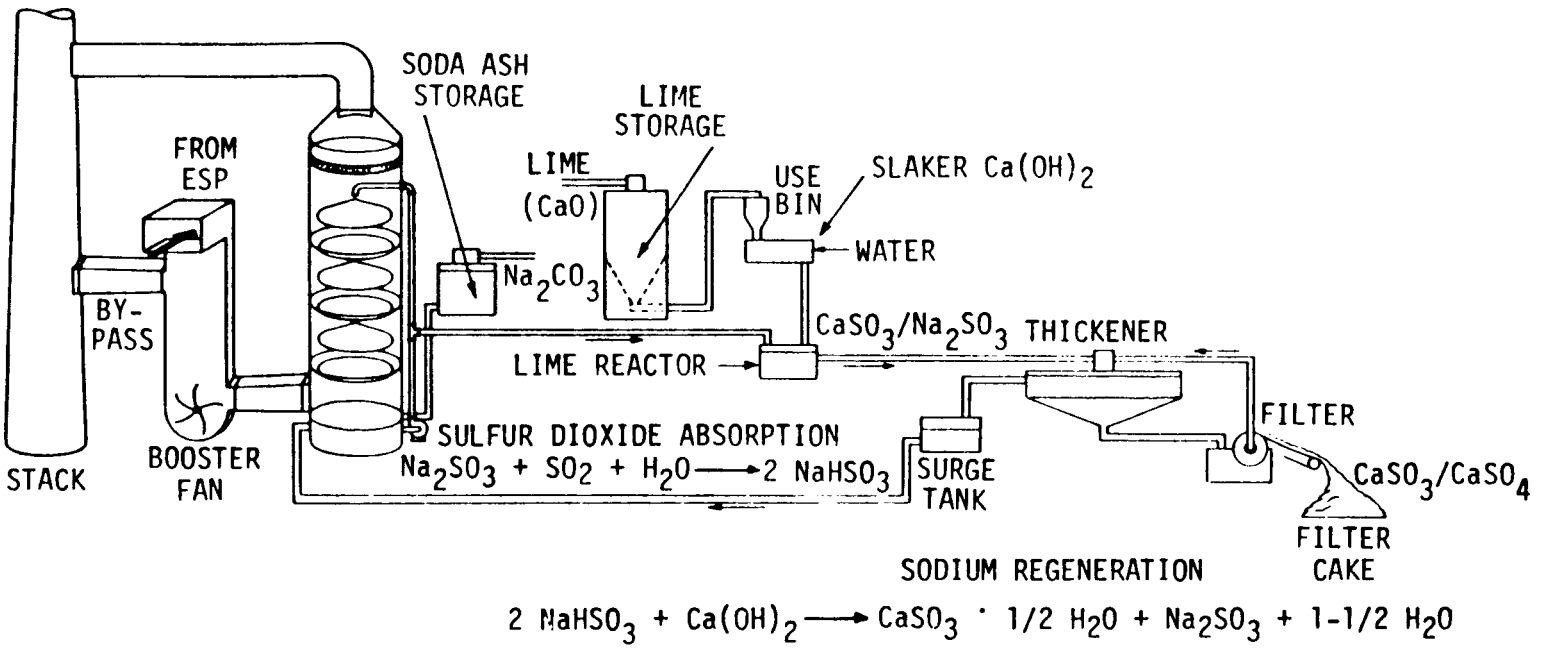
South Carolina Public Service Authority, Winyah 2: Simplified Process Flow Diagram



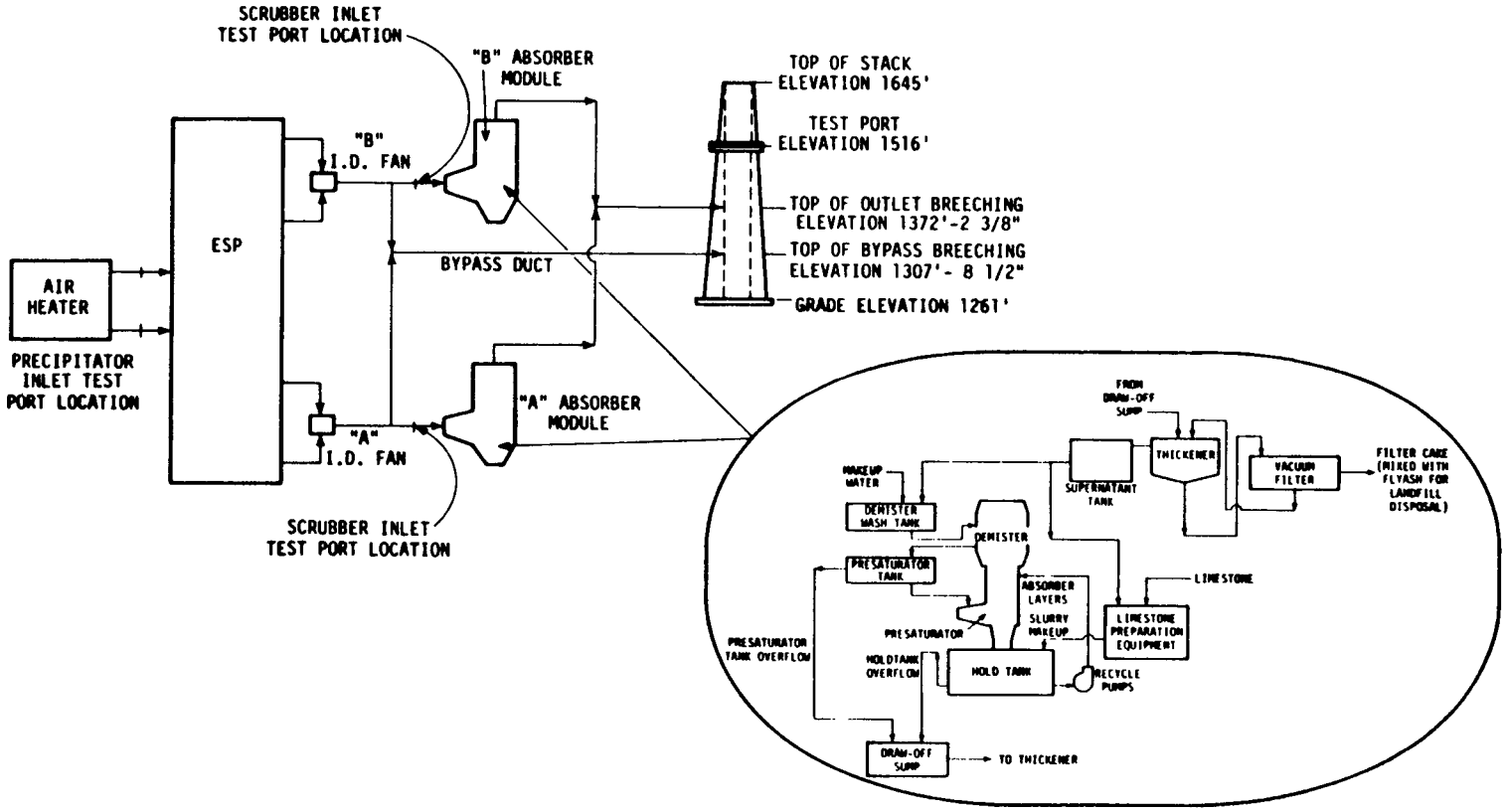
South Mississippi Electric, R.D. Morrow 1 and 2:
Simplified Process Flow Diagram



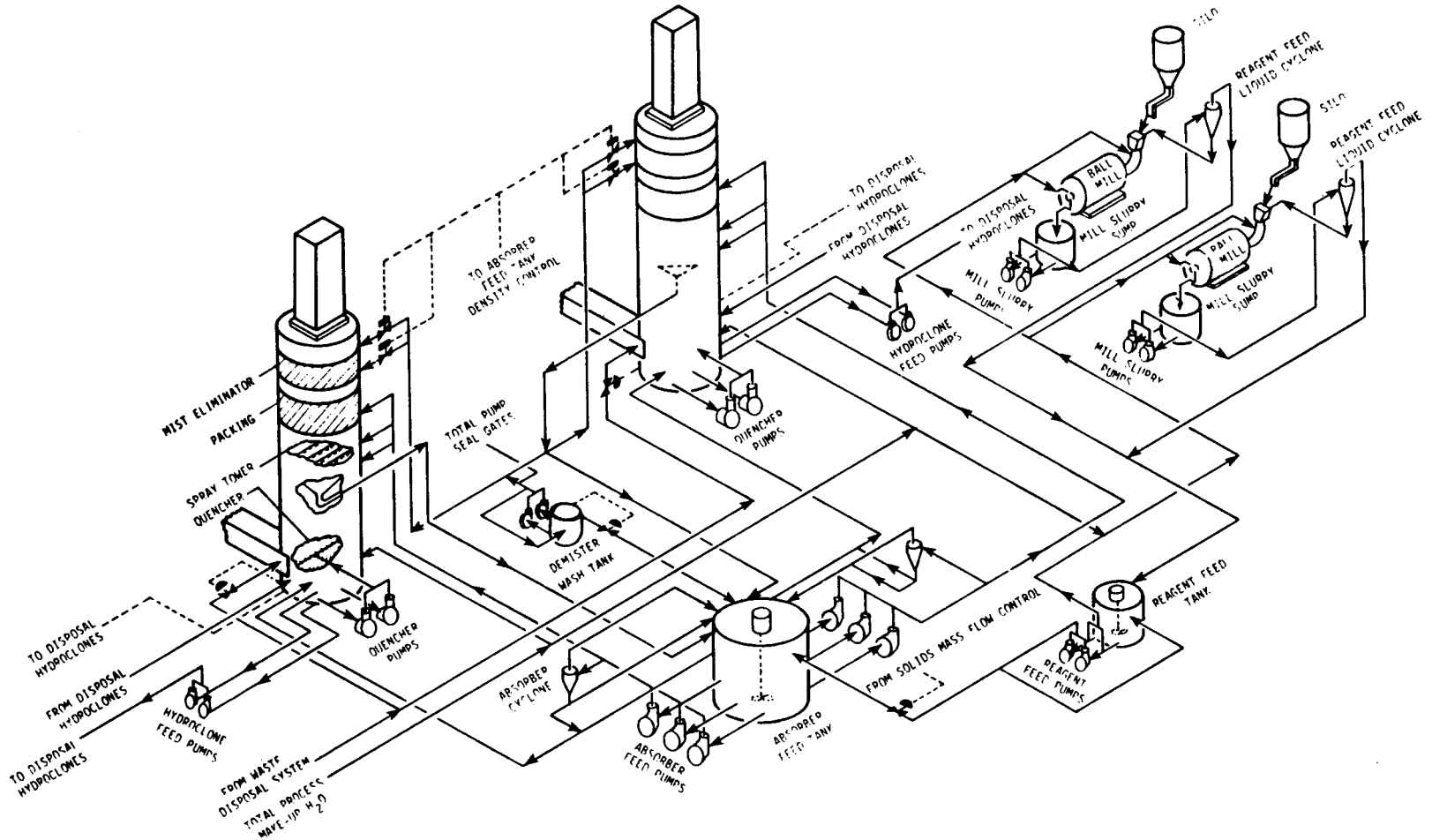
Southern Illinois Power Coop, Marion 4: Simplified Process Flow Diagram



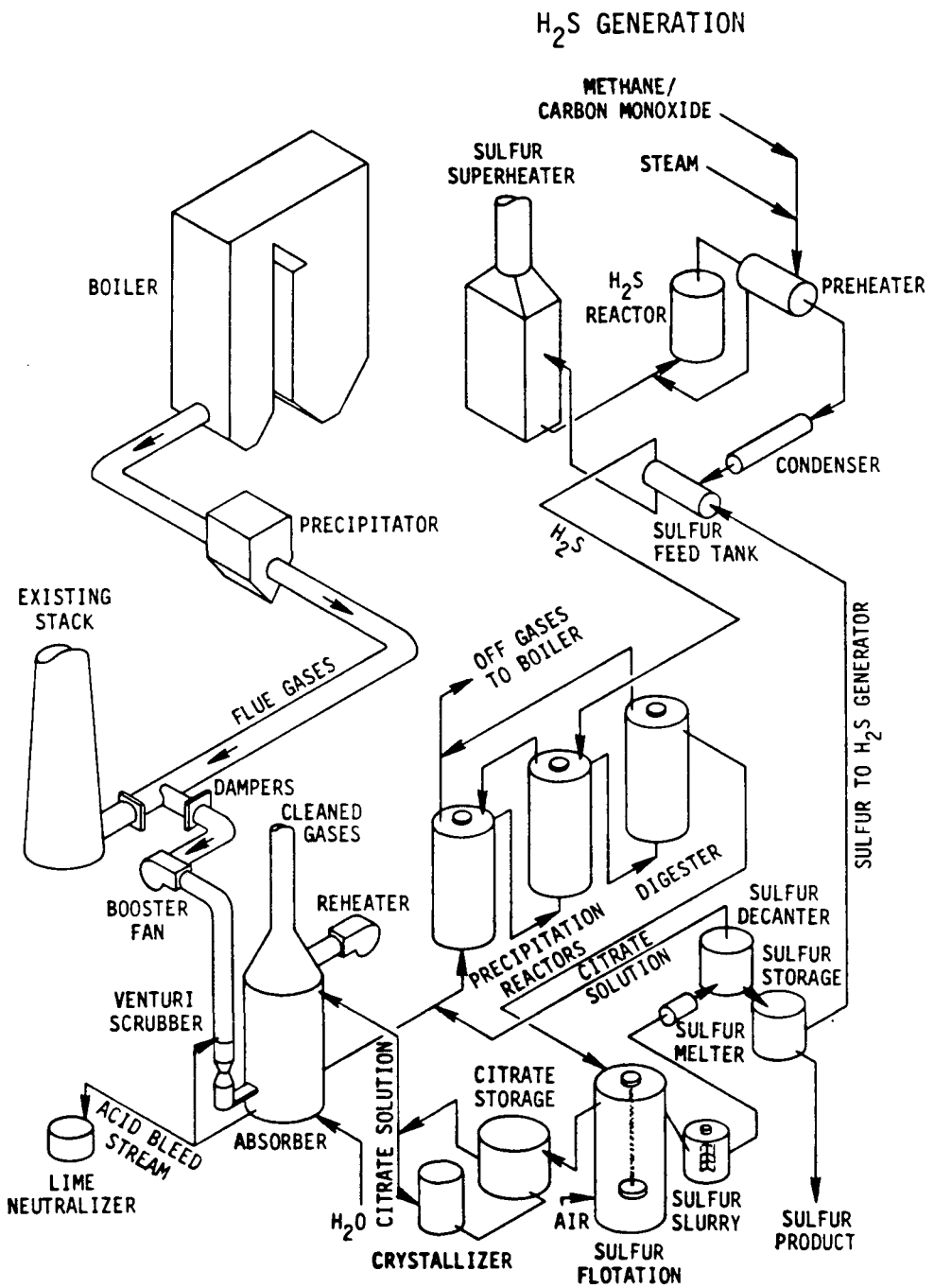
Southern Indiana Gas and Electric, A.B. Brown 1:
Dual Alkali FGD System Simplified Process Flow Diagram



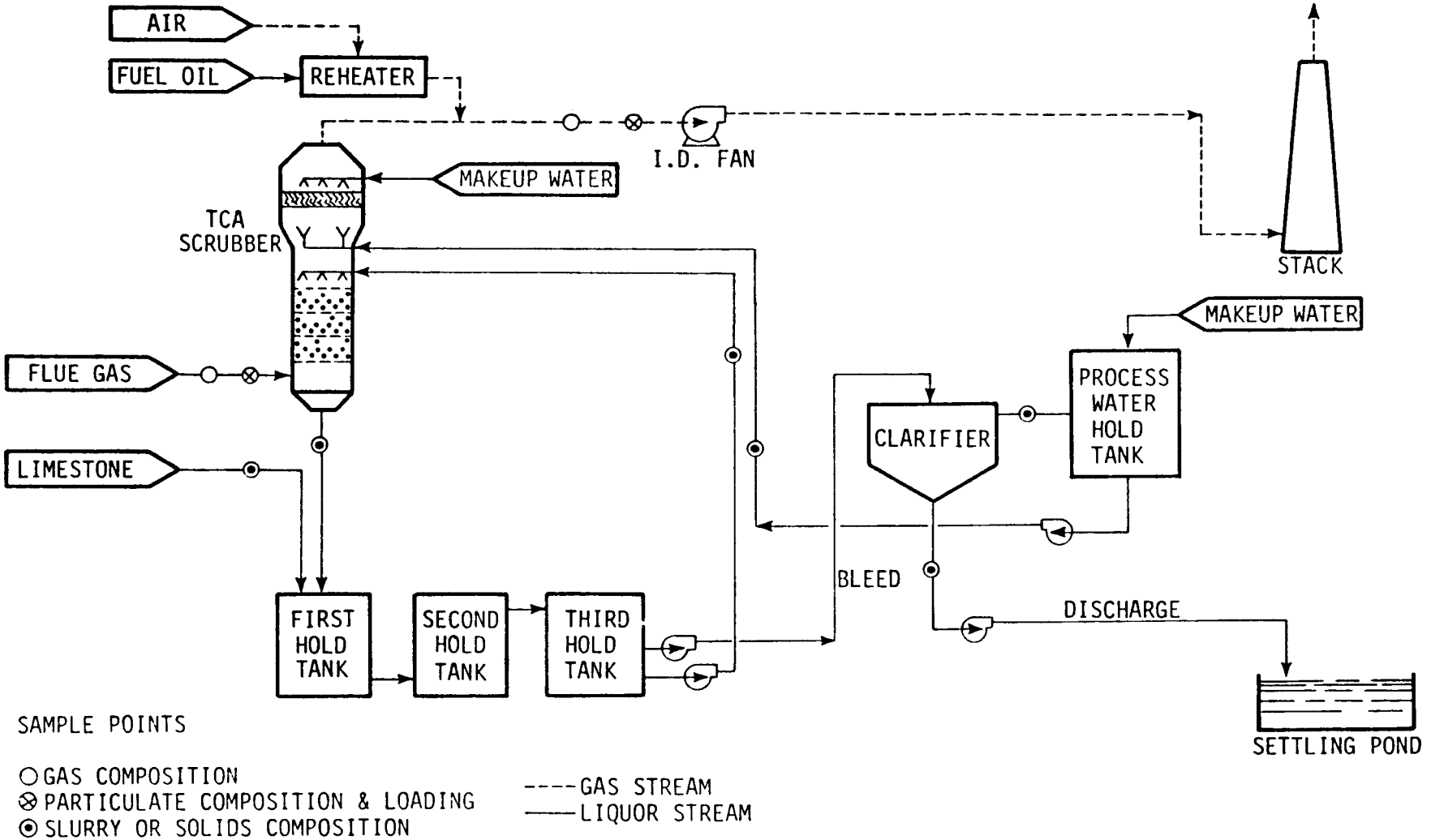
Springfield City Utilities, Southwest 1:
Simplified Process Diagram



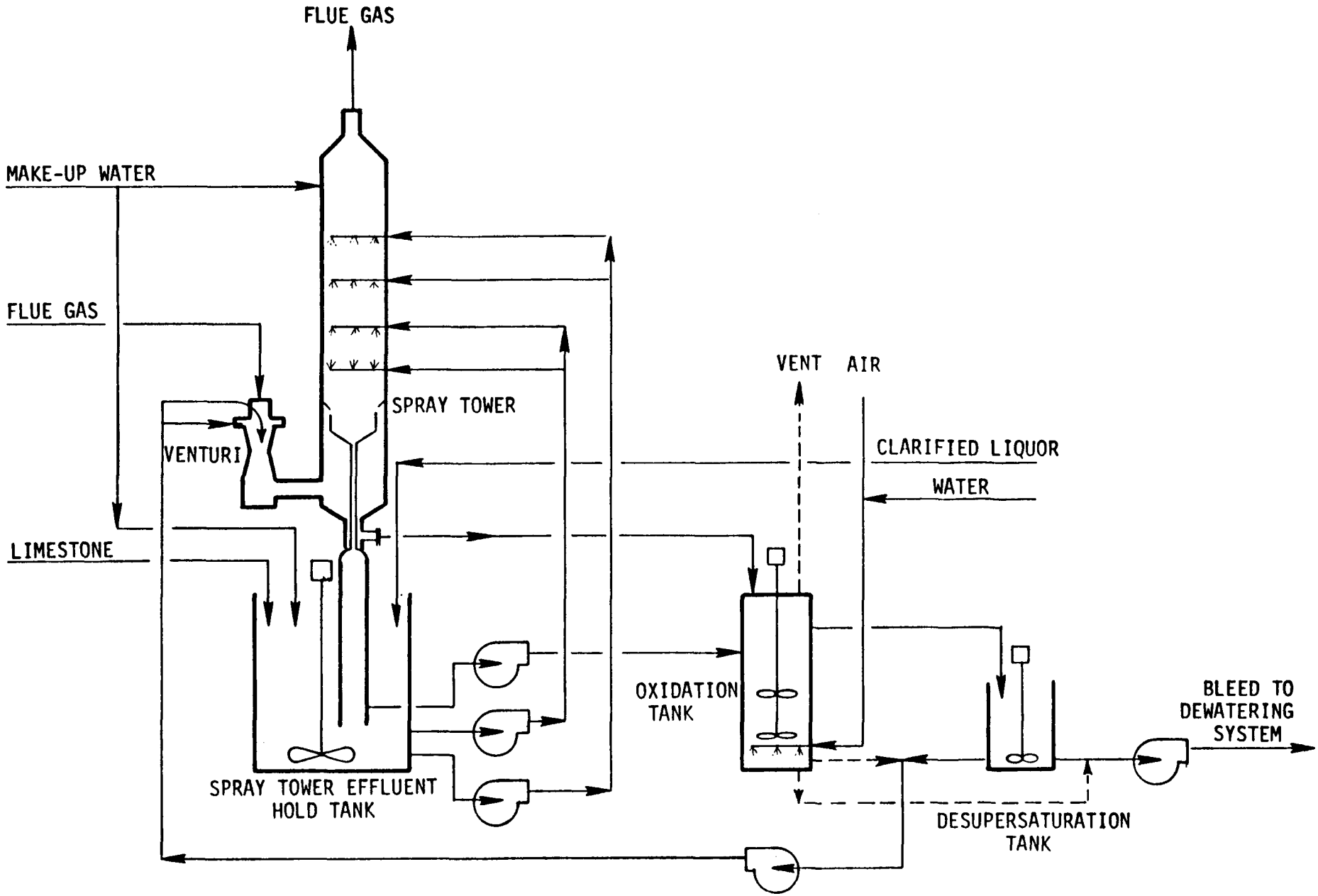
Springfield Water, Light & Power, Dallman 3
Process Flow Diagram



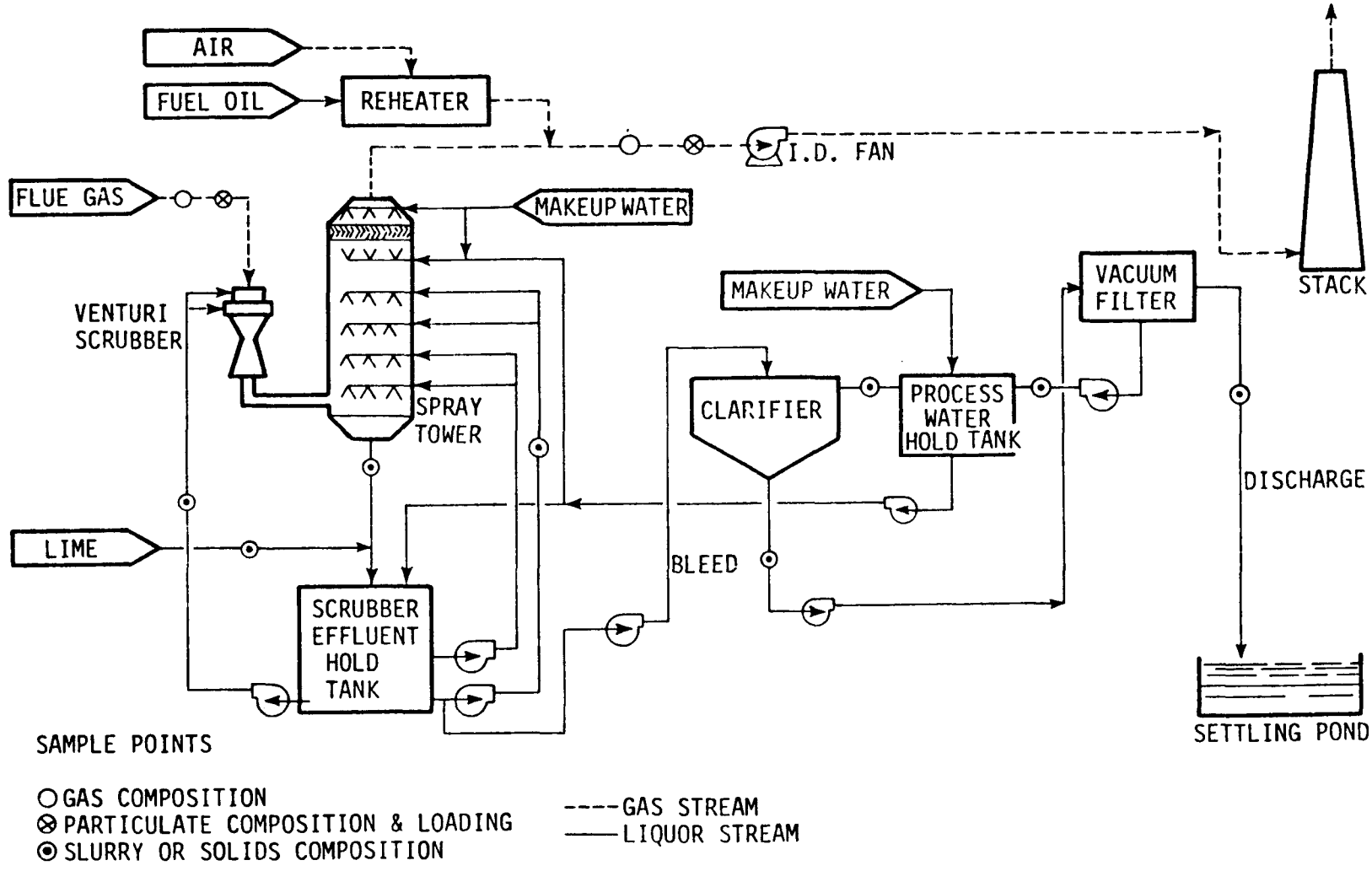
St. Joe Zinc, G.F. Weaton 1:
Citrate FGD System Simplified Process Flow Diagram



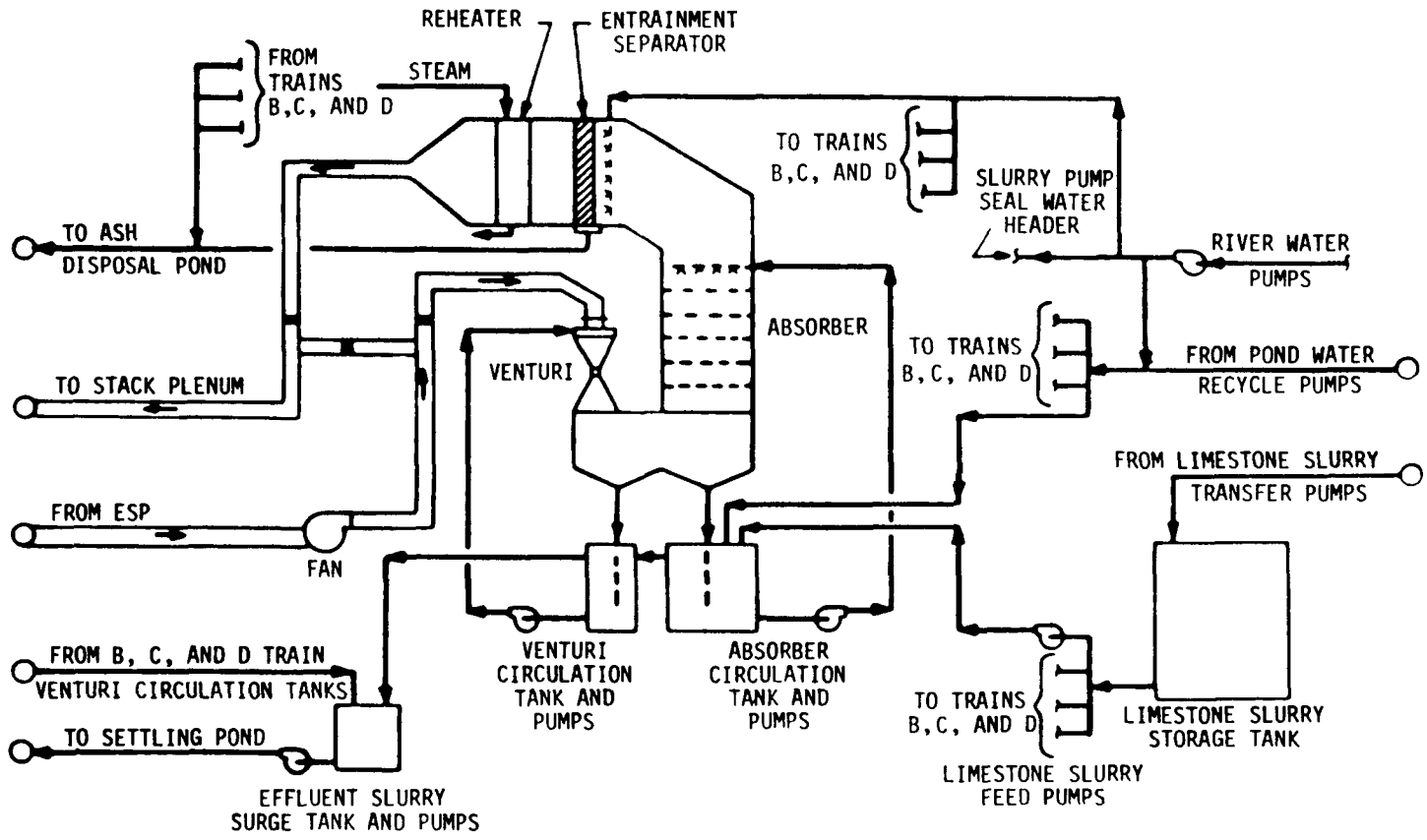
Tennessee Valley Authority,
Shawnee 10A Prototype Test Unit:
General Process Diagram.



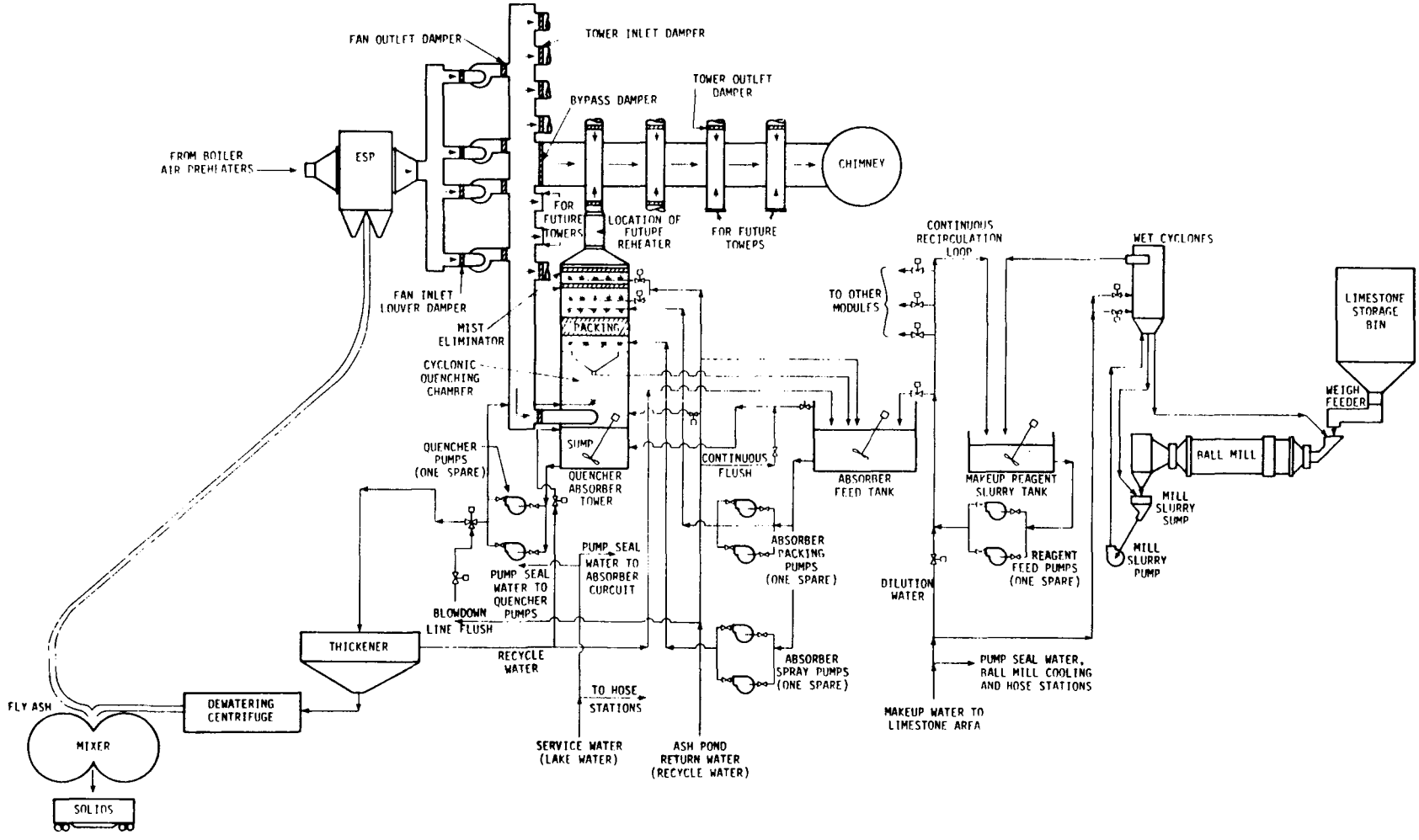
Tennessee Valley Authority, Shawnee 10B Prototype Test Unit:
Modified Venturi/Spray Tower System for 2-Stage Oxidation Testing.



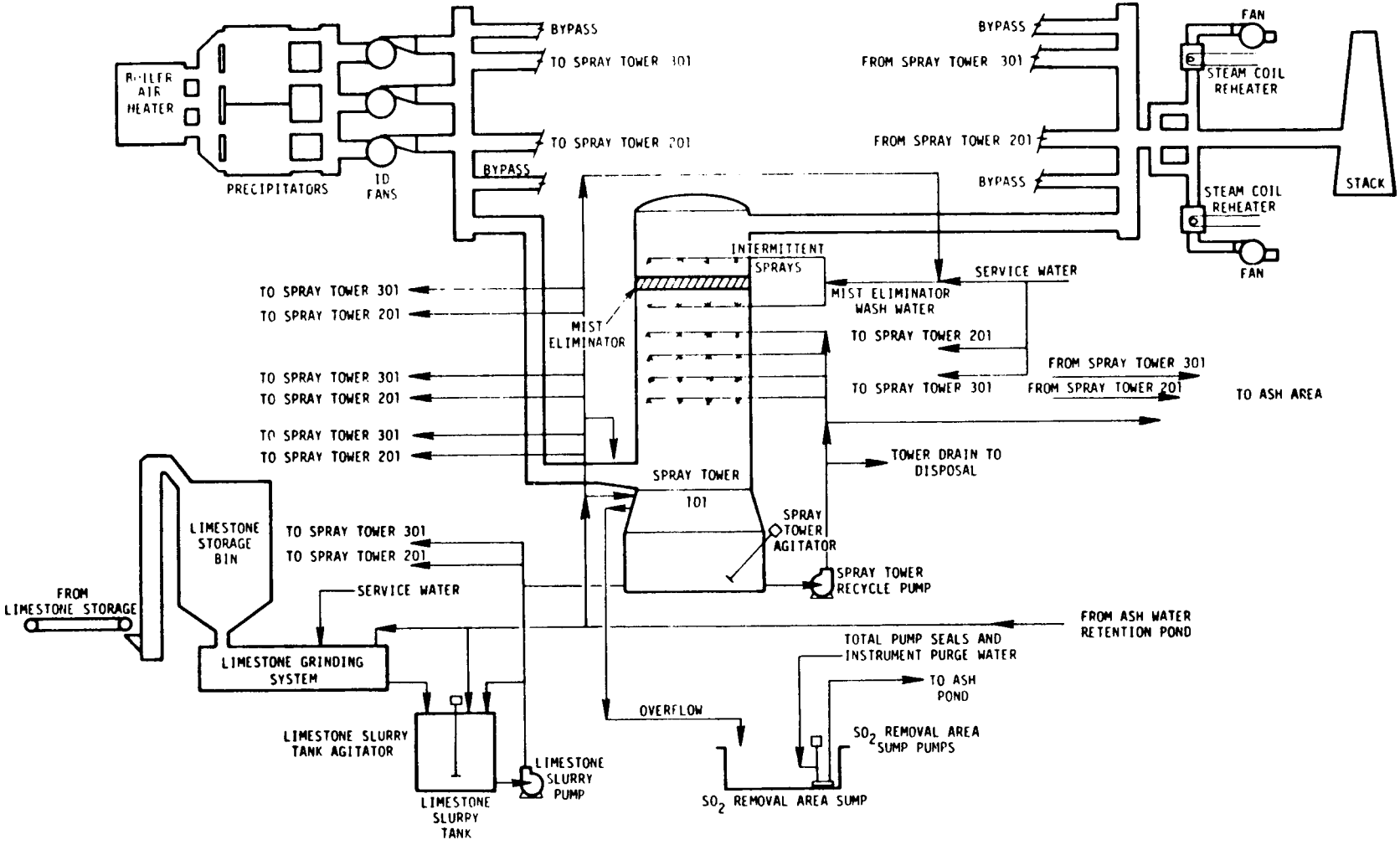
Tennessee Valley Authority, Shawnee 10B Prototype Unit:
General Process Diagram.



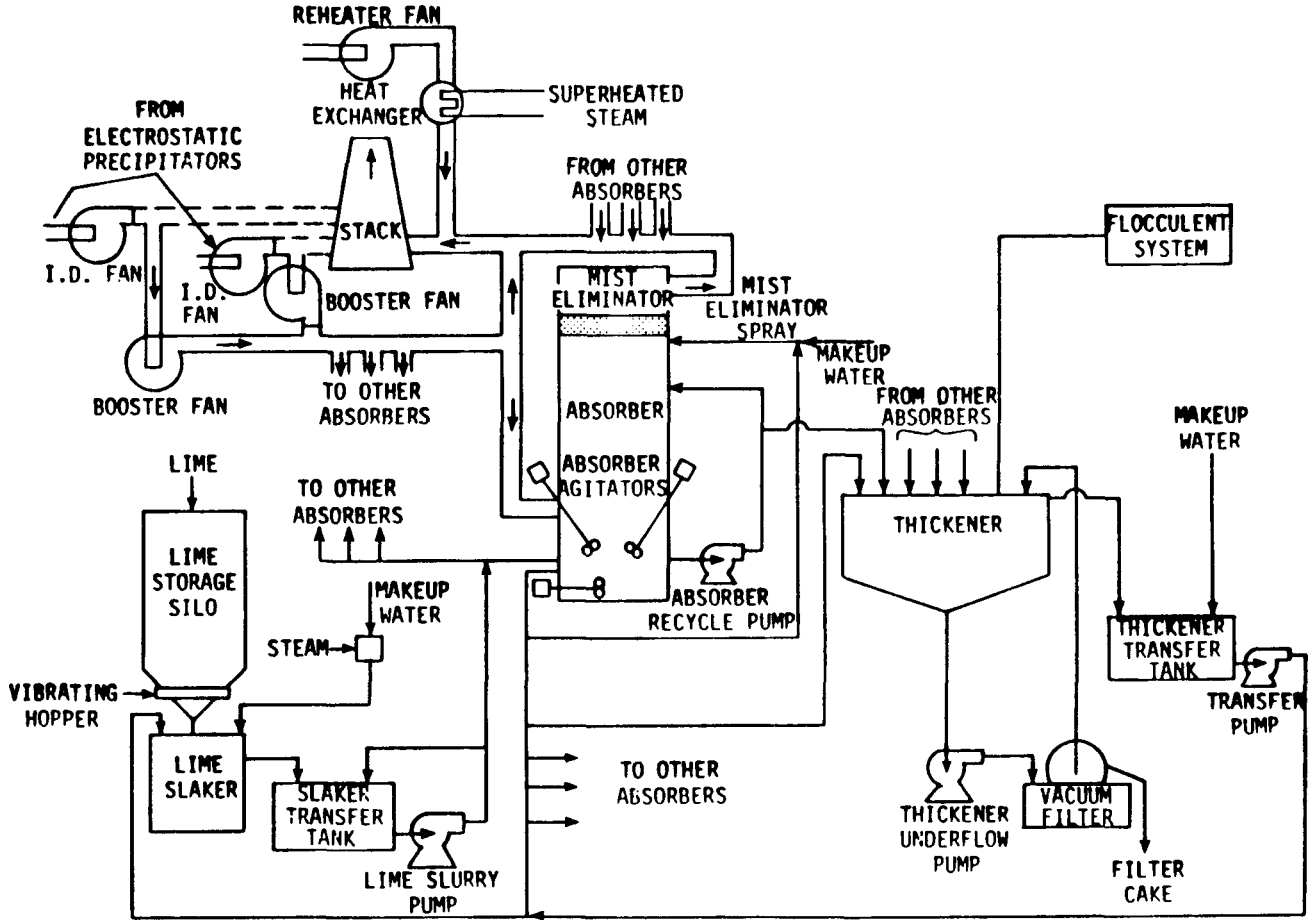
Tennessee Valley Authority, Widows Creek 8 FGD System:
Process Flow Diagram for One of the Four Scrubber Trains



Texas Utilities,
Simplified Process Flow Diagram for One of the Three Identical
Martin Lake FGD Systems



Texas Utilities,
Simplified Process Flow Diagram for Monticello 3



Utah Power & Light, FGD System Simplified Process Flow Diagram for Hunter 1, 2 or Huntington 1

APPENDIX D
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL PARTICLE SCRUBBERS

COMPANY NAME	COMMONWEALTH EDISON	
PLANT NAME	WILL COUNTY	
UNIT NUMBER	1	
CITY	ROMEOVILLE	
STATE	ILLINOIS	
REGULATORY CLASSIFICATION	E	
PARTICULATE EMISSION LIMITATION - NG/J	86.	(0.200 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	774.	(1.800 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	1147	
GROSS UNIT GENERATING CAPACITY - MW	167	
NET UNIT GENERATING CAPACITY W/FGD - MW	137	
NET UNIT GENERATING CAPACITY WO/FGD - MW	144	
EQUIVALENT SCRUBBED CAPACITY - MW	167	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	BABCOCK & WILCOX	
BOILER TYPE	CYCLONE	
BOILER SERVICE LOAD	CYCLING	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	363.36	(770000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	179.4	(355 F)
STACK HEIGHT - M	107.	(350 FT)
STACK SHELL	NR	
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		9100-10500
AVERAGE ASH CONTENT - %	7.40	
RANGE ASH CONTENT - %	3.0-16.0	
AVERAGE MOISTURE CONTENT - %	********	
RANGE MOISTURE CONTENT - %	****	
AVERAGE SULFUR CONTENT - %	1.50	
RANGE SULFUR CONTENT - %	0.3-4.5	
AVERAGE CHLORIDE CONTENT - %	********	
RANGE CHLORIDE CONTENT - %	****	
*** PARTICLE CONTROL		
** MECHANICAL COLLECTOR		
NUMBER	0	
TYPE	NONE	
** FABRIC FILTER		
NUMBER	0	
TYPE	NONE	
** ESP		
NUMBER	1	
TYPE	COLD SIDE	
SUPPLIER	WESTERN PREC. DIVISION, JOY	
INLET FLUE GAS TEMPERATURE - C	179.4	(355 F)
PARTICLE REMOVAL EFFICENCY - %	90.0	
** PARTICLE SCRUBBER		
NUMBER	2	
INITIAL START-UP DATE	4/1972	
GENERIC TYPE	VENTURI TOWER	
SPECIFIC TYPE	VARIABLE-THROAT/SIDE-MOVABLE BLADES	
TRADE NAME/COMMON NAME	N/A	
SUPPLIER	BABCOCK & WILCOX	
DIMENSIONS - FT	8.0 X 26.0 X 16.0	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	AISI 1110	
LINER GENERIC MATERIAL	ORGANIC; INORGANIC	
LINER SPECIFIC MATERIAL	INERT FLAKE-FILLED VINYL ESTER; HYDRAULICALLY-BO	
GAS CONTACTING DEVICE TYPE	NONE	

COMMONWEALTH EDISON: WILL COUNTY 1 (CONT.)

LIQUID RECIRCULATION RATE - LITER/S	365.4	(5800 GPM)
L/G RATIO - LITER/CU.M	2.4	(18.0 GAL/1000ACF)
PH CONTROL ADDITIVE	LIMESTONE	
PRESSURE DROP - KPA	2.2	(9.0 IN-H20)
SUPERFICIAL GAS VELOCITY - M/S	36.6	(120.0 FT/S)
INLET GAS FLOW RATE - CU.M/S	181.7	(385000 ACFM)
INLET GAS TEMPERATURE - C	179.4	(355 F)
PARTICLE REMOVAL EFFICIENCY - %	98.0	
ENERGY CONSUMPTION - %	4.2	

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
2/72	SYSTEM							696			

** PROBLEMS/SOLUTIONS/COMMENTS

IN FEBRUARY 1972 THE BABCOCK & WILCOX WET LIMESTONE FGD SYSTEM AT WILL COUNTY COMMENCED OPERATION. THE LONGEST PERIOD OF CONTINUOUS OPERATION WAS 23 DAYS WITH ONE OF THE TWO MODULES. THE SO2 REMOVAL EFFICIENCY WAS ABOUT 85% AND THE PARTICULATE MATTER REMOVAL EFFICIENCY WAS ABOUT 98%. THE SYSTEM WAS PLAGUED WITH MANY MECHANICAL PROBLEMS. THE MAIN PROBLEMS ASSOCIATED WITH THE FGD SYSTEM WERE PLUGGING OF THE MIST ELIMINATORS, CORROSION OF THE REHEATER TUBES AND SLUDGE DISPOSAL. TO SOLVE THE MIST ELIMINATOR AND REHEATER PROBLEMS, A CONSTANT UNDERSPRAY AND INTERMITTENT OVERSPRAY WERE USED TO WASH ALL THE MIST ELIMINATOR COMPARTMENTS. THE REHEATER UNIT WAS ALSO RETUBED.
DURING THE FIRST TWO MONTHS OF 1975 MODULE A WAS OPERATIONAL WHEN NEEDED WHILE MODULE B WAS UNDERGOING MODIFICATIONS.

3/72	A					0.0					
	B					35.0					
	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

IN MARCH 1972 MODULE A WAS DOWN FOR REPAIRS AND MODIFICATION OF THE MIST ELIMINATOR WASH PIPING ASSEMBLY. MODULE B WAS REMOVED EVERY TWO OR THREE DAYS TO HAND WASH THE MIST ELIMINATOR.

OTHER PROBLEMS ENCOUNTERED DURING THE MONTH INCLUDED VIBRATION OF THE REHEATER TUBE BUNDLES, RAPID EROSION OF THE SCRUBBER SPRAY NOZZLES, AND PLUGGING OF THE VENTURI NOZZLES.

4/72	A					34.0					
	B					14.0					
	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE A WAS OUT OF SERVICE FOR SIX DAYS IN APRIL BECAUSE OF A NEAR-RUPTURE OF A VENTURI PIPE EXPANSION JOINT AND HEAVY BUILDUP OF SOLIDS ON THE MIST ELIMINATOR.

MODULE B WAS OUT OF SERVICE MOST OF THE TIME FOR SIMILAR REPAIR OF THE VENTURI PIPE EXPANSION JOINT, AND FOR MODIFICATION OF THE REHEATER UNIT AND MIST ELIMINATOR WASH SYSTEM.

5/72	A					70.0					
	B					32.0					
	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE B WAS OUT OF SERVICE FOR TWO WEEKS IN MAY TO REBRACE THE REHEAT, INSTALL UNDERSPRAY NOZZLES ON THE MIST ELIMINATOR, AND TO INSTALL HEAVIER SCREENS IN THE SUMP.

COMMONWEALTH EDISON: WILL COUNTY 1 (CONT.)

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

REHEATER PLUGGING DURING THE MONTH CAUSED ADDITIONAL OUTAGES.

6/72	A		8.0								
	B		31.0								
	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JUNE BOTH MODULES WERE OUT OF SERVICE PART OF THE MONTH DUE TO A HIGH DIFFERENTIAL PRESSURE ACROSS THE MIST ELIMINATORS AND PLUGGING OF THE MIST ELIMINATORS DUE TO A LEAKING BYPASS VALVE.

THE RUBBER LINER IN MODULE A WAS REPLACED DURING THE MONTH.

7/72	SYSTEM							744			
8/72	A		79.0								
	B		21.0								
	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

A TWO DAY OUTAGE DURING AUGUST WAS NECESSARY TO UNPLUG THE VENTURI NOZZLES AND THE MIST ELIMINATOR OF MODULE A.

MODULE B WAS OUT OF SERVICE 22 DAYS FOR CLEANING OF THE MIST ELIMINATOR AND REHEATER, INSTALLATION OF OVERHEAD SPRAY NOZZLES AND REPLACEMENT OF SECTIONS OF THE MIST ELIMINATOR.

THE BOILER WAS SHUTDOWN FOR TWO DAYS TO REPAIR THE TURBINE/GENERATOR.

9/72	A		0.0								
	B		30.0								
	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER WAS OFF LINE FROM SEPTEMBER 1 TO SEPTEMBER 5 DUE TO A LACK OF DEMAND.

AN ID FAN PROBLEM CAUSED UNSTABLE OPERATION DURING THE MONTH.

MODULE A WAS OUT OF SERVICE IN SEPTEMBER DUE TO THE NECESSARY MODIFICATION OFTHE REHEATER AND TO REPAIR THE RECYCLE TANK SCREENS.

10/72	A		0.0								
	B		0.0								
	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

DURING OCTOBER THE BOILER WAS OUT OF SERVICE THE ENTIRE MONTH.

MODULES A AND B WERE OUT OF SERVICE DUE TO THE INSTALLATION OF THE REHEATE BAFFLE PLATES TO DAMPEN VIBRATIONS AND ALSO THE INSTALLATION OF AN EXPERIMENTAL MIST ELIMINATOR WASH SYSTEM.

11/72	A		0.0								
	B		0.0								
	SYSTEM							720			

COMMONWEALTH EDISON: WILL COUNTY 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE BOILER REMAINED OUT OF SERVICE DURING THE MONTH OF NOVEMBER.									
		MODULES A AND B REMAINED OUT OF SERVICE DUE TO UNSTABLE OPERATIONS OF THE BOILER.									
12/72	A		22.0								
	B		30.0								
	SYSTEM							744			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		MODULES A AND B OPERATED INTERMITTENTLY DURING DECEMBER DUE TO TESTING OF THE ESP AND MISCELLANEOUS INSTRUMENT PROBLEMS.									
1/73	A		0.0								
	B		0.0								
	SYSTEM							744			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING JANUARY MODULES A AND B WERE OUT OF SERVICE THE ENTIRE MONTH TO PERFORM SOME NECESSARY REPAIRS AND MODIFICATIONS TO THE SYSTEM.									
2/73	A		22.0								
	B		24.0								
	SYSTEM							672			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING FEBRUARY MODULES A AND B REMAINED OUT OF SERVICE DUE TO CRACKS IN THE INLET DUCTWORK OF THE BOOSTER FAN.									
		THE IMPROPER INSTALLATION OF THE MIST ELIMINATOR IN MODULE B CAUSED PLUGGING IN THE REHEATER.									
3/73	A		65.0								
	B		11.0								
	SYSTEM							744			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		MODULE A WAS OUT OF SERVICE FOR FIVE DAYS IN MARCH DUE TO PLUGGING OF THE MIST ELIMINATOR.									
		DURING MARCH THE BOILER WAS OUT OF SERVICE FOR APPROXIMATELY FOUR DAYS DUE TO AN INSPECTION.									
		MODULE B WAS OUT OF SERVICE PART OF THE MONTH DUE TO REHEATER TUBE LEAKS.									
4/73	A		6.0								
	B		13.0								
	SYSTEM							720			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING APRIL PROBLEMS OCCURRED DUE TO THE DEPOSITS OF CALCIUM SULFATE SCALE ON THE REHEATER TUBES OF MODULE A.									
		PERSISTING PROBLEMS WITH THE MIST ELIMINATOR WERE ENCOUNTERED DURING THE MONTH.									

COMMONWEALTH EDISON: WILL COUNTY 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
5/73	A		0.0								
	B		0.0								
	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

MODULES A AND B WERE OUT OF SERVICE FOR THE ENTIRE MONTH OF MAY.

6/73	A		16.0								
	B		0.0								
	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JUNE BOILER-RELATED PROBLEMS WERE RESPONSIBLE FOR MOST OF THE OUTAGE TIME OF MODULE A. MODULE B WAS TAKEN OUT OF SERVICE TO ALLOW CONCENTRATION ON THE PROBLEMS OF MODULE A.

7/73	A		51.0								
	B		0.0								
	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JULY PROBLEMS WERE ENCOUNTERED WITH REHEATER TUBE LEAKS ON MODULE A

HIGH FAN VIBRATIONS CAUSED OUTAGE TIME DURING JULY.

8/73	A		19.0								
	B		0.0								
	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

DURING AUGUST MORE REHEATER TUBE LEAKS ON MODULE A ATTRIBUTED TO CHLORIDE CORROSION ATTACK.

9/73	A		0.0								
	B		0.0								
	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

DURING SEPTEMBER MODULES A AND B REMAINED OUT OF SERVICE. DURING THIS TIME THE CHICAGO FLY ASH CO. FINISHED CLEANING AND TREATING THE NORTHEAST HALF OF THE SLUDGE POND.

10/73	A		32.0								
	B		0.0								
	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

DURING OCTOBER MODULE A TRIPPED SEVERAL TIMES DUE TO BAD LIMIT SWITCHES IN THE BYPASS AND THE BLOCK DAMPERS.

THE BOILER WAS TAKEN OUT OF SERVICE TO BALANCE THE BOOSTER I.D. FAN.

11/73	A		51.0								
	B		0.0								
	SYSTEM							720			

COMMONWEALTH EDISON: WILL COUNTY 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING NOVEMBER PROBLEMS OCCURRED WITH THE MIST ELIMINATOR DUE TO POOR GAS DISTRIBUTION.									
		MODULE A WAS TAKEN OUT OF SERVICE FOR AN INSPECTION. CLEANING AND MODIFICATIONS WERE ALSO DONE DURING NOVEMBER.									
12/73	A		0.0								
	B		0.0								
	SYSTEM							744			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		MODULES A AND B WERE OUT OF SERVICE DURING DECEMBER DUE TO MODIFICATIONS AND MAINTENANCE TO THE ISOLATION VALVES, PUMPS, VENTURI THROATS AND THE MIST ELIMINATOR.									
1/74	A		0.0								
	B		0.0								
	SYSTEM							744			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		MODULES A AND B WERE OUT OF SERVICE DUE TO FREEZING IN THE 10-INCH-DIAMETER, 4400 FT. LINE BETWEEN THE MODULES AND THE POND.									
		DAMAGE OCCURRED TO THE SUMP PUMPS AND ALSO SOME OTHER INSTRUMENTS DUE TO THE FREEZING.									
2/74	A		0.0								
	B		0.0								
	SYSTEM							672			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING FEBRUARY THE FROZEN PIPELINES WERE THAWED, REANCHORED AND RETURNED TO SERVICE. THE INSTRUMENTS DAMAGED BY THE FREEZING WERE REPAIRED.									
		MODULE A REMAINED OUT OF SERVICE UNTIL THE ARRIVAL OF THE SECOND-STAGE MIST ELIMINATOR.									
3/74	A		21.0								
	B		0.0								
	SYSTEM							744			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		MODULE A WAS OPERABLE MARCH 20, BUT WAS NOT RETURNED TO SERVICE UNTIL MARCH 27 DUE TO THE BOILER BEING OUT OF SERVICE.									
4/74	A		72.0								
	B		0.0								
	SYSTEM							720			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING APRIL MODULE A OPERATED ON LOW-SULFUR COAL FOR 23 CONSECUTIVE DAYS. TWO SHORT INSPECTION OUTAGES OCCURRED DURING THAT TIME.									
		THE SUMP SCREEN FROM MODULE B WAS SUBSTITUTED FOR THE DAMAGED SCREEN IN MODULE A.									

COMMONWEALTH EDISON: WILL COUNTY 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
5/74	A		93.0								
	B		0.0								
	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

DURING MAY MODULE A OPERATED MOST OF THE TIME ON HIGH-SULFUR COAL. DURING THIS TIME A FEW SHORT OUTAGES OCCURRED FOR INSPECTIONS.

6/74	A		55.0								
	B		0.0								
	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JUNE MODULE A OPERATED FOR APPROXIMATELY 300 HOURS.

TWO WEEKS OF OUTAGE TIME WAS NECESSARY TO MAKE REPAIRS TO THE VENTURI THROAT DRIVE.

7/74	A		96.0								
	B		0.0								
	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE B WILL REMAIN OUT OF SERVICE UNTIL SATISFACTORY OPERATION OF MODULE A IS ACHIEVED.

8/74	A		91.0								
	B		0.0								
	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

DURING AUGUST THE BOILER WAS TAKEN OFF LINE THREE TIMES DUE TO LACK OF DEMAND.

TWO OUTAGES OCCURRED DUE TO LEAKS IN THE STEAM PIPING.

ONE OUTAGE OCCURRED DUE TO THE BALANCING OF A FAN.

9/74	A		85.0								
	B		0.0								
	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

DURING SEPTEMBER MODULE A WAS OUT OF SERVICE ONCE FOR THE REPAIR OF A SUPERHEATER LEAK AND ONCE FOR CLEANING OF DEPOSITS FROM THE VENTURI THROAT.

10/74	A		94.0								
	B		0.0								
	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

DURING OCTOBER REHEATER LEAKS CAUSED MODULE A TO BE OUT OF SERVICE TWICE. ADDITIONAL OUTAGE TIME WAS A RESULT OF A BOILER OUTAGE AND A INSPECTION OF THE MODULE.

11/74	A		97.0								

COMMONWEALTH EDISON: WILL COUNTY 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	B		0.0								
	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE A WAS SHUT DOWN THREE TIMES DURING NOVEMBER. TWICE DUE TO LACK OF DEMAND AND ONCE FOR AN INSPECTION.

12/74	A		99.0								
	B		0.0								
	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE A WAS TAKEN OFF LINE PART OF THE MONTH TO REPAIR THE VALVE IN THE SPENT LIQUOR LINE TO THE POND AND ALSO FOR AN INSPECTION.

1/75	A		99.0								
	B		0.0								
	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

MODIFICATIONS OF MODULE B ARE STILL CONTINUING.

DURING JANUARY MODULE A WAS OUT OF SERVICE TWICE; ONCE FOR AN INSPECTION AND ONCE DUE TO LACK OF DEMAND.

2/75	A		99.0								
	B		0.0								
	SYSTEM							672			

** PROBLEMS/SOLUTIONS/COMMENTS

DURING FEBRUARY MODULE A WAS OUT OF SERVICE TWO TIMES DUE TO LACK OF DEMAND AND ALSO FOR AN INSPECTION. THE INSPECTION SHOWED THAT CONDITIONS INSIDE THE MODULE WERE THE SAME AS BEFORE.

DURING THE MONTH A SMALL REHEATER LEAK IN A STAINLESS STEEL BUNDLE CAUSED THE SYSTEM TO SHUT DOWN.

DURING THE INSPECTION OF MODULE A, THE UNDERWASH NOZZLES WERE CLEANED AND A SMALL SECTION FO THE MIST ELIMINATOR WAS REPLACED.

CHICAGO FLYASH IS TREATING MATERIAL FROM THE SYSTEM WITH PORTLAND CEMENT AND FLYASH AND DUMPING THE TREATED MATERIAL INTO THE NORTH HALF OF THE HOLDING BASIN.

3/75	A	94.0	99.2		81.2						
	B	0.0	0.0		0.0						
	SYSTEM							744	609		

** 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	0.0		0.0						
	SYSTEM							720	638		

COMMONWEALTH EDISON: WILL COUNTY 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** 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 B 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 B 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 OPERATON. 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 STUC 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 REHEATER PLUGGAGE INSPECTION FORCED ONE MODULE A OUTAGE.									
		A LOW LEVEL TRIP CAUSED A 35 MINUTE OUTAGE, AND NO DEMAND ACCOUNTED FOR TW									

COMMONWEALTH EDISON: WILL COUNTY 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
		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	0.0		0.0						
	B	79.2	79.4		73.5						
	SYSTEM							744	689		
	** 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 MONT, WITH HIGH SULFUR COAL BEING BURNED DURING THE LAST WEEK OF THE MONTH.									
8/75	A	0.0	0.0		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 DU 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 REHEATE TUBE LEAKS. THE FAILURES WERE DUE TO VIBRATION FATIGUE. THE REHEATER, WHIC 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 THER IS A DIESIGN 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	0.0		0.0						
	B	32.3	100.0		26.6						
	SYSTEM							744	194		

COMMONWEALTH EDISON: WILL COUNTY 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
		MODULE A WAS OFF THE ENTIRE 11 DAYS THE BOILER OPERATED THIS MONTH, WAITIN FOR ITS NEW REHEATER, WHICH HAS NOW BEEN RELEASED FOR MANUFACTURING BY SMED.									
		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 SIT DISPOSAL AREA.									
11/75	A	0.0			0.0						
	B	0.0			0.0						
	SYSTEM							720	0		
12/75	A	0.0			0.0						
	B	0.0			0.0						
	SYSTEM							744	0		
1/76	A	0.0			0.0						
	B	0.0			0.0						
	SYSTEM							744	0		
2/76	A	0.0			0.0						
	B	0.0			0.0						
	SYSTEM							696	0		
3/76	A	30.1	45.2		18.8						
	B	8.8	20.4		8.5						
	SYSTEM							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		

COMMONWEALTH EDISON: WILL COUNTY 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** 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	0.0		0.0						
	SYSTEM								744	665	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		A VENTRUI 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 UNITL 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.									
		THE MODULE B I.D. BOOSTER FAN REQUIRED CLEANING DURING THE MONTH.									
		THE REHEATER TUBES ARE SCALING, WHICH RESULTS IN A LOWER HEAT TRANSFER RAT 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.									

COMMONWEALTH EDISON: WILL COUNTY 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
7/76	A	19.9	0.0		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 ABSORBE

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.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
8/76	A	98.2	57.6		38.3						
	B	65.4	61.4		40.9						
	SYSTEM							744	495		

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE A WAS OUT OF THE GAS PATH THE FIRST HALF OF THE MONTH T 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 SACLE FOULING. THE PH SET POINT WAS THEN INCREASED BACK TO 5.4.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
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 ABOSORBER PUMP ALSO FORCED MODULE A OFF.

MODULE A WAS OUT OF TH 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.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
10/76	A	27.9	28.9		37.9						

COMMONWEALTH EDISON: WILL COUNTY 1 (CONT.)

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

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 ABSORBER PUMP CAN BE REPAIRED.

DURING THE LAST HALF OF THE MONTH, MODUELE A OPERATED WHILE MODULE B WAS BEING REPAIRED.

COMMONWEALTH EDISON: WILL COUNTY 1 (CONT.)

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

MODULE B PERFORMED SATISFACTIORILY 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 OUTAG (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.

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 IPERATION. THE SCRUBBER WASTE MATERIAL WAS TREATED WITH LIME FLYASH AND HAULED OFF SITE. DISPOSAL AREA.

COMMONWEALTH EDISON: WILL COUNTY 1 (CONT.)

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

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
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 PERFORM- ANCE 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 T A FAILED 120V CONTROL TRANSFORMER FOR THE POND RETURN PUMPS. THE TRANSFORM ER HAD TO BE ORDERED FROM WESTINGHOUSE.

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

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

MODULE A HAD ONE NO DEMAND AND ONE BOILER OUTAGE THIS MONTH.

COMMONWEALTH EDISON: WILL COUNTY 1 (CONT.)

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

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 SEEMDD TO BE THE MOST SUCCESSFUL OF ALL. USING LIQUID OXYGEN, UP TO 12,000 CFM OF GASEOUS 02 WAS FED INTO EACH VENTURI DOWNCOMER, OXIDATION OF SULFITE TO SULFATE WAS INCREASED FROM 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 INTIL THE UNIT OUTAGE ON SEPTEMBER 21.

10/77	A	0.0			0.0						
	B	0.0			0.0						
	SYSTEM							744	0		
11/77	A	0.0			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		

COMMONWEALTH EDISON: WILL COUNTY 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
		PLUGGAGE WAS ENCOUNTERED IN THE MODULE B REHEATER. BECAUSE NO SPARE REHEA COILS WERE AVAILABLE, THE UTILITY TRIED TAKING SOME COILS FROM MODULE A MODULE B APPEARED TO BE MORE ORE 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, WH E 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		
	** PROBLEMS/SOLUTIONS/COMMENTS										
		MODULE A RAN INTO DIFFICULT OPERATIONG 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 TH									

COMMONWEALTH EDISON: WILL COUNTY 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
				PERFORMANCE DATA							
			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. PARTICULAT 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 CARRY OVER COULD POSSIBLY COMPUND 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 REHATERS 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% DIEMISTER AND 75% ABSORBER SPRAY PLUGGAG 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 SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** 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 LIN 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 T AN OFF SITE DISPOSAL AREA.						
					REHEATER TUBE LEAKS, ONE IN MODULE A AND FOUR IN MODULE B, CAUSED ONE BOILER OUTAGE AND CAUSED THE FGO 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.						

COMMONWEALTH EDISON: WILL COUNTY 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
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 TH TUBES. THIS PROCEDURE CUT OUTAGE TIME FROM ONE OR TWO WEEKS TO TWO DAYS.

11/78	A	96.2	100.0		48.3						
	B	85.2	100.0		48.3						
	SYSTEM							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	65.3	100.0		64.5						
	B	64.5	100.0		64.5						
	SYSTEM							744	480		

** PROBLEMS/SOLUTIONS/COMMENTS

REHEATER TUBE LEAKS CAUSED TWO OUTAGES.

THE MODULE B SPENT SLURRY DRAIN WAS REPAIRED.

1/79	A	83.5	100.0		61.3						
	B	62.2	87.1		53.4						
	SYSTEM							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 INSTAL LED THIS MONTH. THE ORIGINAL REDUCER AND TEE HAD BEEN PATCHED AND WELDED S MANY TIMES THAT THEY WERE BEYOND REPAIR.

2/79	A	93.0	91.3		54.2						
	B	93.0	91.3		54.2						
	SYSTEM							672	399		

COMMONWEALTH EDISON: WILL COUNTY 1 (CONT.)

PERIOD	MODULE	PERFORMANCE DATA AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UNIT WAS FORCED OFF ONCE FOR A MAIN STEAM HEADER LEAK.									
3/79	A	100.0	100.0		46.0						
	B	68.6	100.0		46.0						
	SYSTEM							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				0.0						
	B				0.0						
	SYSTEM							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 AIR 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.									
		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 THE OUTAGE, SEVERAL LENGTHS OF VENTURI PIPING HAD TO BE REPLACED WITH NEW RUBBER LINED PIPE.									

COMMONWEALTH EDISON: WILL COUNTY 1 (CONT.)

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
			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. LATER 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 RE-HEATER 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 42 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 WERE 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 12 OR THE 42 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 20 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	A	79.7	90.5		79.7						
	B	78.6	89.2		78.6						
	SYSTEM	74.1	84.2		74.1			696	613	516	

** PROBLEMS/SOLUTIONS/COMMENTS

SCRUBBER PROBLEMS IN FEBRUARY WERE CAUSED FROM LEAKS IN THE VENTURI SPRAY HEADER. THESE LEAKS DEVELOP WHERE THE RUBBER LINING INSIDE THE VENTURI PIPING HAS WORN AWAY SO THAT THE BARE METAL IS EXPOSED. THIS EXPOSED META

COMMONWEALTH EDISON: WILL COUNTY 1 (CONT.)

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

IS THEN SUBJECT TO ERROSION/CORROSION. THE LINING IS MOST LIKELY TO WEAR AT THE WELD HEAD OF THE SPRAY NOZZLE TO THE MAIN HEADER. ALL THE VENTURI SPRAY PIPING IS BEING REPLACED.

TUBE LEAKS IN THE STEAM COIL REHEAT SYSTEM CAUSED SCRUBBER PROBLEMS THIS MONTH. MODULE A WAS FORCED OUT ONCE AND MODULE B WAS FORCED OUT THREE TIMES. THESE TUBES WILL BE REPLACED DURING THE NEXT OUTAGE.

3/80	A	83.9			0.0						
	A	83.9			0.0						
	SYSTEM	83.9			0.0			744	0	0	

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER WAS OUT OF SERVICE FOR ALL OF MARCH DUE TO BOILER TUBE LEAKS IN THE REHEAT SECTION OF THE BOILER.

4/80	A	100.0	71.0		17.3						
	B	87.7	71.0		17.3						
	SYSTEM	93.9	71.4		17.3			720	175	125	

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE FIRST 15 DAYS OF APRIL THE BOILER WAS OUT OF SERVICE DUE TO TUBE LEAKS IN THE AIR PREHEATER.

WHEN ATTEMPTS WERE MADE TO BRING THE BOILER ON LINE ON THE 16 THE B-MODULE OF THE SO2 SYSTEM DEVELOPED REHEATER TUBE LEAKS. THIS CAUSED A FORCED OUTAGE OF 53 HOURS AND 40 MINUTES.

WHEN ATTEMPTS WERE MADE TO RETURN THE BOILER TO SERVICE AGAIN, THE AUXILIARY LOW PRESSURE GOVENOR DEVELOPED AN OIL LEAK CAUSING A FOUR DAY OUTAGE, FOLLOWED BY ANOTHER REHEATER TUBE LEAK OUTAGE ON THE B MODULE. THIS OUTAGE LASTED 35 HOURS. THE UNIT RETURNED TO SERVICE ON APRIL 24 AND WAS AVAILABLE FOR THE REST OF APRIL.

5/80	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

INFORMATION WAS NOT AVAILABLE FOR THE MONTH OF MAY.

6/80	A	86.5	100.0		81.2						
	B	86.5	100.0		81.2						
	SYSTEM	86.5	100.0		81.2			720	584	584	

** PROBLEMS/SOLUTIONS/COMMENTS

THE SCRUBBING SYSTEM FORCED THE BOILER OUT OF SERVICE FROM JUNE 6 TO JUNE 10. THE OUTAGE WAS CAUSED BY PLUGGED REHEATERS ON BOTH MODULES. THIS WAS THE ONLY FORCED OUTAGE EXPERIENCED DURING JUNE.

7/80	A	87.8	78.3		55.0						
	B	87.8	78.3		55.0						
	SYSTEM	87.8	78.3		55.0			744	522	409	

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE MONTH OF JULY THERE WERE NO FORCED SCRUBBER OUTAGES.

TWO SLAG LINE OUTAGES, ONE FORCED DRAFT FAN AND ONE BOILER SCREEN WALL TUBE OUTAGE OCCURRED. THIS ACCOUNTED FOR 193 HOURS OF BOILER-RELATED OUTAGE TIME DURING THE MONTH.

COMMONWEALTH EDISON: WILL COUNTY 1 (CONT.)

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

ON NINE OCCASIONS IN JULY THE SCRUBBER WAS BY-PASSED SO THAT THE BOILER COULD CARRY MAXIMUM LOAD (163 MW). THE UNIT WAS LIMITED TO 135 MW AFTER A RECENT STACK EMISSION TEST.

8/80	SYSTEM							744			
9/80	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

NO INFORMATION WAS AVAILABLE FOR THE MONTHS OF AUGUST AND SEPTEMBER.

10/80	A	69.9	100.0		60.9						
	B	69.9	100.0		60.9						
	SYSTEM	69.9	100.0		60.9			744	453	453	

** PROBLEMS/SOLUTIONS/COMMENTS

DURING OCTOBER THERE WAS ONE FORCED OUTAGE DUE TO PROBLEMS WITH THE ABSORBER RECIRCULATION PUMP ON MODULE B. DURING THIS OUTAGE THE WALL WASH HEADERS WERE REPLACED ON BOTH MODULES.

DURING OCTOBER THE BOILER WAS SHUT DOWN TWICE DUE TO A LACK OF DEMAND. THIS ACCOUNTED FOR APPROXIMATELY 51 HOURS OF DOWN TIME. ADDITIONAL UNIT OUTAGE TIME WAS DUE TO INTERCEPT VALVE AND AIR HEATER PROBLEMS.

11/80	A	92.4	100.0	83.4	33.0						
	B	92.4	100.0	83.4	33.0						
	SYSTEM	92.4	100.0	83.4	33.0			720	238	238	

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR PROBLEMS WITH THE SCRUBBING SYSTEM WERE ENCOUNTERED DURING NOVEMBER.

12/80	A	77.9	100.0	31.5	31.5						
	B	77.9	100.0	31.5	31.5						
	SYSTEM	77.9	100.0	31.5	31.5			744	234	234	20.3

** PROBLEMS/SOLUTIONS/COMMENTS

DURING DECEMBER AVAILABILITY OF THE FGD SYSTEM WAS LOW DUE TO PLUGGED VENTURI NOZZLES AND HEADER, WHICH HAD TO BE HIGH-PRESSURE JETTED.

1/81	A	82.4	100.0	80.8	80.8 .						
	B	82.4	100.0	80.8	80.8						
	SYSTEM	82.4	100.0	80.8	80.8			744	601	601	

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JANUARY THE MIST ELIMINATOR TRAY WAS REPLACED ON MODULE A.

2/81	A	75.4	100.0	68.9	68.9						
	B	75.4	100.0	68.9	68.9						
	SYSTEM	75.4	100.0	68.9	68.9			672	463	463	59.3

** PROBLEMS/SOLUTIONS/COMMENTS

DURING FEBRUARY THE BOILER WAS OUT OF SERVICE APPROXIMATELY 209 HOURS DUE TO TUBE LEAKS.

THE SCRUBBING SYSTEM WAS OUT OF SERVICE 164 HOURS DUE TO CLEANING AND A TWO HOUR INSPECTION.

COMMONWEALTH EDISON: WILL COUNTY 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
3/81	A	70.2	100.0	68.2	68.2						
	B	70.2	100.0	68.2	68.2						
	SYSTEM	70.2	100.0	68.2	68.2			744	507	507	63.1

** PROBLEMS/SOLUTIONS/COMMENTS

DURING MARCH DOWNTIME OCCURRED DUE TO MISCELLANEOUS CLEANING TO THE BOILER AND THE SCRUBBER.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
4/81	A	32.9	100.0	32.9	32.9						
	B	32.9	100.0	32.9	32.9						
	SYSTEM	32.9	100.0	32.9	32.9			720	237	237	30.1

** PROBLEMS/SOLUTIONS/COMMENTS

DURING MAY THE SCRUBBING MODULES AND THE SCRUBBER PIPING WERE CLEANED. THIS ACCOUNTED FOR THE OUTAGE TIME DURING THE MONTH.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
5/81	A	59.1	100.0	51.0	48.1						
	B	59.1	100.0	51.0	48.1						
	SYSTEM	59.1	100.0	51.0	48.1			744	358	358	42.7

** PROBLEMS/SOLUTIONS/COMMENTS

DURING MAY THE BOILER WAS DOWN FOR 11 DAYS FOR A SCHEDULED OUTAGE.

IN MAY 41 HOURS OF OUTAGE TIME WAS DUE TO A LACK OF DEMAND.

LEAKS IN THE CYCLONE TUBES CAUSED THE SYSTEM TO SHUT DOWN FOR 53 HOURS.

TOWARD THE END OF MAY, THE SYSTEM WAS SHUTDOWN FOR 30 HOURS TO PREPARE FOR AN EMISSION TEST.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
6/81	A	100.0	100.0	100.0	63.7						
	B	100.0	100.0	100.0	63.7						
	SYSTEM	100.0	100.0	100.0	63.7			720	458	458	49.4

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JUNE NO MAJOR PROBLEMS WERE ENCOUNTERED.

APPENDIX D
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL PARTICLE SCRUBBERS

COMPANY NAME	MINNESOTA POWER & LIGHT	
PLANT NAME	CLAY BOSWELL	
UNIT NUMBER	3	
CITY	COHASSET	
STATE	MINNESOTA	
REGULATORY CLASSIFICATION	E	
PARTICULATE EMISSION LIMITATION - NG/J	258.	(0.600 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	1720.	(4.000 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	1000	
GROSS UNIT GENERATING CAPACITY - MW	364	
NET UNIT GENERATING CAPACITY W/FGD - MW	347	
NET UNIT GENERATING CAPACITY WO/FGD - MW	350	
EQUIVALENT SCRUBBED CAPACITY - MW	350	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	COMBUSTION ENGINEERING	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	613.47	(1300000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	123.3	(254 F)
STACK HEIGHT - M	213.	(700 FT)
STACK SHELL	CONCRETE	
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 - %	4.8-16.0	
AVERAGE MOISTURE CONTENT - %	26.00	
RANGE MOISTURE CONTENT - %	24.0-28.0	
AVERAGE SULFUR CONTENT - %	0.92	
RANGE SULFUR CONTENT - %	0.5-1.5	
AVERAGE CHLORIDE CONTENT - %	0.01	
RANGE CHLORIDE CONTENT - %	0.00-0.07	
*** PARTICLE CONTROL		
** MECHANICAL COLLECTOR		
NUMBER	0	
TYPE	NONE	
** FABRIC FILTER		
NUMBER	0	
TYPE	NONE	
** ESP		
NUMBER	0	
TYPE	NONE	
** PARTICLE SCRUBBER		
NUMBER	1	
INITIAL START-UP DATE	5/1973	
GENERIC TYPE	IMPINGEMENT TOWER	
SPECIFIC TYPE	NR	
TRADE NAME/COMMON NAME	NR	
SUPPLIER	KREBS ENGINEERS	
DIMENSIONS - FT	18.0 X 126.0 X 52.0	
SHELL GENERIC MATERIAL	STAINLESS STEEL	
SHELL SPECIFIC MATERIAL	AUSTENITIC	
LINER GENERIC MATERIAL	NONE	
LINER SPECIFIC MATERIAL	N/A	
GAS CONTACTING DEVICE TYPE	NONE	
NUMBER OF CONTACTING ZONES	1	
LIQUID RECIRCULATION RATE - LITER/S	714.4	(11340 GPM)
L/G RATIO - LITER/CU.M	1.1	(8.3 GAL/1000ACF)

MINNESOTA POWER & LIGHT: CLAY BOSWELL 3 (CONT.)

PH CONTROL ADDITIVE	ALKALINE FLYASH	
PRESSURE DROP - KPA	1.0	(4.0 IN-H2O)
SUPERFICIAL GAS VELOCITY - M/S	2.4	(8.0 FT/S)
INLET GAS FLOW RATE - CU.M/S	613.5	(1300000 ACFM)
INLET GAS TEMPERATURE - C	123.3	(254 F)
SO2 REMOVAL EFFICENCY - %	0.0	
PARTICLE REMOVAL EFFICIENCY - %	98.7	
ENERGY CONSUMPTION - %	0.8	

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
5/73	SYSTEM										

** PROBLEMS/SOLUTIONS/COMMENTS

SINCE STARTUP IN MAY 1973 SCALING AND PLUGGING HAVE OCCURRED IN NOZZLES, NOZZLE TREES, STRAINERS, ON PUNCH PLATE BAFFLES, IN THE WET/DRY ZONE, AND ON THE FAN AND THE MIST ELIMINATOR. PLUGGING HAS ALSO RESULTED AS DEPOSIT HAVE FALLEN INTO THE DRAINS AT THE BOTTOM OF THE SCRUBBER. DUE TO THE CALCIUM-RICH ASH, CHARACTERISTIC OF THE WESTERN COAL BURNED, THE SCALING IS AGGRAVATED. THE UTILITY HAS CONTROLLED SCALE BY BLOWDOWN OF THE SCRUBBING SYSTEM. THIS HAS MAINTAINED THE PROCESS CHEMISTRY BELOW SATURATION WITH RESPECT TO CALCIUM SULFITE. A VERY HIGH LEVEL OF MAINTENANCE HAS BEEN MAINTAINED ALSO TO MINIMIZE SCALE ACCUMULATION AND PLUGGING, THIS HAS INCLUDED WASHING OF THE WET FAN WHICH HAS RESULTED IN A STACK MIST PROBLEM. THE USE OF SOOT BLOWERS IN PLACE OF WASHING WAS ATTEMPTED BUT WAS UNSUCCESSFUL. THE UTILITY HAS REDUCED THE AMOUNT OF WASHING AND HAS CONSIDERED THE INSTALLATION OF REHEAT OR CONSTRUCTION OF A NEW LOW-VELOCIT STACK.

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 OF 1980.

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

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO SCRUBBER-RELATED OUTAGES OCCURRED DURING THE SECOND QUARTER OF 1980. DOWN TIME FOR MAINTENANCE WAS NOT REQUIRED SINCE GENERAL MAINTENANCE CAN BE PERFORMED ON THE MINNESOTA POWER AND LIGHT PARTICLE SCRUBBERS WHILE THEY ARE IN SERVICE.

7/80	SYSTEM	100.0	100.0	90.3				720	650	650	60.2
8/80	SYSTEM	100.0	100.0	78.0				744	580	580	52.3

MINNESOTA POWER & LIGHT: CLAY BOSWELL 3 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
9/80	SYSTEM		100.0	100.0	84.0			744	625	625	54.8
	** PROBLEMS/SOLUTIONS/COMMENTS										
			NO OPERATIONAL PROBLEMS WERE REPORTED FOR THE JULY THROUGH SEPTEMBER PERIOD.								
10/80	SYSTEM	100.0	100.0	100.0	85.9			744	639	639	62.3
11/80	SYSTEM	100.0	100.0	100.0	81.5			720	587	587	64.6
12/80	SYSTEM	100.0	100.0	100.0	81.6			744	607	607	60.9
	** PROBLEMS/SOLUTIONS/COMMENTS										
			THE UTILITY REPORTED THAT NO SCRUBBER PROBLEMS WERE ENCOUNTERED DURING THE FOURTH QUARTER 1980.								
1/81	SYSTEM	100.0	100.0	100.0	94.3			744	702	702	69.1
2/81	SYSTEM	100.0	100.0	100.0	97.0			672	651	651	73.2
3/81	SYSTEM	100.0	100.0	100.0	79.0			744	585	585	65.1
	** PROBLEMS/SOLUTIONS/COMMENTS										
			THE UTILITY REPORTED THAT NO SCRUBBER-RELATED PROBLEMS WERE ENCOUNTERED DURING THE FIRST QUARTER 1981.								
			DURING MARCH THE BOILER WAS OUT OF SERVICE APPROXIMATELY 159 HOURS TO REPAIR STEAM LEAKS AND TO PERFORM MAINTENANCE.								
4/81	SYSTEM	100.0	100.0	100.0	62.1			720	447	447	50.9
5/81	SYSTEM	100.0	100.0	100.0	95.3			744	709	709	79.3
6/81	SYSTEM	100.0	100.0	100.0	96.7			720	696	696	75.7
	** PROBLEMS/SOLUTIONS/COMMENTS										
			THE UTILITY REPORTED THAT NO MAJOR PROBLEMS WERE ENCOUNTERED DURING THE SECOND QUARTER 1981.								

APPENDIX D
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL PARTICLE SCRUBBERS

COMPANY NAME	MINNESOTA POWER & LIGHT	
PLANT NAME	SYL LASKIN	
UNIT NUMBER	1	
CITY	AURORA	
STATE	MINNESOTA	
REGULATORY CLASSIFICATION	E	
PARTICULATE EMISSION LIMITATION - NG/J	258.	(0.600 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	1720.	(4.000 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	116	
GROSS UNIT GENERATING CAPACITY - MW	62	
NET UNIT GENERATING CAPACITY W/FGD - MW	57	
NET UNIT GENERATING CAPACITY WO/FGD - MW	58	
EQUIVALENT SCRUBBED CAPACITY - MW	58	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	COMBUSTION ENGINEERING	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	INTERMEDIATE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	141.57	(300000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	171.1	(340 F)
STACK HEIGHT - M	91.	(300 FT)
STACK SHELL	CONCRETE	
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 - %	4.8-16.0	
AVERAGE MOISTURE CONTENT - %	26.70	
RANGE MOISTURE CONTENT - %	24.0-28.0	
AVERAGE SULFUR CONTENT - %	1.00	
RANGE SULFUR CONTENT - %	0.5-1.5	
AVERAGE CHLORIDE CONTENT - %	0.01	
RANGE CHLORIDE CONTENT - %	0.00-0.07	
*** PARTICLE CONTROL		
** MECHANICAL COLLECTOR		
NUMBER	0	
TYPE	NONE	
** FABRIC FILTER		
NUMBER	0	
TYPE	NONE	
** ESP		
NUMBER	0	
TYPE	NONE	
** PARTICLE SCRUBBER		
NUMBER	1	
INITIAL START-UP DATE	6/1971	
GENERIC TYPE	IMPINGEMENT TOWER	
SPECIFIC TYPE	NR	
TRADE NAME/COMMON NAME	NR	
SUPPLIER	KREBS ENGINEERS	
DIMENSIONS - FT	34.0 X 18.0 X 23.0	
SHELL GENERIC MATERIAL	STAINLESS STEEL	
SHELL SPECIFIC MATERIAL	AUSTENITIC	
LINER GENERIC MATERIAL	NONE	
LINER SPECIFIC MATERIAL	N/A	
GAS CONTACTING DEVICE TYPE	NONE	
NUMBER OF CONTACTING ZONES	1	
LIQUID RECIRCULATION RATE - LITER/S	151.2	(2400 GPM)
L/G RATIO - LITER/CU.M	1.1	(8.3 GAL/1000ACF)

MINNESOTA POWER & LIGHT: SYL LASKIN 1 (CONT.)

PH CONTROL ADDITIVE	ALKALINE FLYASH	
PRESSURE DROP - KPA	0.6	(2.5 IN-H2O)
SUPERFICIAL GAS VELOCITY - M/S	2.1	(7.0 FT/S)
INLET GAS FLOW RATE - CU.M/S	137.4	(291160 ACFM)
INLET GAS TEMPERATURE - C	171.1	(340 F)
SO2 REMOVAL EFFICENCY - %	0.0	
PARTICLE REMOVAL EFFICIENCY - %	97.8	
ENERGY CONSUMPTION - %	1.6	

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

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
6/71	SYSTEM										

** PROBLEMS/SOLUTIONS/COMMENTS

SINCE STARTUP IN JUNE 1971 SCALING AND PLUGGING HAVE OCCURRED IN NOZZLES, NOZZLE TREES, STRAINERS, ON PUNCH PLATE BAFFLES, IN THE WET/DRY ZONE, AND ON THE FAN AND THE MIST ELIMINATOR. PLUGGING HAS ALSO RESULTED AS DEPOSIT HAVE FALLEN INTO THE DRAINS AT THE BOTTOM OF THE SCRUBBER. DUE TO THE CALCIUM-RICH ASH, CHARACTERISTIC OF THE WESTERN COAL BURNED, THE SCALING IS AGGRAVATED. THE UTILITY HAS CONTROLLED SCALE BY BLOWDOWN OF THE SCRUBBING SYSTEM. THIS HAS MAINTAINED THE PROCESS CHEMISTRY BELOW SATURATION WITH RESPECT TO CALCIUM SULFITE. A VERY HIGH LEVEL OF MAINTENANCE HAS BEEN MAINTAINED ALSO TO MINIMIZE SCALE ACCUMULATION AND PLUGGING, THIS HAS INCLUDED WASHING OF THE WET FAN WHICH HAS RESULTED IN A STACK MIST PROBLEM. THE USE OF SOOT BLOWERS IN PLACE OF WASHING WAS ATTEMPTED BUT WAS UNSUCCESSFUL. THE UTILITY HAS REDUCED THE AMOUNT OF WASHING AND HAS CONSIDERED THE INSTALLATION OF REHEAT OR CONSTRUCTION OF A NEW LOW-VELOCIT STACK.
THE PROBLEMS AT SYL LASKIN ARE NOT AS SEVERE AS THE PROBLEMS AT CLAY BOSWELL DUE TO THE FACT THAT THE RECYCLE LOOP IS NOT CLOSED TO THE SAME EXTENT. THE MIST CARRYOVER PROBLEM IS LESS SEVERE OWING TO OPERATION OF THE UNIT AT PARTIAL LOAD RESULTING IN A LOWER STACK VELOCITY.

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 OF 1980.

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

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO SCRUBBER-RELATED OUTAGES OCCURRED DURING THE SECOND QUARTER OF 1980. DOWN TIME FOR MAINTENANCE WAS NOT REQUIRED SINCE GENERAL MAINTENANCE CAN BE PERFORMED ON THE MINNESOTA POWER AND LIGHT PAR-

MINNESOTA POWER & LIGHT: SYL LASKIN 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
				PERFORMANCE DATA							
			TICLE SCRUBBERS WHILE THEY ARE IN SERVICE.								
7/80	SYSTEM	100.0	100.0	100.0	56.6			744	421	421	25.2
8/80	SYSTEM	100.0	100.0	100.0	19.0			744	140	140	12.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
			THE UTILITY REPORTED THAT NO BOILER OR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING JULY AND AUGUST. LOW UTILIZATION FACTORS WERE DUE TO A LACK OF POWER DEMAND.								
9/80	SYSTEM	100.0	100.0	100.0	4.4			720	33	33	1.9
	** PROBLEMS/SOLUTIONS/COMMENTS										
			NO SCRUBBER OUTAGES OCCURRED DURING SEPTEMBER. THE LOW UTILIZATION FACTOR WAS AGAIN THE RESULT OF A LACK OF DEMAND FOR POWER.								
10/80	SYSTEM	100.0			0.0			744	0	744	0.0
11/80	SYSTEM	100.0	100.0	100.0	24.3			720	175	175	10.2
12/80	SYSTEM	100.0	100.0	100.0	64.1			744	477	477	23.4
	** PROBLEMS/SOLUTIONS/COMMENTS										
			THE UTILITY REPORTED THAT NO SCRUBBER-RELATED PROBLEMS OCCURRED DURING THE FOURTH QUARTER 1980. LOW UTILIZATION FACTORS WERE CAUSED BY A LACK OF POWER DEMAND.								
1/81	SYSTEM	78.5	100.0	100.0	78.5			744	524	524	23.8
	** PROBLEMS/SOLUTIONS/COMMENTS										
			DURING JANUARY THE BOILER WAS OUT OF SERVICE APPROXIMATELY 160 HOURS DUE TO A TURBINE STEAM LEAK. THE BOILER WAS OUT OF SERVICE AN ADDITIONAL 60 HOURS DUE TO A LACK OF POWER DEMAND.								
2/81	SYSTEM	5.4	100.0	100.0	5.4			672	36	36	17.4
	** PROBLEMS/SOLUTIONS/COMMENTS										
			DURING FEBRUARY THE BOILER REMAINED OFF LINE FOR APPROXIMATELY 708 HOURS TO REPAIR A TURBINE STEAM LEAK.								
3/81	SYSTEM	99.1	100.0	100.0	79.0			744	588	588	44.8
	** PROBLEMS/SOLUTIONS/COMMENTS										
			DURING MARCH THE BOILER WAS OUT OF SERVICE SEVEN HOURS TO CLEAN THE ID FAN AND 77 HOURS DUE TO A LACK OF DEMAND.								
4/81	SYSTEM	100.0	100.0	100.0	100.0			720	720	720	46.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
			DURING APRIL 10 HOURS OF OUTAGE TIME WAS NECESSARY TO WORK ON THE EXCITER.								
5/81	SYSTEM	64.1	100.0	100.0	64.0			744	476	476	31.3

MINNESOTA POWER & LIGHT: SYL LASKIN 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING MAY THE UNIT WAS OUT OF SERVICE 209 HOURS FOR AN OVERHAUL.									
		SYSTEM DOWN TIME WAS NEEDED TO REPAIR A STEAM DRIVEN OIL PUMP.									
		FOLLOWING A TEST THE SYSTEM WAS TAKEN OFF-LINE FOR SANDBLASTING ID FANS.									
6/81	SYSTEM	100.0			0.0			720	0	0	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		IN JUNE THE UNIT WAS DOWN DUE TO A LACK OF DEMAND. DURING THIS PERIOD GENERAL MAINTENANCE WAS PERFORMED.									

APPENDIX D
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.	(0.600 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	1720.	(4.000 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	116	
GROSS UNIT GENERATING CAPACITY - MW	62	
NET UNIT GENERATING CAPACITY W/FGD - MW	57	
NET UNIT GENERATING CAPACITY WO/FGD - MW	58	
EQUIVALENT SCRUBBED CAPACITY - MW	58	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	COMBUSTION ENGINEERING	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	INTERMEDIATE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	141.57	(300000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	171.1	(340 F)
STACK HEIGHT - M	91.	(300 FT)
STACK SHELL	CONCRETE	
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 - %	4.8-16.0	
AVERAGE MOISTURE CONTENT - %	26.70	
RANGE MOISTURE CONTENT - %	24.0-28.0	
AVERAGE SULFUR CONTENT - %	1.00	
RANGE SULFUR CONTENT - %	0.5-1.5	
AVERAGE CHLORIDE CONTENT - %	0.01	
RANGE CHLORIDE CONTENT - %	0.00-0.07	
*** PARTICLE CONTROL		
** MECHANICAL COLLECTOR		
NUMBER	0	
TYPE	NONE	
** FABRIC FILTER		
NUMBER	0	
TYPE	NONE	
** ESP		
NUMBER	0	
TYPE	NONE	
** PARTICLE SCRUBBER		
NUMBER	1	
INITIAL START-UP DATE	6/1971	
GENERIC TYPE	IMPINGEMENT TOWER	
SPECIFIC TYPE	NR	
TRADE NAME/COMMON NAME	NR	
SUPPLIER	KREBS ENGINEERS	
DIMENSIONS - FT	34.0 X 18.0 X 23.0	
SHELL GENERIC MATERIAL	STAINLESS STEEL	
SHELL SPECIFIC MATERIAL	AUSTENITIC	
LINER GENERIC MATERIAL	NONE	
LINER SPECIFIC MATERIAL	N/A	
GAS CONTACTING DEVICE TYPE	NONE	
NUMBER OF CONTACTING ZONES	1	
LIQUID RECIRCULATION RATE - LITER/S	151.2	(2400 GPM)
L/G RATIO - LITER/CU.M	1.1	(8.3 GAL/1000ACF)

MINNESOTA POWER & LIGHT: SYL LASKIN 2 (CONT.)

PH CONTROL ADDITIVE	ALKALINE FLYASH	
PRESSURE DROP - KPA	0.6	(2.5 IN-H2O)
SUPERFICIAL GAS VELOCITY - M/S	2.1	(7.0 FT/S)
INLET GAS FLOW RATE - CU.M/S	137.4	(291160 ACFM)
INLET GAS TEMPERATURE - C	171.1	(340 F)
SO2 REMOVAL EFFICENCY - %	0.0	
PARTICLE REMOVAL EFFICIENCY - %	97.8	
ENERGY CONSUMPTION - %	1.6	

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
6/71	SYSTEM										

** PROBLEMS/SOLUTIONS/COMMENTS

SINCE STARTUP IN JUNE 1971 SCALING AND PLUGGING HAVE OCCURRED IN NOZZLES, NOZZLE TREES, STRAINERS, ON PUNCH PLATE BAFFLES, IN THE WET/DRY ZONE AND ON THE FAN AND THE MIST ELIMINATOR. PLUGGING HAS ALSO RESULTED AS DEPOSIT HAVE FALLEN INTO THE DRAINS AT THE BOTTOM OF THE SCRUBBER. DUE TO THE CALCIUM-RICH ASH, CHARACTERISTIC OF THE WESTERN COAL BURNED, THE SCALING IS AGGRAVATED. THE UTILITY HAS CONTROLLED SCALE BY BLOWDOWN OF THE SCRUBBING SYSTEM. THIS HAS MAINTAINED THE PROCESS CHEMISTRY BELOW SATURATION WITH RESPECT TO CALCIUM SULFITE. A VERY HIGH LEVEL OF MAINTENANCE HAS BEEN MAINTAINED ALSO TO MINIMIZE SCALE ACCUMULATION AND PLUGGING, THIS HAS INCLUDED WASHING OF THE WET FAN WHICH HAS RESULTED IN A STACK MIST PROBLEM. THE USE OF SOOT BLOWERS IN PLACE OF WASHING WAS ATTEMPTED BUT WAS UNSUCCESSFUL. THE UTILITY HAS REDUCED THE AMOUNT OF WASHING AND HAS CONSIDERED THE INSTALLATION OF REHEAT OR CONSTRUCTION OF A NEW LOW-VELOCIT STACK.
THE PROBLEMS AT SYL LASKIN ARE NOT AS SEVERE AS THE PROBLEMS AT CLAY BOSWELL DUE TO THE FACT THAT THE RECYCLE LOOP IS NOT CLOSED TO THE SAME EXTENT. THE MIST CARRYOVER PROBLEM IS LESS SEVERE OWING TO OPERATION OF THE UNIT AT PARTIAL LOAD RESULTING IN A LOWER STACK VELOCITY.

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 OF 1980.

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

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO SCRUBBER-RELATED OUTAGES OCCURRED DURING THE SECOND QUARTER OF 1980. DOWN TIME FOR MAINTENANCE WAS NOT REQUIRED SINCE GENERAL MAINTENANCE CAN BE PERFORMED ON THE MINNESOTA POWER AND LIGHT PAR-

MINNESOTA POWER & LIGHT: SYL LASKIN 2 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
					TICLE SCRUBBERS WHILE THEY ARE IN SERVICE.						
7/80	SYSTEM	100.0	100.0	100.0	24.5			744	182	182	12.3
	** PROBLEMS/SOLUTIONS/COMMENTS										
					THE BOILER DID NOT OPERATE MOST OF JULY DUE TO A BOILER INSPECTION. NO PROBLEMS WERE ENCOUNTERED WITH THE FGD UNIT.						
8/80	SYSTEM	100.0	100.0	100.0	15.0			744	115	115	5.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
					THE BOILER OPERATED ONLY 115 HOURS DURING AUGUST DUE TO A LACK OF DEMAND.						
9/80	SYSTEM	100.0	100.0	100.0	5.2			720	39	39	2.4
	** PROBLEMS/SOLUTIONS/COMMENTS										
					THE UTILITY REPORT THAT NO SCRUBBER OUTAGES OCCURRED DURING SEPTEMBER. THE LOW UTILIZATION FACTOR RESULTED FROM A LACK OF DEMAND FOR POWER.						
10/80	SYSTEM	100.0	100.0	100.0	26.3			744	195	195	15.0
11/80	SYSTEM	100.0	100.0	100.0	76.0			720	547	547	37.2
12/80	SYSTEM	100.0	100.0	100.0	70.8			744	527	527	34.9
	** PROBLEMS/SOLUTIONS/COMMENTS										
					THE UTILITY REPORTED THAT NO SCRUBBER-RELATED PROBLEMS WERE ENCOUNTERED DURING THE FOURTH QUARTER.						
1/81	SYSTEM	100.0	100.0	100.0	45.3			744	337	337	23.8
	** PROBLEMS/SOLUTIONS/COMMENTS										
					DURING JANUARY THE BOILER WAS OUT OF SERVICE APPROXIMATELY 407 HOURS DUE TO A LACK OF POWER DEMAND.						
2/81	SYSTEM	100.0	100.0	100.0	97.4			672	653	653	28.5
	** PROBLEMS/SOLUTIONS/COMMENTS										
					DURING FEBRUARY THE UTILITY REPORTED THAT NO SCRUBBER-RELATED PROBLEMS OCCURRED.						
3/81	SYSTEM	100.0			0.0			744	0	0	0.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
					DURING MARCH THE BOILER WAS OUT OF SERVICE TO FIND THE CAUSE OF A TURBINE VIBRATION.						
4/81	SYSTEM	88.2	100.0	100.0	56.4			720	406	406	26.9
	** PROBLEMS/SOLUTIONS/COMMENTS										
					DURING APRIL 229 HOURS OF DOWN TIME WAS DUE TO A LACK OF DEMAND.						
					THE UNIT WAS DOWN 109 HOURS FOR A BEARING CHECK AND REPAIR DUE TO HIGH VIBRATION.						
5/81	SYSTEM	94.1	100.0	100.0	55.0			744	409	409	28.7

MINNESOTA POWER & LIGHT: SYL LASKIN 2 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER WAS OFF-LINE APPROXIMATELY 210 HOURS IN MAY DUE TO A LACK OF DEMAND.

FOLLOWING A TEST CONDUCTED IN JUNE THE UNIT WAS SHUTDOWN FOR SANDBLASTING THE ID FANS.

6/81	SYSTEM	100.0			0.0			720	0	0	

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JUNE THE UNIT WAS OFF-LINE DUE TO A LACK OF DEMAND. DURING THIS PERIOD GENERAL MAINTENANCE WAS PERFORMED.

APPENDIX D
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL PARTICLE SCRUBBERS

COMPANY NAME	MONTANA-DAKOTA UTILITIES	
PLANT NAME	LEWIS & CLARK	
UNIT NUMBER	1	
CITY	SIDNEY	
STATE	MONTANA	
REGULATORY CLASSIFICATION	E	
PARTICULATE EMISSION LIMITATION - NG/J	86.	(0.200 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	430.	(1.000 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	50	
GROSS UNIT GENERATING CAPACITY - MW	55	
NET UNIT GENERATING CAPACITY W/FGD - MW	50	
NET UNIT GENERATING CAPACITY WO/FGD - MW	52	
EQUIVALENT SCRUBBED CAPACITY - MW	55	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	COMBUSTION ENGINEERING	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	153.37	(325000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	215.6	(420 F)
STACK HEIGHT - M	76.	(250 FT)
STACK SHELL	CARBON STEEL	
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 - %	34.3-38.2	
AVERAGE SULFUR CONTENT - %	0.61	
RANGE SULFUR CONTENT - %	0.3-1.4	
AVERAGE CHLORIDE CONTENT - %	0.03	
RANGE CHLORIDE CONTENT - %	****	
*** PARTICLE CONTROL		
** MECHANICAL COLLECTOR		
NUMBER	1	
TYPE	MULTICLONE	
SUPPLIER	WESTERN PREC. DIVISION, JOY	
INLET FLUE GAS CAPACITY - CU.M/S	106.2	(225000 ACFM)
INLET FLUE GAS TEMPERATURE - C	176.7	(350 F)
PRESSURE DROP - KPA	0.4	(2. IN-H2O)
PARTICLE REMOVAL EFFICENCY -%	85.7	
** ESP		
** PARTICLE SCRUBBER		
GENERIC TYPE	VENTURI TOWER	
SPECIFIC TYPE	VARIABLE-THROAT/BOTTOM-ENTRY LIQUID DISTRIBUTION	
TRADE NAME/COMMON NAME	FLOODED DISC SCRUBBER	
SUPPLIER	RESEARCH-COTTRELL	
DIMENSIONS - FT	10.5 DIA X 27.0	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	AISI 1110	
LINER GENERIC MATERIAL	ORGANIC	
LINER SPECIFIC MATERIAL	GLASS FLAKE-FILLED POLYESTER	
GAS CONTACTING DEVICE TYPE	NONE	
NUMBER OF CONTACTING ZONES	1	
LIQUID RECIRCULATION RATE - LITER/S	212.6	(3374 GPM)
L/G RATIO - LITER/CU.M	1.7	(13.0 GAL/1000ACF)
PH CONTROL ADDITIVE	LIMESTONE	
PRESSURE DROP - KPA	3.2	(13.0 IN-H2O)
INLET GAS FLOW RATE - CU.M/S	148.0	(313730 ACFM)

MONTANA-DAKOTA UTILITIES: LEWIS & CLARK 1 (CONT.)

INLET GAS TEMPERATURE - C	215.6	(420 F)
ENERGY CONSUMPTION - %	3.6	

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER 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 EXTERIOR CARBON STEEL LINED COLUMN WALL SUPPORTING THE FLOODED DISC WERE ERODING, FILLING THE INNER CHAMBER WITH SLURRY AND ULTIMATELY RENDERING TH 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.

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

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER WAS SHUT DOWN FOR TWO WEEKS IN MAY.

CREWS INSPECTING THE SCRUBBING SYSTEM DISCOVERED THAT THE NINE FOOT SCRUBBER LINER SECTION AT THE BOTTOM OF THE CYCLONIC MIST ELIMINATOR WAS SEVERE LY ERRODED. THE LINER HAS LASTED THREE YEARS. THE UTILITY CONSIDERS THIS A NORMAL MAINTENANCE PROBLEM. AT ONE TIME LINERS IN THIS SECTION WERE REPLACED EVERY SIX MONTHS. REPLACEMENT WORK ON THE LATEST FAILURE IS EXPECT ED TO BEGIN BY JULY 21.

THE ENTIRE SCRUBBER COLUMN SUPPORTING THE DISC WHICH WAS ERODING AS REPORT ED DURING THE PREVIOUS TWO QUARTERS HAS BEEN CLAD WITH HASTELLOY G.

MONTANA-DAKOTA UTILITIES: LEWIS & CLARK 1 (CONT.)

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

THE UTILITY REPORTED THAT THE SCRUBBER HAS EXPERIENCED PLUGGING AT WET/DRY INTERFACES WITHIN THE STRUCTURE. IT APPEARS THAT THIS IS RELATED TO COAL SULFUR CONTENT. WHEN THE SULFUR CONTENT IS RELATIVELY HIGH (0.7 TO 1.0% A LEWIS AND CLARK) THE PLUGGING DOES NOT OCCUR. LIMESTONE IS ADDED AS REQUIRED TO PREVENT THE OCCURRANCE OF LOW PH LEVELS. WHEN THE SULFUR CONTEN FALLS TO THE 0.3% RANGE THE PH RISES AS A RESULT OF THE ALKALINE CONSTITUENTS IN THE FLY ASH UNTIL SOFT SCALE PLUGGING RESULTS. THE UTILITY HAS CONSIDERED ADDING ACID TO STABILIZE THE PH WHEN THE COAL SULFUR CONTENT DROPS.

7/80	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JULY TWO WEEKS OF DOWN TIME WAS NECESSARY TO REPLACE THE MIST ELIMINATOR LINER.

THE PROBLEM WITH THE FLOODED DISC BUILDUP MENTIONED EARLIER CONTINUED. THE UTILITY PERFORMS THE NECESSARY REPAIRS IN THREE TO FOUR HOURS WHEN THIS OCCURS.

8/80	SYSTEM							744			
9/80	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR PROBLEMS WERE ENCOUNTERED WITH SCRUBBIN OPERATIONS DURING THE MONTHS OF AUGUST AND SEPTEMBER.

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

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR PROBLEMS WERE ENCOUNTERED WITH THE SCRUBBING OPERATIONS DURING THE OCTOBER THROUGH DECEMBER PERIOD.

SCRUBBING OPERATIONS WERE SHUTDOWN FOR ONE WEEK DURING THE LAST PART OF OCTOBER FOR A SCHEDULED MAINTENANCE OVERHAUL AND NO PROBLEMS WERE FOUND.

1/81	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR SCRUBBER PROBLEMS OCCURRED DURING JANUARY.

2/81	SYSTEM							672			

** PROBLEMS/SOLUTIONS/COMMENTS

ON FEBRUARY 10 THE SCRUBBER WAS SHUT DOWN FOR FIVE HOURS DUE TO A PLUGGED VENTURI.

ON FEBRUARY 23 A LEAK WAS DISCOVERED ON THE OUTER WALL OF THE SCRUBBER, LOCATED BELOW THE VENTURI. THE LEAK WAS TEMPORARILY REPAIRED FROM THE OUTSIDE WHILE THE SCRUBBER REMAINED ON-LINE. THE UTILITY PLANNED TO REPAI THE LEAK DURING THE SCHEDULED OUTAGE IN MARCH.

3/81	SYSTEM							744			

MONTANA-DAKOTA UTILITIES: LEWIS & CLARK 1 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

THE SCHEDULED OUTAGE PERIOD WAS HELD FROM MARCH 3 TO 15. DURING THIS TIME THE VENTURI AND SUMP WERE INSPECTED. THE LEAK DISCOVERED EARLIER IN FEBRUARY WAS REPAIRED CORRECTLY.

APPENDIX D
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	C	
PARTICULATE EMISSION LIMITATION - NG/J	43.	(0.100 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	215.	(0.500 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	*****	
GROSS UNIT GENERATING CAPACITY - MW	330	
NET UNIT GENERATING CAPACITY W/FGD - MW	327	
NET UNIT GENERATING CAPACITY WO/FGD - MW	330	
EQUIVALENT SCRUBBED CAPACITY - MW	330	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	COMBUSTION ENGINEERING	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	707.85	(1500000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	132.2	(270 F)
STACK HEIGHT - M	76.	(250 FT)
STACK SHELL	NR	
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		5000-9000
AVERAGE ASH CONTENT - %	12.00	
RANGE ASH CONTENT - %	****	
AVERAGE MOISTURE CONTENT - %	26.00	
RANGE MOISTURE CONTENT - %	****	
AVERAGE SULFUR CONTENT - %	0.50	
RANGE SULFUR CONTENT - %	****	
AVERAGE CHLORIDE CONTENT - %	0.04	
RANGE CHLORIDE CONTENT - %	****	
*** PARTICLE CONTROL		
** PARTICLE SCRUBBER		
NUMBER	3	
INITIAL START-UP DATE	4/1972	
GENERIC TYPE	VENTURI TOWER	
SPECIFIC TYPE	VARIABLE-THROAT/TOP-ENTRY PLUMB BOB	
TRADE NAME/COMMON NAME	N/A	
SUPPLIER	GE ENVIRONMENTAL SERVICES	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	AISI 1110	
LINER GENERIC MATERIAL	ORGANIC	
LINER SPECIFIC MATERIAL	POLYESTER	
GAS CONTACTING DEVICE TYPE	N/A	
LIQUID RECIRCULATION RATE - LITER/S	409.5	(6500 GPM)
L/G RATIO - LITER/CU.M	1.7	(13.0 GAL/1000ACF)
PH CONTROL ADDITIVE	LIME/ALKALINE FLYASH	
PRESSURE DROP - KPA	2.5	(10.0 IN-H2O)
INLET GAS FLOW RATE - CU.M/S	327.5	(694000 ACFM)
INLET GAS TEMPERATURE - C	135.0	(275 F)
SO2 REMOVAL EFFICENCY - %	40.0	
PARTICLE REMOVAL EFFICIENCY - %	99.7	
ENERGY CONSUMPTION - %	0.9	

PACIFIC POWER & LIGHT: DAVE JOHNSTON 4 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
4/72	SYSTEM										

** PROBLEMS/SOLUTIONS/COMMENTS

SINCE STARTUP IN APRIL 1972, THE SCRUBBING UNIT HAS EXPERIENCED MAJOR SCALING PROBLEMS. HARD GYPSUM SCALE ACCUMULATES IN THE SCRUBBER VESSELS AND PIPING. THE USE OF LIME FOR PH CONTROL AND LIGNO SULFONATE TO ALTER THE HARDNESS OF DEPOSITS IMPROVED THE SCALE PROBLEM. FRESH WATER WASHING HAS BEEN REQUIRED TO FLUSH ASH AND SCALE DEPOSITS FROM THE SCRUBBER VESSELS.
SOLIDS BUILDUP HAS OCCURRED AT THE WET-DRY INTERFACE AND IN THE BLEED AND RECYCLE LINES. THE UTILITY IS USING AN ADDITIVE (HEXAMATA PHOSPHATE) IN WHICH THE EFFECTS HAVE YET TO BE DETERMINED.
ADDITIONAL OPERATING PROBLEMS EXPERIENCED SINCE STARTUP INCLUDE ERROSION IN THE RECYCLE PUMP AND "SILTING" DURING SHUTDOWN.
THE UTILITY CHARACTERIZED THE AVAILABILITY AS BEING DEPENDENT ON THE AMOUNT OF BLOWDOWN AND FRESH WATER IRRIGATION THAT ARE EMPLOYED.

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

NO INFORMATION WAS AVAILABLE FOR THE FIRST QUARTER OF 1980.

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

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR PROBLEMS OCCURRED DURING THE SECOND QUARTER OF 1980.

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

** PROBLEMS/SOLUTIONS/COMMENTS

NO INFORMATION WAS AVAILABLE FOR THE THIRD QUARTER OF 1980.

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

PACIFIC POWER & LIGHT: DAVE JOHNSTON 4 (CONT.)

PERIOD	MODULE	PERFORMANCE DATA: AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UTILITY REPORTED THAT NO MAJOR PROBLEMS WERE ENCOUNTERED WITH THE SCRUBBING OPERATIONS DURING THE OCTOBER THROUGH DECEMBER PERIOD.									
1/81	SYSTEM							744			
2/81	SYSTEM							672			
3/81	SYSTEM							744			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		NO INFORMATION WAS AVAILABLE FOR THE FIRST QUARTER 1981.									

APPENDIX D
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)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	1348	
GROSS UNIT GENERATING CAPACITY - MW	190	
NET UNIT GENERATING CAPACITY W/FGD - MW	183	
NET UNIT GENERATING CAPACITY WO/FGD - MW	*****	
EQUIVALENT SCRUBBED CAPACITY - MW	190	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	COMBUSTION ENGINEERING	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	****	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	********	(******* ACFM)
BOILER FLUE GAS TEMPERATURE - C	*******	(**** F)
STACK HEIGHT - M	213.	(700 FT)
STACK SHELL	CONCRETE	
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 - %	6.0-7.0	
AVERAGE SULFUR CONTENT - %	2.00	
RANGE SULFUR CONTENT - %	****	
AVERAGE CHLORIDE CONTENT - %	********	
RANGE CHLORIDE CONTENT - %	****	
*** PARTICLE CONTROL		
** ESP		
TYPE	COLD SIDE	
** PARTICLE SCRUBBER		
INITIAL START-UP DATE	0/1978	
GENERIC TYPE	VENTURI TOWER	
SPECIFIC TYPE	VARIABLE-THROAT/TOP-ENTRY PLUMB BOB	
TRADE NAME/COMMON NAME	N/A	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	AISI 1110	
LINER GENERIC MATERIAL	NR	
LINER SPECIFIC MATERIAL	NR	
GAS CONTACTING DEVICE TYPE	NONE	
NUMBER OF CONTACTING ZONES	2	

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	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	

POTOMAC ELECTRIC POWER: DICKERSON 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** 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	685	656	
3/80	SYSTEM	100.0	100.0		100.0			744	744	744	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING THE FIRST QUARTER OF 1980 ONLY ONE SCRUBBER OUTAGE OCCURRED. IN FEBRUARY OUTAGE TIME WAS NECESSARY TO REPAIR A SLURRY RECYCLE LINE LEAK.									
4/80	SYSTEM							720			
5/80	SYSTEM							744			
6/80	SYSTEM							720			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DICKERSON 1 SCRUBBER DEPENDABILITY FACTORS WERE UNAVAILABLE FOR THE APRIL-JUNE PERIOD. THESE FIGURES SHOULD BE AVAILABLE BY THE THIRD QUARTER REPORT. THE UTILITY REPORTED THAT THE FGD SYSTEM OPERATED THE ENTIRE SECOND QUARTER WITH ESSENTIALLY 100% AVAILABILITY. NO SCRUBBER-RELATED PROBLEMS WERE REPORTED.									
7/80	SYSTEM							744			
8/80	SYSTEM							744			
9/80	SYSTEM							720			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UTILITY REPORTED HAVING MINIMAL SCRUBBING SYSTEM PROBLEMS DURING THE JULY-SEPTEMBER PERIOD.									
		THE BOILER CAPACITY WAS REDUCED DURING PART OF THE PERIOD DUE TO A LINING FAILURE IN THE SCRUBBING SYSTEM PIPING.									
10/80	SYSTEM							744			
11/80	SYSTEM							720			
12/80	SYSTEM							744			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING THE OCTOBER THROUGH DECEMBER PERIOD THE BOILER WAS OPERATED AT A 60% (110 MW) CAPACITY DUE TO A LINING FAILURE IN THE SCRUBBING SYSTEM PIPING.									
1/81	SYSTEM	97.0	88.1	91.9	82.1			744	694	611	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING JANUARY APPROXIMATELY 53 HOURS OF OUTAGE TIME WAS CAUSED BY PROBLEM WITH THE RECYCLE LINE REDUCER AND THE BLEED LINE SPOOL.									
2/81	SYSTEM	0.0			0.0			672	0	0	

POTOMAC ELECTRIC POWER: DICKERSON 1 (CONT.)

PERIOD	MODULE	PERFORMANCE DATA AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
3/81	SYSTEM	0.0			0.0			744	0	0	

** PROBLEMS/SOLUTIONS/COMMENTS

DICKERSON UNITS 1, 2 AND 3 WERE SHUT DOWN SO THAT THE STACK AND THE COMMON DUCT LEADING TO THE STACK COULD BE RELINED WITH PLASITE. UNIT 1 WAS SHUT DOWN ON JANUARY 31 AND REMAINED DOWN THROUGHOUT FEBRUARY AND MARCH DUE TO THESE REPAIRS.

APPENDIX D
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)
SO2 EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	1348	
GROSS UNIT GENERATING CAPACITY - MW	190	
NET UNIT GENERATING CAPACITY W/FGD - MW	183	
NET UNIT GENERATING CAPACITY WO/FGD - MW	*****	
EQUIVALENT SCRUBBED CAPACITY - MW	190	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	COMBUSTION ENGINEERING	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	****	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	********	(******* ACFM)
BOILER FLUE GAS TEMPERATURE - C	*******	(**** F)
STACK HEIGHT - M	213.	(700 FT)
STACK SHELL	CONCRETE	
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 - %	6.0-7.0	
AVERAGE SULFUR CONTENT - %	2.00	
RANGE SULFUR CONTENT - %	****	
AVERAGE CHLORIDE CONTENT - %	********	
RANGE CHLORIDE CONTENT - %	****	
*** PARTICLE CONTROL		
** ESP		
TYPE	COLD SIDE	
** PARTICLE SCRUBBER		
INITIAL START-UP DATE	0/1978	
GENERIC TYPE	VENTURI TOWER	
SPECIFIC TYPE	VARIABLE-THROAT/TOP-ENTRY PLUMB BOB	
TRADE NAME/COMMON NAME	N/A	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	AISI 1110	
LINER GENERIC MATERIAL	NR	
LINER SPECIFIC MATERIAL	NR	
GAS CONTACTING DEVICE TYPE	NONE	
NUMBER OF CONTACTING ZONES	2	

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	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	

POTOMAC ELECTRIC POWER: DICKERSON 2 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
		A ONE DAY OUTAGE OCCURRED, DUE TO A FAN LINING PROBLEM. NO OTHER SCRUBBER UNIT PROBLEMS WERE ENCOUNTERED DURING THE PERIOD.									
1/80	SYSTEM	95.4	96.4		95.4			744	736	710	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		IN JANUARY THE SCRUBBER WAS DOWN FOR THREE 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	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		IN MARCH THE SCRUBBER WAS DOWN FOR A SCRUBBER LINING WARRANTY INSPECTION. NO REPAIR WORK WAS NECESSARY.									
4/80	SYSTEM							720			
5/80	SYSTEM							744			
6/80	SYSTEM							720			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DICKERSON 2 SCRUBBER DEPENDABILITY FACTORS WERE UNAVAILABLE FOR THE APRIL-JUNE PERIOD. THESE FIGURES SHOULD BE AVAILABLE BY THE THIRD QUARTER REPORT. THE UTILITY REPORTED THAT THE FGD SYSTEM OPERATED THE ENTIRE SECOND QUARTER WITH ESSENTIALLY 100% AVAILABILITY. NO SCRUBBER-RELATED PROBLEMS WERE REPORTED.									
7/80	SYSTEM							744			
8/80	SYSTEM							744			
9/80	SYSTEM							720			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UTILITY HAS NOT FIGURED OUT THE DEPENDABILITY FIGURES AS YET.									
		THE UTILITY REPORTED HAVING MINIMAL SCRUBBING SYSTEM PROBLEMS DURING THE JULY-SEPTEMBER PERIOD.									
		THE BOILER CAPACITY WAS REDUCED DURING PART OF THE PERIOD DUE TO A LINING FAILURE IN THE SCRUBBING SYSTEM PIPING.									
10/80	SYSTEM							744			
11/80	SYSTEM							720			
12/80	SYSTEM							744			

POTOMAC ELECTRIC POWER: DICKERSON 2 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
		PERFORMANCE DATA									
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING THE OCTOBER THROUGH DECEMBER PERIOD THE BOILER WAS OPERATED AT A 60% (110 MW) CAPACITY DUE TO A LINING FAILURE IN THE SCRUBBING SYSTEM PIPING.									
1/81	SYSTEM	96.9	92.8	100.0	81.9			744	654	607	
2/81	SYSTEM	0.0			0.0			672	0	0	
3/81	SYSTEM	0.0			0.0			744	0	0	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DICKERSON UNITS 1, 2 AND 3 WERE SHUT DOWN SO THAT THE STACK AND THE COMMON DUCT LEADING TO THE STACK COULD BE RELINED WITH PLASITE. UNIT 2 WAS SHUT DOWN ON JANUARY 31 AND REMAINED DOWN THROUGHOUT FEBRUARY AND MARCH DUE TO THESE REPAIRS.									

APPENDIX D
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)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	548	
GROSS UNIT GENERATING CAPACITY - MW	190	
NET UNIT GENERATING CAPACITY W/FGD - MW	178	
NET UNIT GENERATING CAPACITY WO/FGD - MW	182	
EQUIVALENT SCRUBBED CAPACITY - MW	95	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	COMBUSTION ENGINEERING	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	278.42	(590000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	126.1	(259 F)
STACK HEIGHT - M	213.	(700 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	*******	(***** FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	BITUMINOUS	
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 - %	6.0-7.0	
AVERAGE SULFUR CONTENT - %	2.00	
RANGE SULFUR CONTENT - %	****	
AVERAGE CHLORIDE CONTENT - %	********	
RANGE CHLORIDE CONTENT - %	****	
*** PARTICLE CONTROL		
** MECHANICAL COLLECTOR		
NUMBER	0	
TYPE	NONE	
** FABRIC FILTER		
NUMBER	0	
TYPE	NONE	
** PARTICLE SCRUBBER		
NUMBER	1	
INITIAL START-UP DATE	9/1975	
GENERIC TYPE	VENTURI TOWER	
SPECIFIC TYPE	VARIABLE-THROAT/TOP-ENTRY PLUMB BOB	
TRADE NAME/COMMON NAME	N/A	
SUPPLIER	GE ENVIRONMENTAL SERVICES	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	AISI 1110	
LINER GENERIC MATERIAL	ORGANIC	
LINER SPECIFIC MATERIAL	FIBER-REINFORCED POLYESTER	
GAS CONTACTING DEVICE TYPE	NONE	
L/G RATIO - LITER/CU.M	2.7	(20.0 GAL/1000ACF)
PRESSURE DROP - KPA	2.7	(11.0 IN-H2O)
INLET GAS FLOW RATE - CU.M/S	139.2	(295000 ACFM)
INLET GAS TEMPERATURE - C	126.1	(259 F)
PARTICLE REMOVAL EFFICIENCY - %	99.0	
ENERGY CONSUMPTION - %	2.1	

POTOMAC ELECTRIC POWER: DICKERSON 3 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	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			

** PROBLEMS/SOLUTIONS/COMMENTS

PROBLEMS DURING THIS PERIOD RANGED FROM CORROSION LEAKS IN EXPANSION JOINT 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			

** 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			

** PROBLEMS/SOLUTIONS/COMMENTS

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

2/75	SYSTEM							672			

POTOMAC ELECTRIC POWER: DICKERSON 3 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
3/75	SYSTEM							744			
4/75	SYSTEM							720			
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.

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

** 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 LIQUO 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 MANUFACTURIN 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 SEPTEMBE 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 MGO MIX TANK, RESULTING IN A VERY MOIST PRODUCT FROM THE CENTRIFUGE. CAKING IN TH 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.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
9/75	SYSTEM							720			
10/75	SYSTEM							744			
11/75	SYSTEM							720			
12/75	SYSTEM							744			
1/76	SYSTEM							744			
2/76	SYSTEM							696			
3/76	SYSTEM							744			
4/76	SYSTEM							720			

POTOMAC ELECTRIC POWER: DICKERSON 3 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
		PERFORMANCE DATA									
5/76	SYSTEM							744			
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			
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 ERROSION. 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	

POTOMAC ELECTRIC POWER: DICKERSON 3 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
				PERFORMANCE DATA							
	** PROBLEMS/SOLUTIONS/COMMENTS										
			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		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			
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 ALLOW ABLE 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 MAINTEN- ANCE PROGRAM.								
6/79	SYSTEM							720			
7/79	SYSTEM							744			

POTOMAC ELECTRIC POWER: DICKERSON 3 (CONT.)

PERIOD	MODULE	PERFORMANCE DATA AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
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.									
4/80	SYSTEM							720			
5/80	SYSTEM							744			
6/80	SYSTEM							720			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UNIT 3 SCRUBBER EXPERIENCED SOME DOWN TIME DURING THE APRIL-JUNE PERIO AS A RESULT OF THE CONTINUING DETERIORATION OF THE SCRUBBER FLAKEGLASS LINING. THE UTILITY REPORTED THAT MAINTENANCE CREWS ARE PATCHING OLD PATCHES. A STUDY WILL BEGIN IN LATE JULY TO ESTABLISH THE OPTIMUM LINER MATERIAL AND APPLICATION STRATEGY FOR THE UNIT 3 SCRUBBING SYSTEM.									
7/80	SYSTEM							744			
8/80	SYSTEM							744			
9/80	SYSTEM							720			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UTILITY HAS NOT FIGURED OUT THE DEPENDABILITY FIGURES AS YET.									
		THE UTILITY REPORTED HAVING MINIMAL SCRUBBING SYSTEM PROBLEMS DURING THE JULY-SEPTEMBER PERIOD.									

POTOMAC ELECTRIC POWER: DICKERSON 3 (CONT.)

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

THE BOILER CAPACITY WAS REDUCED TO 1/2 LOAD DURING PART OF THE PERIOD DUE TO THE NECESSARY PATCHING OF THE SCRUBBER LINING. THE UTILITY IS PRESENTL STUDYING THE POSSIBILITY OF REPLACING THE FLAKEGLASS LINER WITH A RUBBER LINER.

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

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE OCTOBER THROUGH DECEMBER PERIOD THE BOILER WAS OPERATED AT A 60% (110 MW) CAPACITY DUE TO A LINING FAILURE IN THE SCRUBBING SYSTEM PIPING.

UNIT 3 WILL BE SHUTDOWN ON FEBRUARY 2, 1981 TO REPLACE THE FLAKEGLASS LINING.

1/81	SYSTEM	96.8	96.9	97.5	94.2			744	723	701	
2/81	SYSTEM	0.0			0.0			672	0	0	
3/81	SYSTEM	0.0			0.0			744	0	0	

** PROBLEMS/SOLUTIONS/COMMENTS

DICKERSON UNITS 1, 2 AND 3 WERE SHUT DOWN SO THAT THE STACK AND THE COMMON DUCT LEADING TO THE STACK COULD BE RELINED WITH PLASITE. UNIT 3 WAS SHUT DOWN ON JANUARY 30 AND REMAINED DOWN THROUGHOUT FEBRUARY AND MARCH DUE TO THESE REPAIRS.

APPENDIX D
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	D	
PARTICULATE EMISSION LIMITATION - NG/J	43.	(0.100 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	*****	
GROSS UNIT GENERATING CAPACITY - MW	112	
NET UNIT GENERATING CAPACITY W/FGD - MW	109	
NET UNIT GENERATING CAPACITY WO/FGD - MW	*****	
EQUIVALENT SCRUBBED CAPACITY - MW	112	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	****	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	****	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	245.39	(520000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	148.9	(300 F)
STACK HEIGHT - M	******	(**** FT)
STACK SHELL	NR	
STACK TOP DIAMETER - M	*******	(***** FT)
** FUEL DATA		
FUEL TYPE	COAL 1 '50%!	
FUEL GRADE	SUBBITUNINOUS; BITUMINOU	
AVERAGE HEAT CONTENT - J/G	23609.	(10150 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		****
AVERAGE ASH CONTENT - %	10.90	
RANGE ASH CONTENT - %	****	
AVERAGE MOISTURE CONTENT - %	12.45	
RANGE MOISTURE CONTENT - %	****	
AVERAGE SULFUR CONTENT - %	0.80	
RANGE SULFUR CONTENT - %	0.6-1.0; NR	
AVERAGE CHLORIDE CONTENT - %	0.01	
RANGE CHLORIDE CONTENT - %	****	
*** PARTICLE CONTROL		
** MECHANICAL COLLECTOR		
NUMBER	1	
** FABRIC FILTER		
NUMBER	0	
TYPE	NONE	
** ESP		
NUMBER	1	
** PARTICLE SCRUBBER		
NUMBER	1	
INITIAL START-UP DATE	9/1973	
GENERIC TYPE	PACKED TOWER	
SPECIFIC TYPE	MOBILE BED PACKING	
TRADE NAME/COMMON NAME	TURBULENT CONTACT ABSORBER	
SUPPLIER	AIR CORRECTION DIVISION, UOP	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	AISI 1110	
LINER GENERIC MATERIAL	ORGANIC	
LINER SPECIFIC MATERIAL	NATURAL RUBBER	
GAS CONTACTING DEVICE TYPE	STAINLESS STEEL	
NUMBER OF CONTACTING ZONES	3	
L/G RATIO - LITER/CU.M	7.5	(56.0 GAL/1000ACF)
PH CONTROL ADDITIVE	ALKALINE FLYASH	
PRESSURE DROP - KPA	3.0	(12.0 IN-H2O)
SUPERFICIAL GAS VELOCITY - M/S	3.4	(11.0 FT/S)
INLET GAS FLOW RATE - CU.M/S	245.4	(520000 ACFM)

PUBLIC SERVICE OF COLORADO: ARAPAHOE 4 (CONT.)

INLET GAS TEMPERATURE - C	151.7	(305 F)
SO2 REMOVAL EFFICENCY - %	30.0	
PARTICLE REMOVAL EFFICIENCY - %	93.0	

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
9/77	SYSTEM										

** PROBLEMS/SOLUTIONS/COMMENTS

SINCE STARTUP IN SEPTEMBER 1977 SCALING AND PLUGGING AT THE WET/DRY ZONE, ON THE FIRST STAGE GRIDS, AND IN THE REHEATERS HAVE BEEN THE MOST PROMINEN PROBLEM AREAS CHARACTERIZED BY THIS SYSTEM. VARIOUS CHEMICAL ADDITIVES HAVE BEEN TESTED FOR CONTROL OF SCALING, INCLUDING PHOSPHATED ESTERS, BUT WITHOUT SIGNIFICANT IMPROVEMENT. BLOWDOWN IS MAINTAINED AT A HIGH LEVEL TO CHECK THE BUILDUP OF SALTS BUT, OTHER THAN FOR TESTING PURPOSES, NO CHEMICAL CONTROL METHOD HAS BEEN USED TO CONTROL SCALE ACCUMULATION. OTHER OPERATING EXPERIENCES INCLUDE WEAR AND PERIODIC REPLACEMENT OF THE MOBILE BALLS, EROSION OF LINING AND CORROSIVE FAILURE OF REHEATERS. THE EROSION AND LINING FAILURE HAVE NOT BEEN A SERIOUS PROBLEM EXCEPT IN THE RECIRCULATING PUMPS.

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 OF 1980. USE OF THE CARBON STEEL DAMPERS HAS BEEN ABANDONED. THE PROGRAM FOR REPLACING THE DAMPERS HAS BEEN SUSPENDED INDEFINITELY. THE UNIT IS SHUTDOWN WHEN MAJOR SCRUBBER PROBLEMS OCCUR.

REHEATER STEAM TUBE LEAKS ARE STILL CAUSING PROBLEMS. THE SIX STEAM COILS ON THIS IN-LINE REHEAT SYSTEM, TWO OF WHICH ARE 316SS AND FOUR 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. THE OLD BALLS WERE REPLACED WITH THE NEW HOLLOW HARD PLASTIC-WALLED BALLS WITH NOTCHED SEAMS. THE GRIDS WERE ORIGINALLY 316L SS, CERAMIC, POLYPROPYLENE, AND RUBBER LINED CARBON STEEL, BUT HAVE BEEN REPLACED WITH 317L SS GRIDS.

THE SCRUBBERS OPERATED CONTINUOUSLY THROUGHOUT THE QUARTER EXCEPT FOR THE BALL AND GRID REPLACEMENT DOWNTIME.

4/80	SYSTEM				100.0		100.0	720	720	720	

PUBLIC SERVICE OF COLORADO: ARAPAHOE 4 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
5/80	SYSTEM		100.0		100.0			744	744	744	
6/80	SYSTEM		100.0		100.0			720	720	720	

** PROBLEMS/SOLUTIONS/COMMENTS

BOTH BOILER AND SCRUBBERS OPERATED THE ENTIRE APRIL-JUNE PERIOD.

THE ISOLATION DAMPERS ARE STILL EFFECTIVELY INOPERABLE AND A REPLACEMENT PLAN AS YET HAS NOT BEEN REESTABLISHED.

THE UTILITY REPORTED THAT THE REHEATER TUBE LEAK PROBLEM CONTINUED THROUGH THE SECOND QUARTER. THE TUBES WILL BE ENTIRELY REPLACED WITH NEW 316L SS BUNDLES DURING THE NEXT SCHEDULED OUTAGE IN NOVEMBER AND DECEMBER. DURING THE SECOND QUARTER MORE TUBES WERE BLANKED OFF AFTER STEAM LEAKS OCCURRED. TO DATE ROUGHLY 50% OF THE TUBES ARE SEALED OFF AND ARE OUT OF SERVICE BECAUSE OF LEAKS THAT OCCURRED OVER THE PAST MONTHS.

7/80	SYSTEM	100.0	100.0	100.0	100.0			744	744	744	
8/80	SYSTEM	100.0	100.0	100.0	100.0			744	744	744	
9/80	SYSTEM	100.0	100.0	100.0	100.0			720	720	720	

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER AND SCRUBBERS OPERATED ACCEPTABLY DURING THE JULY-SEPTEMBER PERIOD. NO PLANS HAVE BEEN MADE TO REPAIR THE ISOLATION DAMPERS. THE FAULTY REHEATER TUBES WILL BE REPLACED DURING THE SCHEDULED OUTAGE NOW SET FOR TH FIRST THREE WEEKS OF DECEMBER.

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

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE OCTOBER THROUGH DECEMBER PERIOD THE REHEATER TUBES WERE NOT REPLACED AND THE UNIT IS OPERATING WITHOUT REHEAT UNTIL THE NEXT SCHEDULED OUTAGE PERIOD IN FEBRUARY 1981.

NO MAJOR SCRUBBER RELATED PROBLEMS WERE ENCOUNTERED, EXCEPT THE REPLACEMENT OF THE DISCHARGE VALVE ON THE RECIRCULATION PUMP.

1/81	SYSTEM							744			
2/81	SYSTEM							672			
3/81	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE SCHEDULED FOUR WEEK OUTAGE STARTING JANUARY 30 AND ENDING FEBRUARY 24, TWO NEW A-SIDE REHEATER BUNDLES WERE INSTALLED. THE UNIT WAS THEN RESTARTED.

THE UNIT HOWEVER HAD TO BE SHUT DOWN ON FEBRUARY 24 ONLY AFTER OPERATING 3 HOURS DUE TO OPERATOR ERROR. THE BOOSTER FAN WAS RESTARTED WITHOUT ITS OI BEARING COOLING SYSTEM. CONSEQUENTLY, THE FAN BEARINGS WERE DAMAGE AND TH BOOSTER FAN HAD TO BE SHUT DOWN. THE UTILITY HAS SINCE REPAIRED THE FAN SHAFT BUT STILL AWAITS FOR THE REPAIRED FAN BEARINGS BEFORE THE UNIT CAN B

PUBLIC SERVICE OF COLORADO: ARAPAHOE 4 (CONT.)

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

APPENDIX D
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	D	
PARTICULATE EMISSION LIMITATION - NG/J	43.	(0.100 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	710	
GROSS UNIT GENERATING CAPACITY - MW	115	
NET UNIT GENERATING CAPACITY W/FGD - MW	100	
NET UNIT GENERATING CAPACITY WO/FGD - MW	105	
EQUIVALENT SCRUBBED CAPACITY - MW	102	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	BABCOCK & WILCOX	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	****	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	245.39	(520000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	146.1	(295 F)
STACK HEIGHT - M	******	(**** FT)
STACK SHELL	NR	
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 - %	0.65	
RANGE SULFUR CONTENT - %	****	
AVERAGE CHLORIDE CONTENT - %	0.01	
RANGE CHLORIDE CONTENT - %	****	
*** PARTICLE CONTROL		
** MECHANICAL COLLECTOR		
NUMBER	1	
** FABRIC FILTER		
NUMBER	0	
TYPE	NONE	
** ESP		
NUMBER	1	
** PARTICLE SCRUBBER		
NUMBER	1	
INITIAL START-UP DATE	6/1973	
GENERIC TYPE	PACKED TOWER	
SPECIFIC TYPE	MOBILE BED PACKING	
TRADE NAME/COMMON NAME	TURBULENT CONTACT ABSORBER	
SUPPLIER	AIR CORRECTION DIVISION, UOP	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	AISI 1110	
LINER GENERIC MATERIAL	ORGANIC	
LINER SPECIFIC MATERIAL	NATURAL RUBBER	
GAS CONTACTING DEVICE TYPE	STAINLESS STEEL	
NUMBER OF CONTACTING ZONES	3	
L/G RATIO - LITER/CU.M	7.5	(56.0 GAL/1000ACF)
PH CONTROL ADDITIVE	ALKALINE FLYASH	
PRESSURE DROP - KPA	3.2	(13.0 IN-H2O)
SUPERFICIAL GAS VELOCITY - M/S	3.4	(11.0 FT/S)
INLET GAS FLOW RATE - CU.M/S	164.4	(348400 ACFM)

PUBLIC SERVICE OF COLORADO: CHEROKEE 1 (CONT.)

INLET GAS TEMPERATURE - C	146.1	(295 F)
SO2 REMOVAL EFFICENCY - %	16.0	
PARTICLE REMOVAL EFFICIENCY - %	97.0	
ENERGY CONSUMPTION - %	4.3	

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
6/73	SYSTEM										

** PROBLEMS/SOLUTIONS/COMMENTS

SINCE STARTUP IN JUNE 1973 SCALING AND PLUGGING AT THE WET/DRY ZONE, ON THE FIRST STAGE GRIDS, AND IN THE REHEATERS HAVE BEEN THE MOST PROMINEN PROBLEM AREAS CHARACTERIZED BY THIS SYSTEM. VARIOUS CHEMICAL ADDITIVES HAVE BEEN TESTED FOR CONTROL OF SCALING, INCLUDING PHOSPHATED ESTERS, BUT WITHOUT SIGNIFICANT IMPROVEMENT. BLOWDOWN IS MAINTAINED AT A HIGH LEVEL TO CHECK THE BUILDUP OF SALTS BUT, OTHER THAN FOR TESTING PURPOSES NO CHEMICAL CONTROL METHOD HAS BEEN USED TO CONTROL SCALE ACCUMULATION. OTHER OPERATING EXPERIENCES INCLUDE WEAR AND PERIODIC REPLACEMENT OF THE MOBILE BALLS, EROSION OF LINING AND CORROSIVE FAILURE OF REHEATERS. THE EROSION AND LINING FAILURE HAVE NOT BEEN A SERIOUS PROBLEM EXCEPT IN THE RECIRCULATING PUMPS.

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

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE PERIOD ID 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				100.0		100.0	744	744	744	
2/80	SYSTEM				100.0		100.0	696	696	696	
3/80	SYSTEM				100.0		100.0	744	744	744	

** PROBLEMS/SOLUTIONS/COMMENTS

THE SCRUBBERS OPERATED CONTINUOUSLY THROUGHOUT THE FIRST QUARTER OF 1980.

THE ISOLATION DAMPERS HAVE NOT CAUSED ANY PROBLEMS BECAUSE MODULE ISOLATION WAS NOT REQUIRED DURING THE PERIOD.

THE FANS ARE STILL EXPERIENCING EROSION PROBLEMS.

IN MARCH A BOILER/SCRUBBER OVERHAUL BEGAN. 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 BE EQUIPPED WITH REPLACABLE CHROMIUM ALLOY WEAR PLATE BLADE TIPS.

4/80	SYSTEM							720			
5/80	SYSTEM							744			

PUBLIC SERVICE OF COLORADO: CHEROKEE 1 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

THE 1B ID FAN WAS SEVERELY ERRODED. THE FAN WAS REBUILT DURING THE OUTAGE

THE OLD CARBON STEEL ISOLATION DAMPERS WERE REPLACED WITH 316 SS DAMPERS DURING THE CONTINUING MAY-JULY OUTAGE.

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

** PROBLEMS/SOLUTIONS/COMMENTS

SHAFT BEARING FAILURES ON THE RECIRCULATION PUMP CAUSED SCRUBBER SYSTEM PROBLEMS THROUGHOUT THE JULY-SEPTEMBER PERIOD.

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

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED NO MAJOR PROBLEMS WERE ENCOUNTERED DURING THE OCTOBER THROUGH DECEMBER PERIOD. HOWEVER, SHAFT BEARING REPAIRS WERE MADE TO THE RECIRCULATION PUMPS.

1/81	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE MONTH OF JANUARY THE UNIT WAS SHUT DOWN FOR THE ENTIRE MONTH FO A GENERAL SCRUBBER OVERHAUL. THE OVERHAUL INCLUDED THE REPLACEMENT OF THE SCRUBBER BALLS AND REPAIR WORK TO THE SCRUBBER BALL PARTITIONS.

2/81	SYSTEM							672			

** PROBLEMS/SOLUTIONS/COMMENTS

UTILITY REPORTED THAT NO SCRUBBER RELATED PROBLEMS OCCURRED DURING THE MONTH OF FEBRUARY.

3/81	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

DURING PART OF MARCH THE UNIT WAS FORCED TO SHUT DOWN DUE TO A FROZEN GUILLOTINE INLET DAMPER.

APPENDIX D
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	E	
PARTICULATE EMISSION LIMITATION - NG/J	43.	(0.100 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	274	
GROSS UNIT GENERATING CAPACITY - MW	166	
NET UNIT GENERATING CAPACITY W/FGD - MW	157	
NET UNIT GENERATING CAPACITY WO/FGD - MW	163	
EQUIVALENT SCRUBBED CAPACITY - MW	166	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	COMBUSTION ENGINEERING	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	436.98	(926000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	126.7	(260 F)
STACK HEIGHT - M	******	(**** FT)
STACK SHELL	NR	
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 - %	0.70	
RANGE SULFUR CONTENT - %	0.6-0.7	
AVERAGE CHLORIDE CONTENT - %	********	
RANGE CHLORIDE CONTENT - %	****	
*** PARTICLE CONTROL		
** MECHANICAL COLLECTOR		
NUMBER	1	
INLET FLUE GAS CAPACITY - CU.M/S	218.5	(463000 ACFM)
** FABRIC FILTER		
NUMBER	0	
TYPE	NONE	
** ESP		
NUMBER	1	
TYPE	COLD SIDE	
INLET FLUE GAS CAPACITY - CU.M/S	218.5	(463000 ACFM)
** PARTICLE SCRUBBER		
NUMBER	2	
INITIAL START-UP DATE	11/1971	
GENERIC TYPE	PACKED TOWER	
SPECIFIC TYPE	MOBILE BED PACKING	
TRADE NAME/COMMON NAME	TURBULENT CONTACT ABSORBER	
SUPPLIER	AIR CORRECTION DIVISION, UOP	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	AISI 1110	
LINER GENERIC MATERIAL	ORGANIC	
LINER SPECIFIC MATERIAL	NATURAL RUBBER	
GAS CONTACTING DEVICE TYPE	STAINLESS STEEL	
NUMBER OF CONTACTING ZONES	3	
L/G RATIO - LITER/CU.M	7.8	(58.3 GAL/1000ACF)
PH CONTROL ADDITIVE	LIMESTONE/ALKALINE FLYASH	

PUBLIC SERVICE OF COLORADO: VALMONT 5 (CONT.)

PRESSURE DROP - KPA	3.7	(15.0 IN-H2O)
SUPERFICIAL GAS VELOCITY - M/S	3.4	(11.0 FT/S)
INLET GAS FLOW RATE - CU.M/S	109.2	(231500 ACFM)
INLET GAS TEMPERATURE - C	132.8	(271 F)
SO2 REMOVAL EFFICENCY - %	45.0	
PARTICLE REMOVAL EFFICIENCY - %	96.0	
ENERGY CONSUMPTION - %	3.6	

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
11/71	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

THE FIRST PARTICLE MATTER SCRUBBER COMMENCED OPERATION IN NOVEMBER 1971. THE SCRUBBER WAS ORIGINALLY INSTALLED FOR PARTICLE MATTER REMOVAL SINCE TH PLANT BURNS LOW SULFUR COAL; HOWEVER, 45% OF THE SO2 IS REMOVED AS WELL BECAUSE OF THE ALKALINITY OF THE FLYASH.

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 PARTICLE 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 BETWEE 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 SULFATE CONDITION IN THE RECIRCULATING SLURRY. BECAUSE OF THIS IT WAS FEL 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 SCALIN 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 RESIDENC 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

PUBLIC SERVICE OF COLORADO: VALMONT 5 (CONT.)

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

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 500 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.

11/74	SYSTEM							720			
12/74	SYSTEM							744			
1/75	SYSTEM							744			
2/75	SYSTEM							672			
3/75	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SCRUBBING SYSTEM WAS OPERATED FOR A TOTAL OF FOUR AND ONE-HALF MONTHS, FROM MID-OCTOBER 1974 TO MARCH 1975. THE OVERALL RELIABILITY OF THE SYSTEM WAS APPROXIMATELY 75%.

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			
1/76	SYSTEM							744			
2/76	SYSTEM							696			
3/76	SYSTEM							744			
4/76	SYSTEM							720			
5/76	SYSTEM										
6/76	SYSTEM							720			

PUBLIC SERVICE OF COLORADO: VALMONT 5 (CONT.)

PERIOD	MODULE	PERFORMANCE DATA AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
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			
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 CONTINUA 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 78% 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			

PUBLIC SERVICE OF COLORADO: VALMONT 5 (CONT.)

PERIOD	MODULE	PERFORMANCE DATA: AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
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.										
	EROSION AND CORROSION HAVE OCCURRED ON THE SCRUBBER GRID BAR AREA (PACKING SUPPORT).										
	EROSION/CORROSION IS EVIDENT IN THE MIST ELIMINATOR SECTION.										
	EROSION/CORROSION OCCURRS 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.										

PUBLIC SERVICE OF COLORADO: VALMONT 5 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
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 SCRUBBING 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	90.8									
	B	87.7									
	SYSTEM	89.0						744	615		

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE FIRST QUARTER OF 1980, NO MAJOR PROBLEMS WERE ENCOUNTERED WITH THE SCRUBBER.

4/80	A	88.1									
	B	88.1									
	SYSTEM	88.1						720	716		

** PROBLEMS/SOLUTIONS/COMMENTS

THE SCRUBBER WAS SHUT DOWN ON APRIL 14 FOR A WEEK TO MAKE REPAIRS TO A HOL IN THE SCRUBBER RUBBER LINING, RECYCLE PUMP LININGS AND A STEAM REGULATOR ON ONE OF THE REHEATERS.

5/80	A	96.8									
	B	100.0									
	SYSTEM	98.4						744	744		

** PROBLEMS/SOLUTIONS/COMMENTS

NO PROBLEMS WERE REPORTED FOR MAY.

6/80	A	8.0									
	B	8.0									
	SYSTEM	8.0						720	720		

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JUNE THE SCRUBBER WAS FORCED OUT OF SERVICE WHEN AN INBOARD FAN PEDISTLE BEARING FAILED. THE BEARING SECTION WAS REBUILT.

PUBLIC SERVICE OF COLORADO: VALMONT 5 (CONT.)

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

WHILE FAN REPAIRS WERE IN PROGRESS EXTENSIVE MAINTENANCE WAS PERFORMED ON THE SCRUBBER. MAINTENANCE WORK INCLUDED COMPLETE BALL REPLACEMENT, ADDITIONAL REPAIR WORK ON THE SCRUBBER LINER, REPAIR OF HOLES IN THE TOWER SHELL AND OF A RUPTURED MIST ELIMINATOR WASH LINE AND THE REHEATER WAS CLEANED.

DAMPER JAMMING AT VALMONT HAS OCCURRED PERIODICALLY. SOMETIMES DAMPERS DO NOT READILY CLOSE. THE OPERATOR MUST MOVE THE DAMPER UP AND DOWN UNTIL TH GUILLOTINE SEATS. BECAUSE OF CONTINUOUS FLY ASH ACCUMULATION IT APPEARS THAT THE DAMPERS MUST BE EXERCISED FREQUENTLY TO PREVENT JAMMING.

7/80	5A	48.3	46.6				
	5B	48.3	46.6				
	SYSTEM	48.3	46.6	744	719	347	

** PROBLEMS/SOLUTIONS/COMMENTS

THE SCRUBBER SYSTEM WAS SHUT DOWN BECAUSE OF SCRUBBER BOOSTER FAN BEARING FAILURE.

8/80	5A	87.5	84.8				
	5B	95.6	92.6				
	SYSTEM	91.5	87.7	744	721	660	

** PROBLEMS/SOLUTIONS/COMMENTS

THE RECIRCULATION PUMP MOTOR BEARING FAILED CAUSING SOME MINOR OUTAGE TIME IN AUGUST.

9/80	SYSTEM		0.0	720	0	0	

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER AND SCRUBBER WERE SHUT DOWN DURING SEPTEMBER FOR SCHEDULED MAINTENANCE.

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

** PROBLEMS/SOLUTIONS/COMMENTS

THE SCRUBBER REMAINED OUT OF SERVICE THROUGHOUT THE OCTOBER-DECEMBER PERIO AND IS EXPECTED TO START UP AT THE END OF JANUARY. LATE START UP OF THE SCRUBBER IS DUE TO A MANPOWER SHORTAGE. THE BOILER AND TURBINE RETURNED T SERVICE IN MID-DECEMBER.

1/81	SYSTEM			744			
2/81	SYSTEM			672			
3/81	SYSTEM			744			

** PROBLEMS/SOLUTIONS/COMMENTS

SCRUBBER CAME BACK ON-LINE AT THE END OF JANUARY AND OPERATED THROUGHOUT THE MONTHS OF FEBRUARY AND MARCH WITHOUT ANY MAJOR SCRUBBER RELATED PROBLEMS.

APPENDIX D
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	D	
PARTICULATE EMISSION LIMITATION - NG/J	43.	(0.100 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	516.	(1.200 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	350	
GROSS UNIT GENERATING CAPACITY - MW	350	
NET UNIT GENERATING CAPACITY W/FGD - MW	320	
NET UNIT GENERATING CAPACITY WO/FGD - MW	*****	
EQUIVALENT SCRUBBED CAPACITY - MW	350	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	COMBUSTION ENGINEERING	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	778.63	(1650000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	176.7	(350 F)
STACK HEIGHT - M	76.	(250 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	8.2	(27.0 FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	SUBBITUMINOUS	
AVERAGE HEAT CONTENT - J/G	20236.	(8700 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		8400-8700
AVERAGE ASH CONTENT - %	5.00	
RANGE ASH CONTENT - %	5.0-5.5	
AVERAGE MOISTURE CONTENT - %	27.10	
RANGE MOISTURE CONTENT - %	25.0-30.0	
AVERAGE SULFUR CONTENT - %	0.31	
RANGE SULFUR CONTENT - %	0.3-0.5	
AVERAGE CHLORIDE CONTENT - %	********	
RANGE CHLORIDE CONTENT - %	****	
*** PARTICLE CONTROL		
** ESP		
NUMBER	1	
TYPE	COLD SIDE	
SUPPLIER	RESEARCH-COTTRELL	
INLET FLUE GAS CAPACITY - CU.M/S	778.6	(1650000 ACFM)
INLET FLUE GAS TEMPERATURE - C	168.3	(335 F)
PRESSURE DROP - KPA	0.1	(1. IN-H2O)
PARTICLE REMOVAL EFFICENCY - %	95.0	
** PARTICLE SCRUBBER		
NUMBER	6	
NUMBER OF SPARES	1	
GENERIC TYPE	PACKED TOWER	
SPECIFIC TYPE	STATIC BED PACKING	
TRADE NAME/COMMON NAME	MARBLE-BED SCRUBBER	
SUPPLIER	COMBUSTION ENGINEERING	
DIMENSIONS - FT	24.0 X 25.0	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	AISI 1110	
LINER GENERIC MATERIAL	ORGANIC	
LINER SPECIFIC MATERIAL	NR	
GAS CONTACTING DEVICE TYPE	GLASS MARBLES	
NUMBER OF CONTACTING ZONES	1	
LIQUID RECIRCULATION RATE - LITER/S	444.2	(7050 GPM)
L/G RATIO - LITER/CU.M	3.1	(23.0 GAL/1000ACF)
PH CONTROL ADDITIVE	SLUDGE FROM WATER TREATMENT	
SUPERFICIAL GAS VELOCITY - M/S	2.4	(8.0 FT/S)
INLET GAS FLOW RATE - CU.M/S	141.6	(300000 ACFM)

SOUTHWESTERN PUBLIC SERVICE: HARRINGTON 1 (CONT.)

INLET GAS TEMPERATURE - C	60.0	(140 F)
PARTICLE REMOVAL EFFICIENCY - %	50.0	

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER 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 FLUSH PIPING HAS FAILED CAUSING SOME LEAKING.

PLUGGING IN ONE MARBLE BED WAS ENCOUNTERED WHEN THE CHEMISTRY CONTROL WAS TEMPORARILY LOST.

THE CONE SHAPED EXPANDED METAL (316L SS) SCREENS COVERING THE BED DRAIN PIPES HAVE ERODED AWAY FROM BALL MOVEMENT. THE MARBLE BALLS HAVE BEEN DROPPING INTO THE RECYCLE TANK. WHERE THE UTILITY HAS REPLACED THE METAL SCREEN WITH 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 OF 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 DUCTS HAVE EXPERIENCED ANY SCALE OR MOISTURE ACCUMULATION.

4/80	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

A PUMP LINER FAILURE OCCURRED IN APRIL. THE IMPELLER SHAFT LINER WAS RE-PAIRED AND REPLACED.

5/80	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER WAS SHUT DOWN A FEW DAYS IN LATE APRIL AND 12 TO 14 DAYS IN EARLY MAY FOR AIR PREHEATER REPAIRS.

DURING APRIL AND MAY THE SCRUBBING SYSTEM EXPERIENCED AGITATOR PROBLEMS. THE RECENT PROBLEMS HAVE BEEN RELATED TO BEARING FAILURE, HOWEVER, THE SEALS HAVE BEEN LEAKING AS WELL. THE AGITATORS AT THIS FACILITY ARE SIDE MOUNTED. THE AGITATOR SHAFT ENTERS THE TANK AT ROUGHLY 12 FT BELOW THE

SOUTHWESTERN PUBLIC SERVICE: HARRINGTON 1 (CONT.)

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

FLUID SURFACE. IT APPEARS THAT THE SEAL LEAKING MAY BE ATTRIBUTABLE TO FAULTY INSTALLATION.

6/80	SYSTEM	92.1						720	696		79.3

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JUNE THE SCRUBBER EXHIBITED AN AVAILABILITY OF 92.1%. THERE WAS GREATER SCRUBBER CAPACITY AVAILABLE THAN REQUIRED BY THE BOILER. NO PROBLEMS WERE REPORTED FOR JUNE.

DAMPER PROBLEMS REPORTED PREVIOUSLY HAVE BEEN ELIMINATED. THE OLD OPERATO MECHANISMS WERE REPLACED WITH OPERATORS SUPPLIED BY ANOTHER MANUFACTURER.

ONE OF THE MARBLE BEDS IS STILL PARTIALLY PLUGGED. THE MATERIAL SEEMS TO BE HARD CALCIUM SULFATE SCALE. THE SCALE WILL PROBABLY NOT CLEAR FURTHER THROUGH DISSOLUTION DURING NORMAL SCRUBBER OPERATIONS AS HAD BEEN HOPED. ALTHOUGH THE MODULE MUST OPERATE AT LOWER THAN DESIGN GAS FLOW SCRUBBER OPERATIONS ARE NOT HAMPERED OVERALL BECAUSE THE SYSTEM HAS SOME DESIGN SPARE CAPACITY.

THE REHEATER PROBLEM REPORTED PREVIOUSLY HAS OCCURRED ON THREE REHEATERS NOW. THE FAILURE OF THE REHEATER DUCT BOTTOM PANELS MAY BE A RESULT OF AN UNDERSIZED DEFLECTION SHIELD BENEATH THE TUBE BANKS. IT IS ALSO POSSIBLE THAT THE DUCTING WAS IMPROPERLY WELDED.

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

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR SCRUBBING SYSTEM PROBLEMS OCCURRED DURING THE THIRD QUARTER 1980.

THE PROBLEM REPORTED EARLIER WITH THE MIST ELIMINATOR WASH PIPING IS PRESENTLY BEING SOLVED BY REPLACING THE PIPING WITH CARBON STEEL.

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

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE OCTOBER THROUGH DECEMBER PERIOD REPLACEMENT OF THE MIST ELIMINATOR WASH PIPING WITH CARBON STEEL CONTINUED; AS THE OLD PIPING WEARS OUT AND MAINTENANCE TIME PERMITS.

DURING LATE DECEMBER, THE SLURRY SPRAY PUMP HOUSING CRACKED DURING A BACK FLUSH. THIS WAS THE SECOND TIME IN TWO YEARS THAT THIS PROBLEM HAD OCCURRED.

1/81	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT AT THE BEGINNING OF THE YEAR THE SCRUBBER SYSTEM BEGAN TO SEE VOLUMES OF FLUE GAS GREATER THAN THAT PRODUCED BY THE BOILER. IT WAS LATER DISCOVERED THAT THE EXPANSION JOINTS LOCATED AT THE ESP HAD CRACKED AND WERE ALLOWING AMBIENT AIR TO ENTER THE SYSTEM. THE UTILITY

SOUTHWESTERN PUBLIC SERVICE: HARRINGTON 1 (CONT.)

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

REPORTED THEY HAD ORIGINALLY ORDERED VITRON EXPANSION JOINTS BUT INSTEAD RECEIVED CHLOROBUTYL JOINTS WHICH SUBSEQUENTLY FAILED. DUE TO THE INCREASED GAS LOAD THE UTILITY HAS HAD TO RUN MORE MODULES THAN NORMALLY NECESSARY FOR A GIVEN BOILER LOAD. THE UTILITY PLANS TO REPLACE THE EXPANSION JOINTS DURING THE NEXT SCHEDULED OUTAGE IN MAY.

2/81	SYSTEM							672			
3/81	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE 3 WAS SHUT DOWN FOR 24 HOURS TO REPLACE A RUBBER PUMP LINER WHICH HAD BEEN WORN AWAY BY THE PUMP IMPELLERS.

EXCEPT FOR THE PUMP LINER AND EXPANSION JOINT FAILURES THE SCRUBBER SYSTEM OPERATED WELL THROUGHOUT THE JANUARY-MARCH PERIOD.

APPENDIX E
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FOREIGN FGD SYSTEMS

COMPANY NAME	CHUGOKU ELECTRIC	
PLANT NAME	SHIMONOSEKI	
UNIT NUMBER	1	
CITY	SHIMONOSEKI	
COUNTRY	JAPAN	
REGULATORY CLASSIFICATION	****	
PARTICULATE EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	219.	(0.510 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	575	
GROSS UNIT GENERATING CAPACITY - MW	175	
NET UNIT GENERATING CAPACITY W/FGD - MW	*****	
NET UNIT GENERATING CAPACITY WO/FGD - MW	*****	
EQUIVALENT SCRUBBED CAPACITY - MW	175	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	MITSUBISHI	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	266.27	(564255 ACFM)
BOILER FLUE GAS TEMPERATURE - C	130.0	(266 F)
STACK HEIGHT - M	200.	(656 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	3.0	(9.7 FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	****	
AVERAGE HEAT CONTENT - J/G	25046.	(10768 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		****
AVERAGE ASH CONTENT - %	24.60	
RANGE ASH CONTENT - %	****	
AVERAGE MOISTURE CONTENT - %	2.30	
RANGE MOISTURE CONTENT - %	****	
AVERAGE SULFUR CONTENT - %	0.59	
RANGE SULFUR CONTENT - %	****	
AVERAGE CHLORIDE CONTENT - %	0.04	
RANGE CHLORIDE CONTENT - %	0.01-0.11	
*** PARTICLE CONTROL		
** MECHANICAL COLLECTOR		
TYPE	MULTICLONE	
SUPPLIER	MITSUBISHI	
** FABRIC FILTER		
NUMBER	0	
TYPE	NONE	
** ESP		
NUMBER	1	
TYPE	COLD SIDE	
SUPPLIER	MITSUBISHI HEAVY INDUSTRIES	
INLET FLUE GAS CAPACITY - CU.M/S	246.1	(521589 ACFM)
INLET FLUE GAS TEMPERATURE - C	140.0	(284 F)
PRESSURE DROP - KPA	0.8	(3. IN-H2O)
** PARTICLE SCRUBBER		
NUMBER	1	
GENERIC TYPE	SPRAY TOWER	
SPECIFIC TYPE	NR	
TRADE NAME/COMMON NAME	NR	
SUPPLIER	MITSUBISHI	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	AISI 1110	
LINER GENERIC MATERIAL	ORGANIC	
LINER SPECIFIC MATERIAL	SYNTHETIC RUBBER	
GAS CONTACTING DEVICE TYPE	NONE	
NUMBER OF CONTACTING ZONES	1	

CHUGOKU ELECTRIC: SHIMONOSEKI 1 (CONT.)

LIQUID RECIRCULATION RATE - LITER/S	544.3	(8640 GPM)
L/G RATIO - LITER/CU.M	3.0	(22.5 GAL/1000ACF)
SUPERFICIAL GAS VELOCITY - M/S	13.1	(43.0 FT/S)
INLET GAS FLOW RATE - CU.M/S	203.7	(431725 ACFM)

*** FGD SYSTEM

** GENERAL DATA

SALEABLE PRODUCT/THROWAWAY PRODUCT	SALEABLE PRODUCT
SO2 REMOVAL MODE	WET SCRUBBING
PROCESS TYPE	LIMESTONE
PROCESS ADDITIVES	NONE
SYSTEM SUPPLIER	MITSUBISHI HEAVY INDUSTRIES
A-E FIRM	MITSUBISHI
DEVELOPMENT LEVEL	FULL SCALE
NEW/RETROFIT	RETROFIT
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	85.00
CURRENT STATUS	1
COMMERCIAL START-UP	7/1979
INITIAL START-UP	5/1979
CONTRACT AWARDED	5/1977

** DESIGN AND OPERATING PARAMETERS

DESIGN CHLORIDE CONTENT - %	********

** QUENCHER/PRESATURATOR

CONSTRUCTION MATERIAL GENERIC TYPE	NR
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR

** ABSORBER

NUMBER	1	
NUMBER OF SPARES	0	
GENERIC TYPE	COMBINATION TOWER	
SPECIFIC TYPE	NR	
TRADE NAME/COMMON TYPE	N/A	
SUPPLIER	MITSUBISHI	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	AISI 1110	
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A	
LINER GENERIC MATERIAL	ORGANIC	
LINER SPECIFIC MATERIAL	NR	
LINER MATERIAL TRADE NAME/COMMON TYPE	NR	
NUMBER OF CONTACTING ZONES	4	
LIQUID RECIRCULATION RATE - LITER/S	2722.	(43200 GPM)
GAS-SIDE PRESSURE DROP - KPA	1.0	(3.9 IN-H2O)
SUPERFICAL GAS VELOCITY - M/SEC	3.0	(9.8 FT/S)
INLET GAS FLOW - CU. M/S	203.73	(431725 ACFM)
INLET GAS TEMPERATURE - C	50.0	(122 F)
SO2 REMOVAL EFFICIENCY - %	89.0	
PARTICLE REMOVAL EFFICENCY - %	90.0	

** MIST ELIMINATOR

PRE-MIST ELIMINATOR/MIST ELIMINATOR	PRIMARY COLLECTOR	
GENERIC TYPE	IMPINGEMENT	
SPECIFIC TYPE	BAFFLE	
TRADE NAME/COMMON TYPE	CLOSED VANE	
NUMBER OF STAGES	2	
PRESSURE DROP - KPA	0.1	(0.6 IN-H2O)
CONSTRUCTION MATERIAL GENERIC TYPE	NR	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR	
WASH WATER SOURCE	FRESH	
WASH RATE - L/S	200.0	(3170 GAL/MIN)

** REHEATER

GENERIC TYPE	WASTE HEAT RECOVERY	
SPECIFIC TYPE	NR	
TRADE NAME/COMMON TYPE	NR	
TEMPERATURE INCREASE - C	157.8	(284 F)
INLET FLUE GAS FLOW RATE - CU. M/S	203.73	(431725 ACFM)
INLET FLUE GAS TEMPERATURE - C	105.0	(221 F)
CONSTRUCTION MATERIAL GENERIC TYPE	NR	

CHUGOKU ELECTRIC: SHIMONOSEKI 1 (CONT.)

CONSTRUCTION MATERIAL SPECIFIC TYPE	NR
** FANS	
DESIGN	NR
SUPPLIER	MITSUBISHI HEAVY INDUSTRIES
FUNCTION	NR
APPLICATION	NR
SERVICE	NR
FLUE GAS FLOW RATE - CU.M/S	294.04 (623108 ACFM)
FLUE GAS TEMPERATURE - C	140.0 (284 F)
CONSTRUCTION MATERIAL GENERIC TYPE	NR
** DAMPERS	
FUNCTION	NR
GENERIC TYPE	NR
SPECIFIC TYPE	NR
CONSTRUCTION MATERIAL GENERIC TYPE	NR
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR
LINER GENERIC MATERIAL TYPE	NR
LINER SPECIFIC MATERIAL TYPE	NR
** DUCTWORK	
SHELL GENERIC MATERIAL TYPE	NR
SHELL SPECIFIC MATERIAL TYPE	NR
LINER GENERIC MATERIAL TYPE	NR
LINER SPECIFIC MATERIAL TYPE	NR
** REAGENT PREPARATION EQUIPMENT	
FUNCTION	WET BALL MILL
DEVICE	NR
DEVICE TYPE	NR
** TANKS	
SERVICE	NUMBER
-------	------
NR	****
** PUMPS	
SERVICE	NUMBER
-------	------
NR	****
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	CENTRIFUGE
NUMBER	5
NUMBER OF SPARES	0
FEED STREAM CHARACTERISTICS	25% SOLIDS
OUTLET STREAM CHARACTERISTICS	90% SOLIDS
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	THICKENER
NUMBER	1
NUMBER OF SPARES	0
DIMENSIONS - FT	33.0 DIA X 10.0
FEED STREAM CHARACTERISTICS	5% SOLIDS
OUTLET STREAM CHARACTERISTICS	25% SOLIDS
*** SALEABLE BYPRODUCTS	
NATURE	GYPSUM
FULL LOAD QUANTITY - M T/H	6.98 (7.70 TPH)
QUALITY - %	99.0
*** SLUDGE	
** TREATMENT	
METHOD	NR
DEVICE	NR

CHUGOKU ELECTRIC: SHIMONOSEKI 1 (CONT.)

PROPRIETARY PROCESS	NR	
** DISPOSAL		
NATURE	NR	
TYPE	NR	
SITE TREATMENT	NR	
** WATER BALANCE		
WATER LOOP TYPE	OPEN	
EVAPORATION WATER LOSS - LITER/S	3.0	(47 GPM)
POND SEEPAGE/RUNOFF WATER LOSS - LITERS/S	54	
MAKEUP WATER ADDITION - LITERS/S	6.8	(108 GPM)

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
7/79	SYSTEM	100.0	100.0	100.0	50.0			744	372	372	
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	100.0	93.5	100.0	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	100.0	100.0	100.0	53.4			696	372	372	

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JANUARY AND THE FIRST HALF OF FEBRUARY THE FGD UNIT OPERATED WITH NO PROBLEMS. THE BOILER WAS TAKEN OFF-LINE ON FEBRUARY 8 FOR SCHEDULED MAINTENANCE.

3/80	SYSTEM	100.0			0.0			744	0	0	

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER REMAINED DOWN THROUGH MARCH FOR ANNUAL MAINTENANCE.

4/80	SYSTEM	100.0	100.0	100.0	100.0			720	593	593	

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE ANNUAL MAINTENANCE THE SCR (SELECTIVE CATALYTIC REDUCTION OF NOX) UNIT WAS CONNECTED BETWEEN THE BOILER AND AIR PREHEATER. AFTER THE STARTUP ON APRIL 6, COAL ONLY HAS BEEN USED (BEFORE FEBRUARY, COAL AND OIL WERE USED 50:50). EXCEPT FOR A 2 HOUR SHUTDOWN FOR A TURBINE TEST ON APRIL 7, THE FGD SYSTEM HAS OPERATED CONTINUOUSLY WITH NO PROBLEMS.

5/80	SYSTEM	100.0	100.0	100.0	90.3			744	672	672	

CHUGOKU ELECTRIC: SHIMONOSEKI 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE FGD SYSTEM OPERATED CONTINOUSLY WITH NO PROBLEMS. A THREE DAY SHUTDOWN FOR INSPECTION OF THE SCR UNIT FROM MAY 16 TO MAY 19 WAS THE ONLY DOWN TIME EXPERIENCED DURING MAY.									
6/80	SYSTEM	100.0	100.0	100.0	100.0			720	720	720	99.4
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE FGD SYSTEM OPERATED CONTINOUSLY WITH NO PROBLEMS DURING JUNE.									
7/80	SYSTEM	100.0	100.0	100.0	100.0			744	744	744	98.9
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE FGD SYSTEM OPERATED DURING JULY WITH NO PROBLEMS.									
8/80	SYSTEM	88.7	88.7	88.7	88.7			744	744	660	99.5
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING AUGUST THE FGD SYSTEM WAS SHUT DOWN FOR 84 HOURS DUE TO SOME PLUGGING IN THE REHEATER. DURING THIS TIME THE REHEATER WAS WATER WASHED AND THE SOOT BLOWER SYSTEM WAS IMPROVED.									
9/80	SYSTEM	89.0	89.0	89.0	89.0			720	720	641	97.3
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING SEPTEMBER PROBLEMS WITH PLUGGING IN THE REHEATER RECURRED. THE TROUBLE WAS CAUSED BY ESP PROBLEMS, BY WHICH A LARGE AMOUNT OF FLYASH WENT INTO THE REHEATER.									
10/80	SYSTEM	100.0	97.4	100.0	88.0			744	673	655	88.5
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING OCTOBER THE BOILER WAS TAKEN OFF LINE FOR THREE DAYS FOR AN INSPECTION OF THE NOX REMOVAL SYSTEM.									
11/80	SYSTEM	100.0	100.0	100.0	100.0			720	720	720	99.4
12/80	SYSTEM	100.0	100.0	100.0	100.0			744	744	744	99.6
	** PROBLEMS/SOLUTIONS/COMMENTS										
		NO PROBLEMS WERE ENCOUNTERED DURING THE MONTHS OF NOVEMBER AND DECEMBER.									
1/81	SYSTEM							744			
2/81	SYSTEM							672			
3/81	SYSTEM							744			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE FIRST QUARTER 1981 DATA IS NOT AVAILABLE AT THIS TIME; HOWEVER THE DATA WILL BE AVAILABLE IN THE SECOND QUARTER 1981 REPORT.									

APPENDIX E
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FOREIGN FGD SYSTEMS

COMPANY NAME	ELECTRIC POWER DEVELOPMENT	
PLANT NAME	ISOGO	
UNIT NUMBER	1	
CITY	YOKOHAMA	
COUNTRY	JAPAN	
REGULATORY CLASSIFICATION	****	
PARTICULATE EMISSION LIMITATION - NG/J	20.	(0.046 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	58.	(0.135 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	238	
GROSS UNIT GENERATING CAPACITY - MW	265	
NET UNIT GENERATING CAPACITY W/FGD - MW	238	
NET UNIT GENERATING CAPACITY WO/FGD - MW	*****	
EQUIVALENT SCRUBBED CAPACITY - MW	265	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	IHI	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	405.36	(859000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	170.0	(338 F)
STACK HEIGHT - M	122.	(400 FT)
STACK SHELL	CARBON STEEL	
STACK TOP DIAMETER - M	3.7	(12.0 FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	****	
AVERAGE HEAT CONTENT - J/G	25958.	(11160 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		11160-11520
AVERAGE ASH CONTENT - %	16.00	
RANGE ASH CONTENT - %	15.0-17.0	
AVERAGE MOISTURE CONTENT - %	7.00	
RANGE MOISTURE CONTENT - %	6.0-8.0	
AVERAGE SULFUR CONTENT - %	0.60	
RANGE SULFUR CONTENT - %	0.2-0.6	
AVERAGE CHLORIDE CONTENT - %	********	
RANGE CHLORIDE CONTENT - %	****	
*** PARTICLE CONTROL		
** MECHANICAL COLLECTOR		
NUMBER	0	
TYPE	NONE	
** ESP		
NUMBER	2	
TYPE	COLD SIDE	
SUPPLIER	TOYO ENGINEERING	
INLET FLUE GAS CAPACITY - CU.M/S	353.2	(748362 ACFM)
INLET FLUE GAS TEMPERATURE - C	150.0	(302 F)
PARTICLE REMOVAL EFFICENCY - %	98.0	
** PARTICLE SCRUBBER		
NUMBER	1	
NUMBER OF SPARES	0	
GENERIC TYPE	VENTURI TOWER	
SPECIFIC TYPE	NR	
TRADE NAME/COMMON NAME	NR	
SUPPLIER	IHI-CHEMICO	
DIMENSIONS - FT	43.6 DIA X 101.4	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	AISI 1110	
LINER GENERIC MATERIAL	ORGANIC	
LINER SPECIFIC MATERIAL	GLASS FLAKE-FILLED POLYESTER	
GAS CONTACTING DEVICE TYPE	NONE	
NUMBER OF CONTACTING ZONES	1	
LIQUID RECIRCULATION RATE - LITER/S	2194.1	(34827 GPM)
L/G RATIO - LITER/CU.M	9.4	(70.0 GAL/1000ACF)

ELECTRIC POWER DEVELOPMENT: ISOGO 1 (CONT.)

PRESSURE DROP - KPA	1.5	(5.9 IN-H2O)
SUPERFICIAL GAS VELOCITY - M/S	3.0	(10.0 FT/S)
INLET GAS FLOW RATE - CU.M/S	424.6	(899864 ACFM)
INLET GAS TEMPERATURE - C	170.0	(338 F)

*** FGD SYSTEM

** GENERAL DATA

SALEABLE PRODUCT/THROWAWAY PRODUCT	SALEABLE PRODUCT
SO2 REMOVAL MODE	WET SCRUBBING
PROCESS TYPE	LIMESTONE
SYSTEM SUPPLIER	IHI-CHEMICO
DEVELOPMENT LEVEL	FULL SCALE
NEW/RETROFIT	RETROFIT
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	97.00
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	95.00
CURRENT STATUS	1
COMMERCIAL START-UP	3/1976
INITIAL START-UP	12/1975

** DESIGN AND OPERATING PARAMETERS

DESIGN CHLORIDE CONTENT - %	********

** QUENCHER/PRESATURATOR

CONSTRUCTION MATERIAL GENERIC TYPE	NR
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR

** ABSORBER

NUMBER	1	
NUMBER OF SPARES	0	
GENERIC TYPE	VENTURI TOWER	
SPECIFIC TYPE	NR	
TRADE NAME/COMMON TYPE	NR	
SUPPLIER	IHI/CHEMICO	
DIMENSIONS - FT	43.5 DIA X 76.8	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	NR	
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A	
LINER GENERIC MATERIAL	ORGANIC	
LINER SPECIFIC MATERIAL	GLASS FLAKE-FILLED POLYESTER	
LINER MATERIAL TRADE NAME/COMMON TYPE	NR	
GAS CONTACTING DEVICE TYPE	NONE	
NUMBER OF CONTACTING ZONES	1	
LIQUID RECIRCULATION RATE - LITER/S	2194.	(34827 GPM)
L/G RATIO - L/CU.M	9.4	(70.0 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	1.5	(5.9 IN-H2O)
SUPERFICAL GAS VELOCITY - M/SEC	3.0	(10.0 FT/S)
INLET GAS FLOW - CU. M/S	566.28	(1200000 ACFM)
INLET GAS TEMPERATURE - C	55.0	(131 F)
PARTICLE REMOVAL EFFICENCY - %	96.7	

** MIST ELIMINATOR

PRE-MIST ELIMINATOR/MIST ELIMINATOR	PRIMARY COLLECTOR	
GENERIC TYPE	IMPINGEMENT	
SPECIFIC TYPE	BAFFLE	
TRADE NAME/COMMON TYPE	CLOSED VANE	
CONFIGURATION	HORIZONTAL	
NUMBER OF STAGES	4	
NUMBER OF PASSES PER STAGE	4	
PRESSURE DROP - KPA	0.5	(2.0 IN-H2O)
SUPERFICAL GAS VELOCITY - M/S	3.0	(9.8 FT/S)
CONSTRUCTION MATERIAL GENERIC TYPE	ORGANIC	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR	
WASH FREQUENCY	INTERMITTENT	

** REHEATER

GENERIC TYPE	DIRECT COMBUSTION	
SPECIFIC TYPE	NR	
TRADE NAME/COMMON TYPE	OIL	
TEMPERATURE INCREASE - C	83.9	(151 F)
INLET FLUE GAS TEMPERATURE - C	120.0	(248 F)

ELECTRIC POWER DEVELOPMENT: ISOGO 1 (CONT.)

CONSTRUCTION MATERIAL GENERIC TYPE	NR	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR	
** FANS		
NUMBER	2	
NUMBER OF SPARES	0	
DESIGN	NR	
FUNCTION	BOOSTER	
APPLICATION	NR	
SERVICE	NR	
FLUE GAS FLOW RATE - CU.M/S	362.14	(767400 ACFM)
FLUE GAS TEMPERATURE - C	170.0	(338 F)
CONSTRUCTION MATERIAL GENERIC TYPE	NR	
** DAMPERS		
FUNCTION	NR	
GENERIC TYPE	NR	
SPECIFIC TYPE	NR	
CONSTRUCTION MATERIAL GENERIC TYPE	NR	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR	
LINER GENERIC MATERIAL TYPE	NR	
LINER SPECIFIC MATERIAL TYPE	NR	
** DUCTWORK		
SHELL GENERIC MATERIAL TYPE	NR	
SHELL SPECIFIC MATERIAL TYPE	NR	
LINER GENERIC MATERIAL TYPE	NR	
LINER SPECIFIC MATERIAL TYPE	NR	
** REAGENT PREPARATION EQUIPMENT		
FUNCTION	WET BALL MILL	
DEVICE	NR	
DEVICE TYPE	NR	

** TANKS

SERVICE	NUMBER
WASTE SLURRY BLEED	1
ABSORBER RECYCLE	****
REAGENT PREP PRODUCT	1
THICKENER OVERFLOW	1
VACUUM FILTER FILTRATE	1
SPARGER/OXIDIZER	1

** PUMPS

SERVICE	NUMBER
SLURRY MAKEUP	3
ABSORBER RECIRCULATION	8
OXIDATION TOWER SUPPLY TRANSFER	2
FILTRATE	2

** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	CENTRIFUGE
NUMBER	4
NUMBER OF SPARES	1
FEED STREAM CHARACTERISTICS	18.5% SOLIDS
OUTLET STREAM CHARACTERISTICS	90% SOLIDS
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	THICKENER
NUMBER	1
NUMBER OF SPARES	0
DIMENSIONS - FT	20.0 DIA X 10.0
FEED STREAM CHARACTERISTICS	8.5% SOLIDS
OUTLET STREAM CHARACTERISTICS	18.6% SOLIDS
*** SALEABLE BYPRODUCTS	
NATURE	GYPSUM

ELECTRIC POWER DEVELOPMENT: ISOGO 1 (CONT.)

FULL LOAD QUANTITY - M T/H	4.53	(5.00 TPH)
DISPOSITION	MARKETED	

*** SLUDGE

** TREATMENT

METHOD	FORCED OXIDATION
DEVICE	OXIDATION TANK
PROPRIETARY PROCESS	N/A

** DISPOSAL

NATURE	NR
TYPE	NR
SITE TREATMENT	NR

** PROCESS CONTROL AND INSTRUMENTATION

CHEMICAL PARAMETERS	PH
PROCESS CONTROL MANNER	AUTOMATIC
PROCESS CHEMISTRY MODE	FEEDBACK

** WATER BALANCE

WATER LOOP TYPE	OPEN	
POND SEEPAGE/RUNOFF WATER LOSS - LITERS/S	40	
MAKEUP WATER ADDITION - LITERS/S	22.3	(354 GPM)

PERFORMANCE DATA

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

** PROBLEMS/SOLUTIONS/COMMENTS

100% AVAILABILITY FOR THE FGD SYSTEM WAS REPORTED DURING THE PERIOD APRIL 1978 THROUGH MARCH 1979. THE SYSTEM SO2 REMOVAL EFFICIENCY WAS REPORTEDLY AVERAGING 95%.

4/79	SYSTEM							720			
5/79	SYSTEM							744			
6/79	SYSTEM							720			
7/79	SYSTEM							744			

ELECTRIC POWER DEVELOPMENT: ISOGO 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
				PERFORMANCE DATA							
8/79	SYSTEM							744			
9/79	SYSTEM							720			
10/79	SYSTEM							744			
11/79	SYSTEM							720			
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 APRIL 1979 THROUGH MARCH 1980 PERIOD.										
4/80	SYSTEM	100.0	100.0	100.0	100.0			720	720	720	
	** PROBLEMS/SOLUTIONS/COMMENTS										
	THE FGD SYSTEM OPERATED ALONG WITH THE BOILER FOR THE ENTIRE MONTH OF APRIL.										
5/80	SYSTEM	100.0	100.0	100.0	52.8			744	393	393	
6/80	SYSTEM	100.0	100.0	100.0	10.0			720	72	72	
	** PROBLEMS/SOLUTIONS/COMMENTS										
	THE BOILER WAS SHUT DOWN FROM MAY 17 TO JUNE 27 FOR ANNUAL MAINTENANCE. THE FGD SYSTEM WAS OPERATED DURING ALL OF THE BOILER OPERATION IN MAY AND JUNE.										
7/80	SYSTEM	100.0	100.0	100.0	100.0			744	744	744	90.9
8/80	SYSTEM	100.0	100.0	100.0	100.0			744	744	744	91.9
9/80	SYSTEM	100.0	100.0	100.0	99.8			720	718	718	90.4
	** PROBLEMS/SOLUTIONS/COMMENTS										
	DURING SEPTEMBER THE BOILER WAS OUT OF SERVICE FOR APPROXIMATELY TWO HOURS TO CHANGE THE TAP ON THE MAIN TRANSFORMER.										
10/80	SYSTEM	100.0	100.0	100.0	91.4			744	680	680	84.5
11/80	SYSTEM	100.0	100.0	100.0	100.0			720	720	720	91.7
12/80	SYSTEM	100.0	100.0	100.0	100.0			744	744	744	93.2
	** PROBLEMS/SOLUTIONS/COMMENTS										
	DURING JULY THROUGH DECEMBER THE FGD SYSTEM EXPERIENCED NO OPERATIONAL PROBLEMS.										
1/81	SYSTEM							744			
2/81	SYSTEM							672			
3/81	SYSTEM							744			

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

ELECTRIC POWER DEVELOPMENT: ISOGO 1 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

THE FIRST QUARTER 1981 DATA IS NOT AVAILABLE AT THIS TIME; HOWEVER THE DATA WILL BE AVAILABLE IN THE SECOND QUARTER 1981 REPORT.

APPENDIX E
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FOREIGN FGD SYSTEMS

COMPANY NAME	ELECTRIC POWER DEVELOPMENT	
PLANT NAME	ISOGO	
UNIT NUMBER	2	
CITY	YOKOHAMA	
COUNTRY	JAPAN	
REGULATORY CLASSIFICATION	****	
PARTICULATE EMISSION LIMITATION - NG/J	20.	(0.046 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	58.	(0.135 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	238	
GROSS UNIT GENERATING CAPACITY - MW	265	
NET UNIT GENERATING CAPACITY W/FGD - MW	238	
NET UNIT GENERATING CAPACITY WO/FGD - MW	246	
EQUIVALENT SCRUBBED CAPACITY - MW	265	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	IHI	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	405.36	(859000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	170.0	(338 F)
STACK HEIGHT - M	140.	(460 FT)
STACK SHELL	CARBON STEEL	
STACK TOP DIAMETER - M	3.7	(12.0 FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	****	
AVERAGE HEAT CONTENT - J/G	25958.	(11160 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		11160-11520
AVERAGE ASH CONTENT - %	16.00	
RANGE ASH CONTENT - %	15.0-17.0	
AVERAGE MOISTURE CONTENT - %	7.00	
RANGE MOISTURE CONTENT - %	6.0-8.0	
AVERAGE SULFUR CONTENT - %	0.60	
RANGE SULFUR CONTENT - %	0.2-0.6	
AVERAGE CHLORIDE CONTENT - %	********	
RANGE CHLORIDE CONTENT - %	****	
*** PARTICLE CONTROL		
** MECHANICAL COLLECTOR		
NUMBER	0	
TYPE	NONE	
** ESP		
NUMBER	2	
INLET FLUE GAS CAPACITY - CU.M/S	356.6	(755654 ACFM)
INLET FLUE GAS TEMPERATURE - C	150.0	(302 F)
PARTICLE REMOVAL EFFICENCY - %	98.0	
** PARTICLE SCRUBBER		
NUMBER	1	
NUMBER OF SPARES	0	
GENERIC TYPE	VENTURI TOWER	
SPECIFIC TYPE	NR	
TRADE NAME/COMMON NAME	NR	
SUPPLIER	IHI-CHEMICO	
DIMENSIONS - FT	43.6 DIA X 101.4	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	AISI 1110	
LINER GENERIC MATERIAL	ORGANIC	
LINER SPECIFIC MATERIAL	GLASS FLAKE-FILLED POLYESTER	
GAS CONTACTING DEVICE TYPE	NONE	
NUMBER OF CONTACTING ZONES	1	
LIQUID RECIRCULATION RATE - LITER/S	2194.1	(34827 GPM)
L/G RATIO - LITER/CU.M	9.4	(70.0 GAL/1000ACF)
PRESSURE DROP - KPA	1.5	(5.9 IN-H2O)
SUPERFICIAL GAS VELOCITY - M/S	3.0	(10.0 FT/S)

ELECTRIC POWER DEVELOPMENT: ISOGO 2 (CONT.)

INLET GAS FLOW RATE - CU.M/S	424.6	(899864 ACFM)
INLET GAS TEMPERATURE - C	170.0	(338 F)

*** FGD SYSTEM

** GENERAL DATA

SALEABLE PRODUCT/THROWAWAY PRODUCT	SALEABLE PRODUCT
SO2 REMOVAL MODE	WET SCRUBBING
PROCESS TYPE	LIMESTONE
SYSTEM SUPPLIER	IHI-CHEMICO
DEVELOPMENT LEVEL	FULL SCALE
NEW/RETROFIT	RETROFIT
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	97.00
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	95.00
ENERGY CONSUMPTION - %	3.0
CURRENT STATUS	1
COMMERCIAL START-UP	5/1976
INITIAL START-UP	3/1976

** DESIGN AND OPERATING PARAMETERS

DESIGN CHLORIDE CONTENT - %	********

** QUENCHER/PRESATURATOR

CONSTRUCTION MATERIAL GENERIC TYPE	NR
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR

** ABSORBER

NUMBER	1	
NUMBER OF SPARES	0	
GENERIC TYPE	VENTURI TOWER	
SPECIFIC TYPE	NR	
TRADE NAME/COMMON TYPE	NR	
SUPPLIER	IHI/CHEMICO	
DIMENSIONS - FT	43.5 DIA X 76.8	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	NR	
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A	
LINER GENERIC MATERIAL	ORGANIC	
LINER SPECIFIC MATERIAL	GLASS FLAKE-FILLED POLYESTER	
LINER MATERIAL TRADE NAME/COMMON TYPE	NR	
GAS CONTACTING DEVICE TYPE	NONE	
NUMBER OF CONTACTING ZONES	1	
LIQUID RECIRCULATION RATE - LITER/S	2194.	(34827 GPM)
L/G RATIO - L/CU.M	9.4	(70.0 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	1.5	(5.9 IN-H2O)
SUPERFICAL GAS VELOCITY - M/SEC	3.0	(10.0 FT/S)
INLET GAS FLOW - CU. M/S	566.28	(1200000 ACFM)
INLET GAS TEMPERATURE - C	55.0	(131 F)
PARTICLE REMOVAL EFFICENCY - %	96.7	

** MIST ELIMINATOR

PRE-MIST ELIMINATOR/MIST ELIMINATOR	PRIMARY COLLECTOR	
GENERIC TYPE	IMPINGEMENT	
SPECIFIC TYPE	BAFFLE	
TRADE NAME/COMMON TYPE	CLOSED VANE	
CONFIGURATION	HORIZONTAL	
NUMBER OF STAGES	4	
NUMBER OF PASSES PER STAGE	4	
PRESSURE DROP - KPA	0.5	(2.0 IN-H2O)
SUPERFICAL GAS VELOCITY - M/S	3.0	(9.8 FT/S)
CONSTRUCTION MATERIAL GENERIC TYPE	ORGANIC	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR	
WASH FREQUENCY	INTERMITTENT	

** REHEATER

GENERIC TYPE	DIRECT COMBUSTION	
SPECIFIC TYPE	NR	
TRADE NAME/COMMON TYPE	OIL	
TEMPERATURE INCREASE - C	83.9	(151 F)
INLET FLUE GAS FLOW RATE - CU. M/S	132.50	(280783 ACFM)
INLET FLUE GAS TEMPERATURE - C	120.0	(248 F)

ELECTRIC POWER DEVELOPMENT: ISOGO 2 (CONT.)

CONSTRUCTION MATERIAL GENERIC TYPE	NR	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR	
** FANS		
NUMBER	2	
NUMBER OF SPARES	0	
DESIGN	NR	
FUNCTION	BOOSTER	
APPLICATION	NR	
SERVICE	NR	
FLUE GAS FLOW RATE - CU.M/S	362.14	(767400 ACFM)
FLUE GAS TEMPERATURE - C	170.0	(338 F)
CONSTRUCTION MATERIAL GENERIC TYPE	NR	
** DAMPERS		
FUNCTION	NR	
GENERIC TYPE	NR	
SPECIFIC TYPE	NR	
CONSTRUCTION MATERIAL GENERIC TYPE	NR	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR	
LINER GENERIC MATERIAL TYPE	NR	
LINER SPECIFIC MATERIAL TYPE	NR	
** DUCTWORK		
SHELL GENERIC MATERIAL TYPE	NR	
SHELL SPECIFIC MATERIAL TYPE	NR	
LINER GENERIC MATERIAL TYPE	NR	
LINER SPECIFIC MATERIAL TYPE	NR	
** REAGENT PREPARATION EQUIPMENT		
FUNCTION	WET BALL MILL	
DEVICE	NR	
DEVICE TYPE	NR	

** TANKS

SERVICE	NUMBER
WASTE SLURRY BLEED	1
REAGENT PREP PRODUCT	1
THICKENER OVERFLOW	1
VACUUM FILTER FILTRATE	1
SPARGER/OXIDIZER	1

** PUMPS

SERVICE	NUMBER
SLURRY MAKEUP	2
ABSORBER RECIRCULATION	8
OXIDATION TOWER SUPPLY TRANSFER	2
FILTRATE	2

** SOLIDS CONCENTRATING/DEWATERING		
DEVICE	CENTRIFUGE	
NUMBER	4	
NUMBER OF SPARES	0	
FEED STREAM CHARACTERISTICS	18.5% SOLIDS	
OUTLET STREAM CHARACTERISTICS	90% SOLIDS	
** SOLIDS CONCENTRATING/DEWATERING		
DEVICE	THICKENER	
NUMBER	1	
NUMBER OF SPARES	0	
DIMENSIONS - FT	20.0 DIA X 10.0	
FEED STREAM CHARACTERISTICS	8.5% SOLIDS	
OUTLET STREAM CHARACTERISTICS	18.6% SOLIDS	
*** SALEABLE BYPRODUCTS		
NATURE	GYPSUM	
FULL LOAD QUANTITY - M T/H	4.53	(5.00 TPH)

ELECTRIC POWER DEVELOPMENT: ISOGO 2 (CONT.)

DISPOSITION	MARKETED

*** SLUDGE

** TREATMENT

METHOD	FORCED OXIDATION
DEVICE	OXIDATION TANK
PROPRIETARY PROCESS	N/A

** DISPOSAL

NATURE	NR
TYPE	NR
SITE TREATMENT	NR

** PROCESS CONTROL AND INSTRUMENTATION

CHEMICAL PARAMETERS	PH
PROCESS CONTROL MANNER	AUTOMATIC
PROCESS CHEMISTRY MODE	FEEDBACK

** WATER BALANCE

WATER LOOP TYPE	OPEN
POND SEEPAGE/RUNOFF WATER LOSS - LITERS/S	40
MAKEUP WATER ADDITION - LITERS/S	22.3 (354 GPM)

PERFORMANCE DATA

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

** PROBLEMS/SOLUTIONS/COMMENTS

100% AVAILABILITY FOR THE FGD SYSTEM WAS REPORTED DURING THE PERIOD APRIL 1978 THROUGH MARCH 1979. THE FGD SYSTEM LOGGED A TOTAL OF 1,689 HOURS OF OPERATION.

4/79	SYSTEM							720			
5/79	SYSTEM							744			
6/79	SYSTEM							720			
7/79	SYSTEM							744			
8/79	SYSTEM							744			

ELECTRIC POWER DEVELOPMENT: ISOGO 2 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
9/79	SYSTEM							720			
10/79	SYSTEM							744			
11/79	SYSTEM							720			
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 APRIL 1979 THROUGH MARCH 1980 PERIOD.										
4/80	SYSTEM	100.0	100.0	100.0	31.3			720	225	225	
	** PROBLEMS/SOLUTIONS/COMMENTS										
	ON MARCH 30 THE BOILER WAS SHUTDOWN FOR ANNUAL MAINTENANCE. THE UNIT REMAINED DOWN THROUGH APRIL 20. WHEN OPERATIONS COMMENCED THE FGD SYSTEM OPERATED WITH THE BOILER FOR THE REST OF THE MONTH.										
5/80	SYSTEM	100.0	100.0	100.0	100.0			744	744	744	
6/80	SYSTEM	100.0	100.0	100.0	100.0			720	720	720	
	** PROBLEMS/SOLUTIONS/COMMENTS										
	DURING MAY AND JUNE THE FGD SYSTEM OPERATED WITH NO REPORTED PROBLEMS.										
7/80	SYSTEM	100.0	100.0	100.0	88.2			744	656	656	82.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
	DURING JULY THE BOILER WAS OFF LINE APPROXIMATELY 88 HOURS FOR MAINTENANCE.										
8/80	SYSTEM	100.0	100.0	100.0	100.0			744	744	744	91.9
9/80	SYSTEM	100.0	100.0	100.0	99.8			720	718	718	92.1
	** PROBLEMS/SOLUTIONS/COMMENTS										
	APPROXIMATELY TWO HOURS OF BOILER OUTAGE TIME WAS NECESSARY TO CHANGE THE TAP OF THE MAIN TRANSFORMER.										
10/80	SYSTEM	100.0	100.0	100.0	100.0			744	744	744	92.2
11/80	SYSTEM	100.0	100.0	100.0	100.0			720	720	720	92.7
12/80	SYSTEM	100.0	100.0	100.0	100.0			744	744	744	
	** PROBLEMS/SOLUTIONS/COMMENTS										
	DURING JULY THROUGH DECEMBER THE FGD SYSTEM OPERATED WITH NO PROBLEMS.										
1/81	SYSTEM							744			
2/81	SYSTEM							672			

ELECTRIC POWER DEVELOPMENT: ISOGO 2 (CONT.)

PERIOD	MODULE	PERFORMANCE DATA: AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
3/81	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

THE FIRST QUARTER 1981 DATA IS NOT AVAILABLE AT THIS TIME; HOWEVER THE DATA WILL BE AVAILABLE IN THE SECOND QUARTER 1981 REPORT.

APPENDIX E
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FOREIGN FGD SYSTEMS

COMPANY NAME	ELECTRIC POWER DEVELOPMENT	
PLANT NAME	TAKASAGO	
UNIT NUMBER	1	
CITY	TAKASAGO	
COUNTRY	JAPAN	
REGULATORY CLASSIFICATION	****	
PARTICULATE EMISSION LIMITATION - NG/J	37.	(0.086 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	150.	(0.350 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	230	
GROSS UNIT GENERATING CAPACITY - MW	250	
NET UNIT GENERATING CAPACITY W/FGD - MW	230	
NET UNIT GENERATING CAPACITY WO/FGD - MW	238	
EQUIVALENT SCRUBBED CAPACITY - MW	250	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	MITSUBISHI	
BOILER TYPE	****	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	365.25	(774000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	154.4	(310 F)
STACK HEIGHT - M	180.	(590 FT)
STACK SHELL	CARBON STEEL	
STACK TOP DIAMETER - M	3.6	(11.9 FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	****	
AVERAGE HEAT CONTENT - J/G	25958.	(11160 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		11160-11520
AVERAGE ASH CONTENT - %	22.00	
RANGE ASH CONTENT - %	****	
AVERAGE MOISTURE CONTENT - %	7.00	
RANGE MOISTURE CONTENT - %	****	
AVERAGE SULFUR CONTENT - %	1.80	
RANGE SULFUR CONTENT - %	****	
AVERAGE CHLORIDE CONTENT - %	********	
RANGE CHLORIDE CONTENT - %	****	
*** PARTICLE CONTROL		
** MECHANICAL COLLECTOR		
NUMBER	0	
TYPE	NONE	
** ESP		
NUMBER	1	
TYPE	COLD SIDE	
SUPPLIER	MITSUBISHI HEAVY INDUSTRIES	
INLET FLUE GAS CAPACITY - CU.M/S	344.3	(729507 ACFM)
INLET FLUE GAS TEMPERATURE - C	154.4	(310 F)
PARTICLE REMOVAL EFFICENCY - %	99.5	
** PARTICLE SCRUBBER		
NUMBER	1	
NUMBER OF SPARES	0	
GENERIC TYPE	VENTURI TOWER	
SPECIFIC TYPE	NR	
TRADE NAME/COMMON NAME	NR	
SUPPLIER	MITSUI-CHEMICO	
DIMENSIONS - FT	37.7 DIA X 62.3	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	AISI 1110	
LINER GENERIC MATERIAL	ORGANIC	
LINER SPECIFIC MATERIAL	NR	
GAS CONTACTING DEVICE TYPE	NONE	
NUMBER OF CONTACTING ZONES	1	
LIQUID RECIRCULATION RATE - LITER/S	1228.8	(19505 GPM)
L/G RATIO - LITER/CU.M	6.5	(48.6 GAL/1000ACF)

ELECTRIC POWER DEVELOPMENT: TAKASAGO 1 (CONT.)

PRESSURE DROP - KPA	1.5	(5.9 IN-H2O)
INLET GAS FLOW RATE - CU.M/S	260.5	(552000 ACFM)
INLET GAS TEMPERATURE - C	154.4	(310 F)
SO2 REMOVAL EFFICENCY - %	56.0	
PARTICLE REMOVAL EFFICIENCY - %	50.0	

*** FGD SYSTEM

** GENERAL DATA

SALEABLE PRODUCT/THROWAWAY PRODUCT	SALEABLE PRODUCT
SO2 REMOVAL MODE	WET SCRUBBING
PROCESS TYPE	LIMESTONE
SYSTEM SUPPLIER	MITSUI-CHEMICO
DEVELOPMENT LEVEL	FULL SCALE
NEW/RETROFIT	RETROFIT
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	93.00
ENERGY CONSUMPTION - %	3.2
CURRENT STATUS	1
INITIAL START-UP	2/1975

** DESIGN AND OPERATING PARAMETERS

DESIGN CHLORIDE CONTENT - %	********

** QUENCHER/PRESATURATOR

CONSTRUCTION MATERIAL GENERIC TYPE	NR
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR

** ABSORBER

NUMBER	1	
NUMBER OF SPARES	0	
GENERIC TYPE	VENTURI TOWER	
SPECIFIC TYPE	NR	
TRADE NAME/COMMON TYPE	NR	
SUPPLIER	MITSUI/CHEMICO	
DIMENSIONS - FT	45.9 DIA X 78.7	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	NR	
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A	
LINER GENERIC MATERIAL	NR	
LINER SPECIFIC MATERIAL	NR	
LINER MATERIAL TRADE NAME/COMMON TYPE	NR	
GAS CONTACTING DEVICE TYPE	NONE	
NUMBER OF CONTACTING ZONES	1	
LIQUID RECIRCULATION RATE - LITER/S	2566.	(40727 GPM)
L/G RATIO - L/CU.M	6.5	(48.6 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	1.5	(5.9 IN-H2O)
INLET GAS TEMPERATURE - C	55.0	(131 F)
SO2 REMOVAL EFFICIENCY - %	85.0	

** ABSORBER

NUMBER	1	
GENERIC TYPE	VENTURI TOWER	
SPECIFIC TYPE	NR	
TRADE NAME/COMMON TYPE	NR	
SUPPLIER	MITSUI/CHEMICO	
DIMENSIONS - FT	26.2 DIA X 82.3	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	NR	
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A	
LINER GENERIC MATERIAL	NR	
LINER SPECIFIC MATERIAL	NR	
LINER MATERIAL TRADE NAME/COMMON TYPE	NR	
GAS CONTACTING DEVICE TYPE	NONE	
NUMBER OF CONTACTING ZONES	1	
LIQUID RECIRCULATION RATE - LITER/S	610.	(9689 GPM)
INLET GAS FLOW - CU. M/S	69.37	(147000 ACFM)
INLET GAS TEMPERATURE - C	154.4	(310 F)
SO2 REMOVAL EFFICIENCY - %	63.0	

ELECTRIC POWER DEVELOPMENT: TAKASAGO 1 (CONT.)

** ABSORBER		
NUMBER	2	
GENERIC TYPE	SPRAY TOWER	
SPECIFIC TYPE	NR	
TRADE NAME/COMMON TYPE	NR	
SUPPLIER	MITSUI/CHEMICO	
DIMENSIONS - FT	19.7 DIA X 65.0	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	NR	
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A	
LINER GENERIC MATERIAL	NR	
LINER SPECIFIC MATERIAL	NR	
LINER MATERIAL TRADE NAME/COMMON TYPE	NR	
GAS CONTACTING DEVICE TYPE	NONE	
NUMBER OF CONTACTING ZONES	1	
LIQUID RECIRCULATION RATE - LITER/S	9986.	(***** GPM)
INLET GAS FLOW - CU. M/S	18.26	(38686 ACFM)
INLET GAS TEMPERATURE - C	154.4	(310 F)
** MIST ELIMINATOR		
PRE-MIST ELIMINATOR/MIST ELIMINATOR	PRIMARY COLLECTOR	
GENERIC TYPE	IMPINGEMENT	
SPECIFIC TYPE	BAFFLE	
TRADE NAME/COMMON TYPE	CLOSED VANE	
NUMBER OF STAGES	4	
NUMBER OF PASSES PER STAGE	4	
CONSTRUCTION MATERIAL GENERIC TYPE	NR	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR	
WASH WATER SOURCE	BLENDED	
** REHEATER		
NUMBER	1	
GENERIC TYPE	DIRECT COMBUSTION	
SPECIFIC TYPE	NR	
TRADE NAME/COMMON TYPE	OIL	
INLET FLUE GAS TEMPERATURE - C	120.0	(248 F)
CONSTRUCTION MATERIAL GENERIC TYPE	NR	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR	
** FANS		
DESIGN	NR	
FUNCTION	BOOSTER	
APPLICATION	NR	
SERVICE	NR	
CONSTRUCTION MATERIAL GENERIC TYPE	NR	
** DAMPERS		
FUNCTION	NR	
GENERIC TYPE	NR	
SPECIFIC TYPE	NR	
CONSTRUCTION MATERIAL GENERIC TYPE	NR	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR	
LINER GENERIC MATERIAL TYPE	NR	
LINER SPECIFIC MATERIAL TYPE	NR	
** DUCTWORK		
SHELL GENERIC MATERIAL TYPE	NR	
SHELL SPECIFIC MATERIAL TYPE	NR	
LINER GENERIC MATERIAL TYPE	NR	
LINER SPECIFIC MATERIAL TYPE	NR	
** REAGENT PREPARATION EQUIPMENT		
FUNCTION	WET BALL MILL	
DEVICE	NR	
DEVICE TYPE	NR	

ELECTRIC POWER DEVELOPMENT: TAKASAGO 1 (CONT.)

** TANKS

SERVICE	NUMBER
CENTRIFUGE	3
REAGENT PREP PRODUCT	1
ABSORBER RECYCLE	2

** PUMPS

SERVICE	NUMBER
CIRCULATION	5
PH ADJUSTER CIRCULATION	3
REACTOR CIRCULATION	3

** SOLIDS CONCENTRATING/DEWATERING

DEVICE	CENTRIFUGE
NUMBER	7
OUTLET STREAM CHARACTERISTICS	90% SOLIDS

** SOLIDS CONCENTRATING/DEWATERING

DEVICE	THICKENER
OUTLET STREAM CHARACTERISTICS	20% SOLIDS

*** SALEABLE BYPRODUCTS

NATURE	GYPSUM
FULL LOAD QUANTITY - M T/H	8.62 (9.50 TPH)

*** SLUDGE

** TREATMENT

METHOD	FORCED OXIDATION
DEVICE	OXIDATION TANK
PROPRIETARY PROCESS	N/A

** DISPOSAL

NATURE	NR
TYPE	NR
SITE TREATMENT	NR

** PROCESS CONTROL AND INSTRUMENTATION

CHEMICAL PARAMETERS	FLUE GAS VOLUME & SO2 CONCENTRATION

** WATER BALANCE

WATER LOOP TYPE	OPEN
POND SEEPAGE/RUNOFF WATER LOSS - LITERS/S	40
MAKEUP WATER ADDITION - LITERS/S	13.1 (208 GPM)

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
2/75	SYSTEM	96.9			88.8			672	616	597	

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS DOWN ONCE DUE TO A PIPING FLANGE LEAK.

3/75	SYSTEM	100.0			48.4			744	360	360	
4/75	SYSTEM	100.0			44.1			720	318	318	

ELECTRIC POWER DEVELOPMENT: TAKASAGO 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE BOILER WAS TAKEN OFF-LINE FOR ANNUAL MAINTENANCE DURING MARCH AND APRIL.									
5/75	SYSTEM	100.0		96.4				744	717	717	
6/75	SYSTEM	97.9		97.9				720	720	705	
7/75	SYSTEM	98.0		97.8				744	743	728	
8/75	SYSTEM	98.0		98.0				744	744	729	
9/75	SYSTEM	95.7		91.7				720	690	660	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		SYSTEM DOWN TIME FROM JUNE THROUGH SEPTEMBER WAS DUE TO MIST ELIMINATOR SCALING.									
10/75	SYSTEM	95.2		95.2				744	744	708	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		FAN VIBRATIONS CAUSED A SYSTEM OUTAGE DURING THE MONTH.									
11/75	SYSTEM	98.5		98.5				720	720	709	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		MIST ELIMINATOR SCALING WAS ENCOUNTERED IN NOVEMBER.									
12/75	SYSTEM	95.9		92.2				744	715	686	
1/76	SYSTEM	100.0		100.0				744	744	744	
2/76	SYSTEM	95.2		90.8				696	664	632	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING FEBRUARY, THE SYSTEM AGAIN ENCOUNTERED MIST ELIMINATOR SCALING.									
3/76	SYSTEM	100.0		92.3				744	687	687	
4/76	SYSTEM	100.0		30.4				720	219	219	
5/76	SYSTEM	100.0		100.0				744	744	744	
6/76	SYSTEM	100.0		100.0				720	720	720	
7/76	SYSTEM	100.0		100.0				744	744	744	
8/76	SYSTEM							744	744		
9/76	SYSTEM	100.0		100.0				720	720	720	
10/76	SYSTEM	91.7		91.7				744	744	682	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE SYSTEM WAS TAKEN OFF-LINE FOR CLEANING OF THE FIRST STAGE SCRUBBER.									
11/76	SYSTEM	99.3		99.3				720	720	715	

ELECTRIC POWER DEVELOPMENT: TAKASAGO 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
		REPAIR OF A DUCT FORCED ONE SYSTEM OUTAGE DURING THE MONTH.									
12/76	SYSTEM		98.9		98.9			744	744	736	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		A DECEMBER OUTAGE WAS DUE TO THE REPAIR OF A SPRAY PIPE.									
1/77	SYSTEM		99.3		99.3			744	744	739	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE SYSTEM WAS TAKEN OFF-LINE ONCE FOR CLEANING OF THE FIRST STAGE SCRUBBER.									
2/77	SYSTEM		100.0		100.0			672	672	672	
3/77	SYSTEM				0.0			744	0	0	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE SYSTEM WAS OFF DURING MARCH FOR ANNUAL BOILER MAINTENANCE.									
4/77	SYSTEM		100.0		71.3			720	513	513	
5/77	SYSTEM		98.7		98.7			744	744	734	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		FAN VIBRATIONS CAUSED ONE SYSTEM OUTAGE DURING MAY.									
6/77	SYSTEM		100.0		100.0			720	720	720	
7/77	SYSTEM		100.0		96.4			744	717	717	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE FIRST STAGE ABSORBER WAS CLEANED DURING JULY.									
8/77	SYSTEM		100.0		100.0			744	744	744	
9/77	SYSTEM		100.0		100.0			720	720	720	
10/77	SYSTEM		94.2		94.2			744	744	701	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE SYSTEM WAS OFF LINE PART OF THIS MONTH FOR CLEANING OF THE SCRUBBERS AND REACTORS.									
11/77	SYSTEM		100.0		100.0			720	720	720	
12/77	SYSTEM		100.0		100.0			744	744	744	
1/78	SYSTEM		100.0		100.0			744	744	744	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE FIRST REACTOR WAS CLEANED THIS MONTH.									
4/78	SYSTEM							720			

ELECTRIC POWER DEVELOPMENT: TAKASAGO 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
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			
	** PROBLEMS/SOLUTIONS/COMMENTS										
	DURING APRIL 1978 THROUGH MARCH 1979 NO FORCED OUTAGES OCCURRED. THE FGD SYSTEM AVAILABILITY WAS 99.9%, AND LOGGED A TOTAL OF 7823.4 HOURS OF OPERATION WITH 6.1 HOURS OF SCHEDULED OUTAGE TIME.										
4/79	SYSTEM							720			
6/79	SYSTEM							720			
7/79	SYSTEM							744			
8/79	SYSTEM							744			
9/79	SYSTEM							720			
10/79	SYSTEM							744			
11/79	SYSTEM							720			
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 APRIL 1979 THROUGH MARCH 1980 PERIOD.										
4/80	SYSTEM	100.0	100.0	100.0	31.1			720	224	224	
	** PROBLEMS/SOLUTIONS/COMMENTS										
	THE BOILER WAS SHUTDOWN ON MARCH 29 FOR ANNUAL MAINTENANCE. THE UNIT REMAINED OFF LINE THROUGH APRIL 21. WHEN OPERATIONS COMMENCED THE FGD SYSTEM OPERATED WITH THE BOILER FOR THE REST OF THE MONTH.										
5/80	SYSTEM	100.0	100.0	100.0	100.0			744	744	744	

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

ELECTRIC POWER DEVELOPMENT: TAKASAGO 1 (CONT.)

PERIOD	MODULE	PERFORMANCE DATA AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
6/80	SYSTEM	100.0	100.0	100.0	100.0			720	720	720	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE FGD SYSTEM EXPERIENCED NO PROBLEMS DURING THE MAY-JUNE PERIOD.									
7/80	SYSTEM	100.0	100.0	100.0	100.0			744	744	744	83.4
8/80	SYSTEM	100.0	100.0	100.0	100.0			744	744	744	83.6
9/80	SYSTEM	100.0	100.0	100.0	100.0			720	720	720	83.3
	** PROBLEMS/SOLUTIONS/COMMENTS										
		NO PROBLEMS WERE ENCOUNTERED DURING THE THIRD QUARTER 1980.									
10/80	SYSTEM	99.5	99.5	99.5	99.5			744	744	740	85.3
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE FGD SYSTEM WAS SHUT DOWN FOR APPROXIMATELY FOUR HOURS IN OCTOBER FOR AN INSPECTION OF THE SECOND SCRUBBER OUTLET DUCT AND THE MIST ELIMINATOR. THE INSPECTION REVEALED THAT NO PROBLEM EXISTED.									
11/80	SYSTEM	100.0	100.0	100.0	100.0			720	720	720	85.0
12/80	SYSTEM	100.0	100.0	100.0	100.0			744	744	744	89.9
	** PROBLEMS/SOLUTIONS/COMMENTS										
		NO PROBLEMS WERE ENCOUNTERED DURING NOVEMBER AND DECEMBER.									
1/81	SYSTEM							744			
2/81	SYSTEM							672			
3/81	SYSTEM							744			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE FIRST QUARTER 1981 DATA IS NOT AVAILABLE AT THIS TIME; HOWEVER THE DATA WILL BE AVAILABLE IN THE SECOND QUARTER 1981 REPORT.									

APPENDIX E
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FOREIGN FGD SYSTEMS

COMPANY NAME	ELECTRIC POWER DEVELOPMENT	
PLANT NAME	TAKASAGO	
UNIT NUMBER	2	
CITY	TAKASAGO	
COUNTRY	JAPAN	
REGULATORY CLASSIFICATION	****	
PARTICULATE EMISSION LIMITATION - NG/J	37.	(0.086 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	150.	(0.350 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	230	
GROSS UNIT GENERATING CAPACITY - MW	250	
NET UNIT GENERATING CAPACITY W/FGD - MW	230	
NET UNIT GENERATING CAPACITY WO/FGD - MW	238	
EQUIVALENT SCRUBBED CAPACITY - MW	250	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	MITSUBISHI	
BOILER TYPE	****	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	365.25	(774000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	154.4	(310 F)
STACK HEIGHT - M	180.	(590 FT)
STACK SHELL	CARBON STEEL	
STACK TOP DIAMETER - M	3.6	(11.9 FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	****	
AVERAGE HEAT CONTENT - J/G	25958.	(11160 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		11160-11520
AVERAGE ASH CONTENT - %	22.00	
RANGE ASH CONTENT - %	****	
AVERAGE MOISTURE CONTENT - %	7.00	
RANGE MOISTURE CONTENT - %	****	
AVERAGE SULFUR CONTENT - %	1.80	
RANGE SULFUR CONTENT - %	****	
AVERAGE CHLORIDE CONTENT - %	********	
RANGE CHLORIDE CONTENT - %	****	
*** PARTICLE CONTROL		
** MECHANICAL COLLECTOR		
NUMBER	0	
TYPE	NONE	
** ESP		
NUMBER	1	
TYPE	COLD SIDE	
SUPPLIER	MITSUBISHI HEAVY INDUSTRIES	
INLET FLUE GAS CAPACITY - CU.M/S	344.3	(729507 ACFM)
INLET FLUE GAS TEMPERATURE - C	154.4	(310 F)
PARTICLE REMOVAL EFFICENCY - %	99.5	
** PARTICLE SCRUBBER		
NUMBER	1	
NUMBER OF SPARES	0	
GENERIC TYPE	VENTURI TOWER	
SPECIFIC TYPE	NR	
TRADE NAME/COMMON NAME	NR	
SUPPLIER	MITSUI-CHEMICO	
DIMENSIONS - FT	37.7 DIA X 62.3	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	AISI 1110	
LINER GENERIC MATERIAL	ORGANIC	
LINER SPECIFIC MATERIAL	NR	
GAS CONTACTING DEVICE TYPE	NONE	
NUMBER OF CONTACTING ZONES	1	
LIQUID RECIRCULATION RATE - LITER/S	1542.2	(24480 GPM)
L/G RATIO - LITER/CU.M	6.5	(48.6 GAL/1000ACF)

ELECTRIC POWER DEVELOPMENT: TAKASAGO 2 (CONT.)

PRESSURE DROP - KPA	1.5	(5.9 IN-H2O)
INLET GAS FLOW RATE - CU.M/S	260.5	(552000 ACFM)
INLET GAS TEMPERATURE - C	154.4	(310 F)
SO2 REMOVAL EFFICENCY - %	56.0	
PARTICLE REMOVAL EFFICIENCY - %	50.0	

*** FGD SYSTEM

** GENERAL DATA

SALEABLE PRODUCT/THROWAWAY PRODUCT	SALEABLE PRODUCT
SO2 REMOVAL MODE	WET SCRUBBING
PROCESS TYPE	LIMESTONE
SYSTEM SUPPLIER	MITSUI-CHEMICO
DEVELOPMENT LEVEL	FULL SCALE
NEW/RETROFIT	RETROFIT
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	93.00
ENERGY CONSUMPTION - %	3.2
CURRENT STATUS	1
INITIAL START-UP	3/1976

** DESIGN AND OPERATING PARAMETERS

DESIGN CHLORIDE CONTENT - %	********

** QUENCHER/PRESATURATOR

CONSTRUCTION MATERIAL GENERIC TYPE	NR
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR

** ABSORBER

NUMBER	1	
NUMBER OF SPARES	0	
GENERIC TYPE	VENTURI TOWER	
SPECIFIC TYPE	NR	
TRADE NAME/COMMON TYPE	NR	
SUPPLIER	MITSUI/CHEMICO	
DIMENSIONS - FT	45.9 DIA X 78.7	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	NR	
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A	
LINER GENERIC MATERIAL	NR	
LINER SPECIFIC MATERIAL	NR	
LINER MATERIAL TRADE NAME/COMMON TYPE	NR	
GAS CONTACTING DEVICE TYPE	NONE	
NUMBER OF CONTACTING ZONES	1	
LIQUID RECIRCULATION RATE - LITER/S	2066.	(32801 GPM)
L/G RATIO - L/CU.M	6.5	(48.6 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	1.5	(5.9 IN-H2O)
INLET GAS FLOW - CU. M/S	280.24	(593855 ACFM)
INLET GAS TEMPERATURE - C	55.0	(131 F)
SO2 REMOVAL EFFICIENCY - %	85.0	

** ABSORBER

NUMBER	1	
GENERIC TYPE	VENTURI TOWER	
SPECIFIC TYPE	NR	
TRADE NAME/COMMON TYPE	NR	
SUPPLIER	MITSUI/CHEMICO	
DIMENSIONS - FT	26.2 DIA X 82.3	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	NR	
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A	
LINER GENERIC MATERIAL	NR	
LINER SPECIFIC MATERIAL	NR	
LINER MATERIAL TRADE NAME/COMMON TYPE	NR	
GAS CONTACTING DEVICE TYPE	NONE	
NUMBER OF CONTACTING ZONES	1	
LIQUID RECIRCULATION RATE - LITER/S	743.	(11799 GPM)
INLET GAS FLOW - CU. M/S	69.37	(147000 ACFM)
INLET GAS TEMPERATURE - C	154.4	(310 F)
SO2 REMOVAL EFFICIENCY - %	63.0	

ELECTRIC POWER DEVELOPMENT: TAKASAGO 2 (CONT.)

** ABSORBER		
NUMBER	1	
GENERIC TYPE	SPRAY TOWER	
SPECIFIC TYPE	NR	
TRADE NAME/COMMON TYPE	NR	
SUPPLIER	MITSUI/CHEMICO	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	NR	
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A	
LINER GENERIC MATERIAL	NR	
LINER SPECIFIC MATERIAL	NR	
LINER MATERIAL TRADE NAME/COMMON TYPE	NR	
GAS CONTACTING DEVICE TYPE	NONE	
NUMBER OF CONTACTING ZONES	1	
LIQUID RECIRCULATION RATE - LITER/S	19639.	(***** GPM)
INLET GAS FLOW - CU. M/S	36.51	(77372 ACFM)
INLET GAS TEMPERATURE - C	154.4	(310 F)
** MIST ELIMINATOR		
PRE-MIST ELIMINATOR/MIST ELIMINATOR	PRIMARY COLLECTOR	
GENERIC TYPE	IMPINGEMENT	
SPECIFIC TYPE	BAFFLE	
TRADE NAME/COMMON TYPE	CLOSED VANE	
NUMBER OF STAGES	4	
NUMBER OF PASSES PER STAGE	4	
CONSTRUCTION MATERIAL GENERIC TYPE	NR	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR	
WASH WATER SOURCE	BLENDED	
** REHEATER		
NUMBER	1	
GENERIC TYPE	DIRECT COMBUSTION	
SPECIFIC TYPE	NR	
TRADE NAME/COMMON TYPE	OIL	
INLET FLUE GAS TEMPERATURE - C	120.0	(248 F)
CONSTRUCTION MATERIAL GENERIC TYPE	NR	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR	
** FANS		
DESIGN	NR	
FUNCTION	BOOSTER	
APPLICATION	NR	
SERVICE	NR	
CONSTRUCTION MATERIAL GENERIC TYPE	NR	
** DAMPERS		
FUNCTION	NR	
GENERIC TYPE	NR	
SPECIFIC TYPE	NR	
CONSTRUCTION MATERIAL GENERIC TYPE	NR	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR	
LINER GENERIC MATERIAL TYPE	NR	
LINER SPECIFIC MATERIAL TYPE	NR	
** DUCTWORK		
SHELL GENERIC MATERIAL TYPE	NR	
SHELL SPECIFIC MATERIAL TYPE	NR	
LINER GENERIC MATERIAL TYPE	NR	
LINER SPECIFIC MATERIAL TYPE	NR	
** REAGENT PREPARATION EQUIPMENT		
FUNCTION	WET BALL MILL	
DEVICE	NR	
DEVICE TYPE	NR	

** TANKS

SERVICE	NUMBER
CENTRIFUGE	3
REAGENT PREP PRODUCT	1

ELECTRIC POWER DEVELOPMENT: TAKASAGO 2 (CONT.)

ABSORBER RECYCLE	2

** PUMPS

SERVICE	NUMBER
CIRCULATION	5
PH ADJUSTER CIRCULATION	2
REACTOR CIRCULATION	1

** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	CENTRIFUGE
NUMBER	7
OUTLET STREAM CHARACTERISTICS	90% SOLIDS
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	THICKENER
OUTLET STREAM CHARACTERISTICS	20% SOLIDS
*** SALEABLE BYPRODUCTS	
NATURE	GYPSUM
FULL LOAD QUANTITY - M T/H	8.62 (9.50 TPH)
*** SLUDGE	
** TREATMENT	
METHOD	FORCED OXIDATION
DEVICE	OXIDATION TANK
PROPRIETARY PROCESS	N/A
** DISPOSAL	
NATURE	NR
TYPE	NR
SITE TREATMENT	NR
** PROCESS CONTROL AND INSTRUMENTATION	
CHEMICAL PARAMETERS	FLUE GAS VOLUME & SO2 CONCENTRATION
** WATER BALANCE	
WATER LOOP TYPE	OPEN
POND SEEPAGE/RUNOFF WATER LOSS - LITERS/S	40
MAKEUP WATER ADDITION - LITERS/S	13.1 (208 GPM)

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
3/76	SYSTEM	100.0			100.0			744	744	720	
4/76	SYSTEM	100.0			100.0			720	720	720	
5/76	SYSTEM	100.0			29.0			744	216	216	
6/76	SYSTEM	100.0			87.8			720	632	632	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE SYSTEM WAS DOWN FOR PART OF MAY AND JUNE FOR ANNUAL BOILER MAINTENANCE									
7/76	SYSTEM	100.0			100.0			744	744	744	
8/76	SYSTEM	100.0			100.0			744	744	744	
9/76	SYSTEM	100.0			100.0			720	720	720	
10/76	SYSTEM	94.2			94.2			744	744	701	

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

ELECTRIC POWER DEVELOPMENT: TAKASAGO 2 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
		OUTAGE TIME DURING OCTOBER WAS NECESSARY FOR DUCT CLEANING.									
11/76	SYSTEM		100.0		100.0			720	720	720	
12/76	SYSTEM		99.3		99.3			744	744	739	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE SYSTEM WAS DOWN BRIEFLY FOR REPAIR OF A GYPSUM CONVEYOR.									
1/77	SYSTEM		100.0		100.0			744	744	744	
2/77	SYSTEM		88.2		88.2			672	672	593	
3/77	SYSTEM		98.7		98.7			744	744	734	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		OUTAGE TIME IN FEBRUARY & MARCH WAS NEEDED FOR CLEANING OF A PH CONTROLLER									
4/77	SYSTEM		100.0		100.0			720	720	720	
5/77	SYSTEM		100.0		51.6			744	384	384	
6/77	SYSTEM		100.0		3.3			720	240	240	
7/77	SYSTEM		100.0		100.0			744	744	744	
8/77	SYSTEM		100.0		100.0			744	744	744	
9/77	SYSTEM		100.0		100.0			720	720	720	
10/77	SYSTEM		100.0		100.0			744	744	744	
11/77	SYSTEM		89.2		89.2			720	720	642	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		CLEANING OF THE PH CONTROLLER CAUSED ONE OUTAGE DURING NOVEMBER.									
		A REACTOR WAS ALSO CLEANED THIS MONTH.									
12/77	SYSTEM		100.0		100.0			744	744	744	
1/78	SYSTEM							744	744		
2/78	SYSTEM							672			
3/78	SYSTEM							720			
4/78	SYSTEM							720			
5/78	SYSTEM							744			
6/78	SYSTEM							720			
7/78	SYSTEM							744			
8/78	SYSTEM							744			
9/78	SYSTEM							720			

ELECTRIC POWER DEVELOPMENT: TAKASAGO 2 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
10/78	SYSTEM							744			
11/78	SYSTEM							720			
12/78	SYSTEM							744			
1/79	SYSTEM							744			
2/79	SYSTEM							672			
3/79	SYSTEM							744			

** 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 THI TIME. A TOTAL OF 8147.4 HOURS OF FGD SYSTEM OPERATION WERE LOGGED WITH 19.5 HOURS OF SCHEDULED OUTAGE TIME.

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			
11/79	SYSTEM							720			
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 APRIL 1979 THROUGH MARCH 1980 PERIOD.

4/80	SYSTEM	100.0	100.0	100.0	100.0			720	720	720	
5/80	SYSTEM	100.0	100.0	100.0	100.0			744	744	744	

** PROBLEMS/SOLUTIONS/COMMENTS

DURING APRIL AND MAY THE UTILITY EXPERIENCED NO PROBLEMS WITH THE FGD SYSTEM.

6/80	SYSTEM	100.0	100.0	100.0	24.6			720	177	177	

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER WAS SHUTDOWN FROM JUNE 3 TO JUNE 24 FOR ANNUAL MAINTENANCE. THE FGD SYSTEM OPERATED ALONG WITH THE BOILER THE REMAINDER OF THE TIME.

7/80	SYSTEM	100.0	100.0	100.0	100.0			744	744	744	83.0

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

ELECTRIC POWER DEVELOPMENT: TAKASAGO 2 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
8/80	SYSTEM	100.0	100.0	100.0	100.0			744	744	744	83.3
9/80	SYSTEM	100.0	100.0	100.0	100.0			720	720	720	83.4
10/80	SYSTEM	100.0	100.0	100.0	100.0			744	744	744	85.1
11/80	SYSTEM	100.0	100.0	100.0	100.0			720	720	720	84.8
12/80	SYSTEM	100.0	100.0	100.0	87.3			744	649	649	78.4

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JULY THROUGH DECEMBER NO FGD-RELATED PROBLEMS WERE EXPERIENCED.

IN DECEMBER THE BOILER WAS OUT OF SERVICE APPROXIMATELY FOUR DAYS FOR GENERAL MAINTENANCE.

1/81	SYSTEM							744			
2/81	SYSTEM							672			
3/81	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

THE FIRST QUARTER 1981 DATA IS NOT AVAILABLE AT THIS TIME; HOWEVER THE DATA WILL BE AVAILABLE IN THE SECOND QUARTER 1981 REPORT.

APPENDIX E
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FOREIGN FGD SYSTEMS

COMPANY NAME	ELECTRIC POWER DEVELOPMENT	
PLANT NAME	TAKEHARA	
UNIT NUMBER	1	
CITY	MIHARA	
COUNTRY	JAPAN	
REGULATORY CLASSIFICATION	****	
PARTICULATE EMISSION LIMITATION - NG/J	56.	(0.130 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	271.	(0.630 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	231	
GROSS UNIT GENERATING CAPACITY - MW	250	
NET UNIT GENERATING CAPACITY W/FGD - MW	231	
NET UNIT GENERATING CAPACITY WO/FGD - MW	239	
EQUIVALENT SCRUBBED CAPACITY - MW	250	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	BABCOCK-HITACHI	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	577.13	(1223000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	140.0	(284 F)
STACK HEIGHT - M	201.	(660 FT)
STACK SHELL	CARBON STEEL	
STACK TOP DIAMETER - M	3.6	(11.9 FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	****	
AVERAGE HEAT CONTENT - J/G	25130.	(10804 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		10804-11520
AVERAGE ASH CONTENT - %	23.00	
RANGE ASH CONTENT - %	****	
AVERAGE MOISTURE CONTENT - %	9.05	
RANGE MOISTURE CONTENT - %	****	
AVERAGE SULFUR CONTENT - %	2.00	
RANGE SULFUR CONTENT - %	****	
AVERAGE CHLORIDE CONTENT - %	0.05	
RANGE CHLORIDE CONTENT - %	****	
*** PARTICLE CONTROL		
** MECHANICAL COLLECTOR		
NUMBER	0	
TYPE	NONE	
** ESP		
NUMBER	1	
TYPE	COLD SIDE	
SUPPLIER	SUMITOMO HEAVY INDUSTRIES	
INLET FLUE GAS CAPACITY - CU.M/S	333.2	(706000 ACFM)
INLET FLUE GAS TEMPERATURE - C	140.0	(284 F)
PARTICLE REMOVAL EFFICENCY - %	98.0	
** PARTICLE SCRUBBER		
NUMBER	2	
GENERIC TYPE	.VENTURI TOWER	
SPECIFIC TYPE	NR	
TRADE NAME/COMMON NAME	NR	
SUPPLIER	HITACHI	
SHELL GENERIC MATERIAL	NR	
SHELL SPECIFIC MATERIAL	NR	
LINER GENERIC MATERIAL	ORGANIC	
LINER SPECIFIC MATERIAL	NR	
GAS CONTACTING DEVICE TYPE	NONE	
NUMBER OF CONTACTING ZONES	1	
LIQUID RECIRCULATION RATE - LITER/S	533.7	(8471 GPM)
L/G RATIO - LITER/CU.M	2.5	(18.7 GAL/1000ACF)
PRESSURE DROP - KPA	2.3	(9.1 IN-H2O)
INLET GAS FLOW RATE - CU.M/S	168.0	(356000 ACFM)

ELECTRIC POWER DEVELOPMENT: TAKEHARA 1 (CONT.)

INLET GAS TEMPERATURE - C	140.0	(284 F)

*** FGD SYSTEM

** GENERAL DATA

SALEABLE PRODUCT/THROWAWAY PRODUCT	SALEABLE PRODUCT
SO2 REMOVAL MODE	WET SCRUBBING
PROCESS TYPE	LIMESTONE
PROCESS ADDITIVES	NONE
SYSTEM SUPPLIER	BABCOCK-HITACHI
DEVELOPMENT LEVEL	FULL SCALE
NEW/RETROFIT	RETROFIT
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	91.70
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	94.20
ENERGY CONSUMPTION - %	3.2
CURRENT STATUS	1
COMMERCIAL START-UP	2/1979
INITIAL START-UP	2/1977

** DESIGN AND OPERATING PARAMETERS

DESIGN CHLORIDE CONTENT - %	********

** QUENCHER/PRESATURATOR

CONSTRUCTION MATERIAL GENERIC TYPE	NR
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR

** ABSORBER

NUMBER	2	
GENERIC TYPE	TRAY TOWER	
SPECIFIC TYPE	NR	
TRADE NAME/COMMON TYPE	NR	
SUPPLIER	BABCOCK-HITACHI	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	NR	
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A	
LINER GENERIC MATERIAL	ORGANIC	
LINER SPECIFIC MATERIAL	POLYESTER	
LINER MATERIAL TRADE NAME/COMMON TYPE	NR	
NUMBER OF CONTACTING ZONES	5	
LIQUID RECIRCULATION RATE - LITER/S	721.	(11448 GPM)
L/G RATIO - L/CU.M	7.0	(52.4 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	3.8	(15.2 IN-H2O)
INLET GAS FLOW - CU. M/S	164.76	(349142 ACFM)
INLET GAS TEMPERATURE - C	52.2	(126 F)

** MIST ELIMINATOR

PRE-MIST ELIMINATOR/MIST ELIMINATOR	PRIMARY COLLECTOR	
NUMBER PER SYSTEM	2	
GENERIC TYPE	IMPINGEMENT	
SPECIFIC TYPE	TUBE BANK	
TRADE NAME/COMMON TYPE	VERTICAL PARALLEL TUBES	
CONFIGURATION	HORIZONTAL	
PRESSURE DROP - KPA	0.1	(0.4 IN-H2O)
CONSTRUCTION MATERIAL GENERIC TYPE	NR	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR	
WASH WATER SOURCE	FRESH	
WASH FREQUENCY	CONTINUOUS	
WASH RATE - L/S	1.3	(20 GAL/MIN)

** REHEATER

GENERIC TYPE	DIRECT COMBUSTION	
SPECIFIC TYPE	NR	
TRADE NAME/COMMON TYPE	OIL	
INLET FLUE GAS TEMPERATURE - C	120.0	(248 F)
CONSTRUCTION MATERIAL GENERIC TYPE	NR	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR	

** FANS

NUMBER	2
DESIGN	NR
FUNCTION	BOOSTER

ELECTRIC POWER DEVELOPMENT: TAKEHARA 1 (CONT.)

APPLICATION	INDUCED DRAFT
SERVICE	WET
CONSTRUCTION MATERIAL GENERIC TYPE	NR
** DAMPERS	
FUNCTION	NR
GENERIC TYPE	NR
SPECIFIC TYPE	NR
CONSTRUCTION MATERIAL GENERIC TYPE	NR
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR
LINER GENERIC MATERIAL TYPE	NR
LINER SPECIFIC MATERIAL TYPE	NR
** DUCTWORK	
SHELL GENERIC MATERIAL TYPE	NR
SHELL SPECIFIC MATERIAL TYPE	NR
LINER GENERIC MATERIAL TYPE	NR
LINER SPECIFIC MATERIAL TYPE	NR
** REAGENT PREPARATION EQUIPMENT	
FUNCTION	WET BALL MILL
DEVICE	NR
DEVICE TYPE	NR
** TANKS	
SERVICE	NUMBER
-------	------
PRESATURATOR/QUENCHER	2
ABSORBER RECYCLE	****
VACUUM FILTER FILTRATE	****
SPARGER/OXIDIZER	2
** PUMPS	
SERVICE	NUMBER
-------	------
COOLER RECYCLE	2
ABSORBER RECIRCULATION	4
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	CENTRIFUGE
NUMBER	9
NUMBER OF SPARES	1
CAPACITY	4 GPM
FEED STREAM CHARACTERISTICS	20% SOLIDS
OUTLET STREAM CHARACTERISTICS	88% SOLIDS
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	THICKENER
NUMBER	1
CONFIGURATION	HORIZONTAL
DIMENSIONS - FT	45.0 DIA X 10.0
FEED STREAM CHARACTERISTICS	12% SOLIDS
OUTLET STREAM CHARACTERISTICS	20% SOLIDS
*** SALEABLE BYPRODUCTS	
NATURE	GYPSUM
FULL LOAD QUANTITY - M T/H	9.89 (10.90 TPH)
QUALITY - %	95.0
DISPOSITION	MARKETED
*** SLUDGE	
** TREATMENT	
METHOD	FORCED OXIDATION
DEVICE	OXIDATION TANK
PROPRIETARY PROCESS	N/A

ELECTRIC POWER DEVELOPMENT: TAKEHARA 1 (CONT.)

** DISPOSAL

NATURE	NR
TYPE	NR
SITE TREATMENT	NR

** PROCESS CONTROL AND INSTRUMENTATION

CHEMICAL PARAMETERS	PH, GAS FLOW
CONTROL LEVELS	PH 5.0-6.0
PROCESS CONTROL MANNER	AUTOMATIC

** WATER BALANCE

WATER LOOP TYPE	OPEN	
POND SEEPAGE/RUNOFF WATER LOSS - LITERS/S	60	
MAKEUP WATER ADDITION - LITERS/S	14.9	(237 GPM)

PERFORMANCE DATA

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

** PROBLEMS/SOLUTIONS/COMMENTS

99.95% AVAILABILITY WAS REPORTED FOR THE PERIOD FROM APRIL 1978 THROUGH MARCH 1979.

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			
11/79	SYSTEM							720			
12/79	SYSTEM							744			
1/80	SYSTEM							744			

ELECTRIC POWER DEVELOPMENT: TAKEHARA 1 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

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

4/80	SYSTEM	100.0	100.0	100.0	100.0			720	720	720	
5/80	SYSTEM	100.0	100.0	100.0	100.0			744	744	744	
6/80	SYSTEM	87.9	100.0	100.0	87.9			720	633	633	82.4

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS OUT OF SERVICE FOR APPROXIMATELY 3 DAYS IN JUNE TO REMOVE THE SCALE ACCUMULATION IN THE FGD OUTLET DUCT.

7/80	SYSTEM	100.0	100.0	100.0	100.0			744	744	744	95.5
8/80	SYSTEM	100.0	100.0	100.0	100.0			744	744	744	95.3
9/80	SYSTEM	100.0	100.0	100.0	100.0			720	720	720	95.3

** PROBLEMS/SOLUTIONS/COMMENTS

NO PROBLEMS WERE ENCOUNTERED DURING THE THIRD QUARTER 1980.

10/80	SYSTEM	100.0	100.0	100.0	100.0			744	744	744	94.5
11/80	SYSTEM	100.0	100.0	100.0	100.0			720	720	720	95.2
12/80	SYSTEM	100.0	100.0	100.0	27.7			744	206	206	22.4

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER WAS OUT OF SERVICE FROM DECEMBER 1 THROUGH DECEMBER 25 FOR SCHEDULED MAINTENANCE.

1/81	SYSTEM							744			
2/81	SYSTEM							672			
3/81	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

THE FIRST QUARTER 1981 DATA IS NOT AVAILABLE AT THIS TIME; HOWEVER THE DATA WILL BE AVAILABLE IN THE SECOND QUARTER 1981 REPORT.

APPENDIX E
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FOREIGN FGD SYSTEMS

COMPANY NAME	HOKKAIDO ELECTRIC POWER	
PLANT NAME	TOMATOATSUMA THERMAL POW	
UNIT NUMBER	1	
CITY	TOMAKOMAI	
COUNTRY	JAPAN	
REGULATORY CLASSIFICATION	****	
PARTICULATE EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	350	
GROSS UNIT GENERATING CAPACITY - MW	350	
NET UNIT GENERATING CAPACITY W/FGD - MW	175	
NET UNIT GENERATING CAPACITY WO/FGD - MW	175	
EQUIVALENT SCRUBBED CAPACITY - MW	350	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	BABCOCK-HITACHI	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	508.21	(1076939 ACFM)
BOILER FLUE GAS TEMPERATURE - C	121.1	(250 F)
STACK HEIGHT - M	170.	(558 FT)
STACK SHELL	CARBON STEEL	
STACK TOP DIAMETER - M	4.5	(14.6 FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	BITUMINOUS	
AVERAGE HEAT CONTENT - J/G	25121.	(10800 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		****
AVERAGE ASH CONTENT - %	20.50	
RANGE ASH CONTENT - %	****	
AVERAGE MOISTURE CONTENT - %	7.00	
RANGE MOISTURE CONTENT - %	****	
AVERAGE SULFUR CONTENT - %	0.30	
RANGE SULFUR CONTENT - %	****	
AVERAGE CHLORIDE CONTENT - %	********	
RANGE CHLORIDE CONTENT - %	****	
*** PARTICLE CONTROL		
** ESP		
NUMBER	4	
TYPE	HOT SIDE	
SUPPLIER	HITACHI	
INLET FLUE GAS CAPACITY - CU.M/S	828.8	(1756252 ACFM)
INLET FLUE GAS TEMPERATURE - C	363.9	(687 F)
PRESSURE DROP - KPA	0.2	(1. IN-H2O)
PARTICLE REMOVAL EFFICENCY - %	99.8	
** PARTICLE SCRUBBER		
NUMBER	1	
GENERIC TYPE	VENTURI TOWER	
SPECIFIC TYPE	NR	
TRADE NAME/COMMON NAME	NR	
SUPPLIER	BABCOCK-HITACHI	
SHELL GENERIC MATERIAL	NR	
SHELL SPECIFIC MATERIAL	NR	
LINER GENERIC MATERIAL	NR	
LINER SPECIFIC MATERIAL	NR	
GAS CONTACTING DEVICE TYPE	NONE	
INLET GAS FLOW RATE - CU.M/S	198.7	(421036 ACFM)
INLET GAS TEMPERATURE - C	47.2	(117 F)
*** FGD SYSTEM		
** GENERAL DATA		
SALEABLE PRODUCT/THROWAWAY PRODUCT	SALEABLE PRODUCT	
SO2 REMOVAL MODE	WET SCRUBBING	

HOKKAIDO ELECTRIC POWER: TOMATOATSUMA THERMAL POW 1 (CONT.)

PROCESS TYPE	LIMESTONE	
SYSTEM SUPPLIER	BABCOCK-HITACHI	
DEVELOPMENT LEVEL	FULL SCALE	
NEW/RETROFIT	RETROFIT	
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	90.00	
ENERGY CONSUMPTION - %	0.0	
CURRENT STATUS	1	
COMMERCIAL START-UP	10/1980	
INITIAL START-UP	7/1980	
** DESIGN AND OPERATING PARAMETERS		
DESIGN CHLORIDE CONTENT - %	********	
** QUENCHER/PRESATURATOR		
CONSTRUCTION MATERIAL GENERIC TYPE	NR	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR	
** ABSORBER		
NUMBER	1	
GENERIC TYPE	NR	
SPECIFIC TYPE	NR	
TRADE NAME/COMMON TYPE	NR	
SUPPLIER	BABCOCK-HITACHI	
SHELL GENERIC MATERIAL	NR	
SHELL SPECIFIC MATERIAL	NR	
SHELL MATERIAL TRADE NAME/COMMON TYPE	NR	
LINER GENERIC MATERIAL	NR	
LINER SPECIFIC MATERIAL	NR	
LINER MATERIAL TRADE NAME/COMMON TYPE	NR	
INLET GAS FLOW - CU. M/S	198.69	(421036 ACFM)
INLET GAS TEMPERATURE - C	47.2	(117 F)
PARTICLE REMOVAL EFFICENCY - %	90.0	
** MIST ELIMINATOR		
PRE-MIST ELIMINATOR/MIST ELIMINATOR	PRIMARY COLLECTOR	
NUMBER PER SYSTEM	1	
GENERIC TYPE	IMPINGEMENT	
SPECIFIC TYPE	BAFFLE	
TRADE NAME/COMMON TYPE	NR	
CONFIGURATION	VERTICAL	
CONSTRUCTION MATERIAL GENERIC TYPE	NR	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR	
** REHEATER		
NUMBER	1	
GENERIC TYPE	WASTE HEAT RECOVERY	
SPECIFIC TYPE	GAS-GAS	
TRADE NAME/COMMON TYPE	WHEEL TYPE	
PERCENT GAS BYPASSED - AVG	14.3	
TEMPERATURE INCREASE - C	65.6	(118 F)
INLET FLUE GAS FLOW RATE - CU. M/S	199.17	(422057 ACFM)
CONSTRUCTION MATERIAL GENERIC TYPE	NR	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR	
** FANS		
NUMBER	1	
DESIGN	CENTRIFUGAL	
SUPPLIER	HITACHI,LDT.	
FUNCTION	BOOSTER	
APPLICATION	NR	
SERVICE	NR	
FLUE GAS FLOW RATE - CU.M/S	254.47	(539247 ACFM)
FLUE GAS TEMPERATURE - C	137.2	(279 F)
CONSTRUCTION MATERIAL GENERIC TYPE	NR	
** DAMPERS		
FUNCTION	NR	
GENERIC TYPE	NR	
SPECIFIC TYPE	NR	
CONSTRUCTION MATERIAL GENERIC TYPE	NR	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR	

HOKKAIDO ELECTRIC POWER: TOMATOATSUMA THERMAL POW 1 (CONT.)

LINER GENERIC MATERIAL TYPE	NR
LINER SPECIFIC MATERIAL TYPE	NR
** DUCTWORK	
SHELL GENERIC MATERIAL TYPE	NR
SHELL SPECIFIC MATERIAL TYPE	NR
LINER GENERIC MATERIAL TYPE	NR
LINER SPECIFIC MATERIAL TYPE	NR
** REAGENT PREPARATION EQUIPMENT	
FUNCTION	WET BALL MILL
DEVICE	NR
DEVICE TYPE	NR
NUMBER	1
PRODUCT QUALITY - % SOLIDS	92.0
** PUMPS	
SERVICE	NUMBER
-------	------
NR	****
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	THICKENER
NUMBER	2
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	CENTRIFUGE
NUMBER	3
NUMBER OF SPARES	1
*** SALEABLE BYPRODUCTS	
NATURE	GYPSUM
QUALITY - %	45.0
DISPOSITION	MARKETED
*** SLUDGE	
** TREATMENT	
METHOD	NR
DEVICE	NR
PROPRIETARY PROCESS	NR
** DISPOSAL	
NATURE	NR
TYPE	NR
SITE TREATMENT	NR
** WATER BALANCE	
WATER LOOP TYPE	CLOSED
MAKEUP WATER ADDITION - LITERS/S	4.0 (63 GPM)

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
10/80	SYSTEM	100.0	100.0	100.0	70.3	94.40		744	523	523	46.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
	OPERATIONS AT THE TOMATOATSUMA STATION COMMENCED IN OCTOBER 1980.										
11/80	SYSTEM	100.0	100.0	100.0	85.1	92.40		720	613	613	61.1
12/80	SYSTEM	100.0	100.0	100.0	100.0	94.10		744	744	744	94.7

HOKKAIDO ELECTRIC POWER: TOMATOATSUMA THERMAL POW 1 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

DURING DECEMBER SCALE FORMATION WAS OBSERVED IN THE PIPING AND IN A PUMP O THE WASTE WATER TREATMENT FACILITY. A WATER WASH LINE WAS INSTALLED FOR THE PIPING AND A PUMP WAS ADDED TO ELIMINATE SCALE. THE FGD SYSTEM OPERATION WAS NOT AFFECTED DURING THIS TIME.

APPENDIX F
DESIGN AND PERFORMANCE DATA FOR DISCONTINUED DOMESTIC FGD SYSTEMS

COMPANY NAME	ARIZONA PUBLIC SERVICE	
PLANT NAME	FOUR CORNERS	
UNIT NUMBER	5A	
CITY	FARMINGTON	
STATE	NEW MEXICO	
REGULATORY CLASSIFICATION	C	
PARTICULATE EMISSION LIMITATION - NG/J	21.	(0.050 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	258.	(0.600 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	2089	
GROSS UNIT GENERATING CAPACITY - MW	755	
NET UNIT GENERATING CAPACITY W/FGD - MW	*****	
NET UNIT GENERATING CAPACITY WO/FGD - MW	*****	
EQUIVALENT SCRUBBED CAPACITY - MW	755	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	****	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	********	(******* ACFM)
BOILER FLUE GAS TEMPERATURE - C	*******	(**** F)
STACK HEIGHT - M	******	(**** FT)
STACK SHELL	NR	
STACK TOP DIAMETER - M	*******	(***** FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	SUBBITUMINOUS	
AVERAGE HEAT CONTENT - J/G	22562.	(9700 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		****
AVERAGE ASH CONTENT - %	24.00	
RANGE ASH CONTENT - %	****	
AVERAGE MOISTURE CONTENT - %	11.00	
RANGE MOISTURE CONTENT - %	****	
AVERAGE SULFUR CONTENT - %	0.81	
RANGE SULFUR CONTENT - %	****	
AVERAGE CHLORIDE CONTENT - %	********	
RANGE CHLORIDE CONTENT - %	****	
*** PARTICLE CONTROL		
** MECHANICAL COLLECTOR		
NUMBER	0	
TYPE	NONE	
** ESP		
** PARTICLE SCRUBBER		
NUMBER	0	
GENERIC TYPE	NONE	
SPECIFIC TYPE	N/A	
TRADE NAME/COMMON NAME	N/A	
SHELL GENERIC MATERIAL	N/A	
SHELL SPECIFIC MATERIAL	N/A	
LINER GENERIC MATERIAL	N/A	
LINER SPECIFIC MATERIAL	N/A	
GAS CONTACTING DEVICE TYPE	N/A	
*** FGD SYSTEM		
** GENERAL DATA		
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT	
SO2 REMOVAL MODE	WET SCRUBBING	
PROCESS TYPE	LIME	
SYSTEM SUPPLIER	SOUTHERN CALIFORNIA EDISON	
A-E FIRM	BECHTEL	
DEVELOPMENT LEVEL	EXPERIMENTAL	
NEW/RETROFIT	RETROFIT	
CURRENT STATUS	8	

ARIZONA PUBLIC SERVICE: FOUR CORNERS 5A (CONT.)

TERMINATION	12/1976
INITIAL START-UP	2/1976
CONTRACT AWARDED	1/1974
** DESIGN AND OPERATING PARAMETERS	
DESIGN CHLORIDE CONTENT - %	********
** QUENCHER/PRESATURATOR	
CONSTRUCTION MATERIAL GENERIC TYPE	NR
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR
** ABSORBER	
GENERIC TYPE	SPRAY TOWER
SPECIFIC TYPE	OPEN CROSSCURRENT SPRAY
TRADE NAME/COMMON TYPE	HORIZONTAL SPRAY CHAMBER
DIMENSIONS - FT	60.0 X 28.0 X 17.0
SHELL GENERIC MATERIAL	CARBON STEEL
SHELL SPECIFIC MATERIAL	AISI 1110
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A
LINER GENERIC MATERIAL	ORGANIC
LINER SPECIFIC MATERIAL	NATURAL RUBBER; GLASS FLAKE-FILLED POLYESTER
LINER MATERIAL TRADE NAME/COMMON TYPE	BLACK NATURAL RUBBER; NR
GAS CONTACTING DEVICE TYPE	NONE
NUMBER OF CONTACTING ZONES	5
** MIST ELIMINATOR	
PRE-MIST ELIMINATOR/MIST ELIMINATOR	PRIMARY COLLECTOR
NUMBER PER SYSTEM	1
GENERIC TYPE	IMPINGEMENT
SPECIFIC TYPE	BAFFLE
TRADE NAME/COMMON TYPE	CLOSED VANE
CONSTRUCTION MATERIAL GENERIC TYPE	STAINLESS STEEL; CARBON STEEL
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR
** REHEATER	
GENERIC TYPE	INDIRECT HOT AIR
SPECIFIC TYPE	EXTERNAL HEAT EXCHANGER
TRADE NAME/COMMON TYPE	STEAM TUBE BUNDLE
CONSTRUCTION MATERIAL GENERIC TYPE	NR
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR
** FANS	
NUMBER	1
DESIGN	CENTRIFUGAL
FUNCTION	BOOSTER
APPLICATION	FORCED DRAFT
SERVICE	NR
CONSTRUCTION MATERIAL GENERIC TYPE	NR
** DAMPERS	
FUNCTION	NR
GENERIC TYPE	NR
SPECIFIC TYPE	NR
CONSTRUCTION MATERIAL GENERIC TYPE	NR
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR
LINER GENERIC MATERIAL TYPE	NR
LINER SPECIFIC MATERIAL TYPE	NR
** DUCTWORK	
SHELL GENERIC MATERIAL TYPE	NR
SHELL SPECIFIC MATERIAL TYPE	NR
LINER GENERIC MATERIAL TYPE	NR
LINER SPECIFIC MATERIAL TYPE	NR
** REAGENT PREPARATION EQUIPMENT	
FUNCTION	SLAKER
DEVICE	DETENTION
DEVICE TYPE	N/A
NUMBER	1

ARIZONA PUBLIC SERVICE: FOUR CORNERS 5A (CONT.)

** TANKS

SERVICE	NUMBER
REAGENT PREP PRODUCT	2

** PUMPS

SERVICE	NUMBER
SLURRY RECIRCULATION	12

** SOLIDS CONCENTRATING/DEWATERING

DEVICE	THICKENER
NUMBER	1
DIMENSIONS - FT	60.0 DIA
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
OUTLET STREAM CHARACTERISTICS	30% SOLIDS

*** SLUDGE

** TREATMENT

METHOD	NR
DEVICE	NR
PROPRIETARY PROCESS	NR

** DISPOSAL

NATURE	NR
TYPE	NR
SITE TREATMENT	NR

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
2/76	SYSTEM							692			

** PROBLEMS/SOLUTIONS/COMMENTS

UNIT NO. 5 WAS FIRST PLACED IN COMMERCIAL OPERATION IN JULY 1970. THE FGD SYSTEM WHICH WAS RETROFITTED ON UNIT NO. 5 WAS A WEIR HORIZONTAL CROSSFLOW SPRAY ABSORBER WHICH WAS FORMERLY INSTALLED AND OPERATED IN A TEST PROGRAM AT THE MOHAVE GENERATING STATION OF THE SOUTHERN CALIFORNIA EDISON COMPANY THE HORIZONTAL MODULE WAS A FOUR-STAGE SCRUBBING CHAMBER. EACH STAGE CONTAINED A ROW OF 36 EXTERNALLY MOUNTED NOZZLES. THE SLURRY WAS CYCLED THROUGH THE SCRUBBER IN A COUNTERCURRENT MANNER AT A RATE OF 36,000 GPM/ STAGE. THE FRESH LIME SLURRY WAS SPRAYED ACROSS THE FLUE GAS AT THE FOURT STAGE, WHICH WAS THE DISCHARGE END OF THE SCRUBBING CHAMBER. THE SCRUBBIN SOLUTION WAS THEN COLLECTED AND RECYCLED SUCCESSIVELY TO THE THIRD, SECOND AND FIRST STAGES OF THE SCRUBBING MODULE. THIS ALLOWED COMPLETE DEPLETION OF ANY CONCENTRATION. THE CLEANED GASES THEN PASSED THROUGH A MIST ELIMI-NATOR AND WERE REHEATED BEFORE BEING DISCHARGED TO THE STACK. THE SPENT SLURRY WAS DISCHARGED FROM THE SCRUBBING SYSTEM TO A THICKENER AND THE UNDERFLOW WAS PUMPED TO AN ON-SITE SETTLING POND. WATER WAS RETURNED TO THE PROCESS FOR FURTHER USE.

INSTALLATION OF THE MODULE AT THE FOUR CORNERS GENERATING STATION WAS COMPLETED AND THE SYSTEM WAS PLACED IN SERVICE ON FEBRUARY 17, 1976, FOR INITIAL OPERATION.

3/76	SYSTEM							744			
4/76	SYSTEM							720			

ARIZONA PUBLIC SERVICE: FOUR CORNERS 5A (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE FGD SYSTEM WAS TAKEN OFF LINE IN MID-APRIL FOR A SCHEDULED BOILER OVERHAUL. THE SYSTEM WAS SCHEDULED TO COME BACK ON LINE IN JULY 1976.									
5/76	SYSTEM							744			
6/76	SYSTEM							720			
7/76	SYSTEM							744			
8/76	SYSTEM							744			
9/76	SYSTEM							720			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE SYSTEM REMAINED OUT OF SERVICE THROUGH MID-APRIL 1976 DUE TO AN EXTENSIVE OVERHAUL OF THE NO. 5 BOILER PLUS THE DEVELOPMENT OF PROBLEMS WITH THE SCRUBBER MODULE'S REHEATER. .									
10/76	SYSTEM							744			
11/76	SYSTEM							720			
12/76	SYSTEM							744			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE PROTOTYPE WAS IN SERVICE THROUGHOUT THE MONTH OF NOVEMBER. ON DECEMBER 6 THE TEST PROGRAM WAS CONCLUDED AND THE UNIT WAS DISMANTLED.									

APPENDIX F
DESIGN AND PERFORMANCE DATA FOR DISCONTINUED DOMESTIC FGD SYSTEMS

COMPANY NAME	BOSTON EDISON	
PLANT NAME	MYSTIC	
UNIT NUMBER	6	
CITY	EVERETT	
STATE	MASSACHUSETTS	
REGULATORY CLASSIFICATION	****	
PARTICULATE EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	*****	
GROSS UNIT GENERATING CAPACITY - MW	150	
NET UNIT GENERATING CAPACITY W/FGD - MW	*****	
NET UNIT GENERATING CAPACITY WO/FGD - MW	*****	
EQUIVALENT SCRUBBED CAPACITY - MW	150	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	COMBUSTION ENGINEERING	
BOILER TYPE	OIL FIRED	
BOILER SERVICE LOAD	****	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	273.70	(580000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	148.9	(300 F)
STACK HEIGHT - M	99.	(325 FT)
STACK SHELL	NR	
STACK TOP DIAMETER - M	*******	(***** FT)
** FUEL DATA		
FUEL TYPE	OIL	
FUEL GRADE	NO. 6	
AVERAGE HEAT CONTENT - J/G	******	(****** BTU/LB)
RANGE HEAT CONTENT - BTU/LB		****
AVERAGE ASH CONTENT - %	0.07	
RANGE ASH CONTENT - %	****	
AVERAGE MOISTURE CONTENT - %	1.00	
RANGE MOISTURE CONTENT - %	****	
AVERAGE SULFUR CONTENT - %	2.00	
RANGE SULFUR CONTENT - %	****	
AVERAGE CHLORIDE CONTENT - %	********	
RANGE CHLORIDE CONTENT - %	****	
*** PARTICLE CONTROL		
** MECHANICAL COLLECTOR		
NUMBER	0	
TYPE	NONE	
** FABRIC FILTER		
NUMBER	0	
TYPE	NONE	
** ESP		
** PARTICLE SCRUBBER		
NUMBER	0	
GENERIC TYPE	NONE	
SPECIFIC TYPE	N/A	
TRADE NAME/COMMON NAME	N/A	
SHELL GENERIC MATERIAL	N/A	
SHELL SPECIFIC MATERIAL	N/A	
LINER GENERIC MATERIAL	N/A	
LINER SPECIFIC MATERIAL	N/A	
GAS CONTACTING DEVICE TYPE	N/A	
*** FGD SYSTEM		
** GENERAL DATA		
SALEABLE PRODUCT/THROWAWAY PRODUCT	SALEABLE PRODUCT	
SO2 REMOVAL MODE	WET SCRUBBING	
PROCESS TYPE	MAGNESIUM OXIDE	
SYSTEM SUPPLIER	GE ENVIRONMENTAL SERVICES	

BOSTON EDISON: MYSTIC 6 (CONT.)

DEVELOPMENT LEVEL	DEMONSTRATION	
NEW/RETROFIT	RETROFIT	
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	55.00	
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	90.00	
CURRENT STATUS	8	
TERMINATION	7/1974	
COMMERCIAL START-UP	4/1972	
INITIAL START-UP	4/1988	
CONTRACT AWARDED	0/1970	
** DESIGN AND OPERATING PARAMETERS		
DESIGN CHLORIDE CONTENT - %	********	
** QUENCHER/PRESATURATOR		
CONSTRUCTION MATERIAL GENERIC TYPE	NR	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR	
** ABSORBER		
NUMBER	1	
GENERIC TYPE	VENTURI TOWER	
SPECIFIC TYPE	VARIABLE-THROAT/TOP-ENTRY PLUMB BOB	
TRADE NAME/COMMON TYPE	N/A	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	NR	
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A	
LINER GENERIC MATERIAL	ORGANIC	
LINER SPECIFIC MATERIAL	EPOXY	
LINER MATERIAL TRADE NAME/COMMON TYPE	FLAKELINE E	
GAS CONTACTING DEVICE TYPE	N/A	
NUMBER OF CONTACTING ZONES	1	
LIQUID RECIRCULATION RATE - LITER/S	945.	(15000 GPM)
L/G RATIO - L/CU.M	4.4	(33.0 GAL/1000 ACF)
INLET GAS FLOW - CU. M/S	200.56	(425000 ACFM)
INLET GAS TEMPERATURE - C	148.9	(300 F)
** MIST ELIMINATOR		
PRE-MIST ELIMINATOR/MIST ELIMINATOR	PRIMARY COLLECTOR	
NUMBER PER SYSTEM	1	
GENERIC TYPE	IMPINGEMENT	
SPECIFIC TYPE	BAFFLE	
TRADE NAME/COMMON TYPE	CLOSED VANE	
NUMBER OF PASSES PER STAGE	6	
CONSTRUCTION MATERIAL GENERIC TYPE	NR	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR	
WASH WATER SOURCE	FRESH	
** REHEATER		
NUMBER	0	
GENERIC TYPE	NONE	
SPECIFIC TYPE	N/A	
TRADE NAME/COMMON TYPE	N/A	
CONSTRUCTION MATERIAL GENERIC TYPE	NONE	
CONSTRUCTION MATERIAL SPECIFIC TYPE	N/A	
** FANS		
NUMBER	2	
DESIGN	NR	
FUNCTION	NR	
APPLICATION	INDUCED DRAFT	
SERVICE	NR	
CONSTRUCTION MATERIAL GENERIC TYPE	NR	
** DAMPERS		
FUNCTION	NR	
GENERIC TYPE	NR	
SPECIFIC TYPE	NR	
CONSTRUCTION MATERIAL GENERIC TYPE	NR	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR	
LINER GENERIC MATERIAL TYPE	NR	
LINER SPECIFIC MATERIAL TYPE	NR	

BOSTON EDISON: MYSTIC 6 (CONT.)

** DUCTWORK	
SHELL GENERIC MATERIAL TYPE	NR
SHELL SPECIFIC MATERIAL TYPE	NR
LINER GENERIC MATERIAL TYPE	NR
LINER SPECIFIC MATERIAL TYPE	NR
** REAGENT PREPARATION EQUIPMENT	
FUNCTION	SLAKER
DEVICE	NR
DEVICE TYPE	NR
** TANKS	
SERVICE	NUMBER
REAGENT PREP PRODUCT	1
** PUMPS	
SERVICE	NUMBER
NR	3
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	CENTRIFUGE
NUMBER	1
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
FEED STREAM CHARACTERISTICS	10% SOLIDS
*** SLUDGE	
** TREATMENT	
METHOD	NR
DEVICE	NR
PROPRIETARY PROCESS	NR
** DISPOSAL	
NATURE	N/A
TYPE	NONE
SITE TREATMENT	NR
** PROCESS CONTROL AND INSTRUMENTATION	
CHEMICAL PARAMETERS	PH, FLUE GAS INLET TEMP., SCRUBBER OUTLET TEMP.
CONTROL LEVELS	PH 6.8
MONITOR LOCATION	PH - BLEED LINE FROM ABSORBER TO CENTRIFUGE
PROCESS CONTROL MANNER	MANUAL
PROCESS CHEMISTRY MODE	FEEDBACK
** WATER BALANCE	
WATER LOOP TYPE	CLOSED

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
4/72	SYSTEM										

** PROBLEMS/SOLUTIONS/COMMENTS

THIS EXPERIMENTAL MAGNESIUM OXIDE SCRUBBING UNIT WAS RETROFITTED ON A 155 MW, OIL FIRED BOILER. THE SULFUR DIOXIDE AND PARTICLE MATTER REMOVAL OCCURRED IN THE VENTURI SCRUBBER MODULE. THE SO2 WAS CAPTURED AND CONVERTED TO MAGNESIUM SULFITE IN THE VENTURI. THE PRODUCT SLURRY WAS THEN FILTERED AND DRIED. THE DRY MATERIAL CALCINED AT HIGH TEMPERATURES TO DRIVE OFF THE SO2 AND REGENERATE MAGNESIUM OXIDE. THE SO2 STREAM WAS PROCESSED IN A SULFURIC ACID PLANT TO PRODUCE SULFURIC ACID. THE UTILITY AND THE EPA PROVIDED THE MAJOR PORTION OF THE FUNDING FOR THIS

BOSTON EDISON: MYSTIC 6 (CONT.)

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

REGENERABLE DEMONSTRATION PROJECT.

5/73	SYSTEM							

** PROBLEMS/SOLUTIONS/COMMENTS

FROM INITIAL STARTUP IN APRIL 1972 UNTIL MAY 1973 THE SCRUBBER OPERATED INTERMITTENTLY BECAUSE OF MECHANICAL DIFFICULTIES. THE MAJOR PROBLEM ENTAILING DESIGN AND OPERATION OF THE MAGNESIUM SULFITE CRYSTAL DRYER, APPARENTLY WAS RESOLVED BY REDESIGN AND FUEL CHANGE.

6/73	SYSTEM		67.9	55.8		720	592	402
7/73	SYSTEM		61.0	47.2		744	575	351

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JUNE AND JULY THE LONGEST PERIOD OF CONTINUOUS OPERATION OCCURRED. THE SYSTEM OPERATED 7.5 DAYS.

8/73	SYSTEM			0.0		744	0	

** PROBLEMS/SOLUTIONS/COMMENTS

DURING AUGUST THE BOILER WAS TAKEN OFF-LINE FOR AN ANNUAL OVERHAUL.

9/73	SYSTEM		38.1	33.8		720	637	243
10/73	SYSTEM		60.1	50.7		744	627	377

** PROBLEMS/SOLUTIONS/COMMENTS

DURING SEPTEMBER AND OCTOBER HEAVY EROSION/CORROSION IN THE LIQUOR RECIRCULATION PUMPS AND CENTRIFUGE DECREASED THE AVAILABILITY OF THE FGD SYSTEM

11/73	SYSTEM		25.6	22.5		720	629	162
12/73	SYSTEM		13.1	11.6		744	658	86
1/74	SYSTEM		27.4	20.4		744	555	152
2/74	SYSTEM		25.5	20.5		672	541	138

** PROBLEMS/SOLUTIONS/COMMENTS

IN JANUARY AND FEBRUARY FREQUENT SHUTDOWNS DUE TO BOILER-RELATED PROBLEMS LIMITED SYSTEM OPERATION.

3/74	SYSTEM		86.5	47.4		744	408	353

** PROBLEMS/SOLUTIONS/COMMENTS

SINCE FEBRUARY 1974 THE AVAILABILITY OF THE BOILER HAS INCREASED.

4/74	SYSTEM		80.5	65.4		720	585	471

** PROBLEMS/SOLUTIONS/COMMENTS

DURING APRIL, TWO 7-DAY CONTINUOUS OPERATION PERIODS OCCURRED.

5/74	SYSTEM		57.4	37.6		744	488	280

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

BOSTON EDISON: MYSTIC 6 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

DURING MAY, A TWO WEEK OUTAGE OF THE ACID PLANT WAS THE CAUSE OF A LOW FGD SYSTEM OPERABILITY FIGURE.

6/74	SYSTEM		51.5		40.0			720	559	288	

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JUNE 1974 THE DEMONSTRATION PROGRAM WAS COMPLETED AND THE FGD SYSTEM WAS SHUTDOWN. EPA FUNDING OF THE CALCINING PORTION OF THIS OPERATION EXPIRED. THERE WERE NO DEFINITE PLANS FOR RESTARTING THIS UNIT. MAJOR PROBLEM AREAS ENCOUNTERED DURING THE OPERATION OF THIS PROTOTYPE UNIT INCLUDED TRIHYDRATE INSTEAD OF HEXAHYDRATE SULFITE CRYSTAL FORMATION, DUST PROBLEMS IN THE DRYER, LACK OF STACK GAS REHEAT CAUSING CONDENSATION IN THE STACK, LOUVER DAMPER PROBLEMS, EROSION OF PUMPS, PIPING, AND CENTRIFUGE, AND MINOR ANCILLARY EQUIPMENT FAILURES.

APPENDIX F
DESIGN AND PERFORMANCE DATA FOR DISCONTINUED DOMESTIC FGD SYSTEMS

COMPANY NAME	COMMONWEALTH EDISON	
PLANT NAME	POWERTON	
UNIT NUMBER	51	
CITY	PEKIN	
STATE	ILLINOIS	
REGULATORY CLASSIFICATION	E	
PARTICULATE EMISSION LIMITATION - NG/J	43.	(0.100 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	774.	(1.800 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	1700	
GROSS UNIT GENERATING CAPACITY - MW	450	
NET UNIT GENERATING CAPACITY W/FGD - MW	400	
NET UNIT GENERATING CAPACITY WO/FGD - MW	425	
EQUIVALENT SCRUBBED CAPACITY - MW	450	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	BABCOCK & WILCOX	
BOILER TYPE	CYCLONE	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	722.18	(1530370 ACFM)
BOILER FLUE GAS TEMPERATURE - C	157.2	(315 F)
STACK HEIGHT - M	137.	(450 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	6.4	(21.0 FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	****	
AVERAGE HEAT CONTENT - J/G	24516.	(10540 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		****
AVERAGE ASH CONTENT - %	9.16	
RANGE ASH CONTENT - %	****	
AVERAGE MOISTURE CONTENT - %	16.34	
RANGE MOISTURE CONTENT - %	****	
AVERAGE SULFUR CONTENT - %	3.53	
RANGE SULFUR CONTENT - %	****	
AVERAGE CHLORIDE CONTENT - %	0.20	
RANGE CHLORIDE CONTENT - %	****	
*** PARTICLE CONTROL		
** MECHANICAL COLLECTOR		
NUMBER	0	
TYPE	NONE	
** FABRIC FILTER		
NUMBER	0	
TYPE	NONE	
** ESP		
NUMBER	1	
TYPE	COLD SIDE	
SUPPLIER	RESEARCH-COTTRELL	
INLET FLUE GAS CAPACITY - CU.M/S	722.2	(1530370 ACFM)
INLET FLUE GAS TEMPERATURE - C	157.2	(315 F)
PARTICLE REMOVAL EFFICENCY - %	98.7	
** PARTICLE SCRUBBER		
NUMBER	0	
GENERIC TYPE	NONE	
SPECIFIC TYPE	N/A	
TRADE NAME/COMMON NAME	N/A	
SHELL GENERIC MATERIAL	N/A	
SHELL SPECIFIC MATERIAL	N/A	
LINER GENERIC MATERIAL	N/A	
LINER SPECIFIC MATERIAL	N/A	
GAS CONTACTING DEVICE TYPE	N/A	

COMMONWEALTH EDISON: POWERTON 51 (CONT.)

*** FGD SYSTEM

** GENERAL DATA

SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT	
SO2 REMOVAL MODE	WET SCRUBBING	
PROCESS TYPE	LIMESTONE	
SYSTEM SUPPLIER	AIR CORRECTION DIVISION, UOP	
A-E FIRM	SARGENT & LUNDY	
DEVELOPMENT LEVEL	FULL SCALE	
NEW/RETROFIT	RETROFIT	
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	75.50	
ENERGY CONSUMPTION - %	5.6	
CURRENT STATUS	8	
TERMINATION	5/1982	
COMMERCIAL START-UP	6/1981	
INITIAL START-UP	4/1980	
CONTRACT AWARDED	5/1976	

** DESIGN AND OPERATING PARAMETERS

DESIGN CHLORIDE CONTENT - %	********	

** QUENCHER/PRESATURATOR

CONSTRUCTION MATERIAL GENERIC TYPE	NR	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR	

** ABSORBER

NUMBER	3	
GENERIC TYPE	PACKED TOWER	
SPECIFIC TYPE	MOBILE BED PACKING	
TRADE NAME/COMMON TYPE	TURBULENT CONTACT ABSORBER	
SUPPLIER	AIR CORRECTION DIVISION, UOP	
DIMENSIONS - FT	55.0 X 30.0 X 18.0	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	AISI 1110	
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A	
LINER GENERIC MATERIAL	ORGANIC	
LINER SPECIFIC MATERIAL	SYNTHETIC RUBBER	
LINER MATERIAL TRADE NAME/COMMON TYPE	NEOPRENE LS-576	
GAS CONTACTING DEVICE TYPE	PLASTIC/RUBBER MOBILE BALLS	
NUMBER OF CONTACTING ZONES	3	
LIQUID RECIRCULATION RATE - LITER/S	1575.	(25000 GPM)
L/G RATIO - L/CU.M	6.6	(49.0 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	3.0	(12.0 IN-H2O)
SUPERFICAL GAS VELOCITY - M/SEC	3.8	(12.5 FT/S)
INLET GAS FLOW - CU. M/S	240.73	(510123 ACFM)
INLET GAS TEMPERATURE - C	157.2	(315 F)
SO2 REMOVAL EFFICIENCY - %	75.5	

** MIST ELIMINATOR

PRE-MIST ELIMINATOR/MIST ELIMINATOR	PRIMARY COLLECTOR	
NUMBER PER SYSTEM	2	
GENERIC TYPE	IMPINGEMENT	
SPECIFIC TYPE	BAFFLE	
TRADE NAME/COMMON TYPE	CLOSED VANE	
CONFIGURATION	HORIZONTAL	
SUPERFICAL GAS VELOCITY - M/S	2.7	(9.0 FT/S)
CONSTRUCTION MATERIAL GENERIC TYPE	ORGANIC	
CONSTRUCTION MATERIAL SPECIFIC TYPE	FIBER-REINFORCED POLYESTER	

** REHEATER

GENERIC TYPE	INDIRECT HOT AIR	
SPECIFIC TYPE	EXTERNAL HEAT EXCHANGER	
TRADE NAME/COMMON TYPE	STEAM TUBE BUNDLE	
TEMPERATURE INCREASE - C	13.9	(25 F)
INLET FLUE GAS FLOW RATE - CU. M/S	583.28	(1236021 ACFM)
INLET FLUE GAS TEMPERATURE - C	54.4	(130 F)
CONSTRUCTION MATERIAL GENERIC TYPE	NR	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR	

COMMONWEALTH EDISON: POWERTON 51 (CONT.)

** FANS	
DESIGN	CENTRIFUGAL
SUPPLIER	GREEN FAN
FUNCTION	BOOSTER
APPLICATION	FORCED DRAFT
SERVICE	DRY
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL
** DAMPERS	
FUNCTION	NR
GENERIC TYPE	NR
SPECIFIC TYPE	NR
CONSTRUCTION MATERIAL GENERIC TYPE	NR
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR
LINER GENERIC MATERIAL TYPE	NR
LINER SPECIFIC MATERIAL TYPE	NR
** DUCTWORK	
SHELL GENERIC MATERIAL TYPE	NR
SHELL SPECIFIC MATERIAL TYPE	NR
LINER GENERIC MATERIAL TYPE	NR
LINER SPECIFIC MATERIAL TYPE	NR
** REAGENT PREPARATION EQUIPMENT	
FUNCTION	WET BALL MILL
DEVICE	COMPARTMENTED
DEVICE TYPE	NR
MANUFACTURER	KOPPERS
NUMBER	2
FULL LOAD DRY FEED CAPACITY - M.TONS/HR	20.0 (22 TPH)

** TANKS

SERVICE	NUMBER
ABSORBER RECYCLE	3
REAGENT PREP PRODUCT	3
MIST ELIMINATOR WASH	1
WASTE SLURRY BLEED	2
THICKENER OVERFLOW	1

** PUMPS

SERVICE	NUMBER
RECLAIMED WATER TRANSFER	2
WASTE SLURRY TRANSFER	2
FILTRATE TRANSFER	3
CONDENSATE RETURN	2
SERVICE WATER BOOSTER	2
FILTERED WATER BOOSTER	2
SURGE POND RECOVERY	3
SLURRY RECIRCULATION	9
REACTANT FEED	2
DEMISTER WASH	2
WASTE SLURRY	2
SLURRY TRANSFER	4

** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	VACUUM FILTER
NUMBER	3
NUMBER OF SPARES	1
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
OUTLET STREAM CHARACTERISTICS	55% SOLIDS
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	THICKENER
NUMBER	1
DIMENSIONS - FT	170.0 DIA X 10.0
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
OUTLET STREAM CHARACTERISTICS	35% SOLIDS

COMMONWEALTH EDISON: POWERTON 51 (CONT.)

*** SLUDGE

** TREATMENT

METHOD	FIXATION
DEVICE	PUG MILL
PROPRIETARY PROCESS	CONVERSION SYSTEMS 'POZ-O-TEC!
INLET QUALITY - %	35.0

** DISPOSAL

NATURE	FINAL
TYPE	POND
SITE TREATMENT	NONE

** DISPOSAL

NATURE	INTERIM
TYPE	POND
LOCATION	ON-SITE
SITE TREATMENT	CLAY LINING
SITE CAPACITY - CU.M	122300 (100.0 ACRE-FT)

** PROCESS CONTROL AND INSTRUMENTATION

CHEMICAL PARAMETERS	SO2, GAS FLOW, PH
PROCESS CONTROL MANNER	AUTOMATIC
PROCESS CHEMISTRY MODE	FEEDBACK/FEED FORWARD

** WATER BALANCE

WATER LOOP TYPE	CLOSED
MAKEUP WATER ADDITION - LITERS/S	35.3 (560 GPM)

PERFORMANCE DATA

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

** PROBLEMS/SOLUTIONS/COMMENTS

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

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

** PROBLEMS/SOLUTIONS/COMMENTS

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

10/80	SYSTEM					0.0		0.0	744		0
11/80	SYSTEM					0.0		0.0	720		0

COMMONWEALTH EDISON: POWERTON 51 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
12/80	SYSTEM	0.0			0.0			744		0	
	** PROBLEMS/SOLUTIONS/COMMENTS										
	THE FGD SYSTEM WAS NOT OPERATED AT ALL DURING THE FOURTH QUARTER 1980. AN EXPLOSION AND FIRE AT THIS UNIT OCCURRED DURING THE LATTER PART OF NOVEMBER CAUSING THE BOILER TO GO OFF LINE THROUGH THE END OF THE QUARTER.										
1/81	SYSTEM				0.0			744	0	0	0.0
2/81	SYSTEM				0.0			672	0	0	0.0
3/81	SYSTEM				0.0			744	0	0	0.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
	DURING THE FIRST QUARTER 1981 THE FGD SYSTEM WAS NOT OPERATED. REPAIRS ARE BEING MADE TO THE BOILER AND OTHER DAMAGED AREAS DUE TO THE FIRE IN NOVEMBER 1980.										
4/81	SYSTEM				0.0			720		0	
5/81	SYSTEM				0.0			744		0	
6/81	SYSTEM				0.0			720		0	
	** PROBLEMS/SOLUTIONS/COMMENTS										
	DURING THE SECOND QUARTER 1981 THE FGD SYSTEM WAS NOT OPERATED. FIRE REPAIRS TO THE BOILER AND OTHER DAMAGED AREAS HAVE BEEN COMPLETED. THE BOILER CAME BACK ON-LINE IN APRIL.										
7/81	SYSTEM				0.0			744		0	
8/81	SYSTEM				0.0			744		0	
9/81	SYSTEM				0.0			720		0	
	** PROBLEMS/SOLUTIONS/COMMENTS										
	THE FGD SYSTEM WAS NOT OPERATED DURING THE THIRD QUARTER 1981. THE UTILIT DOES NOT ANTICIPATE RUNNING AN ACCEPTANCE TEST BEFORE THE END OF THE YEAR.										
10/81	SYSTEM				0.0			744		0	
11/81	SYSTEM							720			
12/81	SYSTEM				32.2			744		240	
	** PROBLEMS/SOLUTIONS/COMMENTS										
	ON DECEMBER 1 THRU DECEMBER 10 TO UNIT OPERATED ON HIGH SULFUR COAL TO PREPARE FOR AN ACCEPTANCE TEST. THE TEST WAS PERFORMED ON DECEMBER 8 AND 9; HOWEVER, THE RESULTS ARE NOT YET AVAILABLE.										
1/82	SYSTEM							744			
2/82	SYSTEM							672			
3/82	SYSTEM							744			

COMMONWEALTH EDISON: POWERTON 51 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE FIRST QUARTER OF 1982, THE UTILITY DECIDED, DUE TO BUDGETARY CONSTRAINTS, TO SHUTDOWN FGD OPERATIONS AND USE LOW SULFUR COAL AS A COMPLIANCE STRATEGY.

APPENDIX F
DESIGN AND PERFORMANCE DATA FOR DISCONTINUED DOMESTIC FGD SYSTEMS

COMPANY NAME	COMMONWEALTH EDISON	
PLANT NAME	WILL COUNTY	
UNIT NUMBER	1A	
CITY	ROMEOVILLE	
STATE	ILLINOIS	
REGULATORY CLASSIFICATION	E	
PARTICULATE EMISSION LIMITATION - NG/J	86.	(0.200 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	774.	(1.800 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	1147	
GROSS UNIT GENERATING CAPACITY - MW	167	
NET UNIT GENERATING CAPACITY W/FGD - MW	137	
NET UNIT GENERATING CAPACITY WO/FGD - MW	144	
EQUIVALENT SCRUBBED CAPACITY - MW	167	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	BABCOCK & WILCOX	
BOILER TYPE	CYCLONE	
BOILER SERVICE LOAD	CYCLING	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	363.36	(770000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	179.4	(355 F)
STACK HEIGHT - M	107.	(350 FT)
STACK SHELL	NR	
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		9100-10500
AVERAGE ASH CONTENT - %	7.40	
RANGE ASH CONTENT - %	3.0-16.0	
AVERAGE MOISTURE CONTENT - %	********	
RANGE MOISTURE CONTENT - %	****	
AVERAGE SULFUR CONTENT - %	1.50	
RANGE SULFUR CONTENT - %	0.3-4.5	
AVERAGE CHLORIDE CONTENT - %	********	
RANGE CHLORIDE CONTENT - %	****	
*** PARTICLE CONTROL		
** MECHANICAL COLLECTOR		
NUMBER	0	
TYPE	NONE	
** FABRIC FILTER		
NUMBER	0	
TYPE	NONE	
** ESP		
NUMBER	1	
TYPE	COLD SIDE	
SUPPLIER	WESTERN PREC. DIVISION, JOY	
INLET FLUE GAS TEMPERATURE - C	179.4	(355 F)
PARTICLE REMOVAL EFFICENCY - %	90.0	
** PARTICLE SCRUBBER		
NUMBER	2	
INITIAL START-UP DATE	4/1972	
GENERIC TYPE	VENTURI TOWER	
SPECIFIC TYPE	VARIABLE-THROAT/SIDE-MOVABLE BLADES	
TRADE NAME/COMMON NAME	N/A	
SUPPLIER	BABCOCK & WILCOX	
DIMENSIONS - FT	8.0 X 26.0 X 16.0	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	AISI 1110	
LINER GENERIC MATERIAL	ORGANIC; INORGANIC	
LINER SPECIFIC MATERIAL	INERT FLAKE-FILLED VINYL ESTER; HYDRAULICALLY-BO	
GAS CONTACTING DEVICE TYPE	NONE	

COMMONWEALTH EDISON: WILL COUNTY 1A (CONT.)

LIQUID RECIRCULATION RATE - LITER/S	365.4	(5800 GPM)
L/G RATIO - LITER/CU.M	2.4	(18.0 GAL/1000ACF)
PRESSURE DROP - KPA	2.2	(9.0 IN-H2O)
SUPERFICIAL GAS VELOCITY - M/S	36.6	(120.0 FT/S)
INLET GAS FLOW RATE - CU.M/S	181.7	(385000 ACFM)
INLET GAS TEMPERATURE - C	179.4	(355 F)
PARTICLE REMOVAL EFFICIENCY - %	98.0	

*** FGD SYSTEM

** GENERAL DATA

SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT
SO2 REMOVAL MODE	WET SCRUBBING
PROCESS TYPE	LIMESTONE
SYSTEM SUPPLIER	BABCOCK & WILCOX
A-E FIRM	BECHTEL
DEVELOPMENT LEVEL	FULL SCALE
NEW/RETROFIT	RETROFIT
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	98.00
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	76.00
ENERGY CONSUMPTION - %	4.2
CURRENT STATUS	8
TERMINATION	7/1977
COMMERCIAL START-UP	2/1973
INITIAL START-UP	2/1972
CONTRACT AWARDED	2/1971

** DESIGN AND OPERATING PARAMETERS

DESIGN CHLORIDE CONTENT - %	********

** QUENCHER/PRESATURATOR

CONSTRUCTION MATERIAL GENERIC TYPE	NR
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR

** ABSORBER

NUMBER	2	
GENERIC TYPE	TRAY TOWER	
SPECIFIC TYPE	SIEVE TRAY	
TRADE NAME/COMMON TYPE	N/A	
SUPPLIER	BABCOCK & WILCOX	
DIMENSIONS - FT	16.0 X 24.0 X 60.0	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	HIGH STRENGTH LOW ALLOY 'HSLA!	
SHELL MATERIAL TRADE NAME/COMMON TYPE	COR-TEN	
LINER GENERIC MATERIAL	ORGANIC	
LINER SPECIFIC MATERIAL	NATURAL RUBBER	
LINER MATERIAL TRADE NAME/COMMON TYPE	BLACK NATURAL RUBBER	
GAS CONTACTING DEVICE TYPE	PERFORATED TRAYS	
NUMBER OF CONTACTING ZONES	2	
LIQUID RECIRCULATION RATE - LITER/S	693.	(11000 GPM)
L/G RATIO - L/CU.M	4.7	(35.0 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	2.5	(10.0 IN-H2O)
SUPERFICAL GAS VELOCITY - M/SEC	3.0	(10.0 FT/S)
INLET GAS FLOW - CU. M/S	181.68	(385000 ACFM)
INLET GAS TEMPERATURE - C	179.4	(355 F)
PARTICLE REMOVAL EFFICENCY - %	76.0	

** MIST ELIMINATOR

PRE-MIST ELIMINATOR/MIST ELIMINATOR	PRIMARY COLLECTOR	
NUMBER PER SYSTEM	2	
GENERIC TYPE	IMPINGEMENT	
SPECIFIC TYPE	BAFFLE	
TRADE NAME/COMMON TYPE	CLOSED VANE	
CONFIGURATION	HORIZONTAL	
NUMBER OF STAGES	2	
NUMBER OF PASSES PER STAGE	3	
FREEBOARD DISTANCE - M	3.05	(10.0 FT)
DISTANCE BETWEEN VANES - CM	3.8	(1.50 IN)
VANE ANGLES - DEGREES	45	
PRESSURE DROP - KPA	0.2	(1.0 IN-H2O)
CONSTRUCTION MATERIAL GENERIC TYPE	ORGANIC	
CONSTRUCTION MATERIAL SPECIFIC TYPE	FIBER-REINFORCED POLYESTER	

COMMONWEALTH EDISON: WILL COUNTY 1A (CONT.)

WASH WATER SOURCE	BLENDED	
WASH FREQUENCY	UNDERSPRAY-CONTINUOUS; OVERSPRAY-INTERMITTENT	
WASH RATE - L/S	71.0	(1125 GAL/MIN)
** REHEATER		
NUMBER	2	
GENERIC TYPE	IN-LINE	
SPECIFIC TYPE	STEAM	
TRADE NAME/COMMON TYPE	NR	
TEMPERATURE INCREASE - C	28.9	(52 F)
INLET FLUE GAS FLOW RATE - CU. M/S	179.32	(380000 ACFM)
INLET FLUE GAS TEMPERATURE - C	53.3	(128 F)
CONSTRUCTION MATERIAL GENERIC TYPE	STAINLESS STEEL	
CONSTRUCTION MATERIAL SPECIFIC TYPE	AUSTENITIC	
** FANS		
NUMBER	2	
DESIGN	CENTRIFUGAL	
FUNCTION	BOOSTER	
APPLICATION	INDUCED DRAFT	
SERVICE	DRY	
FLUE GAS TEMPERATURE - C	82.2	(180 F)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	
** DAMPERS		
FUNCTION	NR	
GENERIC TYPE	NR	
SPECIFIC TYPE	NR	
CONSTRUCTION MATERIAL GENERIC TYPE	NR	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR	
LINER GENERIC MATERIAL TYPE	NR	
LINER SPECIFIC MATERIAL TYPE	NR	
** DUCTWORK		
SHELL GENERIC MATERIAL TYPE	NR	
SHELL SPECIFIC MATERIAL TYPE	NR	
LINER GENERIC MATERIAL TYPE	NR	
LINER SPECIFIC MATERIAL TYPE	NR	
** REAGENT PREPARATION EQUIPMENT		
FUNCTION	WET BALL MILL	
DEVICE	COMPARTMENTED	
DEVICE TYPE	NR	
NUMBER	2	
FULL LOAD DRY FEED CAPACITY - M.TONS/HR	10.9	(12 TPH)
PRODUCT QUALITY - % SOLIDS	27.5	

** TANKS

SERVICE	NUMBER
SCRUBBER RECYCLE	2
REAGENT PREP PRODUCT	1
ABSORBER RECYCLE	2

** PUMPS

SERVICE	NUMBER
VENTURI RECIRCULATION	6
SLURRY TRANSFER	2
BALL MILL PRODUCT RECIRCULATION	2
ABSORBER RECIRCULATION	8

** SOLIDS CONCENTRATING/DEWATERING		
DEVICE	THICKENER	
NUMBER	1	
CONFIGURATION	CIRCULAR, SLOPED BOTTOM	
DIMENSIONS - FT	65.0 DIA X 15.0	
** SOLIDS CONCENTRATING/DEWATERING		
DEVICE	VACUUM FILTER	
NUMBER	1	

COMMONWEALTH EDISON: WILL COUNTY 1A (CONT.)

CAPACITY	90TON/DAY

*** SLUDGE

** TREATMENT

METHOD	FIXATION
DEVICE	PUG MILL
PROPRIETARY PROCESS	CHICAGO ADMIXTURES

** DISPOSAL

NATURE	INTERIM
TYPE	POND
LOCATION	ON-SITE
SITE TREATMENT	CLAY LINING

** DISPOSAL

NATURE	FINAL
TYPE	LANDFILL
LOCATION	OFF-SITE
SITE TRANSPORTATION METHOD	TRUCK

** PROCESS CONTROL AND INSTRUMENTATION

CHEMICAL PARAMETERS	PRESSURE, LIMESTONE FEED, PH
PROCESS CONTROL MANNER	AUTOMATIC

** WATER BALANCE

WATER LOOP TYPE	CLOSED

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
0/72	SYSTEM										

** PROBLEMS/SOLUTIONS/COMMENTS

REFER TO THE PERFORMANCE UPDATE INFORMATION FOR WILL COUNTY LOCATED IN SECTION 14 OF THIS REPORT.

APPENDIX F
DESIGN AND PERFORMANCE DATA FOR DISCONTINUED DOMESTIC FGD SYSTEMS

COMPANY NAME	DAIRYLAND POWER	
PLANT NAME	ALMA	
UNIT NUMBER	5	
CITY	ALMA	
STATE	WISCONSIN	
REGULATORY CLASSIFICATION	****	
PARTICULATE EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	210	
GROSS UNIT GENERATING CAPACITY - MW	80	
NET UNIT GENERATING CAPACITY W/FGD - MW	*****	
NET UNIT GENERATING CAPACITY WO/FGD - MW	*****	
EQUIVALENT SCRUBBED CAPACITY - MW	80	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	****	
BOILER TYPE	****	
BOILER SERVICE LOAD	****	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	********	(******* ACFM)
BOILER FLUE GAS TEMPERATURE - C	*******	(**** F)
STACK HEIGHT - M	******	(**** FT)
STACK SHELL	NR	
STACK TOP DIAMETER - M	*******	(***** FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	****	
AVERAGE HEAT CONTENT - J/G	******	(****** BTU/LB)
RANGE HEAT CONTENT - BTU/LB		10500-11000
AVERAGE ASH CONTENT - %	********	
RANGE ASH CONTENT - %	12.0-20.0	
AVERAGE MOISTURE CONTENT - %	********	
RANGE MOISTURE CONTENT - %	3.0-3.5	
AVERAGE SULFUR CONTENT - %	********	
RANGE SULFUR CONTENT - %	****	
AVERAGE CHLORIDE CONTENT - %	********	
RANGE CHLORIDE CONTENT - %	****	
*** PARTICLE CONTROL		
** ESP		
NUMBER	1	
** PARTICLE SCRUBBER		
NUMBER	0	
GENERIC TYPE	NONE	
SPECIFIC TYPE	N/A	
TRADE NAME/COMMON NAME	N/A	
SHELL GENERIC MATERIAL	N/A	
SHELL SPECIFIC MATERIAL	N/A	
LINER GENERIC MATERIAL	N/A	
LINER SPECIFIC MATERIAL	N/A	
GAS CONTACTING DEVICE TYPE	N/A	
*** FGD SYSTEM		
** GENERAL DATA		
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT	
SO2 REMOVAL MODE	WET SCRUBBING	
PROCESS TYPE	LIME	
SYSTEM SUPPLIER	FOSTER WHEELER	
DEVELOPMENT LEVEL	EXPERIMENTAL	
NEW/RETROFIT	RETROFIT	
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	32.50	
CURRENT STATUS	8	
TERMINATION	8/1974	
COMMERCIAL START-UP	6/1971	
INITIAL START-UP	6/1971	

DAIRYLAND POWER: ALMA 5 (CONT.)

** DESIGN AND OPERATING PARAMETERS	
DESIGN CHLORIDE CONTENT - %	********
** QUENCHER/PRESATURATOR	
CONSTRUCTION MATERIAL GENERIC TYPE	NR
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR
** ABSORBER	
GENERIC TYPE	NR
SPECIFIC TYPE	NR
TRADE NAME/COMMON TYPE	NR
SHELL GENERIC MATERIAL	NR
SHELL SPECIFIC MATERIAL	NR
SHELL MATERIAL TRADE NAME/COMMON TYPE	NR
LINER GENERIC MATERIAL	NR
LINER SPECIFIC MATERIAL	NR
LINER MATERIAL TRADE NAME/COMMON TYPE	NR
** MIST ELIMINATOR	
PRE-MIST ELIMINATOR/MIST ELIMINATOR	NR
GENERIC TYPE	NR
SPECIFIC TYPE	NR
TRADE NAME/COMMON TYPE	NR
CONSTRUCTION MATERIAL GENERIC TYPE	NR
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR
** REHEATER	
GENERIC TYPE	NR
SPECIFIC TYPE	NR
TRADE NAME/COMMON TYPE	NR
CONSTRUCTION MATERIAL GENERIC TYPE	NR
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR
** FANS	
DESIGN	NR
FUNCTION	NR
APPLICATION	NR
SERVICE	NR
CONSTRUCTION MATERIAL GENERIC TYPE	NR
** DAMPERS	
FUNCTION	NR
GENERIC TYPE	NR
SPECIFIC TYPE	NR
CONSTRUCTION MATERIAL GENERIC TYPE	NR
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR
LINER GENERIC MATERIAL TYPE	NR
LINER SPECIFIC MATERIAL TYPE	NR
** DUCTWORK	
SHELL GENERIC MATERIAL TYPE	NR
SHELL SPECIFIC MATERIAL TYPE	NR
LINER GENERIC MATERIAL TYPE	NR
LINER SPECIFIC MATERIAL TYPE	NR
** REAGENT PREPARATION EQUIPMENT	
FUNCTION	SLAKER
DEVICE	NR
DEVICE TYPE	NR

** TANKS	
SERVICE	NUMBER
-------	------
NR	****

** PUMPS	
SERVICE	NUMBER
-------	------
NR	****

DAIRYLAND POWER: ALMA 5 (CONT.)

** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	NA
*** SLUDGE	
** TREATMENT	
METHOD	NA
DEVICE	NA
PROPRIETARY PROCESS	NA
** DISPOSAL	
NATURE	NR
TYPE	NR

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
6/71	SYSTEM										

** PROBLEMS/SOLUTIONS/COMMENTS

THIS EXPERIMENTAL WET LIME FURNACE SYSTEM COMMENCED OPERATIONS IN JUNE 1971 AND WAS OPERATIONAL FOR PERIODS UP TO 30 DAYS. IN AUGUST 1974 THE UNIT WAS TESTED FOR TWO DAYS USING WESTERN LOW-SULFUR COAL. THE TEST SHOWED ABOUT 50% SO2 REMOVAL EFFICIENCY, BUT ESP PERFORMANCE WAS ADVERSELY AFFECTED. THE FGD PROJECT HAS BEEN SHUT DOWN INDEFINITELY SINCE AUGUST 1974, AND THERE ARE NO PLANS FOR FUTURE OPERATION.

APPENDIX F
DESIGN AND PERFORMANCE DATA FOR DISCONTINUED DOMESTIC FGD SYSTEMS

COMPANY NAME	DETROIT EDISON	
PLANT NAME	ST. CLAIR	
UNIT NUMBER	6A	
CITY	BELLE RIVER	
STATE	MICHIGAN	
REGULATORY CLASSIFICATION	A	
PARTICULATE EMISSION LIMITATION - NG/J	86.	(0.200 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	1376.	(3.200 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	1798	
GROSS UNIT GENERATING CAPACITY - MW	325	
NET UNIT GENERATING CAPACITY W/FGD - MW	154	
NET UNIT GENERATING CAPACITY WO/FGD - MW	163	
EQUIVALENT SCRUBBED CAPACITY - MW	163	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	COMBUSTION ENGINEERING	
BOILER TYPE	****	
BOILER SERVICE LOAD	PEAK	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	465.77	(987000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	132.2	(270 F)
STACK HEIGHT - M	130.	(425 FT)
STACK SHELL	NR	
STACK TOP DIAMETER - M	*******	(***** FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	SUBBITUMINOUS	
AVERAGE HEAT CONTENT - J/G	22330.	(9600 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		9500-9600
AVERAGE ASH CONTENT - %	4.00	
RANGE ASH CONTENT - %	3.0-4.0	
AVERAGE MOISTURE CONTENT - %	22.60	
RANGE MOISTURE CONTENT - %	22.0-24.0	
AVERAGE SULFUR CONTENT - %	0.35	
RANGE SULFUR CONTENT - %	0.3-0.4	
AVERAGE CHLORIDE CONTENT - %	********	
RANGE CHLORIDE CONTENT - %	****	
*** PARTICLE CONTROL		
** MECHANICAL COLLECTOR		
NUMBER	0	
TYPE	NONE	
** FABRIC FILTER		
NUMBER	0	
TYPE	NONE	
** ESP		
NUMBER	2	
SUPPLIER	WHEELABRATOR-FRYE	
PARTICLE REMOVAL EFFICENCY - %	90.0	
** PARTICLE SCRUBBER		
NUMBER	2	
INITIAL START-UP DATE	9/1975	
GENERIC TYPE	VENTURI TOWER	
SPECIFIC TYPE	VARIABLE-THROAT/ADJUSTABLE DRUM	
TRADE NAME/COMMON NAME	RADIAL FLOW VENTURI	
SUPPLIER	PEABODY-LURGI	
SHELL GENERIC MATERIAL	STAINLESS STEEL	
SHELL SPECIFIC MATERIAL	AUSTENITIC	
LINER GENERIC MATERIAL	ORGANIC	
LINER SPECIFIC MATERIAL	NATURAL RUBBER	
GAS CONTACTING DEVICE TYPE	NONE	
LIQUID RECIRCULATION RATE - LITER/S	278.5	(4420 GPM)
L/G RATIO - LITER/CU.M	2.7	(20.0 GAL/1000ACF)
PRESSURE DROP - KPA	3.5	(14.0 IN-H2O)

DETROIT EDISON: ST. CLAIR 6A (CONT.)

SUPERFICIAL GAS VELOCITY - M/S	28.3	(93.0 FT/S)
INLET GAS FLOW RATE - CU.M/S	116.6	(247000 ACFM)
INLET GAS TEMPERATURE - C	132.2	(270 F)

*** FGD SYSTEM

** GENERAL DATA

SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT
SO2 REMOVAL MODE	WET SCRUBBING
PROCESS TYPE	LIMESTONE
SYSTEM SUPPLIER	PEABODY PROCESS SYSTEMS
A-E FIRM	BECHTEL
DEVELOPMENT LEVEL	DEMONSTRATION
NEW/RETROFIT	RETROFIT
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.70
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	90.00
ENERGY CONSUMPTION - %	2.8
CURRENT STATUS	8
TERMINATION	12/1976
COMMERCIAL START-UP	9/1975
INITIAL START-UP	6/1975
CONTRACT AWARDED	0/1971

** DESIGN AND OPERATING PARAMETERS

DESIGN CHLORIDE CONTENT - %	********

** QUENCHER/PRESATURATOR

CONSTRUCTION MATERIAL GENERIC TYPE	NR
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR

** ABSORBER

NUMBER	2	
GENERIC TYPE	SPRAY TOWER	
SPECIFIC TYPE	OPEN COUNTERCURRENT SPRAY	
TRADE NAME/COMMON TYPE	N/A	
SUPPLIER	PEABODY PROCESS SYSTEMS	
SHELL GENERIC MATERIAL	STAINLESS STEEL	
SHELL SPECIFIC MATERIAL	AUSTENITIC	
SHELL MATERIAL TRADE NAME/COMMON TYPE	TYPE 316L	
LINER GENERIC MATERIAL	NONE	
LINER SPECIFIC MATERIAL	N/A	
LINER MATERIAL TRADE NAME/COMMON TYPE	N/A	
GAS CONTACTING DEVICE TYPE	NONE	
L/G RATIO - L/CU.M	10.7	(80.0 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	2.5	(10.0 IN-H2O)
SUPERFICAL GAS VELOCITY - M/SEC	2.9	(9.5 FT/S)
INLET GAS FLOW - CU. M/S	101.46	(215000 ACFM)
INLET GAS TEMPERATURE - C	47.8	(118 F)
SO2 REMOVAL EFFICIENCY - %	90.0	

** MIST ELIMINATOR

PRE-MIST ELIMINATOR/MIST ELIMINATOR	PRIMARY COLLECTOR	
NUMBER PER SYSTEM	2	
GENERIC TYPE	CENTRIFUGAL	
SPECIFIC TYPE	RADIAL VANE	
TRADE NAME/COMMON TYPE	RADIAL BAFFLE	
CONFIGURATION	HORIZONTAL	
FREEBOARD DISTANCE - M	1.37	(4.5 FT)
DISTANCE BETWEEN VANES - CM	20.3	(8.00 IN)
VANE ANGLES - DEGREES	45	
PRESSURE DROP - KPA	0.0	(0.2 IN-H2O)
SUPERFICAL GAS VELOCITY - M/S	3.0	(10.0 FT/S)
CONSTRUCTION MATERIAL GENERIC TYPE	STAINLESS STEEL	
CONSTRUCTION MATERIAL SPECIFIC TYPE	AUSTENITIC	

** REHEATER

NUMBER	1
GENERIC TYPE	DIRECT COMBUSTION
SPECIFIC TYPE	EXTERNAL COMBUSTION CHAMBER
TRADE NAME/COMMON TYPE	OIL
PERCENT GAS BYPASSED - AVG	0.0

DETROIT EDISON: ST. CLAIR 6A (CONT.)

TEMPERATURE INCREASE - C	27.8	(50 F)
INLET FLUE GAS FLOW RATE - CU. M/S	187.20	(396700 ACFM)
INLET FLUE GAS TEMPERATURE - C	50.0	(122 F)
CONSTRUCTION MATERIAL GENERIC TYPE	NR	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR	

** FANS

NUMBER	1
SUPPLIER	PEABODY PROCESS SYSTEMS
FUNCTION	BOOSTER
APPLICATION	INDUCED DRAFT
SERVICE	WET
CONSTRUCTION MATERIAL GENERIC TYPE	STAINLESS STEEL

** DAMPERS

FUNCTION	NR
GENERIC TYPE	NR
SPECIFIC TYPE	NR
CONSTRUCTION MATERIAL GENERIC TYPE	NR
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR
LINER GENERIC MATERIAL TYPE	NR
LINER SPECIFIC MATERIAL TYPE	NR

** DUCTWORK

SHELL GENERIC MATERIAL TYPE	NR
SHELL SPECIFIC MATERIAL TYPE	NR
LINER GENERIC MATERIAL TYPE	NR
LINER SPECIFIC MATERIAL TYPE	NR

** REAGENT PREPARATION EQUIPMENT

FUNCTION	NONE
DEVICE	N/A
DEVICE TYPE	N/A
NUMBER	1
PRODUCT QUALITY - % SOLIDS	35.0

** TANKS

SERVICE	NUMBER
ABSORBER RECYCLE	1

** PUMPS

SERVICE	NUMBER
SLURRY FEED	2
VENTURI RECIRCULATION	3
SPRAY TOWER RECIRCULATION	6

** SOLIDS CONCENTRATING/DEWATERING

DEVICE	NONE
NUMBER	0

*** SLUDGE

** TREATMENT

METHOD	BLEED
DEVICE	N/A
PROPRIETARY PROCESS	N/A

** DISPOSAL

NATURE	FINAL
TYPE	POND
SITE TRANSPORTATION METHOD	PIPELINE
SITE TREATMENT	NONE
SITE SERVICE LIFE - YRS	1

** PROCESS CONTROL AND INSTRUMENTATION

CHEMICAL PARAMETERS	PH, SOLIDS
CONTROL LEVELS	PH 5.8-6.0; SOLIDS 15%

DETROIT EDISON: ST. CLAIR 6A (CONT.)

MONITOR LOCATION	RECYCLE TANK
PROCESS CONTROL MANNER	AUTOMATIC
PROCESS CHEMISTRY MODE	FEEDBACK

** WATER BALANCE

WATER LOOP TYPE	OPEN

PERFORMANCE DATA

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

** PROBLEMS/SOLUTIONS/COMMENTS

REFER TO THE PERFORMANCE UPDATE INFORMATION FOR ST. CLAIR 6 LOCATED IN SECTION 14 OF THIS REPORT.

APPENDIX F
DESIGN AND PERFORMANCE DATA FOR DISCONTINUED DOMESTIC FGD SYSTEMS

COMPANY NAME	GULF POWER	
PLANT NAME	SCHOLZ	
UNIT NUMBER	1	
CITY	SNEADS	
STATE	FLORIDA	
REGULATORY CLASSIFICATION	E	
PARTICULATE EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	80	
GROSS UNIT GENERATING CAPACITY - MW	20	
NET UNIT GENERATING CAPACITY W/FGD - MW	*****	
NET UNIT GENERATING CAPACITY WO/FGD - MW	*****	
EQUIVALENT SCRUBBED CAPACITY - MW	20	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	BABCOCK & WILCOX	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	50.02	(106000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	*******	(**** F)
STACK HEIGHT - M	******	(**** FT)
STACK SHELL	NR	
STACK TOP DIAMETER - M	*******	(***** FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	****	
AVERAGE HEAT CONTENT - J/G	30005.	(12900 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		****
AVERAGE ASH CONTENT - %	********	
RANGE ASH CONTENT - %	****	
AVERAGE MOISTURE CONTENT - %	********	
RANGE MOISTURE CONTENT - %	****	
AVERAGE SULFUR CONTENT - %	3.25	
RANGE SULFUR CONTENT - %	3.0-3.5	
AVERAGE CHLORIDE CONTENT - %	********	
RANGE CHLORIDE CONTENT - %	****	
*** PARTICLE CONTROL		
** ESP		
NUMBER	1	
** PARTICLE SCRUBBER		
GENERIC TYPE	NR	
SPECIFIC TYPE	NR	
TRADE NAME/COMMON NAME	NR	
SHELL GENERIC MATERIAL	NR	
SHELL SPECIFIC MATERIAL	NR	
LINER GENERIC MATERIAL	NR	
LINER SPECIFIC MATERIAL	NR	
*** FGD SYSTEM		
** GENERAL DATA		
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT	
SO2 REMOVAL MODE	WET SCRUBBING	
PROCESS TYPE	DUAL ALKALI/LIMESTONE	
SYSTEM SUPPLIER	THYSSEN/CEA	
A-E FIRM	A.D. LITTLE	
DEVELOPMENT LEVEL	DEMONSTRATION	
NEW/RETROFIT	RETROFIT	
CURRENT STATUS	8	
TERMINATION	5/1981	
INITIAL START-UP	8/1980	

GULF POWER: SCHOLZ 1 (CONT.)

** DESIGN AND OPERATING PARAMETERS	
DESIGN CHLORIDE CONTENT - %	********
** QUENCHER/PRESATURATOR	
CONSTRUCTION MATERIAL GENERIC TYPE	NR
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR
** ABSORBER	
GENERIC TYPE	TRAY TOWER
SPECIFIC TYPE	NR
TRADE NAME/COMMON TYPE	NR
SHELL GENERIC MATERIAL	NR
SHELL SPECIFIC MATERIAL	NR
SHELL MATERIAL TRADE NAME/COMMON TYPE	NR
LINER GENERIC MATERIAL	NR
LINER SPECIFIC MATERIAL	NR
LINER MATERIAL TRADE NAME/COMMON TYPE	NR
** MIST ELIMINATOR	
PRE-MIST ELIMINATOR/MIST ELIMINATOR	NR
GENERIC TYPE	NR
SPECIFIC TYPE	NR
TRADE NAME/COMMON TYPE	NR
CONSTRUCTION MATERIAL GENERIC TYPE	NR
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR
** REHEATER	
GENERIC TYPE	INDIRECT HOT AIR
SPECIFIC TYPE	NR
TRADE NAME/COMMON TYPE	NR
TEMPERATURE INCREASE - C	22.2 (40 F)
CONSTRUCTION MATERIAL GENERIC TYPE	NR
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR
** FANS	
DESIGN	CENTRIFUGAL
FUNCTION	BOOSTER
APPLICATION	INDUCED DRAFT
SERVICE	WET
CONSTRUCTION MATERIAL GENERIC TYPE	NR
** DAMPERS	
FUNCTION	NR
GENERIC TYPE	NR
SPECIFIC TYPE	NR
CONSTRUCTION MATERIAL GENERIC TYPE	NR
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR
LINER GENERIC MATERIAL TYPE	NR
LINER SPECIFIC MATERIAL TYPE	NR
** DUCTWORK	
SHELL GENERIC MATERIAL TYPE	NR
SHELL SPECIFIC MATERIAL TYPE	NR
LINER GENERIC MATERIAL TYPE	NR
LINER SPECIFIC MATERIAL TYPE	NR
** REAGENT PREPARATION EQUIPMENT	
FUNCTION	NR
DEVICE	NR
DEVICE TYPE	NR
** PUMPS	
SERVICE	NUMBER
-------	------
NR	****
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	THICKENER
NUMBER	1
SHELL GENERIC MATERIAL TYPE	CARBON STEEL; ORGANIC 'LINING!

GULF POWER: SCHOLZ 1 (CONT.)

SHELL SPECIFIC MATERIAL TYPE	AISI 1110; NR
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	VACUUM FILTER
NUMBER	1
SHELL SPECIFIC MATERIAL TYPE	FIBERGLASS
FEED STREAM CHARACTERISTICS	20% SOLIDS
*** SLUDGE	
** TREATMENT	
METHOD	DEWATERED
DEVICE	N/A
PROPRIETARY PROCESS	N/A
** DISPOSAL	
NATURE	FINAL
TYPE	POND
SITE TREATMENT	CLAY LINING
** WATER BALANCE	
WATER LOOP TYPE	CLOSED

PERFORMANCE DATA

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

** PROBLEMS/SOLUTIONS/COMMENTS

INITIAL OPERATION OF THIS DEMONSTRATION LIMESTONE DUAL ALKALI SYSTEM BEGAN ON AUGUST 20. OPERATIONS DURING THE REST OF THE MONTH WERE INTERMITTENT AS MECHANICAL PROBLEMS WERE RECTIFIED.

9/80	SYSTEM							720			
10/80	SYSTEM							744			
11/80	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM CONTINUED TO OPERATE THROUGH NOVEMBER IN A DEBUGGING MODE OF OPERATION.

12/80	SYSTEM				75.9			744			565

** PROBLEMS/SOLUTIONS/COMMENTS

DURING DECEMBER THE DEMONSTRATION FGD SYSTEM OPERATED CONTINUOUSLY FOR TWO EIGHT DAY PERIODS. DURING THIS TIME THE SYSTEM SO2 REMOVAL EFFICIENCY WAS FOUND TO BE GREATER THAN 90%.

THE FGD SYSTEM WAS FORCED TO REMAIN OFF LINE FOR 6-8 DAYS IN DECEMBER DUE TO AN UNAVAILABILITY OF RAW MATERIALS.

1/81	SYSTEM				43.4			744			323

** PROBLEMS/SOLUTIONS/COMMENTS

AT THE END OF JANUARY THE SYSTEM WAS SHUT DOWN TO MAKE CORRECTIONS TO THE THICKENER. REPAIRS WERE CONDUCTED ON THE OVERFLOW WEIR AND RETURN LINES TO THE THICKENER CENTERWELL.

2/81	SYSTEM	86.2	86.2		86.2			672	672		579

GULF POWER: SCHOLZ 1 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

THE SYSTEM WAS STARTED UP ON FEBRUARY 2 AT NOONTIME, AFTER CORRECTIONS WER COMPLETED ON THE THICKENER. FAN MAINTENANCE REQUIRED A BRIEF 10 MINUTE SHUT DOWN LATER ON THAT DAY. AFTER TWO DAYS OF OPERATION, THE SYSTEM WAS SHUT DOWN ON FEBRUARY 4 FOR 11 HOURS. THIS WAS A PREVENTIVE MEASURE TO ALLOW SOLIDS IN THE THICKENER TO SETTLE (THICKENER OVERFLOW WAS CLOUDY). THE SYSTEM WAS RESTARTED ON FEBRUARY 5 AND OPERATED FOR 3 DAYS BEFORE IT WAS SHUT DOWN DUE TO THE INABILITY TO TRUCK AWAY SOLID WASTE MATERIAL. HEAVY RAINS WASHED OUT THE ROADS TO THE PONDS AND THE TRUCKS COULD NO LONG ER HAUL THE WASTE MATERIAL DISCHARGED BY THE VACUUM FILTER. IMPROVEMENT I WEATHER CODITIONS AND THE SPREADING OF SOME ROCKS ON THE POND BANKS MADE IT POSSIBLE TO RESUME WASTE DISPOSAL; THE SYSTEM WAS RESTARTED ON FEBRUARY 10 AFTER 39 HOURS OF INTERRUPTION. IT OPERATED UNTIL THE END OF THE MONTH WITH ONE OUTAGE ON FEBRUARY 27 DUE TO A FAILURE IN THE SCRUBBER PUMPS. THE AVERAGE SO2 REMOVAL EFFICIENCY FOR THE MONTH WAS 95.7 PERCENT.

3/81	SYSTEM	58.2				46.5		744		346	

** PROBLEMS/SOLUTIONS/COMMENTS

TWO SEPERATE OUTAGES OCCURRING ON MARCH 2 AND MARCH 3 TOTALING 7.8 HOURS WERE DUE TO PROBLEMS WITH THE SCRUBBER PUMPS. THE MOTOR IN ONE PUMP WAS INOPERATIVE AND THE IMPELLER IN THE OTHER PUMP HAD TO BE REPLACED.

A THIRD OUTAGE LASTING 190 HOURS WAS REQUIRED TO REPAIR THE VACUUM FILTER. THE PERFORMANCE OF THE VACUUM FILTER HAD BEEN DETERIORATING STEADILY. LEAKS HAD BEEN DETECTED IN THE INTERNAL PIPING OF THE FILTER DRUM AND BY THE TIME THE FILTER WAS REMOVED, ONLY HALF OF THE PANELS WERE ABLE TO PULL CAKE. THE SYSTEM WAS RESTARTED ON MARCH 13 AFTER THE FILTER HAD BEEN FIXE AND REINSTALLED. ALTHOUGH ALL 12 PANELS WERE PULLING CAKE, THE QUALITY OF THE SOLID CAKE PRODUCED BY THE FILTER DID NOT IMPROVE SIGNIFICANTLY (PERCENT SOLIDS CONCENTRATION WAS ABOUT 40 PERCENT). THE VACUUM REMAINED LOW, 5 TO 10 INCHES OF HG, VERSUS THE DESIGNED VACUUM OF 5 TO 10 INCHES HG

THE SOLIDS LEFT IN THE THICKENER DETERIORATED AS FAR AS SETTLING CHARAC- TERISTICS ARE CONCERNED, WHILE THE FILTER WAS BEING REPAIRED. THESE SOLID SLOWLY RESUSPENDED DURING THE 8 DAY OUTAGE. WHEN THE SYSTEM WAS RESTARTED ON MARCH 13, THE RESUSPENSION OF SOLIDS WAS AUGMENTED BY THE CIRCULATION OF LIQUOR THROUGHOUT THE SYSTEM. THIS PROBLEM CAUSED 3 OUTAGES TOTALING 94 HOURS. A FLOCCULANT WAS USED TO HELP IN THE SETTLING OF THESE SOLIDS.

ON MARCH 23, THE RAKE LOCKED IN PLACE. ROTATION OF THE RAKE WAS STOPPED TO PREVENT RESUSPENSION OF SOLIDS WHILE GOOD SETTLING SOLIDS BEING GENER- ATED IN THE REACTORS WERE BEING USED TO FORM A BLANKET TO COVER THE POOR SETTLING SOLIDS. AN AIR-LIQUOR SPARGER WAS USED TO FREE THE RAKE. THE OUTAGE LASTED 23 HOURS. THE SYSTEM RESTARTED AND OPERATED UNTIL NOON, MARCH 28. TESTING OF THE SYSTEM CONCLUDED AT THAT TIME. THE AVERAGE SO2 REMOVAL EFFICIENCY DURING THE OPERATING TIME IN THE MONTH OF MARCH WAS 96.8 PERCENT.

THE DECISION CONCERNING THE FUTURE OF THE FGD SYSTEM IS LEFT UP TO THE SOUTHERN COMPANY WHICH CONSISTS OF FOUR POWER COMPANIES (GULF, ALABAMA, GEORGIA, AND MISSISSIPPI).

APPENDIX F
DESIGN AND PERFORMANCE DATA FOR DISCONTINUED DOMESTIC FGD SYSTEMS

COMPANY NAME	GULF POWER	
PLANT NAME	SCHOLZ	
UNIT NUMBER	1,2	
CITY	SNEADS	
STATE	FLORIDA	
REGULATORY CLASSIFICATION	A	
PARTICULATE EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	80	
GROSS UNIT GENERATING CAPACITY - MW	23	
NET UNIT GENERATING CAPACITY W/FGD - MW	23	
NET UNIT GENERATING CAPACITY WO/FGD - MW	*****	
EQUIVALENT SCRUBBED CAPACITY - MW	23	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	BABCOCK & WILCOX	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	********	(******* ACFM)
BOILER FLUE GAS TEMPERATURE - C	*******	(**** F)
STACK HEIGHT - M	23.	(76 FT)
STACK SHELL	FIBER-REINFORCED POLYESTER	
STACK TOP DIAMETER - M	*******	(***** FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	BITUMINOUS	
AVERAGE HEAT CONTENT - J/G	29075.	(12500 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		****
AVERAGE ASH CONTENT - %	11.00	
RANGE ASH CONTENT - %	****	
AVERAGE MOISTURE CONTENT - %	5.00	
RANGE MOISTURE CONTENT - %	****	
AVERAGE SULFUR CONTENT - %	2.50	
RANGE SULFUR CONTENT - %	2.5-5.0	
AVERAGE CHLORIDE CONTENT - %	********	
RANGE CHLORIDE CONTENT - %	****	
*** PARTICLE CONTROL		
** ESP		
NUMBER	2	
TYPE	COLD SIDE	
SUPPLIER	BUELL DIVISION, ENVIROTECH	
INLET FLUE GAS TEMPERATURE - C	151.7	(305 F)
PARTICLE REMOVAL EFFICENCY - %	99.5	
** PARTICLE SCRUBBER		
NUMBER	0	
GENERIC TYPE	NONE	
SPECIFIC TYPE	N/A	
TRADE NAME/COMMON NAME	N/A	
SHELL GENERIC MATERIAL	N/A	
SHELL SPECIFIC MATERIAL	N/A	
LINER GENERIC MATERIAL	N/A	
LINER SPECIFIC MATERIAL	N/A	
GAS CONTACTING DEVICE TYPE	N/A	
*** FGD SYSTEM		
** GENERAL DATA		
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT	
SO2 REMOVAL MODE	WET SCRUBBING	
PROCESS TYPE	LIMESTONE/THOROUGHBRED 121	
PROCESS ADDITIVES	NONE	
SYSTEM SUPPLIER	CHIYODA INTERNATIONAL	
A-E FIRM	CHIYODA CHEMICAL ENG'R & CONSTION	
DEVELOPMENT LEVEL	PROTOTYPE	

GULF POWER: SCHOLZ 1,2 (CONT.)

NEW/RETROFIT	RETROFIT	
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.50	
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	90.00	
CURRENT STATUS	8	
TERMINATION	6/1979	
INITIAL START-UP	8/1978	
** DESIGN AND OPERATING PARAMETERS		
DESIGN CHLORIDE CONTENT - %	********	
** QUENCHER/PRESATURATOR		
CONSTRUCTION MATERIAL GENERIC TYPE	NR	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR	
** ABSORBER		
NUMBER	1	
GENERIC TYPE	MECHANICALLY-AIDED TOWER	
SPECIFIC TYPE	GAS SPARGER	
TRADE NAME/COMMON TYPE	JET BUBBLER REACTOR	
SUPPLIER	CHIYODA INTERNATIONAL	
DIMENSIONS - FT	24.0 DIA	
SHELL GENERIC MATERIAL	STAINLESS STEEL	
SHELL SPECIFIC MATERIAL	AUSTENITIC	
SHELL MATERIAL TRADE NAME/COMMON TYPE	NR	
LINER GENERIC MATERIAL	ORGANIC	
LINER SPECIFIC MATERIAL	FIBER-REINFORCED POLYESTER	
LINER MATERIAL TRADE NAME/COMMON TYPE	NR	
GAS CONTACTING DEVICE TYPE	N/A	
NUMBER OF CONTACTING ZONES	1	
INLET GAS FLOW - CU. M/S	37.75	(80000 ACFM)
INLET GAS TEMPERATURE - C	148.9	(300 F)
SO2 REMOVAL EFFICIENCY - %	95.0	
** MIST ELIMINATOR		
PRE-MIST ELIMINATOR/MIST ELIMINATOR	PRIMARY COLLECTOR	
NUMBER PER SYSTEM	1	
GENERIC TYPE	IMPINGEMENT	
SPECIFIC TYPE	BAFFLE	
TRADE NAME/COMMON TYPE	CLOSED VANE	
CONFIGURATION	VERTICAL	
NUMBER OF STAGES	2	
NUMBER OF PASSES PER STAGE	2	
PRESSURE DROP - KPA	0.2	(1.0 IN-H2O)
CONSTRUCTION MATERIAL GENERIC TYPE	NR	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR	
** REHEATER		
GENERIC TYPE	NONE	
SPECIFIC TYPE	N/A	
TRADE NAME/COMMON TYPE	N/A	
CONSTRUCTION MATERIAL GENERIC TYPE	NONE	
CONSTRUCTION MATERIAL SPECIFIC TYPE	N/A	
** FANS		
NUMBER	1	
DESIGN	CENTRIFUGAL	
FUNCTION	BOOSTER	
APPLICATION	FORCED DRAFT	
SERVICE	DRY	
FLUE GAS FLOW RATE - CU.M/S	25.01	(53000 ACFM)
FLUE GAS TEMPERATURE - C	148.9	(300 F)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	
** DAMPERS		
FUNCTION	NR	
GENERIC TYPE	NR	
SPECIFIC TYPE	NR	
CONSTRUCTION MATERIAL GENERIC TYPE	NR	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR	
LINER GENERIC MATERIAL TYPE	NR	
LINER SPECIFIC MATERIAL TYPE	NR	

GULF POWER: SCHOLZ 1,2 (CONT.)

** DUCTWORK	
SHELL GENERIC MATERIAL TYPE	NR
SHELL SPECIFIC MATERIAL TYPE	NR
LINER GENERIC MATERIAL TYPE	NR
LINER SPECIFIC MATERIAL TYPE	NR
** REAGENT PREPARATION EQUIPMENT	
FUNCTION	WET BALL MILL
DEVICE	COMPARTMENTED
DEVICE TYPE	NR
** PUMPS	
SERVICE	NUMBER
-------	------
NR	****
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	NONE
*** SALEABLE BYPRODUCTS	
NATURE	GYPSUM
DISPOSITION	STACKED IN POND
*** SLUDGE	
** TREATMENT	
METHOD	FORCED OXIDATION
DEVICE	JET BUBBLER
PROPRIETARY PROCESS	N/A
** DISPOSAL	
NATURE	FINAL
TYPE	POND
SITE TREATMENT	CLAY LINING
** PROCESS CONTROL AND INSTRUMENTATION	
PROCESS CONTROL MANNER	MANUAL
** WATER BALANCE	
WATER LOOP TYPE	CLOSED

PERFORMANCE DATA

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

** PROBLEMS/SOLUTIONS/COMMENTS

OPERATION BEGAN ON AUGUST 30, 1978.

NO INITIAL OPERATIONAL PROBLEMS WERE REPORTED.

9/78	SYSTEM							720			
10/78	SYSTEM		100.0					720			

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR OPERATIONAL PROBLEMS WERE REPORTED.

A 130 HOUR SCHEDULED OUTAGE OCCURRED IN OCTOBER.

11/78	SYSTEM		94.8					720			

GULF POWER: SCHOLZ 1,2 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
12/78	SYSTEM		100.0					744		0	

** PROBLEMS/SOLUTIONS/COMMENTS

THERE WERE NO UNPLANNED SHUTDOWNS DURING DECEMBER AND JANUARY.

THE SYSTEM WAS BEING OPERATED IN WHAT WAS CALLED PHASE II OF THE TESTING. THE SYSTEM WAS DELIBERATELY BEING UPSET FROM EQUILIBRIUM (PH, OXIDIZING A INPUT, ETC.) TO SEE HOW IT RESPONDED.

1/79	SYSTEM		100.0					744		0	
2/79	SYSTEM		98.3		98.4			672	672	661	
3/79	SYSTEM	100.0	100.0	100.0	100.0			744	744	744	
4/79	SYSTEM	100.0	100.0	100.0	100.0			720	720	720	

** PROBLEMS/SOLUTIONS/COMMENTS

ONE PUMP FAILURE CAUSING A 5 MINUTE OUTAGE WAS REPORTED BY THE UTILITY.

HIGH PARTICULATE LOADING TESTS WERE DONE IN APRIL. THE ESP WAS TOTALLY SHUT DOWN. THE SO2 REMOVAL WAS NOT AFFECTED BUT THE GYPSUM PRODUCT WAS TEMPORARILY AFFECTED. HIGH CHLORIDE TESTS WERE ALSO PERFORMED BY ADDING CALCIUM CHLORIDE TO THE SYSTEM. A RESULTANT CONCENTRATION OF 6000 PPM CHLORIDE WAS FOUND IN THE UNDERFLOW. NO SIGNIFICANT SCALING WAS ENCOUNTERED.

5/79	SYSTEM							744			
6/79	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM OPERATED THROUGH THE 24TH OF MAY WHEN THE SYSTEM WAS REMOVED FROM SERVICE BECAUSE THE EPRI STUDIES WERE COMPLETED.
JUNE:
AFTER SHUTDOWN THE UNIT WAS MODIFIED TO SIMULATE A SMALLER JET BUBBLER REACTOR WITH THE SAME AMOUNT OF FLUE GAS. THIS WAS DONE BY PLUGGING SOME OF THE SPARGERS AND RISER TUBES. THE UNIT WAS OPERATED LIKE THIS FROM JUNE 8 UNTIL JUNE 29 WITH RESULTS THAT INDICATED SLIGHTLY REDUCED REMOVAL EFFICIENCIES. DURING THE 21 DAYS OF OPERATION THE UNIT WAS DOWN ONLY ONCE FOR NINE HOURS FOR ROUTINE INSPECTION.
DURING THE EPRI STUDY A TOTAL OF 4448 HOURS OF OPERATION WERE LOGGED WITH A TOTAL OF 123.3 HOURS OF SHUTDOWN. THE AVERAGE AVAILABILITY FOR SIX MONTHS WAS 99.53%.
ALL STUDIES WERE COMPLETED AND THE SYSTEM HAS BEEN TERMINATED.

APPENDIX F
DESIGN AND PERFORMANCE DATA FOR DISCONTINUED DOMESTIC FGD SYSTEMS

COMPANY NAME	GULF POWER	
PLANT NAME	SCHOLZ	
UNIT NUMBER	1A	
CITY	SNEADS	
STATE	FLORIDA	
REGULATORY CLASSIFICATION	A	
PARTICULATE EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	516.	(1.200 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	80	
GROSS UNIT GENERATING CAPACITY - MW	48	
NET UNIT GENERATING CAPACITY W/FGD - MW	40	
NET UNIT GENERATING CAPACITY WO/FGD - MW	*****	
EQUIVALENT SCRUBBED CAPACITY - MW	48	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	BABCOCK & WILCOX	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	********	(******* ACFM)
BOILER FLUE GAS TEMPERATURE - C	146.1	(295 F)
STACK HEIGHT - M	******	(**** FT)
STACK SHELL	NR	
STACK TOP DIAMETER - M	*******	(***** FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	****	
AVERAGE HEAT CONTENT - J/G	******	(****** BTU/LB)
RANGE HEAT CONTENT - BTU/LB		****
AVERAGE ASH CONTENT - %	********	
RANGE ASH CONTENT - %	****	
AVERAGE MOISTURE CONTENT - %	********	
RANGE MOISTURE CONTENT - %	****	
AVERAGE SULFUR CONTENT - %	5.00	
RANGE SULFUR CONTENT - %	****	
AVERAGE CHLORIDE CONTENT - %	********	
RANGE CHLORIDE CONTENT - %	****	
*** PARTICLE CONTROL		
** ESP		
NUMBER	1	
TYPE	COLD SIDE	
SUPPLIER	BUELL DIVISION, ENVIROTECH	
PARTICLE REMOVAL EFFICENCY - %	99.5	
** PARTICLE SCRUBBER		
NUMBER	1	
INITIAL START-UP DATE	2/1975	
GENERIC TYPE	VENTURI TOWER	
SPECIFIC TYPE	VARIABLE-THROAT/TOP-ENTRY PLUMB BOB	
TRADE NAME/COMMON NAME	N/A	
SUPPLIER	THYSSEN/CEA	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	AISI 1110	
LINER GENERIC MATERIAL	INORGANIC	
LINER SPECIFIC MATERIAL	HYDRAULICALLY-BONDED MORTAR	
GAS CONTACTING DEVICE TYPE	NONE	
*** FGD SYSTEM		
** GENERAL DATA		
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT	
SO2 REMOVAL MODE	WET SCRUBBING	
PROCESS TYPE	DUAL ALKALI	
SYSTEM SUPPLIER	THYSSEN/CEA	
DEVELOPMENT LEVEL	PROTOTYPE	
NEW/RETROFIT	RETROFIT	

GULF POWER: SCHOLZ 1A (CONT.)

UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.70
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	95.00
CURRENT STATUS	8
TERMINATION	7/1976
COMMERCIAL START-UP	2/1975
INITIAL START-UP	2/1975
** DESIGN AND OPERATING PARAMETERS	
DESIGN CHLORIDE CONTENT - %	********
** QUENCHER/PRESATURATOR	
CONSTRUCTION MATERIAL GENERIC TYPE	NR
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR
** ABSORBER	
GENERIC TYPE	VENTURI TOWER
SPECIFIC TYPE	NR
TRADE NAME/COMMON TYPE	NR
SUPPLIER	THYSSEN/CEA
SHELL GENERIC MATERIAL	CARBON STEEL
SHELL SPECIFIC MATERIAL	AISI 1110
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A
LINER GENERIC MATERIAL	ORGANIC
LINER SPECIFIC MATERIAL	GLASS FLAKE-FILLED POLYESTER
LINER MATERIAL TRADE NAME/COMMON TYPE	NR
GAS CONTACTING DEVICE TYPE	NONE
** MIST ELIMINATOR	
PRE-MIST ELIMINATOR/MIST ELIMINATOR	NR
GENERIC TYPE	NR
SPECIFIC TYPE	NR
TRADE NAME/COMMON TYPE	NR
CONSTRUCTION MATERIAL GENERIC TYPE	NR
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR
** REHEATER	
NUMBER	1
GENERIC TYPE	NR
SPECIFIC TYPE	NR
TRADE NAME/COMMON TYPE	NR
PERCENT GAS BYPASSED - AVG	5.0
CONSTRUCTION MATERIAL GENERIC TYPE	NR
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR
** FANS	
DESIGN	NR
FUNCTION	NR
APPLICATION	NR
SERVICE	NR
CONSTRUCTION MATERIAL GENERIC TYPE	NR
** DAMPERS	
FUNCTION	NR
GENERIC TYPE	NR
SPECIFIC TYPE	NR
CONSTRUCTION MATERIAL GENERIC TYPE	NR
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR
LINER GENERIC MATERIAL TYPE	NR
LINER SPECIFIC MATERIAL TYPE	NR
** DUCTWORK	
SHELL GENERIC MATERIAL TYPE	NR
SHELL SPECIFIC MATERIAL TYPE	NR
LINER GENERIC MATERIAL TYPE	NR
LINER SPECIFIC MATERIAL TYPE	NR
** REAGENT PREPARATION EQUIPMENT	
FUNCTION	NR
DEVICE	NR
DEVICE TYPE	NR

GULF POWER: SCHOLZ 1A (CONT.)

** PUMPS

SERVICE	NUMBER
NR	****

** SOLIDS CONCENTRATING/DEWATERING

DEVICE	VACUUM FILTER
NUMBER	1
CONFIGURATION	ROTARY DRUM
SHELL GENERIC MATERIAL TYPE	INORGANIC
SHELL SPECIFIC MATERIAL TYPE	NR

*** SLUDGE

** TREATMENT

METHOD	DEWATERED
DEVICE	N/A
PROPRIETARY PROCESS	N/A

** DISPOSAL

NATURE	FINAL
TYPE	POND
LOCATION	ON-SITE
SITE TREATMENT	CLAY LINING

** WATER BALANCE

WATER LOOP TYPE	CLOSED

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
2/75	SYSTEM		98.9		67.6			672	459	454	

** PROBLEMS/SOLUTIONS/COMMENTS

THIS PROTOTYPE FGD SYSTEM INSTALLED AT THE SCHOLZ STEAM PLANT WAS INSTALLED ON THE NO. 1 BOILER. THE SYSTEM WAS DESIGNED TO HANDLE APPROXIMATELY 50% OF THE FLUE GAS FROM THE BOILER. THE BOILER WAS RETROFITTED WITH A SECTIONALIZED, HIGH EFFICIENCY ESP INSTALLED UPSTREAM OF THE FGD SYSTEM AND CAPABLE OF 99.7% PARTICLE MATTER REMOVAL.
THE PROTOTYPE SYSTEM INCORPORATED A HIGH DEGREE OF FLEXIBILITY FOR GENERATION OF DESIGN AND OPERATING INFORMATION FOR A WIDE VARIETY OF APPLICATIONS. ALTHOUGH THE BASIC MODE OF SYSTEM OPERATION WAS DUAL ALKALI WITH LIME REGENERATION, THE SYSTEM WAS DESIGNED TO ACCOMMODATE LIMESTONE REGENERATION AND LIME/LIMESTONE REGENERATION. THE SYSTEM CONSISTED OF A VENTURI SCRUBBER AND AN ABSORPTION TOWER, WITH AN ADDITIONAL STORAGE SILO FOR LIMESTONE, A MIX TANK, AND OTHER ASSORTED TANKS, PUMPS, CONTROLLERS, PIPING, AND A LINED DISPOSAL POND.

THE PROTOTYPE DUAL ALKALI SCRUBBING SYSTEM WAS COMPLETED AND PUT IN OPERATION IN EARLY FEBRUARY 1975.

3/75	SYSTEM		95.7		65.2			744	507	485	
4/75	SYSTEM		55.6		46.7			720	604	336	
5/75	SYSTEM		62.7		50.4			744	598	375	
6/75	SYSTEM		100.0		100.0			720	720	720	
7/75	SYSTEM		32.4		29.7			744	683	221	

GULF POWER: SCHOLZ 1A (CONT.)

PERIOD	MODULE	PERFORMANCE DATA AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE SYSTEM WAS OPERATED FROM FEBRUARY 8, 1975 UNTIL JULY 18 WHEN IT WAS TAKEN OUT OF SERVICE FOR TWO MONTHS FOR MODIFICATIONS, REPAIRS AND REPLACE MENT OF PARTS. THE SYSTEM WAS UNAVAILABLE FOR A 491 HOUR PERIOD DUE TO SOME NECESSARY ADJUSTMENTS AND MODIFICATIONS FOR A FORMAL EPA TEST PRO-GRAM IN MID-MAY.									
8/75	SYSTEM	0.0	0.0					744	744	0	
9/75	SYSTEM	44.0	35.3					720	577	254	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE SYSTEM WAS SHUT DOWN FROM MID-JULY TO MID-SEPTEMBER FOR A MECHANICAL OVERHAUL INVOLVING REPLACEMENT OF VALVE PARTS THAT HAD FAILED. THE SYSTEM WAS PUT BACK IN OPERATION ON SEPTEMBER 16.									
10/75	SYSTEM	100.0	75.1					744	559	559	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		FROM MID-SEPTEMBER UNTIL MID-OCTOBER THE AIR PREHEATER WAS REPAIRED AND BOILER OPERATION WAS ADJUSTED TO REDUCE OXYGEN LEVELS IN THE FLUE GAS TO THE 5-6% RANGE. THE SYSTEM OPERATED APPROXIMATELY 800 HOURS DURING THIS PERIOD.									
11/75	SYSTEM	90.3	77.8					720	620	560	
12/75	SYSTEM	100.0	98.4					744	732	732	
1/76	SYSTEM							744			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE SYSTEM RAN CONTINUOUSLY FOR THE REMAINDER OF THE TEST PERIOD THROUGH JANUARY 2, 1976. SO2 LEVELS DURING THIS PERIOD RANGED FROM 800 TO 1700 PPM. THE SYSTEM OPERATED IN THE CONCENTRATED MODE THROUGHOUT THE REMAINDE OF THE TEST PERIOD. IN THE PERIOD FROM MID-SEPTEMBER TO JANUARY 2, 1976 THE SYSTEM OPERATED ABOUT 2100 HOURS, WITH AN OPERABILITY FACTOR OF 97%.									
2/76	SYSTEM							696			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE FGD SYSTEM AND BOILER WERE SHUT DOWN FOR A SCHEDULED OVERHAUL. THE SYSTEM WAS SCHEDULED TO RESTART IN MID-MARCH AND WAS TO CONTINUE UNTIL JUNE. DURING THIS OPERATING PERIOD HIGH-SULFUR COAL (3.5-4.0%) WAS TO BE BURNED TO ALLOW EVALUATION OF SYSTEM PERFORMANCE ON HIGH SULFUR COAL.									
3/76	SYSTEM	60.0	59.8					744	742	445	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE SYSTEM WAS RETURNED TO SERVICE ON MARCH 12, 1976. THE SYSTEM OPERATED A TOTAL OF 445 HOURS.									
5/76	SYSTEM	88.6	87.5					744	735	651	

GULF POWER: SCHOLZ 1A (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

DURING APRIL AND MAY SOME MINOR MECHANICAL PROBLEMS WITH THE AGITATOR SHAFT WERE ENCOUNTERED.

SOME PROBLEMS WERE EXPERIENCED WITH THE CONTROL VALVES DURING APRIL AND MA ACCOUNTING FOR SOME FGD OUTAGE TIME.

SINCE THE SYSTEM RESTART IN MARCH, SO2 INLET CONCENTRATION LEVELS RANGED FROM 2000 TO 2500 PPM DUE TO THE BURNING OF HIGH SULFUR COAL.

6/76	SYSTEM		97.7		89.0			720	656	641	

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE LAST PHASE OF OPERATION, THE SYSTEM WAS TREATING FLUE GAS OF VARYING PARTICULATE MATTER LOADS. THE UPSTREAM ESP WAS SELECTIVELY DE-ENERGIZED, BOTH PARTIALLY AND TOTALLY, WITH NO MAJOR UPSETS IN THE PROCESS CHEMISTRY RESULTING. BOILER LOAD VARIATION RANGED FROM 30 TO 100%.

7/76	SYSTEM		100.0		7.3			744	54	54	

** PROBLEMS/SOLUTIONS/COMMENTS

ON JULY 3, 1976 THE PROTOTYPE TEST PROGRAM WAS CONCLUDED.

APPENDIX F
DESIGN AND PERFORMANCE DATA FOR DISCONTINUED DOMESTIC FGD SYSTEMS

COMPANY NAME	GULF POWER	
PLANT NAME	SCHOLZ	
UNIT NUMBER	1B,2B	
CITY	SNEADS	
STATE	FLORIDA	
REGULATORY CLASSIFICATION	A	
PARTICULATE EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	516.	(1.200 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	80	
GROSS UNIT GENERATING CAPACITY - MW	48	
NET UNIT GENERATING CAPACITY W/FGD - MW	40	
NET UNIT GENERATING CAPACITY WO/FGD - MW	*****	
EQUIVALENT SCRUBBED CAPACITY - MW	48	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	BABCOCK & WILCOX	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	********	(******* ACFM)
BOILER FLUE GAS TEMPERATURE - C	146.1	(295 F)
STACK HEIGHT - M	23.	(76 FT)
STACK SHELL	FIBER-REINFORCED POLYESTER	
STACK TOP DIAMETER - M	*******	(***** FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	****	
AVERAGE HEAT CONTENT - J/G	******	(****** BTU/LB)
RANGE HEAT CONTENT - BTU/LB		****
AVERAGE ASH CONTENT - %	********	
RANGE ASH CONTENT - %	****	
AVERAGE MOISTURE CONTENT - %	********	
RANGE MOISTURE CONTENT - %	****	
AVERAGE SULFUR CONTENT - %	5.00	
RANGE SULFUR CONTENT - %	****	
AVERAGE CHLORIDE CONTENT - %	********	
RANGE CHLORIDE CONTENT - %	****	
*** PARTICLE CONTROL		
** ESP		
NUMBER	1	
TYPE	COLD SIDE	
SUPPLIER	BUELL DIVISION, ENVIROTECH	
PARTICLE REMOVAL EFFICENCY - %	99.5	
** PARTICLE SCRUBBER		
NUMBER	1	
INITIAL START-UP DATE	2/1975	
GENERIC TYPE	VENTURI TOWER	
SPECIFIC TYPE	VARIABLE-THROAT/TOP-ENTRY PLUMB BOB	
TRADE NAME/COMMON NAME	N/A	
SUPPLIER	CHIYODA INTERNATIONAL	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	AISI 1110	
LINER GENERIC MATERIAL	INORGANIC	
LINER SPECIFIC MATERIAL	HYDRAULICALLY-BONDED MORTAR	
GAS CONTACTING DEVICE TYPE	NONE	
*** FGD SYSTEM		
** GENERAL DATA		
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT	
SO2 REMOVAL MODE	WET SCRUBBING	
PROCESS TYPE	THOROUGHBRED 101	
SYSTEM SUPPLIER	CHIYODA INTERNATIONAL	
DEVELOPMENT LEVEL	PROTOTYPE	
NEW/RETROFIT	RETROFIT	

GULF POWER: SCHOLZ 1B,2B (CONT.)

UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.70
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	90.00
CURRENT STATUS	8
TERMINATION	3/1977
COMMERCIAL START-UP	2/1975
INITIAL START-UP	2/1975
** DESIGN AND OPERATING PARAMETERS	
DESIGN CHLORIDE CONTENT - %	********
** QUENCHER/PRESATURATOR	
CONSTRUCTION MATERIAL GENERIC TYPE	NR
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR
** ABSORBER	
NUMBER	1
GENERIC TYPE	PACKED TOWER
SPECIFIC TYPE	NR
TRADE NAME/COMMON TYPE	NR
SUPPLIER	CHIYODA INTERNATIONAL
SHELL GENERIC MATERIAL	STAINLESS STEEL
SHELL SPECIFIC MATERIAL	AUSTENITIC
SHELL MATERIAL TRADE NAME/COMMON TYPE	TYPE 316L
LINER GENERIC MATERIAL	NONE
LINER SPECIFIC MATERIAL	N/A
LINER MATERIAL TRADE NAME/COMMON TYPE	N/A
** MIST ELIMINATOR	
PRE-MIST ELIMINATOR/MIST ELIMINATOR	PRIMARY COLLECTOR
NUMBER PER SYSTEM	2
GENERIC TYPE	IMPINGEMENT
SPECIFIC TYPE	BAFFLE
TRADE NAME/COMMON TYPE	CLOSED VANE
CONSTRUCTION MATERIAL GENERIC TYPE	NR
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR
** REHEATER	
GENERIC TYPE	NR
SPECIFIC TYPE	NR
TRADE NAME/COMMON TYPE	NR
PERCENT GAS BYPASSED - AVG	5.0
CONSTRUCTION MATERIAL GENERIC TYPE	NR
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR
** FANS	
DESIGN	NR
FUNCTION	NR
APPLICATION	NR
SERVICE	NR
CONSTRUCTION MATERIAL GENERIC TYPE	NR
** DAMPERS	
FUNCTION	NR
GENERIC TYPE	NR
SPECIFIC TYPE	NR
CONSTRUCTION MATERIAL GENERIC TYPE	NR
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR
LINER GENERIC MATERIAL TYPE	NR
LINER SPECIFIC MATERIAL TYPE	NR
** DUCTWORK	
SHELL GENERIC MATERIAL TYPE	NR
SHELL SPECIFIC MATERIAL TYPE	NR
LINER GENERIC MATERIAL TYPE	NR
LINER SPECIFIC MATERIAL TYPE	NR
** REAGENT PREPARATION EQUIPMENT	
FUNCTION	MIX TANK
DEVICE	N/A
DEVICE TYPE	AGITATED TANK

GULF POWER: SCHOLZ 1B,2B (CONT.)

** PUMPS

SERVICE	NUMBER
OXIDIZER FEED	2

** SOLIDS CONCENTRATING/DEWATERING

DEVICE	CENTRIFUGE
NUMBER	1
CONFIGURATION	CONTINUOUS SCREW-DECANTER/SOLID BOWL

*** SLUDGE

** TREATMENT

METHOD	DEWATERED
DEVICE	N/A
PROPRIETARY PROCESS	N/A

** DISPOSAL

NATURE	FINAL
TYPE	POND
SITE TREATMENT	CLAY LINING

** WATER BALANCE

WATER LOOP TYPE	OPEN

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
2/75	SYSTEM							672	672		

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM AT SCHOLZ 1B AND 2B WAS DESIGNED FOR TESTING AND PROCESS DEMONSTRATION OF THE THROUGHBRED 101 PROCESS ON A COAL-FIRED APPLICATION. THE PROCESS IS USED IN JAPAN EXCLUSIVELY ON OIL-FIRED AND GAS-FIRED BOILERS, AND TAIL GAS FROM CLAUS UNITS. THE SYSTEM WAS DESIGNED TO HANDLE 50% OF THE LOAD FROM EITHER OF THE TWO BOILERS. VARIOUS TEST COALS WITH SULFUR CONTENTS RANGING UP TO 5% WERE SCHEDULED FOR BURNING.
THE PARTICLE MATTER LOADS FROM THE ESP RANGED FROM 0.02 TO 0.1 GR/SCF. FLUE GAS FROM THE ESP WAS QUENCHED WITH COOLING WATER TO REMOVE ADDITIONAL FLY ASH AND TO COOL THE GAS BEFORE IT ENTERED THE ABSORBER. THE SO2 WAS ABSORBED IN WATER AND CATALYTICALLY OXIDIZED WITH AIR TO FORM SULFURIC ACID. THE DILUTE ACID WAS RECIRCULATED THROUGH THE ABSORBER. A PORTION OF THE ACID WAS NEUTRALIZED WITH LIMESTONE TO PRODUCE GYPSUM AS A BY-PRODUCT.

THE INITIAL SHAKEDOWN AND DEBUGGING OPERATIONS AT THIS PILOT PLANT SIZE DEMONSTRATION UNIT COMMENCED ON FEBRUARY 11, 1975. PROBLEMS ENCOUNTERED INCLUDED CRACKS IN THE FRP LINING AT THE OXIDIZING TOWER.

3/75	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

AFTER INITIAL OPERATION FOR BREAK-IN TESTS IN MARCH, THE SYSTEM WAS SHUTDOWN FOR INTERNAL INSPECTION.

4/75	SYSTEM					27.8	27.8	720	720	200	
5/75	SYSTEM					13.4	13.4	744	744	100	
6/75	SYSTEM					100.0	95.1	720	685	685	
7/75	SYSTEM					83.9	83.9	744	744	624	

GULF POWER: SCHOLZ 1B,2B (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
		RELIABILTY TESTS WERE PERFORMED IN JULY ALTHOUGH EMISSION TESTS HAD NOT BEEN RUN AT THIS TIME.									
		UP TO THIS POINT, SOME PUMP AND INSTRUMENTATION FAILURES HAD OCCURRED.									
		DURING JULY ONE CENTRIFUGE BECAME UNBALANCED, REQUIRING THE SPARE TO BE PLACED IN SERVICE.									
8/75	SYSTEM							744			
9/75	SYSTEM		46.8		46.8			720	720	337	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING THE MONTH OF AUGUST BOTH CENTRIFUGES BECAME UNBALANCED REQUIRING A FORCED OUTAGE WHICH EXTENDED INTO MID-SEPTEMBER.									
		THE UNIT OPERATED AT A 95% SO2 REMOVAL EFFICIENCY DURING THE MONTH OF SEPTEMBER.									
10/75	SYSTEM		100.0		100.0			744	744	744	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE DISCHARGE OF WASTE WATER FROM THIS SYSTEM WAS A CONTIUOUS PROBLEM AREA.									
11/75	SYSTEM		100.0		100.0			720	720	720	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		A MINOR OUTAGE OF LESS THAN ONE HOUR WAS NECESSARY TO REPAIR A PINHOLE IN THE PRESCRUBBER FRP LINER AND TO REPAIR A BROKEN FLUE GAS BLOWER INLET VANE.									
12/75	SYSTEM		97.6		97.6			744	744	726	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		SCRUBBER OUTAGES DURING DECEMBER RESULTED FROM CONTINUING REPAIRS TO THE PINHOLE IN THE PRESCRUBBER FRP LINER.									
1/76	SYSTEM		66.2		60.5			744	680	450	
2/76	SYSTEM		11.2		11.1			696	690	77	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		OUTAGE TIME IN JANUARY AND FEBRUARY WAS PRIMARILY FOR REPAIR AND MODIFICATION OF THE SUCTION AND DISCHARGE PIPING ON THE ABSORBENT CIRCULATING PUMPS. THESE FRP LINES FAILED IN JANUARY AT SOME WEAK JOINTS.									
		SO2 REMOVAL EFFICIENCY UP TO THIS PERIOD HAS BEEN AS HIGH AS 95%.									
3/76	SYSTEM		99.6		99.6			744	744	741	
4/76	SYSTEM		14.0		14.0			720	720	101	

GULF POWER: SCHOLZ 1B,2B (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE SYSTEM WAS SHUTDOWN ON APRIL 5 TO ALLOW SYSTEM MODIFICATIONS FOR REDUCING THE QUANTITY OF LIQUID WASTE FROM THE SYSTEM.									
		THE SYSTEM WAS SHUTDOWN ON APRIL 24 BECAUSE OF EXTENSIVE FIRE DAMAGE IN THE OXIDIZING TOWER. THE FIRE, CAUSED BY A WELDING ACCIDENT, DAMAGED FRP AND POLYPROPYLENE COMPONENTS IN THE OXIDIZING TOWER.									
5/76	SYSTEM				0.0			744		0	
6/76	SYSTEM				0.0			720		0	
7/76	SYSTEM				0.0			744		0	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE SYSTEM REMAINED OUT OF SERVICE DURING MAY, JUNE AND JULY TO REPAIR THE FIRE DAMAGED AREAS.									
8/76	SYSTEM		66.1		66.1			744	744	492	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE SYSTEM CAME BACK ON LINE IN AUGUST; BUT, WAS BROUGHT DOWN DURING THE MONTH TO COMPLETE ADDITIONAL REPAIRS WHICH WENT UNDETECTED DURING THE PREVIOUS OUTAGE. THESE ADDITIONAL REPAIRS ACCOUNTED FOR APPROXIMATELY 242 HOURS OF OUTAGE TIME.									
		THE WATERS SAVINGS PROGRAM WAS TESTED DURING AUGUST. THE TEST PROGRAM CALLED FOR A REDUCTION IN WASTEWATER BLOWDOWN AND FRESH WATER MAKEUP REQUIREMENTS BY RECYCLING THE MOTHER LIQUOR BLEED BACK TO THE PROCESS FOR ADDITIONAL SERVICE.									
9/76	SYSTEM	99.3	68.9	99.3	68.9			720	720	496	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE SYSTEM WAS FORCED OUT OF SERVICE APPROXIMATELY FIVE HOURS DURING SEPTEMBER.									
10/76	SYSTEM	70.6	48.0	62.0	48.0			744	744	357	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING OCTOBER SYSTEM DOWN TIME AMOUNTED TO APPROXIMATELY 387 HOURS. OF THIS TOTAL 218 HOURS WERE REPORTED TO REPAIR ANTICIPATED DAMAGES INCURRED IN THE PRESCRUBBER RESULTING FROM OPERATIONS IN THE WATER SAVINGS PROGRAM. SPECIFICALLY, THE LINING HAD SUFFERED FROM EXTENSIVE CORROSION DAMAGE BECAUSE OF HIGH ACID CONCENTRATIONS WHICH DEVELOPED IN THE SCRUBBER SOLUTION.									
11/76	SYSTEM	99.6	99.6	99.6	99.6			720	720	717	
12/76	SYSTEM	99.6	99.6	99.6	99.6			744	744	741	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING NOVEMBER AND DECEMBER SCRUBBER OUTAGES TOTALLED 6.5 HOURS. PROBLEM INCLUDED A MALFUNCTION OF A LEVEL INDICATOR, A BROKEN GUIDE VANE, AND AN OPERATOR ERROR RESULTING IN A LEAK OF SLURRY INTO THE WATER HEADER.									
1/77	SYSTEM	100.0	100.0	100.0	100.0			744	744	744	

GULF POWER: SCHOLZ 1B,2B (CONT.)

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
2/77	SYSTEM	100.0	100.0	100.0	100.0			672	672	672	
3/77	SYSTEM	100.0		100.0				744	744	514	

** PROBLEMS/SOLUTIONS/COMMENTS

THE CT-101 TESTING AND DEMONSTRATION PROGRAM WAS CONCLUDED ON MARCH 22. DURING JANUARY, FEBRUARY AND MARCH THE TOTAL SCRUBBER OUTAGE TIME WAS 0.33 HOUR. THE SYSTEM HAD OPERATED ON A VIRTUALLY CONTINUOUS BASIS SINCE OCTOBER 17, 1976.

APPENDIX F
DESIGN AND PERFORMANCE DATA FOR DISCONTINUED DOMESTIC FGD SYSTEMS

COMPANY NAME	GULF POWER	
PLANT NAME	SCHOLZ	
UNIT NUMBER	2A	
CITY	SNEADS	
STATE	FLORIDA	
REGULATORY CLASSIFICATION	A	
PARTICULATE EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	80	
GROSS UNIT GENERATING CAPACITY - MW	48	
NET UNIT GENERATING CAPACITY W/FGD - MW	40	
NET UNIT GENERATING CAPACITY WO/FGD - MW	*****	
EQUIVALENT SCRUBBED CAPACITY - MW	48	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	BABCOCK & WILCOX	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	********	(******* ACFM)
BOILER FLUE GAS TEMPERATURE - C	146.1	(295 F)
STACK HEIGHT - M	******	(**** FT)
STACK SHELL	NR	
STACK TOP DIAMETER - M	*******	(***** FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	BITUMINOUS	
AVERAGE HEAT CONTENT - J/G	******	(****** BTU/LB)
RANGE HEAT CONTENT - BTU/LB		****
AVERAGE ASH CONTENT - %	********	
RANGE ASH CONTENT - %	****	
AVERAGE MOISTURE CONTENT - %	********	
RANGE MOISTURE CONTENT - %	****	
AVERAGE SULFUR CONTENT - %	3.50	
RANGE SULFUR CONTENT - %	****	
AVERAGE CHLORIDE CONTENT - %	********	
RANGE CHLORIDE CONTENT - %	****	
*** PARTICLE CONTROL		
** MECHANICAL COLLECTOR		
NUMBER	0	
TYPE	NONE	
** ESP		
NUMBER	1	
** PARTICLE SCRUBBER		
NUMBER	0	
GENERIC TYPE	NONE	
SPECIFIC TYPE	N/A	
TRADE NAME/COMMON NAME	N/A	
SHELL GENERIC MATERIAL	N/A	
SHELL SPECIFIC MATERIAL	N/A	
LINER GENERIC MATERIAL	N/A	
LINER SPECIFIC MATERIAL	N/A	
GAS CONTACTING DEVICE TYPE	N/A	
*** FGD SYSTEM		
** GENERAL DATA		
SALEABLE PRODUCT/THROWAWAY PRODUCT	SALEABLE PRODUCT	
SO2 REMOVAL MODE	SPRAY DRYING	
PROCESS TYPE	ACTIVATED CARBON	
SYSTEM SUPPLIER	FOSTER WHEELER/BERGBAU	
DEVELOPMENT LEVEL	DEMONSTRATION	
NEW/RETROFIT	RETROFIT	
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.70	

GULF POWER: SCHOLZ 2A (CONT.)

UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	74.50
CURRENT STATUS	8
TERMINATION	5/1976
COMMERCIAL START-UP	2/1976
INITIAL START-UP	8/1975
CONTRACT AWARDED	1/1973
** DESIGN AND OPERATING PARAMETERS	
DESIGN CHLORIDE CONTENT - %	********
** QUENCHER/PRESATURATOR	
CONSTRUCTION MATERIAL GENERIC TYPE	NR
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR
** ABSORBER	
NUMBER	1
GENERIC TYPE	PACKED TOWER
SPECIFIC TYPE	NR
TRADE NAME/COMMON TYPE	NR
SUPPLIER	FOSTER WHEELER/BERGBAU
SHELL GENERIC MATERIAL	NR
SHELL SPECIFIC MATERIAL	NR
SHELL MATERIAL TRADE NAME/COMMON TYPE	NR
LINER GENERIC MATERIAL	NR
LINER SPECIFIC MATERIAL	NR
LINER MATERIAL TRADE NAME/COMMON TYPE	NR
** MIST ELIMINATOR	
PRE-MIST ELIMINATOR/MIST ELIMINATOR	NR
GENERIC TYPE	NR
SPECIFIC TYPE	NR
TRADE NAME/COMMON TYPE	NR
CONSTRUCTION MATERIAL GENERIC TYPE	NR
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR
** REHEATER	
NUMBER	0
GENERIC TYPE	NONE
SPECIFIC TYPE	N/A
TRADE NAME/COMMON TYPE	N/A
CONSTRUCTION MATERIAL GENERIC TYPE	NONE
CONSTRUCTION MATERIAL SPECIFIC TYPE	N/A
** FANS	
DESIGN	NR
FUNCTION	NR
APPLICATION	NR
SERVICE	NR
CONSTRUCTION MATERIAL GENERIC TYPE	NR
** DAMPERS	
FUNCTION	NR
GENERIC TYPE	NR
SPECIFIC TYPE	NR
CONSTRUCTION MATERIAL GENERIC TYPE	NR
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR
LINER GENERIC MATERIAL TYPE	NR
LINER SPECIFIC MATERIAL TYPE	NR
** DUCTWORK	
SHELL GENERIC MATERIAL TYPE	NR
SHELL SPECIFIC MATERIAL TYPE	NR
LINER GENERIC MATERIAL TYPE	NR
LINER SPECIFIC MATERIAL TYPE	NR
** REAGENT PREPARATION EQUIPMENT	
FUNCTION	N/A
DEVICE	N/A
DEVICE TYPE	N/A

GULF POWER: SCHOLZ 2A (CONT.)

** PUMPS

SERVICE	NUMBER
NR	****

** SOLIDS CONCENTRATING/DEWATERING

DEVICE	NONE

*** SLUDGE

** TREATMENT

METHOD	N/A
DEVICE	N/A
PROPRIETARY PROCESS	N/A

** DISPOSAL

NATURE	FINAL
TYPE	POND
SITE TREATMENT	CLAY LINING

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
5/75	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

THE DEMONSTRATION SYSTEM AT SCHOLZ 2A CONSISTED OF A 20-MW ADSORBER SECTIO AND A 47.5 MW REGENERATION AND REDUCTION SECTION. THE 20 MW ADSORBER WAS DESIGNED TO HANDLE 50% OF THE MAXIMUM FLUE GAS FLOW. THE PURPOSE OF THE ADSORPTION SECTION OF THE DRY REMOVAL SYSTEM WAS TO REMOVE SULFUR DIOXIDE; NITROGEN OXIDES, AND PARTICLE MATTER FROM THE FLUE GAS WITH ACTIVATED CHAR, CONVERTING THE CAPTURED POLLUTANTS TO SULFURIC ACID. THE REGENERATION SECTION PROVIDED CONTINUOUS ON-SITE REGENERATION OF THE CHAR, WHICH WAS LOADED WITH SULFUR DIOXIDE IN THE FORM OF SULFURIC ACID. THE REGENERATED CHAR AND A LOW VOLUME, SULFUR DIOXIDE-RICH OFF-GAS STREAM WAS FED TO A RESOX REACTOR, WHICH REDUCED THE SULFUR DIOXIDE STREAM TO GASEOUS ELEMENTAL SULFUR THAT WAS COLLECTED AND STORED IN AN INSULATED TANK.

6/75	SYSTEM							720			
7/75	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

COMPLETION OF CONSTRUCTION WAS FOLLOWED BY A THREE MONTH COMMISSIONING PERIOD DURING WHICH VARIOUS PIECES OF EQUIPMENT WERE OPERATED INDIVIDUALLY AND THEN IN COMBINATIONS TO SIMULATE SUBSYSTEM OPERATION.

8/75	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

SUBSYSTEM OPERATIONS WERE INTEGRATED INTO SECTION OPERATIONS AND FLUE GAS WAS PASSED THROUGH THE ABSORBER AND REGENERATOR FOR A TEN DAY PERIOD BEGINNING AUGUST 11. RESOX CONSTRUCTION WAS INCOMPLETE AT THIS TIME.

9/75	SYSTEM							720			
10/75	SYSTEM							744			

GULF POWER: SCHOLZ 2A (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING OCTOBER TWO CONSECUTIVE RUNS WERE CONDUCTED ON THE RESOX PORTION OF THE SYSTEM ON FRONT-END PROCESS OFF-GAS AT FULL OPERATING TEMPERATURES. THIS OPERATIONAL PERIOD LASTED FIVE DAYS.									
11/75	SYSTEM							720			
12/75	SYSTEM							744			
1/76	SYSTEM							744			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		A PROGRAM OF MODIFICATIONS ON THE SYSTEM BEGAN IN LATE AUGUST 1975 AND CONTINUED THROUGH JANUARY 1976, WITH THE EXCEPTION OF FIVE DAYS OF RESOX OPERATION IN OCTOBER.									
2/76	SYSTEM							696			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		MODIFICATIONS WERE COMPLETED AND PRE-STARTUP TESTING WAS CONDUCTED IN LATE JANUARY AND EARLY FEBRUARY. A THREE DAY CONTINUOUS RUN WAS SUCCESSFULLY COMPLETED.									
		DURING FEBRUARY THE MATERIALS HANDLING LOOPS AND THE RESOX LOOPS WERE OPERATED AT FULL OPERATING TEMPERATURES AND PRESSURES. REINTRODUCTION OF FLUE GAS INTO THE SYSTEM COMMENCED, AND A FOUR MONTH FORMAL TEST PROGRAM CONDUCTED BY SOUTHERN SERVICES AND FOSTER WHEELER BEGAN.									
3/76	SYSTEM							744			
4/76	SYSTEM							720			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THREE OPERATIONAL PERIODS WERE LOGGED BY THE PROTOTYPE SYSTEM DURING MARCH AND APRIL. THE RESOX SECTION OPERATED INTERMITTENTLY BECAUSE OF PLUGGING PROBLEMS IN THE SULFUR CONDENSER. ALSO, THE FRONT END OF THE SYSTEM WAS TAKEN OUT OF SERVICE AT ONE POINT DUE TO FREQUENT HIGH TEMPERATURE EXCURSIONS. THIS PROBLEM WAS CORRECTED BY MODIFYING SYSTEM OPERATING PROCEDURES. WORK BEGAN ON THE SOLUTION OF THE SULFUR CONDENSER PROBLEM.									
5/76	SYSTEM							744			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE FGD SYSTEM COMPLETED AN OPERATIONAL PERIOD IN EARLY MAY WHICH HAD COMMENCED ON APRIL 26. THE SYSTEM WAS TAKEN OUT OF SERVICE AT THIS POINT DUE TO THE DEPLETION OF CHAR SUPPLY, HIGH CHAR CONSUMPTION RATES DUE TO MECHANICAL ATTRITION AND TO CORRECT/MODIFY THE CHAR/SAND SCREEN SEPARATOR.									
		DURING MAY A DECISION WAS MADE TO PREMATURELY TERMINATE THE SYSTEM DEMONSTRATION PROGRAM RATHER THAN SHUT DOWN, DEBUG AND RESTART THE SYSTEM AGAIN. THE SYSTEM SUPPLIER WAS PURSUING ADDITIONAL FUNDING FOR THE CONTINUATION OF THE PROTOTYPE DEMONSTRATION PROGRAM.									

APPENDIX F
DESIGN AND PERFORMANCE DATA FOR DISCONTINUED DOMESTIC FGD SYSTEMS

COMPANY NAME	ILLINOIS POWER COMPANY	
PLANT NAME	WOOD RIVER	
UNIT NUMBER	4	
CITY	EAST ALTON	
STATE	ILLINOIS	
REGULATORY CLASSIFICATION	C	
PARTICULATE EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	774.	(1.800 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	651	
GROSS UNIT GENERATING CAPACITY - MW	110	
NET UNIT GENERATING CAPACITY W/FGD - MW	103	
NET UNIT GENERATING CAPACITY WO/FGD - MW	*****	
EQUIVALENT SCRUBBED CAPACITY - MW	110	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	COMBUSTION ENGINEERING	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	********	(******* ACFM)
BOILER FLUE GAS TEMPERATURE - C	154.4	(310 F)
STACK HEIGHT - M	76.	(250 FT)
STACK SHELL	NR	
STACK TOP DIAMETER - M	*******	(***** FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	****	
AVERAGE HEAT CONTENT - J/G	25121.	(10800 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		****
AVERAGE ASH CONTENT - %	10.00	
RANGE ASH CONTENT - %	****	
AVERAGE MOISTURE CONTENT - %	4.30	
RANGE MOISTURE CONTENT - %	****	
AVERAGE SULFUR CONTENT - %	3.10	
RANGE SULFUR CONTENT - %	****	
AVERAGE CHLORIDE CONTENT - %	********	
RANGE CHLORIDE CONTENT - %	****	
*** PARTICLE CONTROL		
** MECHANICAL COLLECTOR		
NUMBER	1	
** FABRIC FILTER		
NUMBER	0	
TYPE	NONE	
** ESP		
NUMBER	1	
SUPPLIER	RESEARCH-COTTRELL	
PARTICLE REMOVAL EFFICENCY - %	99.6	
** PARTICLE SCRUBBER		
NUMBER	0	
GENERIC TYPE	NONE	
SPECIFIC TYPE	N/A	
TRADE NAME/COMMON NAME	N/A	
SHELL GENERIC MATERIAL	N/A	
SHELL SPECIFIC MATERIAL	N/A	
LINER GENERIC MATERIAL	N/A	
LINER SPECIFIC MATERIAL	N/A	
GAS CONTACTING DEVICE TYPE	N/A	
*** FGD SYSTEM		
** GENERAL DATA		
SALEABLE PRODUCT/THROWAWAY PRODUCT	SALEABLE PRODUCT	
SO2 REMOVAL MODE	WET SCRUBBING	

ILLINOIS POWER COMPANY: WOOD RIVER 4 (CONT.)

PROCESS TYPE	CATALYTIC OXIDATION	
SYSTEM SUPPLIER	MONSANTO ENVIRO CHEM SYSTEMS	
DEVELOPMENT LEVEL	DEMONSTRATION	
NEW/RETROFIT	RETROFIT	
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.90	
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	85.00	
CURRENT STATUS	8	
TERMINATION	0/1974	
COMMERCIAL START-UP	10/1972	
INITIAL START-UP	9/1972	
CONTRACT AWARDED	6/1970	
** DESIGN AND OPERATING PARAMETERS		
DESIGN CHLORIDE CONTENT - %	********	
** QUENCHER/PRESATURATOR		
CONSTRUCTION MATERIAL GENERIC TYPE	NR	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR	
** ABSORBER		
NUMBER	1	
GENERIC TYPE	PACKED TOWER	
SPECIFIC TYPE	NR	
TRADE NAME/COMMON TYPE	NR	
DIMENSIONS - FT	30.0 DIA X 65.0	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	AISI 1110	
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A	
LINER GENERIC MATERIAL	NR	
LINER SPECIFIC MATERIAL	NR	
LINER MATERIAL TRADE NAME/COMMON TYPE	NR	
NUMBER OF CONTACTING ZONES	8	
DISTANCE BETWEEN GAS CONTACTING ZONES - CM	30.5	(12.0IN)
GAS-SIDE PRESSURE DROP - KPA	1.0	(4.0 IN-H2O)
INLET GAS TEMPERATURE - C	454.4	(850 F)
SO2 REMOVAL EFFICIENCY - %	85.0	
** ABSORBER		
NUMBER	1	
GENERIC TYPE	PACKED TOWER	
SPECIFIC TYPE	NR	
TRADE NAME/COMMON TYPE	NR	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	AISI 1110	
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A	
LINER GENERIC MATERIAL	INORGANIC	
LINER SPECIFIC MATERIAL	PREFIRED BRICK/SHAPES	
LINER MATERIAL TRADE NAME/COMMON TYPE	ACID-RESISTANT BRICK 'LOW H2O ABSORPTION!	
INLET GAS TEMPERATURE - C	121.1	(250 F)
** MIST ELIMINATOR		
PRE-MIST ELIMINATOR/MIST ELIMINATOR	PRIMARY COLLECTOR	
NUMBER PER SYSTEM	1	
GENERIC TYPE	IMPINGEMENT	
SPECIFIC TYPE	MESH	
TRADE NAME/COMMON TYPE	KNITTED WIRE MESH PAD	
PRESSURE DROP - KPA	4.5	(18.0 IN-H2O)
CONSTRUCTION MATERIAL GENERIC TYPE	HIGH ALLOY	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR	
WASH FREQUENCY	INTERMITTENT	
** REHEATER		
NUMBER	1	
GENERIC TYPE	IN-LINE	
SPECIFIC TYPE	NR	
TRADE NAME/COMMON TYPE	NR	
PERCENT GAS BYPASSED - AVG	14.5	
TEMPERATURE INCREASE - C	247.8	(446 F)
INLET FLUE GAS TEMPERATURE - C	176.7	(350 F)
CONSTRUCTION MATERIAL GENERIC TYPE	NR	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR	

ILLINOIS POWER COMPANY: WOOD RIVER 4 (CONT.)

** FANS	
NUMBER	1
DESIGN	CENTRIFUGAL
FUNCTION	NR
APPLICATION	INDUCED DRAFT
SERVICE	NR
CONSTRUCTION MATERIAL GENERIC TYPE	STAINLESS STEEL
** DAMPERS	
FUNCTION	NR
GENERIC TYPE	NR
SPECIFIC TYPE	NR
CONSTRUCTION MATERIAL GENERIC TYPE	NR
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR
LINER GENERIC MATERIAL TYPE	NR
LINER SPECIFIC MATERIAL TYPE	NR
** DUCTWORK	
SHELL GENERIC MATERIAL TYPE	STAINLESS STEEL
SHELL SPECIFIC MATERIAL TYPE	NR
LINER GENERIC MATERIAL TYPE	NONE
LINER SPECIFIC MATERIAL TYPE	N/A
** REAGENT PREPARATION EQUIPMENT	
FUNCTION	N/A
DEVICE	N/A
DEVICE TYPE	N/A

** TANKS	
SERVICE	NUMBER
-------	------
SALEABLE BYPRODUCT	2

** PUMPS	
SERVICE	NUMBER
-------	------
ACID RECIRCULATION	****
PRODUCT ACID	****

** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	NR
NUMBER	0
*** SLUDGE	
** TREATMENT	
METHOD	N/A
DEVICE	N/A
PROPRIETARY PROCESS	N/A
** DISPOSAL	
NATURE	N/A
TYPE	NONE
SITE TREATMENT	NR
** PROCESS CONTROL AND INSTRUMENTATION	
CHEMICAL PARAMETERS	TEMPERATURE, ASH LOADINGS, ACID CONCENTRATION

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
9/72	SYSTEM				33.9			720		244	

ILLINOIS POWER COMPANY: WOOD RIVER 4 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE EMISSION CONTROL EQUIPMENT AT THE WOOD RIVER SITE INCLUDED MECHANICAL COLLECTORS, A HIGH EFFICIENCY ESP, AND A MONSANTO CATALYTIC OXIDATION (CATOX) FGD SYSTEM FOR THE CONTROL OF PARTICLE MATTER AND SULFUR DIOXIDE. FOLLOWING PASSAGE THROUGH THE PARTICLE MATTER REMOVAL SYSTEM, THE FLUE GAS ENTERED THE SCRUBBING SYSTEM AND WAS HEATED TO A TEMPERATURE OF 850F AND THEN PASSED THROUGH A VANADIUM PENTOXIDE FIXED-BED CATALYTIC CONVERTER, WHERE THE SULFUR DIOXIDE WAS OXIDIZED TO SULFUR TRIOXIDE. THE GAS THEN FLOWED THROUGH AN ACID ABSORPTION TOWER, WHERE THE SULFUR TRIOXIDE IN THE GAS WAS CONVERTED TO SULFURIC ACID. AN ACID MIST ELIMINATOR ENSURED REMOVAL OF ENTRAINED ACID MIST FROM THE GAS STREAM. THE CLEANED GAS WAS DISCHARGED TO THE STACK AND THE PRODUCT ACID WAS COOLED AND STORED IN TANKS.								
10/72	SYSTEM				23.9			744		178	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE WOOD RIVER SYSTEM WAS STARTED-UP IN SEPTEMBER 1972 BUT WAS SHUTDOWN ALMOST IMMEDIATELY (IN OCTOBER) TO CONVERT THE BURNERS TO OIL FIRING.									
7/73	SYSTEM				21.2			744		158	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		IN JUNE 1973 THE CONVERSION TO OIL FIRING WAS COMPLETED AND A SUCCESSFUL PERFORMANCE TEST WAS MADE. A CATALYST PLUGGING HAZARD CAUSED THE SYSTEM TO SHUTDOWN AGAIN TO INSTALL AN EXTERNAL BURNER SYSTEM.									
		IN APRIL 1974 THE INSTALLATION OF THE EXTERNAL BURNERS WAS COMPLETED. VARIOUS OTHER PROBLEMS OCCURRED, WITH THE RESULT THAT ONLY 657 HOURS OF OPERATING TIME WAS LOGGED IN TWO YEARS.									
		SEVERAL OTHER MAJOR PROBLEM AREAS ENCOUNTERED DURING THE INTERMITTENT OPERATION OF THIS REGENERABLE SYSTEM INCLUDED: FROZEN DAMPERS ON REHEAT BURNERS, CRACKS IN THE TEFLON LINER ON THE ACID PUMP'S DISCHARGE HEADER CRACKS IN THE REHEAT DUCTING, FALL OF REFRACTORY BRICKS FROM THE REHEATER BURNER DOME, AND NEED FOR REINFORCEMENT OF THE STRUCTURE SUPPORTING THE HIGH TEMPERATURE FLUEGAS DUCT TO THE CATALYTIC CONVERTER.									

APPENDIX F
DESIGN AND PERFORMANCE DATA FOR DISCONTINUED DOMESTIC FGD SYSTEMS

COMPANY NAME	KANSAS CITY POWER & LIGHT	
PLANT NAME	HAWTHORN	
UNIT NUMBER	3	
CITY	KANSAS CITY	
STATE	MISSOURI	
REGULATORY CLASSIFICATION	E	
PARTICULATE EMISSION LIMITATION - NG/J	64.	(0.150 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	836	
GROSS UNIT GENERATING CAPACITY - MW	90	
NET UNIT GENERATING CAPACITY W/FGD - MW	85	
NET UNIT GENERATING CAPACITY WO/FGD - MW	87	
EQUIVALENT SCRUBBED CAPACITY - MW	90	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	COMBUSTION ENGINEERING	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	CYCLING	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	235.95	(500000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	148.9	(300 F)
STACK HEIGHT - M	61.	(200 FT)
STACK SHELL	CARBON STEEL	
STACK TOP DIAMETER - M	5.5	(18.0 FT)
** FUEL DATA		
FUEL TYPE	COAL 1 '25%!	
FUEL GRADE	BITUMINOUS; BITUMINOUS	
AVERAGE HEAT CONTENT - J/G	26388.	(11345 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		9500-10800; 10500-13000
AVERAGE ASH CONTENT - %	11.75	
RANGE ASH CONTENT - %	6-15; 9-12	
AVERAGE MOISTURE CONTENT - %	7.28	
RANGE MOISTURE CONTENT - %	9-17; 1.5-12	
AVERAGE SULFUR CONTENT - %	2.78	
RANGE SULFUR CONTENT - %	0.2-1.2; 0.6-4.6	
AVERAGE CHLORIDE CONTENT - %	0.15	
RANGE CHLORIDE CONTENT - %	0.01-0.06; 0.01-0.40	
*** PARTICLE CONTROL		
** MECHANICAL COLLECTOR		
NUMBER	0	
TYPE	NONE	
** FABRIC FILTER		
NUMBER	0	
TYPE	NONE	
** PARTICLE SCRUBBER		
NUMBER	0	
GENERIC TYPE	NONE	
SPECIFIC TYPE	N/A	
TRADE NAME/COMMON NAME	N/A	
SHELL GENERIC MATERIAL	N/A	
SHELL SPECIFIC MATERIAL	N/A	
LINER GENERIC MATERIAL	N/A	
LINER SPECIFIC MATERIAL	N/A	
GAS CONTACTING DEVICE TYPE	N/A	
*** FGD SYSTEM		
** GENERAL DATA		
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT	
SO2 REMOVAL MODE	WET SCRUBBING	
PROCESS TYPE	LIME	
PROCESS ADDITIVES	NONE	
SYSTEM SUPPLIER	COMBUSTION ENGINEERING	
A-E FIRM	BLACK & VEATCH	

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

DEVELOPMENT LEVEL	FULL SCALE	
NEW/RETROFIT	RETROFIT	
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.00	
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	70.00	
ENERGY CONSUMPTION - %	2.2	
CURRENT STATUS	8	
TERMINATION	10/1982	
COMMERCIAL START-UP	11/1972	
INITIAL START-UP	11/1972	
CONTRACT AWARDED	0/1971	
** DESIGN AND OPERATING PARAMETERS		
DESIGN COAL SULFER CONTENT - %	2.80	
DESIGN COAL HEAT CONTENT - J/G	26400.1	(11350 BTU/LB)
DESIGN COAL ASH CONTENT - %	11.80	
DESIGN MOISTURE CONTENT - %	7.30	
DESIGN CHLORIDE CONTENT - %	0.15	
SPACE REQUIREMENTS - SQ M	688.4	(7410 SQ FT)
OPER. & MAINT. REQUIREMENT - MANHR/DAY	136.0	
** QUENCHER/PRESATURATOR		
NUMBER	0	
** ABSORBER		
NUMBER	2	
NUMBER OF SPARES	0	
GENERIC TYPE	PACKED TOWER	
SPECIFIC TYPE	STATIC BED PACKING	
TRADE NAME/COMMON TYPE	MARBLE-BED SCRUBBER	
SUPPLIER	COMBUSTION ENGINEERING	
DIMENSIONS - FT	18.0 X 26.0 X 56.0	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	AISI 1110	
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A	
LINER GENERIC MATERIAL	STAINLESS STEEL	
LINER SPECIFIC MATERIAL	AUSTENITIC	
LINER MATERIAL TRADE NAME/COMMON TYPE	TYPE 316L	
GAS CONTACTING DEVICE TYPE	GLASS MARBLES	
NUMBER OF CONTACTING ZONES	1	
LIQUID RECIRCULATION RATE - LITER/S	321.	(5090 GPM)
L/G RATIO - L/CU.M	2.7	(20.4 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	2.7	(11.0 IN-H2O)
SUPERFICAL GAS VELOCITY - M/SEC	1.8	(6.0 FT/S)
INLET GAS FLOW - CU. M/S	117.97	(250000 ACFM)
INLET GAS TEMPERATURE - C	148.9	(300 F)
SO2 REMOVAL EFFICIENCY - %	50.0	
PARTICLE REMOVAL EFFICENCY - %	99.5	
** MIST ELIMINATOR		
PRE-MIST ELIMINATOR/MIST ELIMINATOR	PRIMARY COLLECTOR	
NUMBER PER SYSTEM	2	
NUMBER OF SPARES PER SYSTEM	0	
NUMBER PER MODULE	1	
GENERIC TYPE	IMPINGEMENT	
SPECIFIC TYPE	BAFFLE	
TRADE NAME/COMMON TYPE	CLOSED VANE	
MANUFACTURER	COMBUSTION ENGINEERING	
CONFIGURATION	HORIZONTAL	
NUMBER OF STAGES	2	
NUMBER OF PASSES PER STAGE	2	
FREEBOARD DISTANCE - M	3.05	(10.0 FT)
DISTANCE BETWEEN STAGES - CM	15.24	(6.0 IN)
DISTANCE BETWEEN VANES - CM	7.6	(3.00 IN)
VANE ANGLES - DEGREES	45	
PRESSURE DROP - KPA	0.3	(1.2 IN-H2O)
SUPERFICAL GAS VELOCITY - M/S	1.8	(6.0 FT/S)
CONSTRUCTION MATERIAL GENERIC TYPE	ORGANIC	
CONSTRUCTION MATERIAL SPECIFIC TYPE	FIBER-REINFORCED POLYESTER	
WASH WATER SOURCE	FRESH	
WASH FREQUENCY	EVERY 48 HOURS	
WASH RATE - L/S	63.1	(1000 GAL/MIN)

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

** REHEATER			
NUMBER	4		
NUMBER OF SPARES	0		
NUMBER PER MODULE	1		
GENERIC TYPE	IN-LINE		
SPECIFIC TYPE	HOT WATER		
TRADE NAME/COMMON TYPE	BARE TUBE		
LOCATION	TOP OF ABSORBER VESSEL		
PERCENT GAS BYPASSED - AVG	0.0		
TEMPERATURE INCREASE - C	33.3	(60 F)	
INLET FLUE GAS TEMPERATURE - C	48.9	(120 F)	
OUTLET FLUE GAS TEMPERATURE - C	82.2	(180 F)	
NUMBER OF HEAT EXCHANGER BANKS	6		
NUMBER OF BUNDLES PER BANK	1		
CONSTRUCTION MATERIAL GENERIC TYPE	STAINLESS STEEL		
CONSTRUCTION MATERIAL SPECIFIC TYPE	AUSTENITIC		
** FANS			
NUMBER	2		
NUMBER OF SPARES	0		
DESIGN	CENTRIFUGAL		
SUPPLIER	HOUDEN, CANADA		
FUNCTION	BOOSTER		
APPLICATION	INDUCED DRAFT		
SERVICE	DRY		
FLUE GAS TEMPERATURE - C	79.4	(175 F)	
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL		
** DAMPERS			
NUMBER	2		
FUNCTION	SHUT-OFF		
GENERIC TYPE	LOUVER		
SPECIFIC TYPE	PARALLEL BLADE MULTILOUVER		
MANUFACTURER	COMBUSTION ENGINEERING		
MODULATION	OPEN/CLOSED		
SEAL AIR FLOW - CU. M/S	0.00	(0 ACFM)	
SERVICE CONDITIONS	330		
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL		
CONSTRUCTION MATERIAL SPECIFIC TYPE	HIGH STRENGTH LOW ALLOY 'HSLA!		
LINER GENERIC MATERIAL TYPE	NONE		
LINER SPECIFIC MATERIAL TYPE	N/A		
** DAMPERS			
NUMBER	2		
FUNCTION	SHUT-OFF		
GENERIC TYPE	LOUVER		
SPECIFIC TYPE	PARALLEL BLADE MULTILOUVER		
MANUFACTURER	COMBUSTION ENGINEERING		
MODULATION	OPEN/CLOSED		
SEAL AIR FLOW - CU. M/S	0.00	(0 ACFM)	
SERVICE CONDITIONS	330		
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL		
CONSTRUCTION MATERIAL SPECIFIC TYPE	HIGH STRENGTH LOW ALLOY 'HSLA!		
LINER GENERIC MATERIAL TYPE	NONE		
LINER SPECIFIC MATERIAL TYPE	N/A		
** DAMPERS			
NUMBER	2		
FUNCTION	SHUT-OFF		
GENERIC TYPE	GUILLOTINE		
SPECIFIC TYPE	TOP-ENTRY GUILLOTINE		
MANUFACTURER	SELF-DESIGNED & INSTALLED BY KCP & L		
MODULATION	OPEN/CLOSED		
SEAL AIR FLOW - CU. M/S	0.00	(0 ACFM)	
SERVICE CONDITIONS	330		
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL		
CONSTRUCTION MATERIAL SPECIFIC TYPE	HIGH STRENGTH LOW ALLOY 'HSLA!		
LINER GENERIC MATERIAL TYPE	NONE		
LINER SPECIFIC MATERIAL TYPE	N/A		

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

** DUCTWORK

LOCATION	SCRUBBER INLET
CONFIGURATION	RECTANGULAR
DIMENSIONS	4.5 FT X 26 FT
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
SHELL SPECIFIC MATERIAL TYPE	HIGH STRENGTH LOW ALLOY 'HSLA!
LINER GENERIC MATERIAL TYPE	INORGANIC
LINER SPECIFIC MATERIAL TYPE	HYDRAULICALLY-BONDED MORTAR

** DUCTWORK

LOCATION	SCRUBBER OUTLET
CONFIGURATION	RECTANGULAR
DIMENSIONS	3 FT X 26 FT
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
SHELL SPECIFIC MATERIAL TYPE	HIGH STRENGTH LOW ALLOY 'HSLA!
LINER GENERIC MATERIAL TYPE	INORGANIC
LINER SPECIFIC MATERIAL TYPE	HYDRAULICALLY-BONDED MORTAR

** DUCTWORK

LOCATION	BYPASS
CONFIGURATION	RECTANGULAR
DIMENSIONS	3 FT X 26 FT
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
SHELL SPECIFIC MATERIAL TYPE	HIGH STRENGTH LOW ALLOY 'HSLA!
LINER GENERIC MATERIAL TYPE	NONE
LINER SPECIFIC MATERIAL TYPE	N/A

** REAGENT PREPARATION EQUIPMENT

FUNCTION	SLAKER
DEVICE	NR
DEVICE TYPE	NR
MANUFACTURER	COFFMAN INDUSTRIES
NUMBER	1
NUMBER OF SPARES	0
FULL LOAD DRY FEED CAPACITY - M.TONS/HR	51.7 (57 TPH)
PRODUCT QUALITY - % SOLIDS	25.0

** TANKS

SERVICE	NUMBER
ABSORBER RECYCLE	2
LIME SLURRY	1
CLEARWELL	1

** PUMPS

SERVICE	NUMBER
RECYCLE	2
CLEAR WATER SUPPLY	2
SLUDGE	2
BLOWDOWN	2
REHEATER FEED	4
MIST ELIMINATOR WASH	4
LIME SLURRY	1
SCRUBBER MAKEUP	2

** SOLIDS CONCENTRATING/DEWATERING

DEVICE	THICKENER
NUMBER	1
NUMBER OF SPARES	0
DIMENSIONS - FT	115.0 DIA X 10.0
CAPACITY	75000
SHELL GENERIC MATERIAL TYPE	CARBON STEEL 'WALLS!; INORGANIC 'BOTTOM!
SHELL SPECIFIC MATERIAL TYPE	AISI 1110; HYDRAULICALLY-BONDED CONCRETE
LINER GENERIC MATERIAL TYPE	ORGANIC
LINER SPECIFIC MATERIAL TYPE	NR
FEED STREAM SOURCE	ABSORBER BLEED
FEED STREAM CHARACTERISTICS	12% SOLIDS
OUTLET STREAM CHARACTERISTICS	30% SOLIDS
OVERFLOW STREAM CHARACTERISTICS	13900 GPM

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

OUTLET STREAM DISPOSITION	TO ASH POND
OVERFLOW STREAM DISPOSITION	TO RECYCLE CANAL, ASH SLUICE PUMP

*** SLUDGE

** TREATMENT

METHOD	BLEED
DEVICE	N/A
PROPRIETARY PROCESS	N/A

** DISPOSAL

NATURE	FINAL
TYPE	POND
LOCATION	ON-SITE
SITE TRANSPORTATION METHOD	PIPELINE
SITE TREATMENT	NONE
SITE DIMENSIONS	40 ACRES/15 FT
SITE CAPACITY - CU.M	733800 (600.0 ACRE-FT)
SITE SERVICE LIFE - YRS	3

** PROCESS CONTROL AND INSTRUMENTATION

PROCESS STREAM	RECIRCULATING SLURRY
CHEMICAL PARAMETERS	PH
PHYSICAL VARIABLES	% SOLIDS
CONTROL LEVELS	PH 5.5-6.0, 10% SOLIDS
MONITOR LOCATION	GRAB SAMPLES TO LABORATORY
PROCESS CONTROL MANNER	MANUAL
PROCESS CHEMISTRY MODE	FEEDBACK

** WATER BALANCE

WATER LOOP TYPE	OPEN
RECEIVING WATER STREAM	MISSOURI RIVER
SOURCE OF MAKEUP WATER	MISSOURI RIVER

** CHEMICALS AND CONSUMPTION

FUNCTION	ABSORBENT
NAME	LIME
PRINCIPAL CONSTITUENT	93% CAO
SOURCE/SUPPLIER	ASHGROVE
POINT OF ADDITION	LIME SLAKER

** FGD SPARE CAPACITY INDICES

ABSORBER - %	0.0
MIST ELIMINATOR - %	0.0
REHEATER - %	0.0
FAN - %	0.0
SLAKER - %	0.0
EFFLUENT HOLD TANK - %	0.0
RECIRCULATION PUMP - %	0.0
THICKENER - %	0.0

** FGD SPARE COMPONENT INDICES

ABSORBER	0.0
MIST ELIMINATOR	0.0
REHEATER	0.0
FAN	0.0
SLAKER	0.0
EFFLUENT HOLD TANK	0.0
RECIRCULATION PUMP	0.0
THICKENER	0.0

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

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
0/72	SYSTEM										

** PROBLEMS/SOLUTIONS/COMMENTS

THE ORIGINAL FGD SYSTEM INSTALLED ON THE HAWTHORN 3 UNIT BEGAN INITIAL OPERATIONS IN NOVEMBER 1972. THE PROCESS CONSISTED OF DRY LIMESTONE INJECTION INTO THE BOILER FURNACE WHERE THE LIMESTONE WAS CALCINED TO LIME. THE FURNACE CALCINED LIMESTONE AND BOILER FLUE GAS WERE THEN DISCHARGED TO A TAIL-END WET SCRUBBING SYSTEM CONSISTING OF TWO MARBLE-BED ABSORBERS WHERE PARTICLES AND SO2 WERE REMOVED FROM THE GAS STREAM. EACH ABSORBER WAS CAPABLE OF TREATING 500,000 ACFM OF FLUE GAS AT 300 F.

7/75	3A		0.0		0.0						
	3B		42.0		33.2						
	SYSTEM		21.0		16.6			744	584	123	

** PROBLEMS/SOLUTIONS/COMMENTS

PROBLEMS WITH THE 3A MODULE DURING JULY INCLUDED A LEAK IN THE CITY WATER LINE, A PLUGGED DUCT TO THE ID FAN, AND A MALFUNCTIONING OUTLET DAMPER FROM THE SCRUBBER. IN MODULE 3B SOME MARBLES WERE LOST FROM THE BED AND A SPRAY HEADER WAS BROKEN.

8/75	SYSTEM				0.0			744	0	0	0.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE ID FAN FOR HALF THE BOILER WAS LOST DURING AUGUST.

THE PROBLEMS ENCOUNTERED IN JULY CONTINUED INTO AUGUST FORCING THE FGD SYSTEM TO REMAIN OFF LINE FOR THE MONTH.

9/75	3A		69.0		34.3						
	3B		23.0		11.3						
	SYSTEM		46.0		22.8			720	358	164	

** PROBLEMS/SOLUTIONS/COMMENTS

AN OUTAGE DUE TO CLEANING AND MECHANICAL REPAIRS OCCURRED. POTS, COVERS, AND MARBLES IN THE MARBLE BED OF MODULE 3B WERE REPLACED. THE BOILER HOURS OF OPERATION ARE BASED ON THE NUMBER OF HOURS OF COAL FIRED OPERATION (I.E., TIME DURING WHICH THE BOILER FIRED NATURAL GAS IS NOT INCLUDED).

10/75	3A		65.0		15.7						
	3B		81.0		19.5						
	SYSTEM		73.0		17.6			744	180	131	

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE 3A OUTAGE WAS DUE LARGELY TO REPLACEMENT OF A RECYCLE PUMP MOTOR.

A SCHEDULED BOILER OVERHAUL REDUCED BOILER OPERATION HOURS DURING OCTOBER.

11/75	SYSTEM				0.0			720	0	0	0.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILERS AND SCRUBBERS WERE SHUT DOWN FOR A SCHEDULED TURBINE OVERHAUL. THE SYSTEM IS SCHEDULED TO GO BACK ON-LINE IN JANUARY 1976.

12/75	SYSTEM				0.0			744	0	0	0.0

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

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
1/76	SYSTEM				0.0			744	0	0	0.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM REMAINED OFF LINE THROUGH JANUARY DUE TO FROZEN EQUIPMENT AND LINES, LACK OF HEAT TRACING AND A LACK OF MANPOWER DUE TO A BOILER AND TURBINE OVERHAUL ON THE NO. 5 BOILER.

2/76	3A		29.4		21.3						
	3B		1.4		1.0						
	SYSTEM		15.4		11.2			696	503	77	

** PROBLEMS/SOLUTIONS/COMMENTS

SCRUBBER OUTAGES IN FEBRUARY RESULTED FROM PLUGGING IN THE SCRUBBER BED, STEMMING FROM THE CONVERSION FROM AN UNDER-BED TO OVER-BED SPRAY SYSTEM.

3/76	SYSTEM				0.0			744	0	0	0.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS INOPERATIVE DURING MARCH DUE TO MANPOWER CONSTRAINTS AND INCLEMENT WEATHER. THE UTILITY WAS UNABLE TO PERFORM NECESSARY MAINTENANCE.

RECONVERSION OF THE MODULE 3B SPRAY SYSTEM TO AN UNDER-BED CONFIGURATION HAS BEEN COMPLETED.

THE BYPASS SYSTEM WILL BE MODIFIED AND CHANGED TO A SLIDE-GATE DAMPER ARRANGEMENT.

4/76	SYSTEM				0.0			720	0	0	0.0
5/76	SYSTEM				0.0			744	0	0	0.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE SYSTEM REMAINED DOWN THROUGH MAY DUE TO THE CONTINUATION OF MAN-POWER SHORTAGE PROBLEMS. THE UTILITY PERFORMED SOME CLEANING AND REPAIRS DURING THE MONTH.

6/76	3A		39.0		27.6						
	3B		44.0		30.4						
	SYSTEM		41.5		29.0			720	505	209	

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY IS IN THE PROCESS OF MODIFYING THE MIST ELIMINATOR WASH SYSTE ON BOTH UNITS 3 AND 4. THE WATER LANCES ARE BEING CHANGED FROM FRP TO CARBON STEEL IN AN ATTEMPT TO PREVENT THE LOSS OF THE NOZZLE INSERTS AND THE SUBSEQUENT SHATTERING OF THE LANCES.

7/76	SYSTEM				0.0			744	0	0	0.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY BEGAN CONVERTING THIS SYSTEM FROM LIMESTONE INJECTION AND TAIL END SCRUBBING TO A LIME SLURRY BASED SCRUBBING SYSTEM DURING JULY.

8/76	SYSTEM				0.0			744	0	0	0.0
9/76	SYSTEM				0.0			720	0	0	0.0

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

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE SYSTEM WAS VIRTUALLY OUT OF SERVICE THE ENTIRE JULY-SEPTEMBER PERIOD DUE TO CONTINUING SYSTEM MODIFICATIONS. MANPOWER COMMITMENTS WERE SERIOUSLY HAMPERED BY A MAJOR EXPLOSION WHICH OCCURRED IN THE COAL MILL PULVERIZING AREA OF HAWTHORN NO. 5.									
10/76	SYSTEM				0.0			744	0	0	0.0
11/76	SYSTEM				0.0			720	0	0	0.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UNIT DID NOT OPERATE BECAUSE OF THE ONGOING MAJOR MODIFICATIONS BEING IMPLEMENTED ON THE SCRUBBING SYSTEM. THE SYSTEM SHOULD BE READY FOR OPERATION FEB 1. THE UNIT MUST UNDERGO A SERIES OF TESTS TO INSURE COMPLIANC WITH CITY AND FEDERAL REGULATIONS.									
12/76	SYSTEM				0.0			744	0	0	0.0
1/77	SYSTEM				0.0			744	0	0	0.0
2/77	3A		87.8		50.1						
	3B		68.8		39.3						
	SYSTEM		78.3		44.7			672	383	300	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		UNIT NO. 3 WAS DOWN FOR THE ENTIRE DECEMBER-JANUARY PERIOD FOR THE COMPLETION OF MODIFICATIONS AND REPAIRS ON THE SCRUBBERS AND BOILER. THE UNIT BECAME AVAILABLE FOR SERVICE AND TESTING ON FEBRUARY 7. THE PARTICULATE EMISSION LEVEL MEASURED AT THE SCRUBBER OUTLET WAS 0.12 LB/MM BTU (WELL BELOW THE REQUIRED 0.17 LB/MM BTU) BURNING APPROXIMATELY 2.0 % SULFUR COAL. THE CONVERSION FROM LIMESTONE TO LIME HAS GONE SMOOTHLY. SOME INITIAL PROBLEMS WITH PROCESS CHEMISTRY CONTROL HAVE BEEN CORRECTED. OTHER MINOR PROBLEMS INCLUDED PUMP MALFUNCTIONS AND LOSS OF SLAKING WATER PRESSURE. SYSTEM OPERATIONS ARE CONTINUING AT 0% SOLIDS AND 100% BLOWDOW WITH A FRESH WATER MAKE-UP OF APPROXIMATELY 7.0 GPM/MW.									
3/77	3A		98.8		64.0						
	3B		85.3		55.2						
	SYSTEM		92.1		59.6			744	482	443	
4/77	3A		56.7		56.7						
	3B		56.7		56.7						
	SYSTEM		56.7		56.7			720	720	408	
5/77	3A		58.0		40.6						
	3B		58.0		40.6						
	SYSTEM		58.0		40.6			744	736	302	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE SYSTEM IS NOW OPERATING AT ABOUT 15-25% BLOWDOWN. THE PH CONTROL SYSTEM OPERATIONS HAVE BEEN EXCELLENT. DURING MAY THE BOILER BURNED GAS FOR 216 HOURS (NOT INCLUDED IN OPERABILITY FIGURES). SO2 REMOVAL EFFICIENCY IS ESTIMATED AT 50-60% FOR BOTH MODULES, ALTHOUGH ACTUAL TESTS HAVE NOT BEEN RUN FOR ABOUT A YEAR AND A HALF. BOTH MODULES ARE CURRENTLY OPERATING SIMULTANEOUSLY.									
6/77	3A		100.0		10.0						
	3B		100.0		10.0						
	SYSTEM		100.0		10.0			720	72	72	

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

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UNIT FIRED NATURAL GAS THROUGHOUT JUNE WITH THE EXCEPTION OF A 72-HOUR PERIOD DURING WHICH COAL WAS FIRED AND THE SCRUBBERS WERE OPERATE FOR SCRUBBER PERSONNEL PURPOSES ONLY. (GAS OPERATION IS NOT INCLUDED IN THE OPERABILITY FIGURES).									
7/77	SYSTEM				0.0			744	0	0	
8/77	SYSTEM				0.0			744	0	0	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UNIT FIRED NATURAL GAS FOR THE ENTIRE JULY-AUGUST PERIOD, MAKING SCRUBBER OPERATION UNNECESSARY.									
9/77	SYSTEM				0.0			720	0	0	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UNIT CONTINUED TO FIRE NATURAL GAS THROUGH THE SEPTEMBER REPORT PERIOD.									
10/77	SYSTEM				0.0			744	0	0	0.0
11/77	SYSTEM		100.0		57.1			720	411	411	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UNIT WAS SHUT DOWN IN OCTOBER DUE TO A LACK OF NATURAL GAS AND REMAINED DOWN UNTIL NOVEMBER 3, WHEN IT RE-STARTED FIRING COAL.									
		DURING THE BOILER DOWN TIME, THE REACTION TANKS AND SPRAY HEADERS WERE REPLACED BY STAINLESS STEEL COMPONENTS; THE INTERCONNECTING PIPING IS RUBBER LINED.									
12/77	SYSTEM		100.0		72.1			744	541	541	
1/78	SYSTEM		100.0		46.5			744	346	346	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE FGD MODULES WERE CLEANED DURING BOILER OUTAGES (THERE WERE NO FGD-RELATED OUTAGES).									
		SOME LEAKS IN THE FGD PIPING WERE REPAIRED DURING DECEMBER.									
2/78	SYSTEM		100.0		24.9			672	167	167	
3/78	SYSTEM		100.0		54.6			744	406	406	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING FEBRUARY THE UNIT WAS DOWN FOUR TIMES WITH ECONOMIZER AND WATER WALL LEAKS (504 HOURS TOTAL). WATER WALL LEAK REPAIR AS WELL AS ACID CLEANING OF THE BOILER CAUSED ADDITIONAL OUTAGE TIME DURING THE LAST WEEK OF MARCH.									
		A TWO WEEK OUTAGE WAS SCHEDULED DURING MARCH FOR SEASONAL MAINTENANCE.									
4/78	SYSTEM		40.1		30.6			720	548	220	
5/78	SYSTEM		100.0		54.2			744	403	403	

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

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
	AN AIR PREHEATER FIRE DISCOVERED ON MAY 12 CAUSED DAMAGES THAT FORCED MODULE A TO BE DOWN THE REST OF THE MONTH.										
6/78	SYSTEM							720			
7/78	SYSTEM							744			
	** PROBLEMS/SOLUTIONS/COMMENTS										
	NO INFORMATION WAS AVAILABLE FOR THE JUNE-JULY REPORT PERIOD DUE TO A PLANT STRIKE; HOWEVER, THE FGD SYSTEM HAS OPERATED AND IS BEING RUN BY SUPERVISORY PERSONNEL.										
8/78	SYSTEM							744			
9/78	SYSTEM							720			
	** PROBLEMS/SOLUTIONS/COMMENTS										
	THE SCRUBBER SYSTEM IS OPERATING EVEN THOUGH THE UTILITY IS STILL IN THE MIDST OF A STRIKE. FGD PERFORMANCE FIGURES ARE NOT AVAILABLE SINCE THE UTILITY IS NOT RECORDING FGD SYSTEM OPERATING HOURS DURING THE STRIKE.										
10/78	SYSTEM							744			
11/78	SYSTEM							720			
	** PROBLEMS/SOLUTIONS/COMMENTS										
	ALTHOUGH THE STRIKE IS OVER, OPERATIONAL DATA IS STILL UNAVAILABLE. THE FGD SYSTEM IS IN OPERATION.										
12/78	SYSTEM							744			
1/79	SYSTEM							744			
	** PROBLEMS/SOLUTIONS/COMMENTS										
	HOURS OF OPERATION ARE STILL NOT AVAILABLE. THE FGD SYSTEM IS IN OPERATION BUT AT PRESENT PERSONNEL ARE BEING REASSIGNED PREVENTING ACCURATE DATA RECORDING.										
2/79	SYSTEM							672			
3/79	SYSTEM							744			
	** PROBLEMS/SOLUTIONS/COMMENTS										
	OPERATING INFORMATION IS STILL NOT AVAILABLE FOR UNIT 3.										
4/79	SYSTEM		100.0		18.1			720	130	130	9.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
	THE BOILER WAS DOWN IN APRIL FOR 543 HOURS FOR TURBINE OVERHAUL.										
5/79	SYSTEM		100.0		55.0			744	409	409	29.0

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

PERIOD	MODULE	PERFORMANCE DATA: AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
		IN MAY THE BOILER OUTAGE TIME WAS DUE TO TUBE LEAKS.									
6/79	SYSTEM							720	696		
7/79	SYSTEM							744	744		
8/79	SYSTEM							744	558		
9/79	SYSTEM	100.0		84.0				720	605	605	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UTILITY BURNED PRIMARILY GAS DURING JUNE, JULY AND AUGUST. THE UNIT RETURNED TO FIRING ALL COAL IN SEPTEMBER. THE SCRUBBER WAS LARGELY AVAILABLE BUT WAS NOT NEEDED FOR MOST OF THE PERIOD. THE UTILITY REPORTED ONLY REGULAR MAINTENANCE TOOK PLACE WITH NO PROBLEMS ENCOUNTERED.									
10/79	SYSTEM	100.0		91.0				744	677	677	
11/79	SYSTEM	100.0		38.1				720	274	274	
12/79	SYSTEM	100.0		91.9				744	684	684	
1/80	SYSTEM	100.0		93.0				744	692	692	
2/80	SYSTEM	100.0		100.0				696	696	696	
3/80	SYSTEM	100.0		100.0				744	744	744	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE FGD SYSTEM WAS AVAILABLE 100% OF THE TIME THE BOILER OPERATED. NO PROBLEMS WERE ENCOUNTERED.									
4/80	SYSTEM			68.0				720		490	
5/80	SYSTEM			60.0				744		446	
6/80	SYSTEM			66.0				720		475	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UNIT 3 BOILER EXPERIENCED SUPERHEATER AND ECONOMIZER LEAKS DURING THE APRIL-JUNE PERIOD ACCOUNTING FOR THE LOW SCRUBBER UTILIZATION FIGURES.									
7/80	SYSTEM	100.0		65.0				744	484	484	45.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE OUTAGE TIME DURING JULY WAS CAUSED BY BOILER TUBE LEAKS. NO FGD-RELATED PROBLEMS WERE ENCOUNTERED.									
8/80	SYSTEM							744	642		49.4
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UTILITY REPORTED THAT THE FGD SYSTEM IS NOW CERTIFIED, THEREFORE THE SCRUBBER OPERATING HOURS ARE NO LONGER RECORDED.									
		THE FGD SYSTEM WAS SHUT DOWN FOR 10 HOURS DURING AUGUST TO REPAIR REHEATER TUBE LEAKS.									

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

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
9/80	SYSTEM							720	248		13.9

** PROBLEMS/SOLUTIONS/COMMENTS

DURING SEPTEMBER BOILER OPERATION WAS LIMITED DUE TO A SCHEDULED OVERHAUL.

DURING THE MONTH 67 HOURS OF SCRUBBER OUTAGE TIME WERE DUE TO REQUIRED CLEANING OF THE SCRUBBER MODULES.

10/80	SYSTEM	100.0	100.0	100.0	32.9			744	245	245	12.0

** PROBLEMS/SOLUTIONS/COMMENTS

DURING OCTOBER THE UNIT WAS SHUTDOWN FOR A FALL OUTAGE WHICH LASTED APPROXIMATELY 359 HOURS.

ONE HOUR OF OUTAGE TIME WAS REQUIRED DURING THE MONTH TO REPAIR A SUPER HEATER TUBE LEAK.

11/80	SYSTEM	80.1	100.0	100.0	40.0			720	288	288	32.0

** PROBLEMS/SOLUTIONS/COMMENTS

DURING NOVEMBER 143 HOURS OF OUTAGE TIME WERE REQUIRED TO CLEAN THE SCRUBBER MODULES.

AN ECONOMIZER LEAK CAUSED THE UNIT TO SHUTDOWN FOR 108 HOURS.

THE UNIT DID NOT OPERATE 181 HOURS DURING THE MONTH DUE TO LACK OF DEMAND.

12/80	SYSTEM	57.9	100.0	100.0	24.5			744	182	182	15.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS OUT OF SERVICE 82 HOURS IN DECEMBER SO THAT THE MODULES COULD BE CLEANED.

THE UNIT DID NOT OPERATE 249 HOURS DURING DECEMBER. OF THE 249 HOURS 114 HOURS WERE DUE TO LACK OF DEMAND AND 135 HOURS WERE THE RESULT OF A FUEL SUPPLY LIMITATION.

1/81	SYSTEM	100.0	100.0	100.0	73.9			744	550	550	

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JANUARY THE UNIT WAS SHUTDOWN FOR 194 HOURS DUE TO ECONOMIZER LEAKS.

2/81	SYSTEM	84.8	100.0	66.5	30.0			672	202	202	

** PROBLEMS/SOLUTIONS/COMMENTS

DURING FEBRUARY APPROXIMATELY 101 HOURS OF OUTAGE TIME WAS CAUSED BY SUPERHEATER TUBE LEAKS.

THE BOILER DID NOT OPERATE 369 HOURS DUE TO A LACK OF DEMAND.

3/81	SYSTEM	52.2	100.0	100.0	52.2			744	388	388	

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

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
					ECONOMIZER LEAKS AND HIGH VIBRATIONS OF THE ID FAN CAUSED 356 HOURS OF OUTAGE TIME DURING MARCH.						
4/81	SYSTEM	100.0	100.0	100.0	69.4			720	500	500	28.0
5/81	SYSTEM	100.0	100.0	100.0	31.0			744	231	231	20.0
6/81	SYSTEM	100.0	100.0	100.0	55.0			720	396	396	35.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
					THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE SECOND QUARTER 1981.						
					BOILER TUBE LEAKS WERE ENCOUNTERED DURING THE SECOND QUARTER CAUSING SYSTEM DOWN TIME.						
7/81	SYSTEM	100.0	100.0		51.9			744	386	386	23.7
8/81	SYSTEM	100.0	100.0		10.3			744	77	77	2.7
9/81	SYSTEM	100.0	100.0		57.8			720	416	416	24.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
					ALL UNIT OUTAGES DURING THE THIRD QUARTER WERE ATTRIBUTED TO A LACK OF DEMAND WITH THE EXCEPTION OF FOUR ECONOMIZER LEAKS IN SEPTEMBER THAT CAUSE A TOTAL OF 157 HOURS OF OUTAGE TIME.						
10/81	SYSTEM		100.0		43.5			744	324	324	24.4
	** PROBLEMS/SOLUTIONS/COMMENTS										
					DURING OCTOBER ECONOMIZER TUBE LEAKS CAUSED A LOW BOILER CAPACITY FACTOR.						
11/81	SYSTEM		100.0		19.0			720	137	137	12.3
	** PROBLEMS/SOLUTIONS/COMMENTS										
					BOILER RETUBING STARTED ON NOVEMBER 16 AND CONTINUED THRU THE END OF THE MONTH.						
12/81	SYSTEM		0.0		0.0				0	0	0.0
1/82	SYSTEM		0.0		0.0			744	0	0	0.0
2/82	SYSTEM		0.0		0.0			672	0	0	0.0
3/82	SYSTEM		0.0		0.0			744	0	0	0.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
					FROM DECEMBER 1981 THRU MARCH 1982 THE BOILER RETUBING WORK CONTINUED. ALSO DURING THIS TIME THE TURBINE WAS OVERHAULED.						
4/82	SYSTEM		100.0		0.0			720	0	0	0.0

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

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING APRIL THE UNIT WAS DOWN FOR A TURBINE OVERHAUL. THE FGD SYSTEM WAS AVAILABLE FOR OPERATION IF NECESSARY.									
5/82	SYSTEM	100.0		9.0				744	67	67	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE TURBINE OVERHAUL WAS COMPLETED DURING MAY ACCOUNTING FOR 495 HOURS OF DOWN TIME.									
		AN ADDITIONAL 182 HOURS WAS NECESSARY AFTER THE RESTART OF THE UNIT TO BALANCE THE TURBINE.									
6/82	SYSTEM	100.0		42.6				720	307	307	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DUE TO TURBINE VIBRATION, THE UNIT WAS SHUT DOWN 413 HOURS TO BALANCE THE TURBINE.									
		FIVE OUTAGES IN JUNE WERE CAUSED BY ECONOMIZER LEAKS.									
7/82	SYSTEM							744			
8/82	SYSTEM							744			
9/82	SYSTEM							720			
10/82	SYSTEM							744			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE HAWTHORN 3 AND 4 UNITS ARE IN RESERVE SHUTDOWN. THEY ARE NOT EXPECTED TO BE NEEDED AGAIN UNTIL 1990 DUE TO ECONOMIC CONDITIONS, THE DRASTIC DROP IN SYSTEM LOAD AND THE AVAILABILITY OF MORE EFFICIENT GENERATING UNITS.									

APPENDIX F
DESIGN AND PERFORMANCE DATA FOR DISCONTINUED DOMESTIC FGD SYSTEMS

COMPANY NAME	KANSAS CITY POWER & LIGHT	
PLANT NAME	HAWTHORN	
UNIT NUMBER	4	
CITY	KANSAS CITY	
STATE	MISSOURI	
REGULATORY CLASSIFICATION	E	
PARTICULATE EMISSION LIMITATION - NG/J	64.	(0.150 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	836	
GROSS UNIT GENERATING CAPACITY - MW	90	
NET UNIT GENERATING CAPACITY W/FGD - MW	85	
NET UNIT GENERATING CAPACITY WO/FGD - MW	87	
EQUIVALENT SCRUBBED CAPACITY - MW	90	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	COMBUSTION ENGINEERING	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	CYCLING	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	235.95	(500000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	148.9	(300 F)
STACK HEIGHT - M	61.	(200 FT)
STACK SHELL	CARBON STEEL	
STACK TOP DIAMETER - M	5.5	(18.0 FT)
** FUEL DATA		
FUEL TYPE	COAL 1 '25%!	
FUEL GRADE	BITUMINOUS; BITUMINOUS	
AVERAGE HEAT CONTENT - J/G	26388.	(11345 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		9500-10800; 10500-13000
AVERAGE ASH CONTENT - %	11.75	
RANGE ASH CONTENT - %	6-15; 9-12	
AVERAGE MOISTURE CONTENT - %	7.28	
RANGE MOISTURE CONTENT - %	9-17; 1.5-12	
AVERAGE SULFUR CONTENT - %	2.78	
RANGE SULFUR CONTENT - %	0.2-1.2; 0.6-4.6	
AVERAGE CHLORIDE CONTENT - %	0.15	
RANGE CHLORIDE CONTENT - %	0.01-0.06; 0.01-0.40	
*** PARTICLE CONTROL		
** MECHANICAL COLLECTOR		
NUMBER	0	
TYPE	NONE	
** FABRIC FILTER		
NUMBER	0	
TYPE	NONE	
** PARTICLE SCRUBBER		
NUMBER	0	
GENERIC TYPE	NONE	
SPECIFIC TYPE	N/A	
TRADE NAME/COMMON NAME	N/A	
SHELL GENERIC MATERIAL	N/A	
SHELL SPECIFIC MATERIAL	N/A	
LINER GENERIC MATERIAL	N/A	
LINER SPECIFIC MATERIAL	N/A	
GAS CONTACTING DEVICE TYPE	N/A	
*** FGD SYSTEM		
** GENERAL DATA		
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT	
SO2 REMOVAL MODE	WET SCRUBBING	
PROCESS TYPE	LIME	
PROCESS ADDITIVES	NONE	
SYSTEM SUPPLIER	COMBUSTION ENGINEERING	
A-E FIRM	BLACK & VEATCH	

KANSAS CITY POWER & LIGHT: HAWTHORN 4 (CONT.)

DEVELOPMENT LEVEL	FULL SCALE	
NEW/RETROFIT	RETROFIT	
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.00	
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	70.00	
ENERGY CONSUMPTION - %	2.2	
CURRENT STATUS	8	
TERMINATION	10/1982	
COMMERCIAL START-UP	11/1972	
INITIAL START-UP	8/1972	
CONTRACT AWARDED	0/1971	
** DESIGN AND OPERATING PARAMETERS		
DESIGN COAL SULFER CONTENT - %	2.80	
DESIGN COAL HEAT CONTENT - J/G	26400.1	(11350 BTU/LB)
DESIGN COAL ASH CONTENT - %	11.80	
DESIGN MOISTURE CONTENT - %	7.30	
DESIGN CHLORIDE CONTENT - %	0.15	
SPACE REQUIREMENTS - SQ M	688.4	(7410 SQ FT)
OPER. & MAINT. REQUIREMENT - MANHR/DAY	136.0	
** QUENCHER/PRESATURATOR		
NUMBER	0	
** ABSORBER		
NUMBER	2	
NUMBER OF SPARES	0	
GENERIC TYPE	PACKED TOWER	
SPECIFIC TYPE	STATIC BED PACKING	
TRADE NAME/COMMON TYPE	MARBLE-BED SCRUBBER	
SUPPLIER	COMBUSTION ENGINEERING	
DIMENSIONS - FT	18.0 X 26.0 X 56.0	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	AISI 1110	
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A	
LINER GENERIC MATERIAL	STAINLESS STEEL	
LINER SPECIFIC MATERIAL	AUSTENITIC	
LINER MATERIAL TRADE NAME/COMMON TYPE	TYPE 316L	
GAS CONTACTING DEVICE TYPE	GLASS MARBLES	
NUMBER OF CONTACTING ZONES	1	
LIQUID RECIRCULATION RATE - LITER/S	321.	(5090 GPM)
L/G RATIO - L/CU.M	2.7	(20.4 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	2.7	(11.0 IN-H2O)
SUPERFICAL GAS VELOCITY - M/SEC	1.8	(6.0 FT/S)
INLET GAS FLOW - CU. M/S	117.97	(250000 ACFM)
INLET GAS TEMPERATURE - C	148.9	(300 F)
SO2 REMOVAL EFFICIENCY - %	50.0	
PARTICLE REMOVAL EFFICENCY - %	99.5	
** MIST ELIMINATOR		
PRE-MIST ELIMINATOR/MIST ELIMINATOR	PRIMARY COLLECTOR	
NUMBER PER SYSTEM	2	
NUMBER OF SPARES PER SYSTEM	0	
NUMBER PER MODULE	1	
GENERIC TYPE	IMPINGEMENT	
SPECIFIC TYPE	BAFFLE	
TRADE NAME/COMMON TYPE	CLOSED VANE	
MANUFACTURER	COMBUSTION ENGINEERING	
CONFIGURATION	HORIZONTAL	
NUMBER OF STAGES	2	
NUMBER OF PASSES PER STAGE	2	
FREEBOARD DISTANCE - M	3.05	(10.0 FT)
DISTANCE BETWEEN STAGES - CM	15.24	(6.0 IN)
DISTANCE BETWEEN VANES - CM	7.6	(3.00 IN)
VANE ANGLES - DEGREES	45	
PRESSURE DROP - KPA	0.3	(1.2 IN-H2O)
SUPERFICAL GAS VELOCITY - M/S	1.8	(6.0 FT/S)
CONSTRUCTION MATERIAL GENERIC TYPE	ORGANIC	
CONSTRUCTION MATERIAL SPECIFIC TYPE	FIBER-REINFORCED POLYESTER	
WASH WATER SOURCE	FRESH	
WASH FREQUENCY	EVERY 48 HOURS	
WASH RATE - L/S	63.1	(1000 GAL/MIN)

KANSAS CITY POWER & LIGHT: HAWTHORN 4 (CONT.)

** REHEATER		
NUMBER	4	
NUMBER OF SPARES	0	
NUMBER PER MODULE	1	
GENERIC TYPE	IN-LINE	
SPECIFIC TYPE	HOT WATER	
TRADE NAME/COMMON TYPE	BARE TUBE	
LOCATION	TOP OF ABSORBER VESSEL	
PERCENT GAS BYPASSED - AVG	0.0	
TEMPERATURE INCREASE - C	33.3	(60 F)
INLET FLUE GAS TEMPERATURE - C	48.9	(120 F)
OUTLET FLUE GAS TEMPERATURE - C	82.2	(180 F)
NUMBER OF HEAT EXCHANGER BANKS	6	
NUMBER OF BUNDLES PER BANK	1	
CONSTRUCTION MATERIAL GENERIC TYPE	STAINLESS STEEL	
CONSTRUCTION MATERIAL SPECIFIC TYPE	AUSTENITIC	
** FANS		
NUMBER	2	
NUMBER OF SPARES	0	
DESIGN	CENTRIFUGAL	
SUPPLIER	HOUDEN, CANADA	
FUNCTION	BOOSTER	
APPLICATION	INDUCED DRAFT	
SERVICE	DRY	
FLUE GAS TEMPERATURE - C	79.4	(175 F)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	
** DAMPERS		
NUMBER	2	
FUNCTION	SHUT-OFF	
GENERIC TYPE	LOUVER	
SPECIFIC TYPE	PARALLEL BLADE MULTILOUVER	
MANUFACTURER	COMBUSTION ENGINEERING	
MODULATION	OPEN/CLOSED	
SEAL AIR FLOW - CU. M/S	0.00	(0 ACFM)
SERVICE CONDITIONS	330	
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	
CONSTRUCTION MATERIAL SPECIFIC TYPE	HIGH STRENGTH LOW ALLOY 'HSLA!	
LINER GENERIC MATERIAL TYPE	NONE	
LINER SPECIFIC MATERIAL TYPE	N/A	
** DAMPERS		
NUMBER	2	
FUNCTION	SHUT-OFF	
GENERIC TYPE	LOUVER	
SPECIFIC TYPE	PARALLEL BLADE MULTILOUVER	
MANUFACTURER	COMBUSTION ENGINEERING	
MODULATION	OPEN/CLOSED	
SEAL AIR FLOW - CU. M/S	0.00	(0 ACFM)
SERVICE CONDITIONS	330	
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	
CONSTRUCTION MATERIAL SPECIFIC TYPE	HIGH STRENGTH LOW ALLOY 'HSLA!	
LINER GENERIC MATERIAL TYPE	NONE	
LINER SPECIFIC MATERIAL TYPE	N/A	
** DAMPERS		
NUMBER	2	
FUNCTION	SHUT-OFF	
GENERIC TYPE	GUILLOTINE	
SPECIFIC TYPE	TOP-ENTRY GUILLOTINE	
MANUFACTURER	SELF-DESIGNED & INSTALLED BY KCP & L	
MODULATION	OPEN/CLOSED	
SEAL AIR FLOW - CU. M/S	0.00	(0 ACFM)
SERVICE CONDITIONS	330	
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	
CONSTRUCTION MATERIAL SPECIFIC TYPE	HIGH STRENGTH LOW ALLOY 'HSLA!	
LINER GENERIC MATERIAL TYPE	NONE	
LINER SPECIFIC MATERIAL TYPE	N/A	

KANSAS CITY POWER & LIGHT: HAWTHORN 4 (CONT.)

** DUCTWORK	
LOCATION	SCRUBBER INLET
CONFIGURATION	RECTANGULAR
DIMENSIONS	4.5 FT X 26 FT
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
SHELL SPECIFIC MATERIAL TYPE	HIGH STRENGTH LOW ALLOY 'HSLA!
LINER GENERIC MATERIAL TYPE	INORGANIC
LINER SPECIFIC MATERIAL TYPE	HYDRAULICALLY-BONDED MORTAR
** DUCTWORK	
LOCATION	SCRUBBER OUTLET
CONFIGURATION	RECTANGULAR
DIMENSIONS	3 FT X 26 FT
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
SHELL SPECIFIC MATERIAL TYPE	HIGH STRENGTH LOW ALLOY 'HSLA!
LINER GENERIC MATERIAL TYPE	INORGANIC
LINER SPECIFIC MATERIAL TYPE	HYDRAULICALLY-BONDED MORTAR
** DUCTWORK	
LOCATION	BYPASS
CONFIGURATION	RECTANGULAR
DIMENSIONS	3 FT X 26 FT
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
SHELL SPECIFIC MATERIAL TYPE	HIGH STRENGTH LOW ALLOY 'HSLA!
LINER GENERIC MATERIAL TYPE	NONE
LINER SPECIFIC MATERIAL TYPE	N/A
** REAGENT PREPARATION EQUIPMENT	
FUNCTION	SLAKER
DEVICE	NR
DEVICE TYPE	NR
MANUFACTURER	COFFMAN INDUSTRIES
NUMBER	1
NUMBER OF SPARES	0
FULL LOAD DRY FEED CAPACITY - M.TONS/HR	51.7 (57 TPH)
PRODUCT QUALITY - % SOLIDS	25.0

** TANKS	
SERVICE	NUMBER
-------	------
ABSORBER RECYCLE	2
LIME SLURRY	1
CLEARWELL	1

** PUMPS	
SERVICE	NUMBER
-------	------
RECYCLE	2
CLEAR WATER SUPPLY	2
SLUDGE	2
BLOWDOWN	2
REHEATER FEED	4
MIST ELIMINATOR WASH	4
LIME SLURRY	1
SCRUBBER MAKEUP	2

** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	THICKENER
NUMBER	1
NUMBER OF SPARES	0
DIMENSIONS - FT	115.0 DIA X 10.0
CAPACITY	75000
SHELL GENERIC MATERIAL TYPE	CARBON STEEL 'WALLS!; INORGANIC 'BOTTOM!
SHELL SPECIFIC MATERIAL TYPE	AISI 1110; HYDRAULICALLY-BONDED CONCRETE
LINER GENERIC MATERIAL TYPE	ORGANIC
LINER SPECIFIC MATERIAL TYPE	NR
FEED STREAM SOURCE	ABSORBER BLEED
FEED STREAM CHARACTERISTICS	12% SOLIDS
OUTLET STREAM CHARACTERISTICS	30% SOLIDS
OVERFLOW STREAM CHARACTERISTICS	13900 GPM

KANSAS CITY POWER & LIGHT: HAWTHORN 4 (CONT.)

OUTLET STREAM DISPOSITION	TO ASH POND
OVERFLOW STREAM DISPOSITION	TO RECYCLE CANAL, ASH SLUICE PUMP

*** SLUDGE

** TREATMENT

METHOD	BLEED
DEVICE	N/A
PROPRIETARY PROCESS	N/A

** DISPOSAL

NATURE	FINAL
TYPE	POND
LOCATION	ON-SITE
SITE TRANSPORTATION METHOD	PIPELINE
SITE TREATMENT	NONE
SITE DIMENSIONS	40 ACRES/15 FT
SITE CAPACITY - CU.M	733800 (600.0 ACRE-FT)
SITE SERVICE LIFE - YRS	3

** PROCESS CONTROL AND INSTRUMENTATION

PROCESS STREAM	RECIRCULATING SLURRY
CHEMICAL PARAMETERS	PH
PHYSICAL VARIABLES	% SOLIDS
CONTROL LEVELS	PH 5.5-6.0, 10% SOLIDS
MONITOR LOCATION	GRAB SAMPLES TO LABORATORY
PROCESS CONTROL MANNER	MANUAL
PROCESS CHEMISTRY MODE	FEEDBACK

** WATER BALANCE

WATER LOOP TYPE	OPEN
RECEIVING WATER STREAM	MISSOURI RIVER
SOURCE OF MAKEUP WATER	MISSOURI RIVER

** CHEMICALS AND CONSUMPTION

FUNCTION	ABSORBENT
NAME	LIME
PRINCIPAL CONSTITUENT	93% CAO
SOURCE/SUPPLIER	ASHGROVE
POINT OF ADDITION	LIME SLAKER

** FGD SPARE CAPACITY INDICES

ABSORBER - %	0.0
MIST ELIMINATOR - %	0.0
REHEATER - %	0.0
FAN - %	0.0
SLAKER - %	0.0
EFFLUENT HOLD TANK - %	0.0
RECIRCULATION PUMP - %	0.0
THICKENER - %	0.0

** FGD SPARE COMPONENT INDICES

ABSORBER	0.0
MIST ELIMINATOR	0.0
REHEATER	0.0
FAN	0.0
SLAKER	0.0
EFFLUENT HOLD TANK	0.0
RECIRCULATION PUMP	0.0
THICKENER	0.0

PERIOD	MODULE	PERFORMANCE DATA AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
0/72	SYSTEM										

** PROBLEMS/SOLUTIONS/COMMENTS

THE ORIGINAL FGD SYSTEM INSTALLED ON THE HAWTHORN 4 UNIT BEGAN INITIAL OPERATIONS IN AUGUST 1972. THE PROCESS CONSISTED OF DRY LIMESTONE INJECTION INTO THE BOILER FURNACE WHERE THE LIMESTONE WAS CALCINED TO LIME. THE FURNACE CALCINED LIME AND BOILER FLUE GAS WERE THEN DISCHARGED TO A TAIL-END WET SCRUBBING SYSTEM CONSISTING OF TWO MARBLE-BED ABSORBERS WHERE PARTICLES AND SO2 WERE REMOVED FROM THE GAS STREAM. BECAUSE OF BOILER TUBE PLUGGING ATTRIBUTED TO THE LIMESTONE INJECTION, THE MODE OF OPERATION WAS MODIFIED IN LATE 1972 TO LIMESTONE INJECTION INTO THE FLUE GAS DUCT NEAR THE INLET TO THE MARBLE-BED ABSORBERS.

7/75	4A	8.0		5.5							
	4B	25.0		17.2							
	SYSTEM	16.3		11.4				744	518	84	

** PROBLEMS/SOLUTIONS/COMMENTS

BOTH MODULES ENCOUNTERED MARBLE BED PLUGGING AND STRAINER PROBLEMS.

8/75	4A			22.6							
	4B			28.5							
	SYSTEM			25.5				744		190	

** PROBLEMS/SOLUTIONS/COMMENTS

A NEW PROCESS CHEMISTRY IS BEING TRIED- ATTEMPTING TO RUN AT 100% BLOWDOW AND NEAR 0% SOLIDS WITH PH BEING MAINTAINED AT 5 WITHOUT LIMESTONE INJECTION. EMPHASIS IS BEING PLACED ON PARTICULATE CONTROL.

LOST HALF OF BOILER TO ID FAN OUTAGE CAUSING BOTH FGD MODULES TO BE SHUT DOWN TO PREVENT LOSS OF THE ENTIRE UNIT.

9/75	4A	52.2		28.6							
	4B	53.2		29.2							
	SYSTEM	52.7		28.9				720	395	208	

** PROBLEMS/SOLUTIONS/COMMENTS

SCRUBBER MODULES WERE RETURNED TO SERVICE ON SEPTEMBER 21 AFTER REPLACEMENT THE ORIGINAL ID FAN ON MODULE 4B.

THE MARBLE BED WAS REMOVED FROM MODULE A AND REPLACED WITH A STAINLESS STEEL PERFORATED BED. THE MARBLES WERE REMOVED BECAUSE OF CONTINUING OPERATIONAL DIFFICULTIES. THE NEW DESIGN RESULTED IN INCREASED AVAILABILITY AND CONTINUED HIGH PARTICULATE EFFICIENCY (97%).

10/75	4A	59.5		57.7							
	4B	91.0		88.2							
	SYSTEM	75.3		73.0				744	721	543	

** PROBLEMS/SOLUTIONS/COMMENTS

THE EXPERIMENT WITH A PROCESS CHEMISTRY OF 100% BLOWDOWN AND 0% SOLIDS IS STILL IN PROGRESS. SO2 REMOVAL EFFICIENCY IS IN THE 50 TO 60% RANGE. KCP&L IS CONCENTRATING ON PARTICULATE CONTROL.

THERE WAS A MINOR BOILER RESTRICTION ON THE A-SIDE BETWEEN THE ECONOMIZER AND THE INLET DRAFT DUCT RESULTING IN A LOSS OF FLUE GAS VELOCITY.

11/75	4A	0.0		0.0							

KANSAS CITY POWER & LIGHT: HAWTHORN 4 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	4B		99.0		99.0						
	SYSTEM		49.5		49.5			720	720	357	
12/75	4A		0.0		0.0						
	4B		16.1		13.8						
	SYSTEM		8.1		6.9			744	640	52	

** PROBLEMS/SOLUTIONS/COMMENTS

A BOILER OUTAGE OF 5 DAYS IN DECEMBER WAS DUE TO A SCHEDULED OVERHAUL.

MODULE 4A WAS SHUT DOWN DURING THE NOVEMBER-DECEMBER PERIOD DUE TO LOSS OF DRAFT THROUGH THE DUCTWORK FROM THE ECONOMIZER TO THE AIR PREHEATER, WHICH WAS RESULTING IN FREQUENT PLUGGING OF THE REHEATER.

1/76	SYSTEM				0.0			744	0	0	0.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS DOWN ALL MONTH DUE TO FROZEN EQUIPMENT AND LINES; MANPOWER WAS ASSIGNED TO A BOILER AND TURBINE OVERHAUL ON UNIT 5.

2/76	4A		0.0		0.0						
	4B		77.7		64.7						
	SYSTEM		38.9		32.3			696	579	225	

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE 4A WAS SHUT DOWN THE ENTIRE MONTH BECAUSE OF CONTINUING LOSS OF DRAFT THROUGH THE DUCTWORK FROM THE ECONOMIZER TO THE AIR PREHEATER.

MODULE B EXPERIENCED PLUGGING IN THE MARBLE BED.

A RECYCLE PUMP MALFUNCTIONED ON THE B-SIDE.

3/76	4A		0.0		0.0						
	4B		3.4		3.2						
	SYSTEM		1.7		1.6			744	706	12	
4/76	4A		42.0		32.1						
	4B		40.0		30.6						
	SYSTEM		41.0		31.4			720	550	226	

** PROBLEMS/SOLUTIONS/COMMENTS

THE SCRUBBER BYPASS SEALS WERE REPLACED WITH SLIDE-GATE DAMPERS ON APRIL 1

5/76	4A		39.3		26.7						
	4B		43.5		29.6						
	SYSTEM		41.4		28.2			744	506	209	

** PROBLEMS/SOLUTIONS/COMMENTS

CURRENTLY, THE UTILITY IS IN THE PROCESS OF MODIFYING THE SCRUBBING SYSTE FROM A LIMESTONE INJECTION AND TAIL-END SCRUBBING BASED SYSTEM TO A LIME SLURRY BASED SYSTEM.

6/76	4A		63.9		40.8						
	4B		5.0		3.2						
	SYSTEM		34.5		22.0			720	460	158	

KANSAS CITY POWER & LIGHT: HAWTHORN 4 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
		PLUGGING IN THE B-SIDE REHEATER WAS EXPERIENCED DURING JUNE AND ONE SECTION OF REHEAT TUBES WERE REMOVED TO FACILITATE CLEANING AND MAINTENANCE WORK.									
7/76	SYSTEM				0.0			744	0	0	0.0
8/76	SYSTEM				0.0			744	0	0	0.0
9/76	SYSTEM				0.0			720	0	0	0.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE SYSTEM WAS OUT OF SERVICE VIRTUALLY THE ENTIRE JULY-SEPTEMBER PERIOD DUE TO THE ON-GOING SYSTEM MODIFICATIONS AND A MAJOR EXPLOSION WHICH OCCURRED IN THE COAL MILL PULVERIZING AREA OF UNIT 5, WHICH SERIOUSLY HAMPERED MANPOWER COMMITMENTS.									
10/76	SYSTEM				0.0			744	0	0	0.0
11/76	4A		90.8		61.4						
	4B		0.0		0.0						
	SYSTEM		45.5		30.7			720	486	221	
12/76	SYSTEM				0.0			744	0	0	0.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE A-SIDE OPERATED 442 HOURS IN NOVEMBER WHILE BOTH MODULES REMAINED OUT OF SERVICE IN DECEMBER DUE TO THE FGD SYSTEM MODIFICATIONS BEING PERFORMED.									
1/77	85.3		85.0		65.6						
	4B		74.1		57.0						
	SYSTEM		79.7		61.3			744	572	456	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UNIT BECAME AVAILABLE FOR SERVICE IN THE LIME SCRUBBING MODE ON JANUARY 5, 1977. TESTING FOR COMPLIANCE WITH PARTICULATE CODES OCCURRED DURING THE MONTH. THE UNIT WAS FOUND TO MEET THE EMISSION REGULATION OF 0.17 LB/MM BTU BURNING 2.0% SULFUR COAL. SYSTEM OPERATIONS ARE STILL CONTINUING AT 0% SOLIDS AND 100% BLOWDOWN. THE FRESH WATER MAKE-UP REQUIREMENT IS 770 GPM/MW.									
2/77	4A		79.2		69.6						
	4B		49.4		43.5						
	SYSTEM		64.3		56.6			672	591	380	
3/77	4A		81.6		59.1						
	4B		97.4		70.6						
	SYSTEM		89.5		64.9			744	539	482	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING THE FEBRUARY-MARCH PERIOD PROBLEMS WERE ENCOUNTERED WITH PLUGGING ON THE SUCTION SIDE OF THE SCRUBBER RECYCLE TANK.									
4/77	4A		43.2		43.2						
	4B		43.2		43.2						
	SYSTEM		43.2		43.2			720	720	311	

KANSAS CITY POWER & LIGHT: HAWTHORN 4 (CONT.)

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE SYSTEM IS NOW OPERATING WELL AT ABOUT 15-25% BLOWDOWN. THE PH CONTRO SYSTEM OPERATIONS HAVE BEEN EXCELLENT. DURING MAY THE BOILER BURNED GAS FOR 408 HOURS (NOT INCLUDED IN THE OPERABILITY VALUES). SO2 REMOVAL EFFICIENCY IS ESTIMATED AT 50-60% FOR BOTH MODULES. ALTHOUGH ACTUAL TEST HAVE NOT BEEN RUN FOR ONE-AND-A-HALF YEARS. CURRENTLY BOTH MODULES ARE BEING OPERATED SIMULTANEOUSLY.								
5/77	4A		54.2		24.2						
	4B		54.2		24.2						
	SYSTEM		54.2		24.2			744	740	180	
6/77	SYSTEM				0.0			720	0	0	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		UNIT NO. 4 FIRED GAS THROUGHOUT THE MONTH, ALLOWING THE SCRUBBER PLANT TO BE SHUT DOWN FOR MODIFICATIONS DURING THE PERIOD.									
		MODIFICATIONS TO THE SCRUBBER MODULES INCLUDED: REPLACEMENT OF THE UNDER-BED SPRAY HEADERS WITH 316L SS, INSTALLATION OF A NEW REACTION TANK LINER, AND REPLACEMENT OF THE ORIGINAL CARBON STEEL PIPING WITH RUBBER-LINED PIPING (FROM THE RECYCLE PUMPS TO THE SPRAY MANIFOLD).									
7/77	4A		17.2		16.1						
	4B		17.2		16.1						
	SYSTEM		17.2		16.1			744	696	120	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE STAINLESS STEEL MODIFICATIONS WERE COMPLETED BY JULY 25 AND THE UNIT RESUMED COAL FIRING. THE SCRUBBER MODULES WERE IN SERVICE APPROXIMATELY 120 HOURS FOR THE REMAINDER OF THE MONTH. THE SYSTEM SUCCESSFULLY COM-PLETED FEDERAL PARTICULATE REMOVAL TESTS (0.15 LB/MM BTU MEASURED) DURING THIS TIME, WHILE BURNING HIGH SULFUR, HIGH ASH (PEABODY-OKLAHOMA) COAL. OPACITY TESTS FOR BOTH UNITS 3 AND 4 WILL BE CONDUCTED IN SEPTEMBER.									
8/77	4A		100.0		73.9						
	4B		100.0		73.9						
	SYSTEM		100.0		73.9			744	550	550	
9/77	4A		100.0		72.2						
	4B		100.0		72.2						
	SYSTEM		100.0		72.2			720	589	520	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING THE LATTER PART OF SEPTEMBER THE CLARIFIER BECAME PLUGGED. THE UNIT FIRED NATURAL GAS UNTIL THE CLARIFIER WAS CLEANED. THE BOILER HOURS DURING WHICH GAS WAS FIRED WERE NOT INCLUDED IN THE OPERABILITY FIGURES.									
10/77	SYSTEM		100.0		73.9			744	550	550	
11/77	SYSTEM		100.0		68.9			720	496	496	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE BOILER WENT DOWN FOR PART OF OCTOBER DUE TO A PROBLEM WITH THE GENERATOR EXCITER.									
		SOME FGD SYSTEM OUTAGE TIME IN OCTOBER WAS DUE TO A PLUGGED HEADER.									

KANSAS CITY POWER & LIGHT: HAWTHORN 4 (CONT.)

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

AN FGD SYSTEM OUTAGE ALSO OCCURRED IN OCTOBER WHEN THE LIQUID LEVEL IN THE INTERNAL REACTION TANK EXCEEDED THE CONTROL LEVEL, RESULTING IN PLUGGING OF THE INLET GAS DUCT TO THE SCRUBBER.

DURING NOVEMBER THERE WERE TWO INSTANCES OF PLUGGED UNDER BED NOZZLES ON THE 4A MODULE.

ON NOVEMBER 10 AN EPA OPACITY TEST WAS RUN ON UNITS 3 AND 4. THE AVERAGE OPACITY WAS 16.76% RUNNING AT OR NEAR FULL LOAD. THE UNITS ARE NOW CERTIFIED FOR PARTICULATE AND OPACITY.

12/77	SYSTEM		100.0		69.9			744	520	520	
1/78	SYSTEM		100.0		68.3			744	508	508	

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JANUARY SPRAY NOZZLE PLUGGING WAS ENCOUNTERED. SOME NEW SPRAY NOZZLES WERE INSTALLED.

THE STRAINER ON THE RECYCLE PUMP MALFUNCTIONED CAUSING DOWN TIME.

THERE WERE SEVERAL BOILER RELATED OUTAGES IN JANUARY.

2/78	SYSTEM		100.0		29.5			672	198	198	

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS DOWN THREE TIMES DURING FEBRUARY FOR NON-SCRUBBER RELATED PROBLEMS AND ONCE FOR A FUEL SAFETY TRIP.

3/78	SYSTEM		100.0		63.3			744	471	471	

** PROBLEMS/SOLUTIONS/COMMENTS

DURING MARCH THERE WERE THREE ECONOMIZER LEAK OUTAGES (231 HOURS) AND THE ABSORBER REQUIRED AN ADDITIONAL 32 HOURS OF OUTAGE FOR MAINTENANCE.

4/78	SYSTEM		100.0		40.0			720	288	288	

** PROBLEMS/SOLUTIONS/COMMENTS

APRIL OUTAGE TIME WAS FOR SCHEDULED GENERAL MAINTENANCE AND CLEANING.

5/78	SYSTEM		100.0		56.6			744	421	421	

** PROBLEMS/SOLUTIONS/COMMENTS

FGD OUTAGE IN MAY WAS DUE TO CLARIFIER PLUGGING.

6/78	SYSTEM							720			
7/78	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

NO INFORMATION WAS AVAILABLE FOR THE JUNE-JULY PERIOD BECAUSE OF A PLANT STRIKE.

8/78	SYSTEM							744			
9/78	SYSTEM							720			

KANSAS CITY POWER & LIGHT: HAWTHORN 4 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE SCRUBBING SYSTEM IS OPERATING ALTHOUGH THE UTILITY IS STILL IN THE MIDST OF A STRIKE. FGD PERFORMANCE FIGURES ARE NOT AVAILABLE BECAUSE THE UTILITY IS NOT RECORDING FGD OPERATION HOURS DURING THE STRIKE.									
10/78	SYSTEM							744			
11/78	SYSTEM							720			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		ALTHOUGH THE STRIKE IS OVER NO OPERATIONAL DATA ARE YET AVAILABLE. THE FGD SYSTEM IS OPERATIONAL.									
12/78	SYSTEM							744			
1/79	SYSTEM							744			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		HOURS OF OPERATION ARE STILL NOT AVAILABLE. THE FGD SYSTEM IS OPERATIONAL BUT AT PRESENT PERSONNEL ARE BEING REASSIGNED PREVENTING ACCURATE DATA RECORDING.									
2/79	SYSTEM							672			
3/79	SYSTEM							744			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		OPERATING INFORMATION FOR UNIT 4 IS STILL NOT AVAILABLE.									
4/79	SYSTEM		100.0		56.9			720	410	410	30.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		AN EXCITER FAILURE ON THE GENERATOR CAUSED THE APRIL BOILER OUTAGE TIME.									
5/79	SYSTEM		100.0		94.0			744	699	699	49.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		MAY OUTAGE TIME WAS FOR SCRUBBER CLEANING AND GENERAL MAINTENANCE.									
6/79	SYSTEM		100.0		14.0			720	101	101	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE LOW BOILER HOURS IN JUNE WERE A RESULT OF A SCHEDULED BOILER OVERHAUL.									
7/79	SYSTEM							744	692		
8/79	SYSTEM							744	744		
9/79	SYSTEM							720	497		
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING JULY AND AUGUST MOSTLY GAS WAS FIRED. THERE WERE NO MAJOR SCRUBBER PROBLEMS DURING THE JULY-SEPTEMBER PERIOD.									
10/79	SYSTEM		100.0		91.0			744	677	677	

KANSAS CITY POWER & LIGHT: HAWTHORN 4 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
11/79	SYSTEM		100.0		38.1			720	274	274	
12/79	SYSTEM		100.0		91.9			744	684	684	
1/80	SYSTEM				0.0			744	0	0	0.0
2/80	SYSTEM				0.0			696	0	0	0.0
3/80	SYSTEM				0.0			744	0	0	0.0

** PROBLEMS/SOLUTIONS/COMMENTS

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

4/80	SYSTEM				65.0			720		468	

** PROBLEMS/SOLUTIONS/COMMENTS

LOW APRIL SCRUBBER UTILIZATION FIGURES OCCURRED BECAUSE THE BOILER WAS OUT OF SERVICE FOR SCHEDULED MAINTENANCE DURING PART OF THE MONTH.

5/80	SYSTEM				90.1			744		670	
6/80	SYSTEM				98.1			720		706	

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO UNUSUAL FGD SYSTEM PROBLEMS OCCURRED DURING MAY AND JUNE.

7/80	SYSTEM		100.0		78.0			744	580	580	55.0

** PROBLEMS/SOLUTIONS/COMMENTS

NECESSARY REPAIRS TO THE GENERATOR COLLECTOR RING CAUSED SYSTEM OUTAGE TIME DURING JULY.

A 53 HOUR OUTAGE WAS DUE TO THE REPLACING OF THE UNDER BED SPRAY HEADERS ON THE 4A MODULE. THIS WAS THE ONLY FGD-RELATED PROBLEM DURING JULY.

8/80	SYSTEM							744	569		47.4

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE FGD SYSTEM IS NOW CERTIFIED, THEREFORE THE SCRUBBER OPERATING HOURS ARE NO LONGER RECORDED.

DURING AUGUST APPROXIMATELY 66 HOURS WERE NECESSARY TO PERFORM GENERAL MAINTENANCE ON THE SYSTEM.

9/80	SYSTEM							720	111		9.4

** PROBLEMS/SOLUTIONS/COMMENTS

LOW BOILER UTILIZATION DURING SEPTEMBER WAS DUE TO A LACK OF DEMAND.

NO FGD SYSTEM PROBLEMS WERE REPORTED FOR THE MONTH OF SEPTEMBER.

10/80	SYSTEM	100.0	100.0	100.0	68.4			744	509	509	31.0

KANSAS CITY POWER & LIGHT: HAWTHORN 4 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
					DURING OCTOBER THE BOILER DID NOT OPERATE 155 HOURS DUE TO A LACK OF DEMAND.						
					AN ECONOMIZER LEAK CAUSED THE UNIT TO COME OFF LINE APPROXIMATELY 48 HOURS						
11/80	SYSTEM	71.8	100.0	100.0	65.8			720	474	474	53.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
					A 203 HOUR OUTAGE WAS NECESSARY DURING NOVEMBER TO CLEAN THE SCRUBBER AND TO REPAIR A RECYCLE PIPING BLOWDOWN LINE LEAK.						
					DURING THE MONTH THE UNIT WAS OFF LINE 43 HOURS DUE TO A LACK OF DEMAND.						
12/80	SYSTEM	92.1	100.0	100.0	59.1			744	440	440	41.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
					DURING DECEMBER 162 HOURS OUTAGE TIME WAS NECESSARY TO REPAIR A WATER WALL TUBE LEAK.						
					DURING THE MONTH THE SYSTEM WAS OFF LINE FOR 59 HOURS FOR CLEANING.						
					THE UNIT DID NOT OPERATE 81 HOURS DUE TO LACK OF DEMAND.						
1/81	SYSTEM	100.0	100.0	100.0	66.7			744	498	498	
	** PROBLEMS/SOLUTIONS/COMMENTS										
					DURING JANUARY A BREAKER FAILURE CAUSED BY A BROKEN LINKAGE CAUSED SOME OUTAGE TIME.						
2/81	SYSTEM	5.4	100.0	5.4	5.4			672	36	36	
	** PROBLEMS/SOLUTIONS/COMMENTS										
					DURING FEBRUARY THE SYSTEM AND UNIT WERE OFF LINE FOR THE SPRING OVERHAUL. THE SYSTEM OPERATED A TOTAL OF 36 HOURS FOR THE MONTH.						
3/81	SYSTEM	85.6	100.0	100.0	61.8			744	460	460	
	** PROBLEMS/SOLUTIONS/COMMENTS										
					THE SPRING OVERHAUL WAS COMPLETED IN MARCH. THIS ACCOUNTED FOR 107 HOURS OF DOWN TIME.						
					DURING THE MONTH 177 HOURS OF OUTAGE TIME WAS CAUSED BY WATER WALL AND SUPERHEATER LEAKS.						
4/81	SYSTEM	80.8	100.0	72.1	49.4			720	356	356	24.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
					DURING APRIL THE SYSTEM WAS OUT OF SERVICE FOR 138 HOURS FOR CLEANING AND GENERAL REPAIRS.						
5/81	SYSTEM	95.8	100.0	95.5	88.7			744	660	660	64.0

KANSAS CITY POWER & LIGHT: HAWTHORN 4 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING MAY 31 HOURS OF OUTAGE TIME WERE ATTRIBUTED TO INLET DAMPER REPAIRS.									
6/81	SYSTEM	100.0	100.0	100.0	94.5			720	681	681	58.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING JUNE NO FGD-RELATED PROBLEMS WERE ENCOUNTERED.									
7/81	SYSTEM	96.0	100.0		48.5			744	361	361	26.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING JULY, 30 HOURS OF OUTAGE TIME WAS ATTRIBUTED TO A WATER WALL LEAK.									
8/81	SYSTEM	100.0	100.0		18.3			744	136	136	6.2
9/81	SYSTEM	100.0	100.0		3.3			720	24	24	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		UNIT 4 WAS OUT OF SERVICE FOR MOST OF SEPTEMBER AS A RESULT OF A TURBINE BEARING FAILURE.									
10/81	SYSTEM		0.0		0.0			744	0	0	0.0
11/81	SYSTEM		100.0		20.0			720	144	144	11.2
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING OCTOBER AND NOVEMBER THE OUTAGE TIME WAS CAUSED BY A TURBINE BEARIN FAILURE.									
12/81	SYSTEM		100.0		54.7			744	407	407	24.9
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING DECEMBER THE OUTAGE TIME WAS DUE TO SUPERHEATER TUBE LEAKS AND WEARING OF THE HYDROGEN SEALS ON THE GENERATOR.									
1/82	SYSTEM		100.0		74.2			744	552	552	30.4
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING JANUARY 192 HOURS OF THE TOTAL OUTAGE TIME WAS DUE TO ECONOMIZER TUBE LEAKS.									
2/82	SYSTEM		100.0		67.7			672	455	455	28.9
	** PROBLEMS/SOLUTIONS/COMMENTS										
		PLUGGING OF THE COAL FEED LINES LEADING TO SOME OF THE BURNERS CAUSED SOME DOWN TIME DURING FEBRUARY.									
3/82	SYSTEM		100.0		47.7			744	355	355	17.1
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE HYDROGEN SEAL REPAIRS STARTED IN JANUARY CONTINUED THRU MARCH.									
4/82	SYSTEM		100.0		4.9			720	36	36	

KANSAS CITY POWER & LIGHT: HAWTHORN 4 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UNIT AND FGD SYSTEM WERE OUT OF SERVICE DURING MOST OF APRIL FOR THE SPRING OUTAGE.									
5/82	SYSTEM	100.0		64.4				744	479	479	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING MAY 264 HOURS OF DOWN TIME WERE DUE TO BOILER RELATED PROBLEMS WHIC INCLUDED ECONOMIZER LEAKS, CONDENSER VALVE FAILURE, AND VENTURI PROBLEMS.									
6/82	SYSTEM	100.0		94.7				720	682	682	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING JUNE A THOTTLE VALVE ON THE TURBINE FAILED AMOUNTING TO 38 HOURS OF OUTAGE TIME FOR REPAIRS.									
7/82	SYSTEM							744			
8/82	SYSTEM							744			
9/82	SYSTEM							720			
10/82	SYSTEM							744			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE HAWTHORN 3 AND 4 UNITS ARE IN RESERVE SHUTDOWN. THEY ARE NOT EXPECTED TO BE NEEDED AGAIN UNTIL 1990 DUE TO ECONOMIC CONDITIONS, THE DRASTIC DROP IN SYSTEM LOAD AND THE AVAILABILITY OF MORE EFFICIENT GENERATING UNITS.									

APPENDIX F
DESIGN AND PERFORMANCE DATA FOR DISCONTINUED DOMESTIC FGD SYSTEMS

COMPANY NAME	KEY WEST UTILITY BOARD	
PLANT NAME	STOCK ISLAND	
UNIT NUMBER	1	
CITY	KEY WEST	
STATE	FLORIDA	
REGULATORY CLASSIFICATION	E	
PARTICULATE EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	473.	(1.100 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	42	
GROSS UNIT GENERATING CAPACITY - MW	42	
NET UNIT GENERATING CAPACITY W/FGD - MW	37	
NET UNIT GENERATING CAPACITY WO/FGD - MW	*****	
EQUIVALENT SCRUBBED CAPACITY - MW	37	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	ERIE CITY	
BOILER TYPE	OIL FIRED	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	********	(******* ACFM)
BOILER FLUE GAS TEMPERATURE - C	*******	(**** F)
STACK HEIGHT - M	34.	(110 FT)
STACK SHELL	NR	
STACK TOP DIAMETER - M	*******	(***** FT)
** FUEL DATA		
FUEL TYPE	OIL	
FUEL GRADE	NO. 6	
AVERAGE HEAT CONTENT - J/G	******	(****** BTU/LB)
RANGE HEAT CONTENT - BTU/LB		****
AVERAGE ASH CONTENT - %	0.04	
RANGE ASH CONTENT - %	****	
AVERAGE MOISTURE CONTENT - %	********	
RANGE MOISTURE CONTENT - %	****	
AVERAGE SULFUR CONTENT - %	2.01	
RANGE SULFUR CONTENT - %	2.0-3.0	
AVERAGE CHLORIDE CONTENT - %	********	
RANGE CHLORIDE CONTENT - %	****	
*** PARTICLE CONTROL		
** MECHANICAL COLLECTOR		
NUMBER	1	
PRESSURE DROP - KPA	0.6	(3. IN-H2O)
** FABRIC FILTER		
NUMBER	0	
TYPE	NONE	
** ESP		
NUMBER	0	
TYPE	NONE	
** PARTICLE SCRUBBER		
NUMBER	0	
GENERIC TYPE	NONE	
SPECIFIC TYPE	N/A	
TRADE NAME/COMMON NAME	N/A	
SHELL GENERIC MATERIAL	N/A	
SHELL SPECIFIC MATERIAL	N/A	
LINER GENERIC MATERIAL	N/A	
LINER SPECIFIC MATERIAL	N/A	
GAS CONTACTING DEVICE TYPE	N/A	
*** FGD SYSTEM		
** GENERAL DATA		
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT	
SO2 REMOVAL MODE	WET SCRUBBING	

KEY WEST UTILITY BOARD: STOCK ISLAND 1 (CONT.)

PROCESS TYPE	LIMESTONE	
SYSTEM SUPPLIER	ZURN AIR SYSTEM	
DEVELOPMENT LEVEL	DEMONSTRATION	
NEW/RETROFIT	NEW	
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	90.00	
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	85.00	
CURRENT STATUS	8	
TERMINATION	1/1975	
INITIAL START-UP	10/1972	
CONTRACT AWARDED	0/1970	
** DESIGN AND OPERATING PARAMETERS		
DESIGN CHLORIDE CONTENT - %	********	
** QUENCHER/PRESATURATOR		
CONSTRUCTION MATERIAL GENERIC TYPE	NR	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR	
** ABSORBER		
NUMBER	2	
GENERIC TYPE	VENTURI TOWER	
SPECIFIC TYPE	NR	
TRADE NAME/COMMON TYPE	NR	
SUPPLIER	ZURN AIR SYSTEMS	
SHELL GENERIC MATERIAL	STAINLESS STEEL	
SHELL SPECIFIC MATERIAL	AUSTENITIC	
SHELL MATERIAL TRADE NAME/COMMON TYPE	TYPE 304L	
LINER GENERIC MATERIAL	NONE	
LINER SPECIFIC MATERIAL	N/A	
LINER MATERIAL TRADE NAME/COMMON TYPE	N/A	
GAS CONTACTING DEVICE TYPE	SCRUBBING TUBE	
LIQUID RECIRCULATION RATE - LITER/S	25.	(400 GPM)
GAS-SIDE PRESSURE DROP - KPA	1.5	(6.0 IN-H2O)
INLET GAS FLOW - CU. M/S	58.04	(123000 ACFM)
INLET GAS TEMPERATURE - C	62.8	(145 F)
** MIST ELIMINATOR		
PRE-MIST ELIMINATOR/MIST ELIMINATOR	PRIMARY COLLECTOR	
GENERIC TYPE	IMPINGEMENT	
SPECIFIC TYPE	CURVED DEFLECTOR PLATE	
TRADE NAME/COMMON TYPE	GULL WING	
CONSTRUCTION MATERIAL GENERIC TYPE	ORGANIC	
CONSTRUCTION MATERIAL SPECIFIC TYPE	FIBER-REINFORCED POLYESTER	
** REHEATER		
NUMBER	0	
GENERIC TYPE	NONE	
SPECIFIC TYPE	N/A	
TRADE NAME/COMMON TYPE	N/A	
CONSTRUCTION MATERIAL GENERIC TYPE	NONE	
CONSTRUCTION MATERIAL SPECIFIC TYPE	N/A	
** FANS		
NUMBER	1	
DESIGN	NR	
FUNCTION	NR	
APPLICATION	INDUCED DRAFT	
SERVICE	NR	
CONSTRUCTION MATERIAL GENERIC TYPE	NR	
** DAMPERS		
FUNCTION	NR	
GENERIC TYPE	NR	
SPECIFIC TYPE	NR	
CONSTRUCTION MATERIAL GENERIC TYPE	NR	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR	
LINER GENERIC MATERIAL TYPE	NR	
LINER SPECIFIC MATERIAL TYPE	NR	

KEY WEST UTILITY BOARD: STOCK ISLAND 1 (CONT.)

** DUCTWORK	
SHELL GENERIC MATERIAL TYPE	NR
SHELL SPECIFIC MATERIAL TYPE	NR
LINER GENERIC MATERIAL TYPE	NR
LINER SPECIFIC MATERIAL TYPE	NR
** REAGENT PREPARATION EQUIPMENT	
FUNCTION	WET BALL MILL
DEVICE	NR
DEVICE TYPE	NR
** PUMPS	
SERVICE	NUMBER
-------	------
NR	****
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	NA
*** SLUDGE	
** TREATMENT	
METHOD	BLEED
DEVICE	N/A
PROPRIETARY PROCESS	N/A
** DISPOSAL	
NATURE	FINAL
TYPE	POND
SITE TREATMENT	NONE
** PROCESS CONTROL AND INSTRUMENTATION	
CHEMICAL PARAMETERS	TEMPERATURE, PARTICLE LOADING, PH
** WATER BALANCE	
WATER LOOP TYPE	OPEN

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

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
8/73	SYSTEM		3.6					744			

** PROBLEMS/SOLUTIONS/COMMENTS

THE EMISSION CONTROL SYSTEM AT THE STOCK ISLAND PLANT CONSISTED OF A MULTIPLE TUBE MECHANICAL COLLECTOR INSTALLED UPSTREAM OF TWO SULFUR DIOXID WET SCRUBBERS. THIS DEMONSTRATION FACILITY EMPLOYED LIMESTONE IN A SEAWATE SOLUTION FOR THE REMOVAL OF SO2. THE LIMESTONE ABSORBENT WAS OBTAINED FROM CORAL DREDGED FROM THE OCEAN. THE CORAL CONSISTED PRIMARILY OF CACO3 WITH LITTLE OR NO MGCO3. THE CORAL WAS GROUND TO A FINE POWDER IN A HAMMERMILL CRUSHER TO 90% MINUS 325 MESH AND SLURRIED IN SEAWATER.

THE SCRUBBING SYSTEM WAS SCHEDULED TO START UP IN JULY 1972, BUT DID NOT OPERATE UNTIL AUGUST 1973. DURING THE INTERIM, THE PRIMARY CRUSHING SYSTEM BECAME FROZEN BECAUSE OF SALT AIR CORROSION TAKING PLACE FROM DISUSE.

9/73	SYSTEM		0.0					720			
10/73	SYSTEM		4.6					744			
11/73	SYSTEM		5.8					720			
12/73	SYSTEM		9.7					744			

KEY WEST UTILITY BOARD: STOCK ISLAND 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
				PERFORMANCE DATA							
	** PROBLEMS/SOLUTIONS/COMMENTS										
		FROM STARTUP IN AUGUST 1973 UNTIL DECEMBER 10, 1973 THE LONGEST SCRUBBER RUN WAS FIVE DAYS; ASIDE FROM THAT, THE SCRUBBER WAS UP AND DOWN ONE DAY AT A TIME FOR SHAKEDOWN TESTING.									
		ON DECEMBER 12 A HIGH PRESSURE DROP (15 IN. H2O) CAUSED THE SCRUBBER TO SHUTDOWN.									
		A CHANGE IN THE BOILER LOAD, PROBLEMS WITH THE GRID, AND A HIGH PRESSURE DROP CAUSED THE SYSTEM TO SHUTDOWN ON DECEMBER 17. THE SYSTEM REMAINED DOWN THROUGH THE END OF THE MONTH SO THE SYSTEM COULD BE CLEANED.									
1/74	SYSTEM		33.5					744			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		ON JANUARY 2 THE 1A SCRUBBER EXPERIENCED PLUGGING CAUSING THE SYSTEM TO SHUTDOWN.									
		A HIGH PRESSURE DROP CAUSED SOME OUTAGE TIME IN JANUARY.									
		THE ENTIRE PLANT SHUTDOWN FOR SEVEN DAYS DURING JANUARY DUE TO A MAIN BEARING FAILURE.									
		THE HIGH PRESSURE ALARM AND THE SENSING DEVICE TRIPPED DUE TO SLUDGE BUILDUP. THIS KEPT THE SYSTEM OUT OF SERVICE FOR APPROXIMATELY FOUR DAYS.									
		ON JANUARY 22 THE SYSTEM WAS TAKEN OUT OF SERVICE FOR ABOUT THREE HOURS DUE TO A RUPTURED LINE ON ONE OF THE PUMPS AND A DECREASE IN THE PRESSURE DROP. CORRODED LOOSE NUTS AND BOLTS WERE FOUND IN THE LINE.									
		ON JANUARY 28 THE SYSTEM WAS SHUTDOWN FOR MODIFICATIONS WHICH INCLUDED; REPLACEMENT OF THE CYCLONE BY A BAGHOUSE AND REPLACEMENT OF THE VIBRATORY FEEDER BY A SCREW FEEDER.									
2/74	SYSTEM		0.0					672			
3/74	SYSTEM		0.0					744			
4/74	SYSTEM		0.0					720			
5/74	SYSTEM		0.0					744			
6/74	SYSTEM		0.0					720			
7/74	SYSTEM		0.0					744			
8/74	SYSTEM		4.4					744			
9/74	SYSTEM		0.0					720			
10/74	SYSTEM		37.5					744			
11/74	SYSTEM		43.1					720			
12/74	SYSTEM		16.1					744			
1/75	SYSTEM		0.0					744			

KEY WEST UTILITY BOARD: STOCK ISLAND 1 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

AFTER STARTUP IN AUGUST 1973, ENSUING OPERATION PROCEEDED ON AN INTERMITTENT BASIS. THE MAJOR PROBLEM AREAS ENCOUNTERED INCLUDED:

+SEVERE CORROSION OF THE GAS QUENCH DUCT AND DAMPER SEALING FANS ON THE INLET AND OUTLET OF THE SCRUBBERS
+PLUGGING AT THE BOTTOM OF THE SCRUBBER TUBES
+LIQUID LEVEL CONTROL FAILURES IN THE SCRUBBER MODULES
+POOR LIMESTONE UTILIZATION (APPROXIMATELY 20%)
+INDUCED DRAFT FAN REPAIRS
+REPLACEMENT OF INTERNAL STAINLESS STEEL PARTS WITH MONEL COMPONENTS
+BOILER FOUNDATION AND BOILER TUBE PROBLEMS
+LIMESTONE SUPPLY SHORTAGES

AS OF MARCH 1977 IT HAD NOT BEEN DECIDED WHETHER THERE WOULD BE FUTURE FGD OPERATIONS AT THE STOCK ISLAND PLANT. DURING OPERATION THE SCRUBBING SYSTEM LOGGED 1579 HOURS FOR A TOTAL OPERABILITY OF 8%.

APPENDIX F
DESIGN AND PERFORMANCE DATA FOR DISCONTINUED DOMESTIC FGD SYSTEMS

COMPANY NAME	LOUISVILLE GAS & ELECTRIC	
PLANT NAME	PADDY'S RUN	
UNIT NUMBER	6	
CITY	LOUISVILLE	
STATE	KENTUCKY	
REGULATORY CLASSIFICATION	E	
PARTICULATE EMISSION LIMITATION - NG/J	43.	(0.100 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	516.	(1.200 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	302	
GROSS UNIT GENERATING CAPACITY - MW	72	
NET UNIT GENERATING CAPACITY W/FGD - MW	67	
NET UNIT GENERATING CAPACITY WO/FGD - MW	69	
EQUIVALENT SCRUBBED CAPACITY - MW	72	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	FOSTER WHEELER	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	PEAK	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	174.60	(370000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	168.3	(335 F)
STACK HEIGHT - M	76.	(250 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	4.3	(14.0 FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	BITUMINOUS	
AVERAGE HEAT CONTENT - J/G	26284.	(11300 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		10400-11900
AVERAGE ASH CONTENT - %	14.00	
RANGE ASH CONTENT - %	10.0-20.0	
AVERAGE MOISTURE CONTENT - %	9.00	
RANGE MOISTURE CONTENT - %	8.0-10.8	
AVERAGE SULFUR CONTENT - %	3.70	
RANGE SULFUR CONTENT - %	3.5-4.0	
AVERAGE CHLORIDE CONTENT - %	0.04	
RANGE CHLORIDE CONTENT - %	.03-.06	
*** PARTICLE CONTROL		
** MECHANICAL COLLECTOR		
NUMBER	0	
TYPE	NONE	
** ESP		
NUMBER	1	
NUMBER OF SPARES	0	
TYPE	COLD SIDE	
SUPPLIER	RESEARCH-COTTRELL	
INLET FLUE GAS CAPACITY - CU.M/S	174.6	(370000 ACFM)
INLET FLUE GAS TEMPERATURE - C	168.3	(335 F)
PARTICLE REMOVAL EFFICENCY - %	99.1	
** PARTICLE SCRUBBER		
NUMBER	0	
GENERIC TYPE	NONE	
SPECIFIC TYPE	N/A	
TRADE NAME/COMMON NAME	N/A	
SHELL GENERIC MATERIAL	N/A	
SHELL SPECIFIC MATERIAL	N/A	
LINER GENERIC MATERIAL	N/A	
LINER SPECIFIC MATERIAL	N/A	
GAS CONTACTING DEVICE TYPE	N/A	
*** FGD SYSTEM		

LOUISVILLE GAS & ELECTRIC: PADDY'S RUN 6 (CONT.)

** GENERAL DATA		
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT	
SO2 REMOVAL MODE	WET SCRUBBING	
PROCESS TYPE	LIME	
SYSTEM SUPPLIER	COMBUSTION ENGINEERING	
A-E FIRM	FLUOR - PIONEER	
DEVELOPMENT LEVEL	FULL SCALE	
NEW/RETROFIT	RETROFIT	
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.10	
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	90.00	
ENERGY CONSUMPTION - %	2.8	
CURRENT STATUS	8	
TERMINATION	6/1984	
COMMERCIAL START-UP	4/1973	
INITIAL START-UP	4/1973	
CONTRACT AWARDED	7/1971	
** DESIGN AND OPERATING PARAMETERS		
DESIGN COAL SULFER CONTENT - %	4.00	
DESIGN COAL HEAT CONTENT - J/G	24190.4	(10400 BTU/LB)
DESIGN CHLORIDE CONTENT - %	********	
OPER. & MAINT. REQUIREMENT - MANHR/DAY	192.0	
** QUENCHER/PRESATURATOR		
NUMBER	0	
** ABSORBER		
NUMBER	2	
NUMBER OF SPARES	0	
GENERIC TYPE	PACKED TOWER	
SPECIFIC TYPE	STATIC BED PACKING	
TRADE NAME/COMMON TYPE	MARBLE-BED SCRUBBER	
SUPPLIER	COMBUSTION ENGINEERING	
DIMENSIONS - FT	17.0 X 18.0 X 50.0	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	AISI 1110	
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A	
LINER GENERIC MATERIAL	ORGANIC	
LINER SPECIFIC MATERIAL	GLASS FLAKE-FILLED POLYESTER; MICA FLAKE-FILLED	
LINER MATERIAL TRADE NAME/COMMON TYPE	FLAKELINE 103; FLAKELINE 151	
GAS CONTACTING DEVICE TYPE	GLASS MARBLES	
NUMBER OF CONTACTING ZONES	2	
DISTANCE BETWEEN GAS CONTACTING ZONES - CM	7.6	(3.0IN)
LIQUID RECIRCULATION RATE - LITER/S	510.	(8100 GPM)
L/G RATIO - L/CU.M	5.9	(43.8 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	2.7	(11.0 IN-H2O)
SUPERFICAL GAS VELOCITY - M/SEC	3.0	(10.0 FT/S)
INLET GAS FLOW - CU. M/S	87.30	(185000 ACFM)
INLET GAS TEMPERATURE - C	168.3	(335 F)
SO2 REMOVAL EFFICIENCY - %	85.0	
PARTICLE REMOVAL EFFICENCY - %	99.0	
** MIST ELIMINATOR		
PRE-MIST ELIMINATOR/MIST ELIMINATOR	PRIMARY COLLECTOR	
NUMBER PER SYSTEM	4	
NUMBER OF SPARES PER SYSTEM	0	
NUMBER PER MODULE	2	
GENERIC TYPE	IMPINGEMENT	
SPECIFIC TYPE	BAFFLE	
TRADE NAME/COMMON TYPE	CLOSED VANE	
MANUFACTURER	COMBUSTION ENGINEERING	
CONFIGURATION	HORIZONTAL	
NUMBER OF STAGES	2	
NUMBER OF PASSES PER STAGE	3	
FREEBOARD DISTANCE - M	1.52	(5.0 FT)
DISTANCE BETWEEN STAGES - CM	121.92	(48.0 IN)
DISTANCE BETWEEN VANES - CM	4.3	(1.70 IN)
VANE ANGLES - DEGREES	45	
PRESSURE DROP - KPA	0.4	(1.5 IN-H2O)
SUPERFICAL GAS VELOCITY - M/S	3.0	(10.0 FT/S)

LOUISVILLE GAS & ELECTRIC: PADDY'S RUN 6 (CONT.)

CONSTRUCTION MATERIAL GENERIC TYPE	ORGANIC	
CONSTRUCTION MATERIAL SPECIFIC TYPE	POLYPROPYLENE	
WASH WATER SOURCE	FRESH	
WASH FREQUENCY	EVERY 8 HOURS	
WASH RATE - L/S	8.8	(140 GAL/MIN)
** REHEATER		
NUMBER	4	
NUMBER OF SPARES	0	
NUMBER PER MODULE	2	
GENERIC TYPE	DIRECT COMBUSTION	
SPECIFIC TYPE	IN-LINE BURNER	
TRADE NAME/COMMON TYPE	NATURAL GAS	
COMBUSTION FUEL SULFER CONTENT - %	0.0	
LOCATION	IN OUTLET DUCT	
PERCENT GAS BYPASSED - AVG	0.0	
TEMPERATURE INCREASE - C	27.8	(50 F)
INLET FLUE GAS TEMPERATURE - C	52.2	(126 F)
OUTLET FLUE GAS TEMPERATURE - C	80.0	(176 F)
CONSTRUCTION MATERIAL GENERIC TYPE	CAST IRON	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR	
** FANS		
NUMBER	1	
NUMBER OF SPARES	0	
DESIGN	CENTRIFUGAL	
SUPPLIER	WESTINGHOUSE	
FUNCTION	BOOSTER	
APPLICATION	INDUCED DRAFT	
SERVICE	DRY	
FLUE GAS FLOW RATE - CU.M/S	82.58	(175000 ACFM)
FLUE GAS TEMPERATURE - C	80.0	(176 F)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	
** DAMPERS		
NUMBER	7	
FUNCTION	CONTROL/SHUT-OFF	
GENERIC TYPE	LOUVER	
SPECIFIC TYPE	NR	
MANUFACTURER	COMBUSTION ENGINEERING	
SEAL AIR FLOW - CU. M/S	0.00	(0 ACFM)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	
CONSTRUCTION MATERIAL SPECIFIC TYPE	AISI 1110	
LINER GENERIC MATERIAL TYPE	NONE	
LINER SPECIFIC MATERIAL TYPE	N/A	
** DUCTWORK		
LOCATION	INLET	
CONFIGURATION	RECTANGULAR	
SHELL GENERIC MATERIAL TYPE	CARBON STEEL	
SHELL SPECIFIC MATERIAL TYPE	AISI 1110	
LINER GENERIC MATERIAL TYPE	NONE	
LINER SPECIFIC MATERIAL TYPE	N/A	
** DUCTWORK		
LOCATION	OUTLET	
CONFIGURATION	RECTANGULAR	
SHELL GENERIC MATERIAL TYPE	CARBON STEEL	
SHELL SPECIFIC MATERIAL TYPE	AISI 1110	
LINER GENERIC MATERIAL TYPE	NONE	
LINER SPECIFIC MATERIAL TYPE	N/A	
** DUCTWORK		
LOCATION	BYPASS	
CONFIGURATION	RECTANGULAR	
SHELL GENERIC MATERIAL TYPE	CARBON STEEL	
SHELL SPECIFIC MATERIAL TYPE	AISI 1110	
LINER GENERIC MATERIAL TYPE	NONE	
LINER SPECIFIC MATERIAL TYPE	N/A	

LOUISVILLE GAS & ELECTRIC: PADDY'S RUN 6 (CONT.)

** REAGENT PREPARATION EQUIPMENT	
FUNCTION	GRINDING OF SOLIDS FOUND IN BARGE DELIVERED CARB
PRODUCT QUALITY - % SOLIDS	25.0
** TANKS	
SERVICE	NUMBER
ABSORBER RECYCLE	-1
REAGENT PREP PRODUCT	****
THICKENER OVERFLOW	****
** PUMPS	
SERVICE	NUMBER
RECYCLE	3
ABSORBER BLEED	****
THICKENER UNDERFLOW	2
CARBIDE LIME SLURRY	****
THICKENER OVERFLOW	****
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	VACUUM FILTER
NUMBER	2
NUMBER OF SPARES	1
CAPACITY	240 TONS/DAY
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
SHELL SPECIFIC MATERIAL TYPE	AISI 1110
LINER GENERIC MATERIAL TYPE	NR
LINER SPECIFIC MATERIAL TYPE	NR
BELT GENERIC MATERIAL TYPE	ORGANIC
BELT SPECIFIC MATERIAL TYPE	POLYPROPYLENE
FEED STREAM SOURCE	THICKENER UNDERFLOW
FEED STREAM CHARACTERISTICS	23% SOLIDS
OUTLET STREAM CHARACTERISTICS	45-50% SOLIDS
OUTLET STREAM DISPOSITION	LANDFILL
OVERFLOW STREAM DISPOSITION	TO THICKENER
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	THICKENER
NUMBER	1
NUMBER OF SPARES	0
DIMENSIONS - FT	50 DIA X 17.0
CAPACITY	250000
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
SHELL SPECIFIC MATERIAL TYPE	AISI 1110
LINER GENERIC MATERIAL TYPE	NONE
LINER SPECIFIC MATERIAL TYPE	N/A
FEED STREAM SOURCE	ABSORBER BLEED
FEED STREAM CHARACTERISTICS	10% SOLIDS
OUTLET STREAM CHARACTERISTICS	23% SOLIDS
OUTLET STREAM DISPOSITION	VACUUM FILTER
OVERFLOW STREAM DISPOSITION	TO REACTION TANK
*** SLUDGE	
% CASO3 - DRY	96.0
% CASO4 - DRY	4.0
% ASH - DRY	3.5
** TREATMENT	
METHOD	FIXATION
DEVICE	LANDFILL
PROPRIETARY PROCESS	NONE
INLET QUALITY - %	40.0
** DISPOSAL	
NATURE	FINAL
TYPE	LANDFILL
LOCATION	OFF-SITE

LOUISVILLE GAS & ELECTRIC: PADDY'S RUN 6 (CONT.)

SITE TRANSPORTATION METHOD	TRUCK
SITE TREATMENT	NONE

** PROCESS CONTROL AND INSTRUMENTATION

PROCESS STREAM	INLET, OVERFLOW POT DRAINS, SUMP
CHEMICAL PARAMETERS	PH
CONTROL LEVELS	PH <6 UPPER BED, PH >4 LOWER BED, PH 8-10 AT INL

** WATER BALANCE

WATER LOOP TYPE	CLOSED
MAKEUP WATER ADDITION - LITERS/S	3.2 (50 GPM)

** CHEMICALS AND CONSUMPTION

FUNCTION	ABSORBENT
NAME	CARBIDE LIME
PRINCIPAL CONSTITUENT	CA'OH!2
SOURCE/SUPPLIER	AIRCO
CONSUMPTION	4800 LB/HR DRY CA'OH!2
POINT OF ADDITION	ADDITIVE SLURRY TANK

** FGD SPARE CAPACITY INDICES

ABSORBER - %	20.0
MIST ELIMINATOR - %	0.0
REHEATER - %	0.0
FAN - %	0.0
EFFLUENT HOLD TANK - %	0.0
RECIRCULATION PUMP - %	33.0
THICKENER - %	0.0
VACUUM FILTER - %	0.0

** FGD SPARE COMPONENT INDICES

ABSORBER	0.0
MIST ELIMINATOR	0.3
REHEATER	0.0
FAN	0.0
EFFLUENT HOLD TANK	0.0
RECIRCULATION PUMP	1.0
THICKENER	0.0
VACUUM FILTER	0.0

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
4/73	6A		18.0		8.0						
	6B		56.0		24.9						
	SYSTEM		37.0		16.5			720	320	118	

** PROBLEMS/SOLUTIONS/COMMENTS

INITIAL OPERATION OF THE FGD SYSTEM AT PADDY'S RUN BEGAN IN APRIL. THE MODULES WERE OPERATED ONE AT A TIME, WITH FREQUENT SHUTDOWNS FOR INSPECTION OF EQUIPMENT AND MINOR REPAIRS.

5/73	6A		11.0		3.9						
	6B		65.0		23.1						
	SYSTEM		38.0		13.5			744	265	101	

** PROBLEMS/SOLUTIONS/COMMENTS

SINGLE-MODULE OPERATION CONTINUED THROUGH MAY 19, WHEN THE UNIT WAS SHUT DOWN FOR MODIFICATIONS.

EQUIPMENT WAS INSTALLED FOR INJECTION OF A FLOCCULATING AGENT INTO THE CLARIFIER TANK.

6/73	6A		0.1		0.0						

LOUISVILLE GAS & ELECTRIC: PADDY'S RUN 6 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	6B		6.0		2.1						
	SYSTEM		3.1		1.1			720	255	8	
7/73	6A		21.0		6.7						
	6B		21.0		6.7						
	SYSTEM		21.0		6.7			744	240	50	

** PROBLEMS/SOLUTIONS/COMMENTS

DURING A SCHEDULED OUTAGE FROM JULY 12 TROUGH AUGUST 1, SEVERAL REPAIRS WERE MADE TO THE LIME SLURRY MAKE-UP SYSTEM. A DISINTEGRATOR UNIT WAS INSTALLED TO REDUCE PLUGGING OF STRAINERS AND SLURRY CONTROL VALVES.

OPERATION WAS INTERMITTENT FROM JUNE 19 TO JULY 11 BECAUSE OF MECHANICAL PROBLEMS WITH THE SLURRY PUMPS.

8/73	6A		53.0		23.5						
	6B		64.0		28.4						
	SYSTEM		58.5		26.0			744	330	193	

** PROBLEMS/SOLUTIONS/COMMENTS

THE OPERATION WAS CONTINUOUS FROM AUGUST 2 TO AUGUST 18 EXCEPT FOR A BRIE SHUTDOWN DUE TO A BOILER-RELATED PROBLEM.

FROM AUGUST 19 TO SEPTEMBER 5, THE SYSTEM WAS SHUT DOWN TO REPLACE THE CLARIFIER UNDERFLOW LINE WITH ONE OF LARGER DIAMETER AND TO INSTALL ADDITIONAL PUMP CAPACITY IN THE CLARIFIER OVERFLOW SYSTEM.

9/73	6A		85.0		46.1						
	6B		72.0		39.0						
	SYSTEM		78.5		42.6			720	390	306	

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT OPERATED CONTINUOUSLY BETWEEN SEPTEMBER 6 AND 20 EXCEPT FOR A 7-HOUR SHUTDOWN TO REPAIR A MARBLE BED SUPPORT PLATE.

THE UNIT WAS SHUT DOWN FROM SEPTEMBER 20 TO THE END OF THE MONTH.

10/73	6A		49.0		45.4						
	6B		94.0		87.2						
	SYSTEM		71.5		66.3			744	690	493	
11/73	6A		35.0		35.0						
	6B		100.0		100.0						
	SYSTEM		67.5		67.5			720	720	486	
12/73	6A		44.0		11.3						
	6B		78.0		19.9						
	SYSTEM		61.0		15.6			744	190	116	

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS OPERATED UNTIL DECEMBER 20 AFTER WHICH THE BOILER AND THE SCRUBBER MODULES WERE SHUT DOWN BECAUSE OF A LACK OF DEMAND (THIS IS A PEAKING-LOAD BOILER).

1/74	SYSTEM				0.0			744	0	0	0.0

LOUISVILLE GAS & ELECTRIC: PADDY'S RUN 6 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
				THE BOILER WAS SHUT DOWN DUE TO A LACK OF DEMAND.							
2/74	SYSTEM				0.0			672	0	0	0.0
3/74	SYSTEM				0.0			744	0	0	0.0
4/74	SYSTEM				0.0			720	0	0	0.0
5/74	SYSTEM				0.0			744	0	0	0.0
6/74	SYSTEM				0.0			720	0	0	0.0
7/74	6A		51.0		21.0						
	6B		81.0		33.3						
	SYSTEM		66.0		27.2			744	306	202	
8/74	6A		50.0		2.1						
	6B		77.0		3.2						
	SYSTEM		63.5		2.7			744	31	20	
	** PROBLEMS/SOLUTIONS/COMMENTS										
				THE UNIT HAS BEEN ON AND OFF FREQUENTLY DUE TO FLUCTUATION IN POWER DEMAND.							
9/74	SYSTEM		0.0		0.0			720	43	0	
	** PROBLEMS/SOLUTIONS/COMMENTS										
				THE BOILER WAS SHUT DOWN BECAUSE OF A LACK OF DEMAND.							
10/74	6A		100.0		32.9						
	6B		100.0		32.9						
	SYSTEM		100.0		32.9			744	245	245	
	** PROBLEMS/SOLUTIONS/COMMENTS										
				THE BOILER WAS OPERATED TO PERFORM LIMESTONE TESTS ON THE FGD SYSTEM.							
11/74	SYSTEM		0.0		0.0			720	122	0	
	** PROBLEMS/SOLUTIONS/COMMENTS										
				THE BOILER WAS SHUT DOWN BECAUSE OF A LACK OF DEMAND.							
12/74	SYSTEM				0.0			744	0	0	0.0
1/75	SYSTEM				0.0			744	0	0	0.0
2/75	SYSTEM				0.0			672	0	0	0.0
3/75	SYSTEM				0.0			744	0	0	0.0
4/75	SYSTEM				0.0			720	0	0	0.0
5/75	SYSTEM				0.0			744	0	0	0.0
6/75	SYSTEM				0.0			720	0	0	0.0
7/75	SYSTEM				0.0			744	0	0	0.0
8/75	SYSTEM				0.0			744	0	0	0.0

LOUISVILLE GAS & ELECTRIC: PADDY'S RUN 6 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
			PERFORMANCE DATA								
9/75	6A		100.0		100.0						
	6B		100.0		100.0						
	SYSTEM	100.0	100.0		100.0			720	720	720	
10/75	6A		100.0		100.0						
	6B		100.0		100.0						
	SYSTEM	100.0	100.0		100.0			744	744	744	

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER AND FGD SYSTEM WERE OPERATIONAL ALL OF SEPTEMBER AND THE FIRST TWO WEEKS IN OCTOBER. OPERABILITY FOR BOTH MODULES DURING THE OPERATIONAL PERIOD WAS 100% (BASED UPON LG&E'S PEAK LOAD DETERMINATION). SO2 REMOVAL WAS REPORTED TO BE OVER 98%.

SYSTEM OUTAGE IN THE LAST TWO WEEKS OF OCTOBER WAS DUE PRIMARILY TO PROBLEMS WITH THE BREECHING IN THE BOILER SECTION.

11/75	6A		100.0		100.0						
	6B		100.0		100.0						
	SYSTEM	100.0	100.0		100.0			720	720	720	

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER AND SCRUBBER SYSTEM OPERATED MOST OF THE REPORT PERIOD ON A MONDAY-FRIDAY BASIS.

12/75	6A		90.1		90.1						
	6B		90.1		90.1						
	SYSTEM		90.1		90.1			744	744	670	

** PROBLEMS/SOLUTIONS/COMMENTS

TWO MINOR OUTAGES IN DECEMBER WERE DUE TO MALFUNCTION AND REPAIR OF THE DUAL STRAINER SWITCH SHAFT IN THE BOTTOM OF THE SCRUBBER MODULE.

1/76	SYSTEM		53.5		18.7			744	260	139	

** PROBLEMS/SOLUTIONS/COMMENTS

SO2 REMOVAL EFFICIENCY WAS REPORTED TO BE 99% DURING JANUARY.

2/76	SYSTEM		66.7		9.8			696	102	68	

** PROBLEMS/SOLUTIONS/COMMENTS

THE SYSTEM WAS SHUTDOWN IN EARLY FEBRUARY IN PREPARATION FOR AN EXTENSIVE SLUDGE STUDY TO MONITOR FIXATION, LEACHATES, AND SEASONAL VARIATIONS. THE STUDY IS SCHEDULED TO BEGIN IN JUNE OR JULY. THE SCRUBBER WILL NOT BE OPERATED UNTIL THE START OF THE PROGRAM UNLESS THE BOILER IS REQUIRED FOR PEAKING POWER DEMANDS. HIGHLIGHTS OF THE SCRUBBER/SLUDGE STUDY PROGRAM ARE AS FOLLOWS:

- -SIX MONTHS DURATION.
- -ONE SCHEDULED SHUTDOWN FOR TEST MODIFICATIONS.
- -DELIBERATE HIGH CHLORIDE CONCENTRATION OPERATION.
- -MGO INNOCULATION.

3/76	SYSTEM				0.0			744	0	0	0.0

LOUISVILLE GAS & ELECTRIC: PADDY'S RUN 6 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
		PERFORMANCE DATA									
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UNIT REMAINED OFF LINE DURING MARCH IN PREPARATION FOR THE EPA SCRUBBER/SLUDGE STUDY. THE UTILITY IS NOW COMPLETING SYSTEM MODIFICATIONS NECESSARY FOR THE OPERATION OF THE TEST PROGRAM.									
4/76	SYSTEM		0.0		0.0			720	2	0	
5/76	SYSTEM		85.0		2.3			744	20	17	
6/76	SYSTEM		95.0		21.3			720	161	153	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THIS PEAK LOAD UNIT WAS OPERATED PART OF THE TIME DURING THE REPORT PERIOD (APPROXIMATELY 2 WEEKS IN MAY AND TWO WEEKS IN JUNE). THE SCRUBBER WAS AVAILABLE TO THE BOILER 100% OF THE TIME AND SO2 REMOVAL EFFICIENCY WAS 98 TO 99% DURING THIS OPERATING SEGMENT.									
7/76	SYSTEM		87.7		30.8			744	261	229	
8/76	SYSTEM		92.8		8.6			744	69	64	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THIS UNIT WAS OPERATIONAL PART OF THE TIME DURING THE JULY-AUGUST PERIOD. THE SCRUBBING SYSTEM WAS AVAILABLE TO THE BOILER ON A 100% BASIS. NO MAJOR SCRUBBER-RELATED PROBLEMS WERE ENCOUNTERED.									
9/76	SYSTEM				0.0			720	0	0	0.0
10/76	SYSTEM		94.6		21.2			744	167	158	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UNIT DID NOT OPERATE THROUGHOUT SEPTEMBER AND THE FIRST THREE WEEKS IN OCTOBER. THE EPA-FUNDED SCRUBBER/SLUDGE STUDY PROGRAM COMMENCED OCTOBER 25. THE INITIAL PHASE OF THE PROGRAM CALLS FOR OPERATIONS TO PROCEED FOR A 20-30 DAY PERIOD WITH CARBIDE LIME SCRUBBING ABSORBENT. FOLLOWING COMPLETION OF THIS RUN, THE UNIT WILL BE SHUT DOWN AND MODIFICATIONS WILL BE INCORPORATED INTO THE SYSTEM FOR OPERATION WITH COMMERCIAL GRADE (HIGH CALCIUM) LIME.									
11/76	SYSTEM		99.3		99.3			720	720	715	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UNIT WAS IN SERVICE DURING THE REPORT PERIOD. THE SCRUBBING SYSTEM OPERATED 99.5% OF THE TIME THAT THE BOILER WAS IN SERVICE. CARBIDE LIME WAS EMPLOYED AS THE SO2 ABSORBENT. THE HIGH CALCIUM (VIRGIN) LIME RUN, SCHEDULED AS PART OF THE SCRUBBER/SLUDGE STUDY, WILL COMMENCE ON MARCH 1, 1977.									
12/76	SYSTEM		98.5		71.4			744	539	531	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UNIT WAS IN SERVICE DURING THE REPORT PERIOD. THE SCRUBBING SYSTEM OPERATED 99.5% OF THE TIME THAT THE BOILER WAS IN SERVICE. CARBIDE LIME WAS EMPLOYED AS THE SO2 ABSORBENT. THE HIGH CALCIUM (VIRGIN) LIME RUN, SCHEDULED AS PART OF THE SCRUBBER/SLUDGE STUDY, WILL COMMENCE ON MARCH 1, 1977.									
1/77	SYSTEM		0.0		0.0			744	103	0	

LOUISVILLE GAS & ELECTRIC: PADDY'S RUN 6 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
				PERFORMANCE DATA							
2/77	SYSTEM		0.0	0.0				672	62	0	
3/77	SYSTEM		79.2	41.4				744	389	308	
	** PROBLEMS/SOLUTIONS/COMMENTS										
			BECAUSE OF SEVERE WEATHER CONDITIONS THERE WERE NO BOILER OPERATIONS AND NO SCRUBBER OPERATIONS (SINCE DECEMBER 31) UNTIL MARCH 15, 1977.								
4/77	SYSTEM		93.6	42.6				720	328	307	
5/77	SYSTEM		42.5	16.0				744	280	119	
	** PROBLEMS/SOLUTIONS/COMMENTS										
			IN MID MARCH LG&E BEGAN TESTS FOR EPA WITH REGULAR LIME SINCE ONE OF THE OBJECTIVES OF THE TEST WAS TO DETERMINE WHETHER THERE WERE APPRECIABLE DIFFERENCES BETWEEN REGULAR LIME AND CARBIDE LIME AT THIS FACILITY. DURING OPERATION WITH REGULAR LIME, SCALING PROBLEMS OCCURRED, INDICATING THAT THE SCALING RESULTED FROM INCREASED OXIDATION LEVELS. AVAILABLE OPTIONS FOR CONTROLLING SCALING WERE LIMITED BY THE FIXED DESIGN FEATURES OF THE SCRUBBER HARDWARE. THE OPTION SELECTED WAS ADDITION OF MGO TO THE SCRUBBING MEDIUM. WHEN MGO WAS ADDED, THE SCALING PROBLEM WAS ELIMINATED ALLOWING COMPLETION OF THE TEST PROGRAM.								
6/77	SYSTEM		93.4	43.3				720	334	312	
	** PROBLEMS/SOLUTIONS/COMMENTS										
			THE SCRUBBER/SLUDGE EVALUATION STUDY CONTINUED DURING THE PERIOD. THE SCRUBBER PLANT (ONE MODULE IS BEING UTILIZED FOR THIS EXPERIMENTAL PROGRAM) WAS IN SERVICE ON A VIRTUALLY CONTINUOUS BASIS FROM JUNE 18 TO AUGUST 8 OPERATING ON MAGNESIUM INNOCULATED COMMERCIAL LIME. SYSTEM OPERABILITY DURING THIS PERIOD WAS APPROXIMATELY 96%. SO2 REMOVAL EFFICIENCY WAS MEASURED IN EXCESS OF 99.5%. THE SYSTEM WAS SHUT DOWN AT THIS POINT TO PERFORM A NUMBER OF SCHEDULED MODIFICATIONS TO THE SYSTEM FOR TEST PURPOSES. SPECIFICALLY, MODIFICATIONS ARE BEING IMPLEMENTED TO THE SYSTE IN ORDER TO BYPASS THE REACTION TANK SO A SHORT TERM RETENTION TIME TEST COULD BE CONDUCTED. THE TESTING WAS COMPLETED IN AUGUST 1977 AFTER THE MODIFICATIONS WERE MADE.								
7/77	SYSTEM		96.9	95.8				744	736	713	
8/77	SYSTEM		94.0	73.5				744	582	547	
9/77	SYSTEM		25.9	5.8				720	162	42	
	** PROBLEMS/SOLUTIONS/COMMENTS										
			THE UNIT IS CURRENTLY NOT OPERATING DUE TO THE LACK OF POWER REQUIREMENT.								
10/77	SYSTEM		46.9	2.0				744	32	15	
11/77	SYSTEM			0.0				720	0	0	0.0
12/77	SYSTEM			0.0				744	0	0	0.0
1/78	SYSTEM			0.0				744	0	0	0.0
2/78	SYSTEM			0.0				672	0	0	0.0
3/78	SYSTEM			0.0				744	0	0	0.0

LOUISVILLE GAS & ELECTRIC: PADDY'S RUN 6 (CONT.)

PERIOD	MODULE	PERFORMANCE DATA AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UNIT WAS OUT OF SERVICE FROM NOVEMBER THROUGH MARCH IN PART BECAUSE O LOW DEMAND AND IN PART AS A RESULT OF PROBLEMS RELATED TO COLD WEATHER.									
4/78	SYSTEM				0.0			720	0	0	0.0
5/78	SYSTEM				0.0			744	0	0	0.0
6/78	SYSTEM		98.1		7.1			720	52	51	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		PADDY'S RUN WAS ON LINE ONLY A FEW HOURS DURING THIS PERIOD. NO OPERATIONAL PROBLEMS WERE REPORTED BY THE UTILITY.									
7/78	SYSTEM		99.5		25.4			744	190	189	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UNIT RAN INTERMITTENTLY FOR ABOUT EIGHT TO TEN DAYS OVER THIS PERIOD.									
8/78	SYSTEM				0.0			744	0	0	0.0
9/78	SYSTEM		100.0		47.1			720	339	339	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THIS UNIT WAS OPERATED FOR TWO WEEKS IN SEPTEMBER SO THAT TESTING OF A NEW FLOCCULANT COULD BE CARRIED OUT. THE RESULTS OF THESE TESTS WILL DETERMINE THE TYPE OF FLOCCULANT THAT WILL BE USED IN THE FUTURE AT THE OTHER LG&E UNITS.									
10/78	SYSTEM				0.0			744	0	0	0.0
11/78	SYSTEM				0.0			720	0	0	0.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE BOILER WAS NOT OPERATED DURING OCTOBER OR NOVEMBER.									
12/78	SYSTEM				0.0			744	0	0	0.0
1/79	SYSTEM				0.0			744	0	0	0.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UNIT WAS NOT OPERATED DURING DECEMBER OR JANUARY.									
2/79	SYSTEM				0.0			672	0	0	0.0
3/79	SYSTEM				0.0			744	0	0	0.0
4/79	SYSTEM				0.0			720	0	0	0.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UNIT WAS NOT OPERATED DURING THESE MONTHS BECAUSE OF LACK OF DEMAND.									
5/79	SYSTEM				0.0			744	0	0	0.0
6/79	SYSTEM				0.0			720	0	0	0.0

LOUISVILLE GAS & ELECTRIC: PADDY'S RUN 6 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
				PERFORMANCE DATA							
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UTILITY REPORTED THAT THE UNIT DID NOT OPERATE DURING MAY OR JUNE DUE TO INSUFFICIENT DEMAND.									
7/79	SYSTEM		0.0		0.0			744	19	0	
8/79	SYSTEM		45.0		13.0			744	218	99	
9/79	SYSTEM		0.0		0.0			720	36	0	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		NO PROBLEMS WERE REPORTED WITH RESPECT TO OPERATION AT THIS UNIT DURING TH THIRD QUARTER 1979.									
10/79	SYSTEM				0.0			744	0	0	0.0
11/79	SYSTEM				0.0			720	0	0	0.0
12/79	SYSTEM				0.0			744	0	0	0.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UNIT DID NOT OPERATE DURING THE FOURTH QUARTER OF 1979 BECAUSE OF THE LACK OF DEMAND.									
1/80	SYSTEM				0.0			744	0	0	0.0
2/80	SYSTEM				0.0			696	0	0	0.0
3/80	SYSTEM				0.0			744	0	0	0.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THIS UNIT DID NOT OPERATE DURING THE FOURTH QUARTER OF 1979 OR THE FIRST QUARTER OF 1980 DUE TO A LACK OF DEMAND. THIS UNIT IS USED AS A PEAKING UNIT AND WILL BE RETIRED SOMETIME IN 1987.									
4/80	SYSTEM	100.0			0.0			720	0	0	0.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING APRIL THE FGD SYSTEM WAS AVAILABLE 100% OF THE TIME BUT WAS NOT OPERATED DUE TO A BOILER RELATED PROBLEM.									
5/80	SYSTEM	100.0	86.6	86.6	7.8			744	67	58	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING MAY, NINE HOURS OF OUTAGE TIME RESULTED FROM THE UNAVAILABLITY OF THE LIME SLURRY.									
6/80	SYSTEM	100.0	94.1	94.1	6.7			720	51	48	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE THREE HOURS THE SCRUBBERS DID NOT OPERATE IN JUNE WAS DUE TO THE FACT THAT THE BOILER WAS BROUGHT ON LINE BEFORE THE SCRUBBER OPERATORS WERE ON DUTY.									
7/80	A	100.0			0.0						

LOUISVILLE GAS & ELECTRIC: PADDY'S RUN 6 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	B	100.0			0.0						
	SYSTEM	100.0			0.0			744	0	0	0.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE BOILER AND FGD SYSTEM DID NOT OPERATE DURING THE MONTH OF JULY DUE TO A LACK OF DEMAND.									
8/80	SYSTEM	100.0			0.0			744	0	0	0.0
9/80	SYSTEM	100.0			0.0			720	0	0	0.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE BOILER DID NOT OPERATE DURING AUGUST AND SEPTEMBER. THE FGD SYSTEM WAS AVAILABLE 100% OF THE TIME.									
10/80	SYSTEM	100.0			0.0			744	0	0	0.0
11/80	SYSTEM	100.0			0.0			720	0	0	0.0
12/80	SYSTEM	100.0			0.0			744	0	0	0.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UNIT WAS NOT OPERATED DURING THE FOURTH QUARTER 1980 DUE TO THE LACK OF DEMAND.									
1/81	SYSTEM	100.0			0.0			744	0	0	0.0
2/81	SYSTEM	100.0			0.0			672	0	0	0.0
3/81	SYSTEM	100.0			0.0			744	0	0	0.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING THE FIRST QUARTER 1981 THE UNIT WAS NOT OPERATED DUE TO THE LACK OF DEMAND.									
4/81	SYSTEM	100.0			0.0			720	0	0	0.0
5/81	SYSTEM	100.0			0.0			744	0	0	0.0
6/81	SYSTEM	100.0			0.0			720	0	0	0.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THROUGHOUT THE SECOND QUARTER 1981 THE BOILER DID NOT OPERATE; HOWEVER, THE FGD SYSTEM WAS AVAILABLE 100%.									
7/81	SYSTEM	100.0			0.0			744	0	0	0.0
8/81	SYSTEM	100.0			0.0			744	0	0	0.0
9/81	SYSTEM	100.0			0.0			720	0	0	0.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		PADDY'S RUN UNIT 6 REMAINED OFF LINE DURING THE THIRD QUARTER 1981.									
10/81	SYSTEM	100.0			0.0			744	0	0	
11/81	SYSTEM	100.0			0.0			720	0	0	
12/81	SYSTEM	100.0			0.0			744	0	0	

LOUISVILLE GAS & ELECTRIC: PADDY'S RUN 6 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
				PERFORMANCE DATA							
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THROUGHOUT THE FOURTH QUARTER THE FGD SYSTEM WAS AVAILABLE FOR OPERATION; HOWEVER, THE BOILER WAS NOT NEEDED.									
1/82	SYSTEM	100.0			0.0			744	744	0	
2/82	SYSTEM	100.0			0.0			672	0	0	0.0
3/82	SYSTEM	100.0			0.0			744	0	0	0.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING THE FIRST QUARTER 1982 THE FGD SYSTEM WAS AVAILABLE FOR OPERATION; HOWEVER, THE SYSTEM WAS NOT NEEDED DUE TO A LACK OF POWER DEMAND.									
4/82	SYSTEM	100.0			0.0			720	0		0.0
5/82	SYSTEM	100.0			0.0			744	0	0	0.0
6/82	SYSTEM	100.0			0.0			720	0	0	0.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DUE TO A LACK OF POWER DEMAND, THE UNIT DID NOT OPERATE DURING THE SECOND QUARTER 1982.									
7/82	SYSTEM	100.0			0.0			744	0	0	0.0
8/82	SYSTEM	100.0			0.0			744	0	0	0.0
9/82	SYSTEM	100.0			0.0			720	0	0	0.0
10/82	SYSTEM	100.0			0.0			744	0	0	0.0
11/82	SYSTEM	100.0			0.0			720	0	0	0.0
12/82	SYSTEM	100.0			0.0			744	0	0	0.0
1/83	SYSTEM	100.0			0.0			744	0	0	0.0
2/83	SYSTEM	100.0			0.0			672	0	0	0.0
3/83	SYSTEM	100.0			0.0			744	0	0	0.0
4/83	SYSTEM	100.0			0.0			720	0	0	0.0
5/83	SYSTEM	100.0			0.0			744	0	0	0.0
6/83	SYSTEM	100.0			0.0			720	0	0	0.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UTILITY REPORTED THAT THE UNIT AND FGD SYSTEM DID NOT OPERATE DURING THE PERIOD OF JULY 1, 1982 THROUGH JUNE 30, 1983. THE FGD SYSTEM WAS REPORTED AVAILABLE 100% OF THE TIME.									
7/83	SYSTEM	100.0			0.0			744	0	0	0.0
8/83	SYSTEM	100.0			0.0			744	0	0	0.0
9/83	SYSTEM	100.0			0.0			720	0	0	0.0

LOUISVILLE GAS & ELECTRIC: PADDY'S RUN 6 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
				PERFORMANCE DATA							
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UNIT AND FGD SYSTEM DID NOT OPERATE DURING THE THIRD QUARTER OF 1983, HOWEVER, THE FGD SYSTEM WAS REPORTED TO BE 100% AVAILABLE.									
10/83	SYSTEM	100.0			0.0			744	0	0	0.0
11/83	SYSTEM	100.0			0.0			720	0	0	0.0
12/83	SYSTEM	100.0			0.0			744	0	0	0.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UTILITY REPORTED THAT THE UNIT AND SCRUBBER DID NOT OPERATE DURING THE FOURTH QUARTER OF 1983.									
1/84	SYSTEM							744			
2/84	SYSTEM							696			
3/84	SYSTEM							744			
4/84	SYSTEM							720			
5/84	SYSTEM							744			
6/84	SYSTEM							720			
7/84	SYSTEM							744			
8/84	SYSTEM							744			
9/84	SYSTEM							720			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		INFORMATION WAS UNAVAILABLE FOR THE FIRST THREE QUARTERS OF 1984.									

APPENDIX F
DESIGN AND PERFORMANCE DATA FOR DISCONTINUED DOMESTIC FGD SYSTEMS

COMPANY NAME	NIAGARA MOHAWK POWER	
PLANT NAME	CHARLES R. HUNTLEY	
UNIT NUMBER	66	
CITY	BUFFALO	
STATE	NEW YORK	
REGULATORY CLASSIFICATION	E	
PARTICULATE EMISSION LIMITATION - NG/J	73.	(0.170 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	602.	(1.400 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	*****	
GROSS UNIT GENERATING CAPACITY - MW	100	
NET UNIT GENERATING CAPACITY W/FGD - MW	95	
NET UNIT GENERATING CAPACITY WO/FGD - MW	*****	
EQUIVALENT SCRUBBED CAPACITY - MW	100	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	BABCOCK & WILCOX	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	CYCLING	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	188.76	(400000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	160.0	(320 F)
STACK HEIGHT - M	61.	(200 FT)
STACK SHELL	CARBON STEEL	
STACK TOP DIAMETER - M	3.7	(12.2 FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	****	
AVERAGE HEAT CONTENT - J/G	29075.	(12500 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		****
AVERAGE ASH CONTENT - %	7.03	
RANGE ASH CONTENT - %	****	
AVERAGE MOISTURE CONTENT - %	********	
RANGE MOISTURE CONTENT - %	****	
AVERAGE SULFUR CONTENT - %	1.80	
RANGE SULFUR CONTENT - %	****	
AVERAGE CHLORIDE CONTENT - %	0.70	
RANGE CHLORIDE CONTENT - %	****	
*** PARTICLE CONTROL		
** MECHANICAL COLLECTOR		
NUMBER	16	
TYPE	CYCLONE	
SUPPLIER	ATOMICS INTERNATIONAL	
** ESP		
NUMBER	1	
TYPE	COLD SIDE	
SUPPLIER	WESTERN PREC. DIVISION, JOY	
INLET FLUE GAS CAPACITY - CU.M/S	235.9	(500000 ACFM)
INLET FLUE GAS TEMPERATURE - C	154.4	(310 F)
** PARTICLE SCRUBBER		
NUMBER	0	
GENERIC TYPE	NONE	
SPECIFIC TYPE	N/A	
TRADE NAME/COMMON NAME	N/A	
GAS CONTACTING DEVICE TYPE	N/A	
*** FGD SYSTEM		
** GENERAL DATA		
SALEABLE PRODUCT/THROWAWAY PRODUCT	SALEABLE PRODUCT	
SO2 REMOVAL MODE	SPRAY DRYING	
PROCESS TYPE	AQUEOUS CARBONATE/SPRAY DRYING	
SYSTEM SUPPLIER	ROCKWELL INTERNATIONAL	
A-E FIRM	UNITED ENGINEERS & CONSTRUCTORS	
DEVELOPMENT LEVEL	DEMONSTRATION	

NIAGARA MOHAWK POWER: CHARLES R. HUNTLEY 66 (CONT.)

NEW/RETROFIT	RETROFIT	
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.80	
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	87.50	
CURRENT STATUS	8	
TERMINATION	12/1984	
COMMERCIAL START-UP	8/1982	
INITIAL START-UP	4/1982	
CONTRACT AWARDED	1/1977	
** DESIGN AND OPERATING PARAMETERS		
DESIGN CHLORIDE CONTENT - %	********	
OPER. & MAINT. REQUIREMENT - MANHR/DAY	840.0	
** QUENCHER/PRESATURATOR		
CONSTRUCTION MATERIAL GENERIC TYPE	NR	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR	
** ABSORBER		
NUMBER	1	
NUMBER OF SPARES	0	
GENERIC TYPE	SPRAY DRYER	
SPECIFIC TYPE	COUNTERCURRENT	
TRADE NAME/COMMON TYPE	ROTARY ATOMIZER	
SUPPLIER	ROCKWELL INTERNATIONAL	
DIMENSIONS - FT	42.0 DIA X 60.0	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	ASTM A-36	
SHELL MATERIAL TRADE NAME/COMMON TYPE	NR	
LINER GENERIC MATERIAL	NONE	
LINER SPECIFIC MATERIAL	N/A	
LINER MATERIAL TRADE NAME/COMMON TYPE	N/A	
NUMBER OF CONTACTING ZONES	3	
L/G RATIO - L/CU.M	0.0	(0.2 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	0.7	(3.0 IN-H2O)
INLET GAS TEMPERATURE - C	162.8	(325 F)
SO2 REMOVAL EFFICIENCY - %	85.3	
PARTICLE REMOVAL EFFICENCY - %	99.8	
** MIST ELIMINATOR		
PRE-MIST ELIMINATOR/MIST ELIMINATOR	NONE	
GENERIC TYPE	N/A	
SPECIFIC TYPE	N/A	
TRADE NAME/COMMON TYPE	N/A	
CONSTRUCTION MATERIAL GENERIC TYPE	NR	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR	
** REHEATER		
GENERIC TYPE	DIRECT COMBUSTION	
SPECIFIC TYPE	NR	
TRADE NAME/COMMON TYPE	NR	
CONSTRUCTION MATERIAL GENERIC TYPE	NR	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR	
** FANS		
NUMBER	1	
NUMBER OF SPARES	0	
DESIGN	NR	
SUPPLIER	BUFFALO FORGE	
FUNCTION	NR	
APPLICATION	NR	
SERVICE	DRY	
FLUE GAS FLOW RATE - CU.M/S	202.92	(430000 ACFM)
FLUE GAS TEMPERATURE - C	76.7	(170 F)
CONSTRUCTION MATERIAL GENERIC TYPE	NR	
** DAMPERS		
FUNCTION	NR	
GENERIC TYPE	NR	
SPECIFIC TYPE	NR	
CONSTRUCTION MATERIAL GENERIC TYPE	NR	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR	

NIAGARA MOHAWK POWER: CHARLES R. HUNTLEY 66 (CONT.)

LINER GENERIC MATERIAL TYPE	NR
LINER SPECIFIC MATERIAL TYPE	NR
** DUCTWORK	
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
SHELL SPECIFIC MATERIAL TYPE	AISI 1110
LINER GENERIC MATERIAL TYPE	NONE
LINER SPECIFIC MATERIAL TYPE	N/A
** REAGENT PREPARATION EQUIPMENT	
FUNCTION	MIX TANK
DEVICE	N/A
DEVICE TYPE	AGITATED TANK
** PUMPS	
SERVICE	NUMBER
-------	------
NR	****
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	CENTRIFUGE
*** SALEABLE BYPRODUCTS	
NATURE	ELEMENTAL SULFUR
FULL LOAD QUANTITY - M T/H	0.54 (0.60 TPH)
QUALITY - %	99.9
DISPOSITION	MARKETED
*** SLUDGE	
** TREATMENT	
METHOD	N/A
DEVICE	N/A
PROPRIETARY PROCESS	N/A
** DISPOSAL	
NATURE	N/A
TYPE	NONE
** PROCESS CONTROL AND INSTRUMENTATION	
PHYSICAL VARIABLES	SO2 & TEMP
MONITOR LOCATION	STACK
PROCESS CONTROL MANNER	AUTOMATIC
PROCESS CHEMISTRY MODE	FEEDBACK
** WATER BALANCE	
WATER LOOP TYPE	OPEN
EVAPORATION WATER LOSS - LITER/S	7.2 (114 GPM)
MAKEUP WATER ADDITION - LITERS/S	7.6 (121 GPM)
** FGD SPARE CAPACITY INDICES	
ABSORBER - %	0.0
** FGD SPARE COMPONENT INDICES	
ABSORBER	0.0

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
4/82	SYSTEM							720			

NIAGARA MOHAWK POWER: CHARLES R. HUNTLEY 66 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
		INITIAL FGD OPERATIONS BEGAN AT THIS FACILITY DURING APRIL 1982.									
5/82	SYSTEM							744			
6/82	SYSTEM							720			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE FGD SYSTEM COMMENCED OPERATION IN APRIL AND IS CURRENTLY IN THE STARTU PHASE OF OPERATION. SOME MODIFICATIONS ARE BEING PERFORMED ON THE CLEANIN FACILITY AND THE UTILITY IS PREPARING TO START UP THE REGENERATIVE SYSTEM.									
7/82	SYSTEM							744			
8/82	SYSTEM							744			
9/82	SYSTEM							720			
10/82	SYSTEM							744			
11/82	SYSTEM							720			
12/82	SYSTEM							744			
1/83	SYSTEM							744			
2/83	SYSTEM							672			
3/83	SYSTEM							720			
4/83	SYSTEM							720			
5/83	SYSTEM							744			
6/83	SYSTEM							720			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UTILITY REPORTED THAT THE FGD SYSTEM IS STILL IN THE STARTUP PHASE OF OPERATION. THE LONGEST NON-INTEGRATED RUN ACHIEVED BY THE FGD SYSTEM WAS FOR THREE WEEKS DURING THE MONTH OF JUNE. SINCE INITIAL STARTUP IN APRIL, 1982, THE DEMONSTRATION UNIT HAS ONLY ONCE MET COMPLIANCE BY OPERATING 24 CONTINUOUS HOURS AS A TOTAL INTEGRATED SYSTEM. ONCE THE SYSTEM HAS OBTAINED 330 DAYS OF COMPLIANCE OPERATION, THE UTILITY PLANS TO DISMANTLE THE SYSTEM AND AGAIN BURN LOW SULFUR COAL AS A COMPLIANCE STRATEGY.									
		REPAIRS WERE MADE TO THE ROTARY ATOMIZER MOTORS. IMPROPER ATOMIZATION WAS REPORTED AS THE REASON FOR THE REPAIRS.									
		REPAIRS WERE ALSO REQUIRED ON THE REDUCER PNEUMATIC CONVEYOR SYSTEM BECAUS OF PLUGGING AND DUSTING PROBLEMS.									
		THE UTILITY REPORTED THAT IT EXPERIENCED PROBLEMS WITH THE CARBONATION TRAY WASH SYSTEM.									
7/83	SYSTEM							744			
8/83	SYSTEM							744			
9/83	SYSTEM							720			

NIAGARA MOHAWK POWER: CHARLES R. HUNTLEY 66 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UTILITY REPORTED THAT THE DRY SCRUBBER AND THE SULFUR BYPRODUCT RECOVERY PORTIONS OF THE FGD SYSTEM ARE FOR THE MOST PART MEETING COMPLIANCE LEVELS. MINOR PROBLEMS EXPERIENCED DURING THE THIRD QUARTER INCLUDED NOZZLE EROSION AND PNEUMATIC PUMP SEALS LEAKING.									
		THE SILICON CARBIDE NOZZLE INSERTS LOCATED IN THE ROTARY ATOMIZER HAVE BEE ERODING (NOZZLE DIAMETER GRADUALLY ENLARGES). THE SUPPLIER IS PRESENTLY STUDYING THE PROBLEM.									
		REPAIRS WERE MADE TO THE PNEUMATIC SOLID FEED SYSTEM WHICH TRANSPORTS SPENT SLURRY FROM A STORAGE SILO TO THE MOLTEN SALT REDUCER. THE PNEUMATI LINES WERE ENLARGED TO DECREASE BACK PRESSURE ON THE PUMP SEALS. THIS HELPS CORRECT THE LEAKING PROBLEM.									
10/83	SYSTEM							744			
11/83	SYSTEM							720			
12/83	SYSTEM							744			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UTILITY REPORTED THAT THE FGD SYSTEM WAS OFF-LINE FOR APPROXIMATELY 10 DAYS IN DECEMBER TO REPAIR A BREAK IN THE REDUCER OFF-GAS PIPELINE. THIS LINE CARRIES CO2 GAS FROM THE REDUCER TO THE CARBONATION COLUMN WHICH IS PART OF THE NA2CO3 REGENERATION SYSTEM. VIBRATION PROBLEMS WERE ALSO EXPERIENCED WITH THE REDUCER FAN DUE TO MATERIAL BUILD-UP.									
		THE UTILITY REPORTED BRINGING THE FGD SYSTEM BACK TO OPERATION COMPLIANCE LEVELS BY YEAR'S END.									
1/84	SYSTEM							744			
2/84	SYSTEM							696			
3/84	SYSTEM							744			
4/84	SYSTEM							720			
5/84	SYSTEM							744			
6/84	SYSTEM							720			
7/84	SYSTEM							744			
8/84	SYSTEM							744			
9/84	SYSTEM							720			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UTILITY REPORTED PROBLEMS WITH THE MOLTEN SALT REDUCER VESSEL REFRACTORY. THE FGD SYSTEM HAS BEEN ON STANDBY SINCE LATE JANUARY, 1984 WITH NO FURTHER TESTING SCHEDULED UNTIL THESE PROBLEMS ARE RESOLVED AND A DECISION IS MADE REGARDING A COURSE OF ACTION.									
10/84	SYSTEM							744			
11/84	SYSTEM							720			
12/84	SYSTEM							744			

NIAGARA MOHAWK POWER: CHARLES R. HUNTLEY 66 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT SCRUBBING OPERATORS AT CHARLES R. HUNTLEY HAVE BEEN TERMINATED. UTILITY AND SPONSORS OF THE PROJECT FELT THAT ANY FURTHER WORK WOULD NOT PROVIDE ANY ADDITIONAL INFORMATION. UTILITY STATED THAT FUTURE WORK SHOULD FOLLOW UP ON HARDWARE AND MATERIAL PROBLEMS EXPERIENCED DURING THE TEST. THE MOST SERIOUS OF PROBLEMS EXPERIENCED WAS THE BREAKDOWN OF THE REFRACTORY IN THE HIGH TEMPERATURE REDUCER VESSEL. THE UTILITY HOPED THAT THE UTILITY INDUSTRY AND/OR GOVERNMENT WOULD CONTINUE INVESTIGATING THE APPLICATION AND TESTING OF AQUEOUS CARBONATE SCRUBBING ON UTILITY BOILERS. THIS SYSTEM HAD DEMONSTRATED 90% SO2 REMOVAL EFFICIENCY AND PRODUCED A 99.99% PURE SULFUR SALEABLE BYPRODUCT. AS A RESULT OF THIS PROJECT, THE UTILITY GREATLY FAVORS FGD DESIGNS WHICH HAVE SALEABLE BYPRODUCT RECOVERY SCHEMES. THE UTILITY STATED THE CHARLES R. HUNTLEY DEMONSTRATION SYSTEM WILL BE DISMANTLED AND REMOVED FROM THE PLANT SITE.

APPENDIX F
DESIGN AND PERFORMANCE DATA FOR DISCONTINUED DOMESTIC FGD SYSTEMS

COMPANY NAME	NORTHERN INDIANA PUB SERVICE	
PLANT NAME	DEAN H. MITCHELL	
UNIT NUMBER	11	
CITY	GARY	
STATE	INDIANA	
REGULATORY CLASSIFICATION	E	
PARTICULATE EMISSION LIMITATION - NG/J	43.	(0.100 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	516.	(1.200 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	505	
GROSS UNIT GENERATING CAPACITY - MW	116	
NET UNIT GENERATING CAPACITY W/FGD - MW	94	
NET UNIT GENERATING CAPACITY WO/FGD - MW	108	
EQUIVALENT SCRUBBED CAPACITY - MW	115	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	BABCOCK & WILCOX	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	198.20	(420000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	142.2	(288 F)
STACK HEIGHT - M	51.	(168 FT)
STACK SHELL	FRP	
STACK TOP DIAMETER - M	*******	(***** FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	****	
AVERAGE HEAT CONTENT - J/G	25586.	(11000 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		****
AVERAGE ASH CONTENT - %	********	
RANGE ASH CONTENT - %	****	
AVERAGE MOISTURE CONTENT - %	11.00	
RANGE MOISTURE CONTENT - %	****	
AVERAGE SULFUR CONTENT - %	3.50	
RANGE SULFUR CONTENT - %	3.2-3.5	
AVERAGE CHLORIDE CONTENT - %	********	
RANGE CHLORIDE CONTENT - %	****	
*** PARTICLE CONTROL		
** ESP		
NUMBER	1	
TYPE	COLD SIDE	
SUPPLIER	AMERICAN STANDARD	
** PARTICLE SCRUBBER		
NUMBER	1	
INITIAL START-UP DATE	7/1976	
GENERIC TYPE	VENTURI TOWER	
SPECIFIC TYPE	VARIABLE-THROAT/BOTTOM-ENTRY PLUMB BOB	
TRADE NAME/COMMON NAME	N/A	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	AISI 1110	
LINER GENERIC MATERIAL	NR	
LINER SPECIFIC MATERIAL	NR	
GAS CONTACTING DEVICE TYPE	NONE	
NUMBER OF CONTACTING ZONES	1	
INLET GAS TEMPERATURE - C	142.2	(288 F)
*** FGD SYSTEM		
** GENERAL DATA		
SALEABLE PRODUCT/THROWAWAY PRODUCT	SALEABLE PRODUCT	
SO2 REMOVAL MODE	WET SCRUBBING	
PROCESS TYPE	WELLMAN LORD	
SYSTEM SUPPLIER	DAVY MCKEE	
A-E FIRM	DAVY MCKEE	
DEVELOPMENT LEVEL	DEMONSTRATION	

NORTHERN INDIANA PUB SERVICE: DEAN H. MITCHELL 11 (CONT.)

NEW/RETROFIT	RETROFIT	
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	98.50	
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	90.00	
ENERGY CONSUMPTION - %	12.1	
CURRENT STATUS	8	
TERMINATION	3/1982	
COMMERCIAL START-UP	6/1977	
INITIAL START-UP	7/1976	
CONTRACT AWARDED	6/1972	
** DESIGN AND OPERATING PARAMETERS		
DESIGN CHLORIDE CONTENT - %	********	
** QUENCHER/PRESATURATOR		
CONSTRUCTION MATERIAL GENERIC TYPE	NR	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR	
** ABSORBER		
NUMBER	1	
GENERIC TYPE	TRAY TOWER	
SPECIFIC TYPE	VALVE TRAY	
TRADE NAME/COMMON TYPE	BUBBLE CAP TRAY TOWER	
SUPPLIER	DAVY MCKEE	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	AISI 1110	
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A	
LINER GENERIC MATERIAL	INORGANIC	
LINER SPECIFIC MATERIAL	PREFIRED BRICK/SHAPES	
LINER MATERIAL TRADE NAME/COMMON TYPE	ACID-RESISTANT BRICK 'LOW H2O ABSORPTION!	
GAS CONTACTING DEVICE TYPE	VALVE TRAYS	
NUMBER OF CONTACTING ZONES	3	
GAS-SIDE PRESSURE DROP - KPA	3.0	(12.0 IN-H2O)
INLET GAS FLOW - CU. M/S	198.20	(420000 ACFM)
SO2 REMOVAL EFFICIENCY - %	91.0	
** MIST ELIMINATOR		
PRE-MIST ELIMINATOR/MIST ELIMINATOR	NR	
GENERIC TYPE	NR	
SPECIFIC TYPE	NR	
TRADE NAME/COMMON TYPE	NR	
CONSTRUCTION MATERIAL GENERIC TYPE	NR	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR	
** REHEATER		
GENERIC TYPE	DIRECT COMBUSTION	
SPECIFIC TYPE	NR	
TRADE NAME/COMMON TYPE	NATURAL GAS	
TEMPERATURE INCREASE - C	27.8	(50 F)
INLET FLUE GAS TEMPERATURE - C	54.4	(130 F)
CONSTRUCTION MATERIAL GENERIC TYPE	NR	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR	
** FANS		
NUMBER	1	
DESIGN	CENTRIFUGAL	
FUNCTION	BOOSTER	
APPLICATION	FORCED DRAFT	
SERVICE	DRY	
FLUE GAS FLOW RATE - CU.M/S	198.20	(420000 ACFM)
FLUE GAS TEMPERATURE - C	142.2	(288 F)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	
** FANS		
NUMBER	2	
DESIGN	CENTRIFUGAL	
FUNCTION	UNIT	
APPLICATION	FORCED DRAFT	
SERVICE	DRY	
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL; HIGH ALLOY	

NORTHERN INDIANA PUB SERVICE: DEAN H. MITCHELL 11 (CONT.)

** DAMPERS	
FUNCTION	NR
GENERIC TYPE	NR
SPECIFIC TYPE	NR
CONSTRUCTION MATERIAL GENERIC TYPE	NR
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR
LINER GENERIC MATERIAL TYPE	NR
LINER SPECIFIC MATERIAL TYPE	NR
** DUCTWORK	
LOCATION	SCRUBBER INLET
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
SHELL SPECIFIC MATERIAL TYPE	AISI 1110
LINER GENERIC MATERIAL TYPE	NONE
LINER SPECIFIC MATERIAL TYPE	N/A
** REAGENT PREPARATION EQUIPMENT	
FUNCTION	MIX TANK
DEVICE	N/A
DEVICE TYPE	AGITATED TANK
MANUFACTURER	AGITATED TANK
** TANKS	
SERVICE	NUMBER
-------	------
REAGENT PREP PRODUCT	-2
ABSORBER RECYCLE	****
** PUMPS	
SERVICE	NUMBER
-------	------
DISSOLVING TANK TO ABSORBER FEED TAN	****
FLYASH PURGE TO POND TRANSFER	****
ABSORBER RECIRCULATION	3
EVAPORATOR-CRYSTALLIZER FEED	****
SLURRY FEED	****
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	CENTRIFUGE
NUMBER	1
*** SALEABLE BYPRODUCTS	
NATURE	ELEMENTAL SULFUR
QUALITY - %	99.9
*** SLUDGE	
** TREATMENT	
METHOD	N/A
DEVICE	N/A
PROPRIETARY PROCESS	N/A
** DISPOSAL	
NATURE	N/A
TYPE	NONE
** WATER BALANCE	
WATER LOOP TYPE	CLOSED
** FGD SPARE CAPACITY INDICES	
ABSORBER - %	0.0
** FGD SPARE COMPONENT INDICES	
ABSORBER	0.0

NORTHERN INDIANA PUB SERVICE: DEAN H. MITCHELL 11 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
11/76	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

FOLLOWING COMPLETION OF CONSTRUCTION IN MID-1976, START-UP OF THE VARIOUS SUBSYSTEMS AND COMPONENT PARTS WAS INITIATED. DURING THE JULY THROUGH NOVEMBER PERIOD, THREE SUSTAINED RUNS OF THE SO2 ABSORBER AND REGENERATION SYSTEM UNDER NORMAL OPERATING CONDITIONS WERE ACHIEVED. SO2 REMOVAL EFFICIENCY WAS EQUAL TO OR GREATER THAN THE 90% PERFORMANCE CRITERIA. THE UNIT 11 BOILER OPERATED 121 FULL DAYS AND 10 PARTIAL DAYS. THE WELLMAN LORD SO2 RECOVERY UNIT OPERATED 71 FULL DAYS AND 23 PARTIAL DAYS. DURING THIS PERIOD, NUMEROUS MODIFICATIONS AND CORRECTIONS TO THE SYSTEM WERE COMPLETED. THESE INCLUDED MODIFYING THE ABSORBER KOCH VALVE TRAYS TO IMPROVE TURNDOWN, RUBBER LINING THE BOTTOM ABSORBER COLLECTOR TRAY, RELOCATING AND IMPROVING TEMPERATURE CONTROL OF THE LOW PRESSURE STEAM SUPPLY, INSTALLING IMPROVED SO2 SAMPLE PROBES AND SEVERAL REPLACEMENTS AND MODIFICATIONS TO THE PURGE SALT RECOVERY AREA. FULLY INTEGRATED OPERATIONS INCLUDING SO2 REDUCTION AND SULFUR RECOVERY OCCURRED IN NOVEMBER, 1976. FROM JANUARY THROUGH MAY 1977, THE UNIT 11 BOILER WAS OUT OF SERVICE FOR ABOUT FIVE MONTHS FOLLOWING A BOILER-RELATED MISHAP WHICH OCCURRED ON JANUARY 15, 1977 DURING START-UP AFTER A SCHEDULED MAINTENANCE TURN AROUND.
ON JUNE 13, 1977 FGD OPERATIONS RESUMED FOLLOWING RETURN TO FULL SERVICE OF THE UNIT 11 BOILER. BY JUNE 15 FULLY INTEGRATED OPERATION OF THE ENTIRE FGD PLANT WAS ACHIEVED. THROUGH JUNE AND JULY, SEVERAL HUNDRED HOURS OF TOTAL SYSTEM OPERATION AT BOTH PARTIAL AND FULL LOAD WERE ACCRUED.

12/76	SYSTEM							744			
1/77	SYSTEM							744			
2/77	SYSTEM							672			
3/77	SYSTEM							744			
4/77	SYSTEM							720			
5/77	SYSTEM							744			
6/77	SYSTEM							720			
7/77	SYSTEM							744			
8/77	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

PERFORMANCE TESTS COMMENCED ON AUGUST 29, 1977 AND WERE SUCCESSFULLY COMPLETED ON SEPTEMBER 14, 1977. THE TEST PERIOD INCLUDED 12 DAYS AT 92 MW FLUE GAS EQUIVALENT AND 3.5 DAYS AT 110 MW FLUE GAS EQUIVALENT. DURING THIS PERIOD, 91% OF THE SO2 WAS REMOVED WHILE BURNING COAL CONTAINING 3% SULFUR AND 204 TONS OF ELEMENTAL SULFUR WERE RECOVERED. ALL PERFORMANCE CRITERIA WERE MET INCLUDING SO2 REMOVAL, PARTICULATE EMISSION, RAW MATERIAL AND UTILITY CONSUMPTIONS AND RECOVERED SULFUR QUALITY. THE FGD UNIT SHUT DOWN SEPTEMBER 19 AND REMAINED IDLE THROUGH SEPTEMBER 30 DUE TO COAL FEED PROBLEMS RESULTING FROM WET COAL.

9/77	SYSTEM							720			
10/77	SYSTEM							744			

NORTHERN INDIANA PUB SERVICE: DEAN H. MITCHELL 11 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
		PERFORMANCE DATA									
	** PROBLEMS/SOLUTIONS/COMMENTS										
		A DEMONSTRATION PERIOD OF ONE YEAR BEGAN SEPTEMBER 16. IN OCTOBER, THE FGD UNIT OPERATED 132 HOURS. OPERATIONS WERE INTERUPTED WHILE HEAT BALANCE TESTS WERE CONDUCTED ON THE BOILER BY NIPSCO AND TRW AND WERE INTERRUPTED FURTHER TO MAKE REPAIRS TO THE SO2 REDUCTION SECTION, THE EVAPORATOR, AND THE UNIT 11 BOILER.									
		NOTE: BEGINNING NOVEMBER 1977, PERIOD HOURS REPORTED BY THE UTILITY WERE GIVEN IN 30 DAY AVERAGES FOR EACH MONTH EXCEPT DECEMBER TO WHICH ADDITIONAL DAYS ARE ADDED TO BRING THE ANNUAL TO 365 DAYS. FOR THE PURPOSES OF THIS REPORT INCREMENTED PERIODS CORRESPOND EXACTLY TO THE APPROPRIATE CALENDAR MONTHS. FOR THIS REASON THE PRINTED UTILIZATION FIGURES WILL NOT BE IDENTICAL TO A FIGURE CALCULATED ON THE BASIS OF THE PRINTED FGD AND PERIOD HOURS.									
11/77	SYSTEM	74.0		72.0	59.0			720		428	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE FGD UNIT OPERATED FOR 18 CONSECUTIVE DAYS, AVERAGING 90% SO2 REMOVAL WITH 285 LONG TONS OF SULFUR RECOVERED. FGD OPERATION WAS INTERRUPTED BY BOILER TUBE LEAK AND RESUMPTION OF FGD OPERATION WAS FURTHER DELAYED BY NECESSARY MAINTENANCE IN THE EVAPORATOR SECTION.									
		THE FLUE GAS ISOLATION DAMPER NEEDED REPAIRS.									
		MAINTENANCE WAS PERFORMED ON THE FLUE GAS BOOSTER BLOWER.									
		THE SO2 REDUCTION SECTION REQUIRED MAINTENANCE DURING NOVEMBER.									
12/77	SYSTEM	49.0			0.0			744		0	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE FLUE GAS BOOSTER BLOWER MALFUNCTIONED CAUSING MAINTENANCE ATTENTION.									
		MAINTENANCE WAS PERFORMED ON THE ABSORBER SOLUTION REGENERATION SECTION.									
		THE FGD SYSTEM WAS NOT OPERATED DURING THIS PERIOD DUE TO ABNORMAL BOILER OPERATING CONDITIONS RELATED TO HIGH SILICA LEVELS IN THE FEED WATER. TH HIGH SILICA LEVELS RESULTED FROM HIGH MAKE-UP WATER REQUIREMENTS DUE IN PART TO A HIGHER THAN NORMAL FGD PLANT USAGE, AS WELL AS A BOILER COAL FEED PROBLEM AND AN ESP MALFUNCTION.									
1/78	SYSTEM	80.0		0.0	0.0			744		0	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE FGD SYSTEM REMAINED DOWN THROUGHOUT JANUARY AS HIGH SILICA LEVELS IN THE UNIT 11 BOILER FEED WATER PERSISTED.									
		MAINTENANCE WAS PERFORMED ON THE ESP.									
		PROBLEMS CONTINUED WITH THE FLUE GAS BOOSTER BLOWER.									
		THE FGD SYSTEM SO2 COMPRESSOR MALFUNCTIONED AND NEEDED MAINTENANCE.									
2/78	SYSTEM	47.0			0.0			672		0	

NORTHERN INDIANA PUB SERVICE: DEAN H. MITCHELL 11 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
		PERFORMANCE DATA									
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE FGD SYSTEM WAS NOT OPERATED DUE TO ABNORMAL BOILER OPERATING CONDITIONS RELATED TO HIGH SILICA LEVELS IN THE BOILER FEED WATER, COUPLED WITH UNIT 11 COAL FEED PROBLEMS, STOP VALVE PROBLEMS, AN ESP MALFUNCTION AND A LEAKING BOILER TUBE.									
		MAINTENANCE WAS PERFORMED ON THE FLUE GAS BOOSTER BLOWER.									
		THE FLUE GAS ISOLATION DAMPER WAS REPAIRED DURING FEBRUARY.									
		THE EVAPORATOR CIRCIRCULATING PUMP NEEDED MAINTENANCE ATTENTION.									
		THE SO2 SUPERHEATER PIPING REPAIRS WERE PERFORMED DURING THE MONTH.									
3/78	SYSTEM	90.0		77.0	30.0			744		215	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE FGD SYSTEM OPERATED FOR TEN DAYS. OPERATION WAS INTERRUPTED BY A SHUTDOWN OF THE UNIT 11 BOILER FOR REPAIR OF COAL GRINDING MILLS AND ESPS. PROPER CONDITIONS COULD NOT BE RE-ESTABLISHED FOR RE-START OF THE FGD OPERATION BECAUSE OF COAL FEED AND GRINDING PROBLEMS CAUSED BY EXTREMELY POOR QUALITY COAL.									
		MAINTENANCE WAS PERFORMED ON THE BOOSTER BLOWER.									
		OPERATING PROBLEMS WERE AGAIN ENCOUNTERED WITH THE FLUE GAS ISOLATION DAMPER.									
4/78	SYSTEM	0.0		0.0	0.0			720		0	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE FLUE GAS BOOSTER BLOWER WAS OUT OF SERVICE FOR THIS ENTIRE PERIOD FOR REBLADING. THE FGD SYSTEM WAS INOPERABLE.									
		A FAILURE OF THE FLUE GAS ISOLATION DAMPER OCCURRED.									
		A NEW SUPPLY OF HIGH SULFUR COAL WAS OBTAINED AND SUCCESSFULLY TESTED ON UNIT 11 BOILER. THIS COAL IS EXPECTED TO ALLEVIATE PAST DIFFICULTIES WIT THE COAL FEED AND GRINDING SYSTEM.									
		MAINTENANCE WAS PERFORMED ON THE BOILER ID FANS.									
		THE FGD ABSORBER REQUIRED MAINTENANCE DURING APRIL.									
5/78	SYSTEM	51.0		50.0	37.0			744		263	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE SO2 RECOVERY PORTION OF THE FGD SYSTEM OPERATED FOR 26 DAYS. THE FGD SYSTEM AS A WHOLE OPERATED FOR 11 DAYS.									
		FGD OPERATIONS WERE INTERRUPTED BY FAILURE OF THE FLUE GAS ISOLATION DAMP ER.									
		FGD OPERATIONS WERE INTERRUPTED BY PROBLEMS WITH WET COAL WHICH REQUIRED THE BOILER TO OPERATE ON LOW SULFUR COAL FOR A SHORT PERIOD.									
		PLUGGING OF AN ENTRAINMENT SEPARATOR IN THE SO2 REDUCTION UNIT CAUSED PROBLEMS DURING MAY.									
6/78	SYSTEM	13.0		1.0	0.0			720		3	

NORTHERN INDIANA PUB SERVICE: DEAN H. MITCHELL 11 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
						THE FGD PROCESS FACILITIES, CONSISTING OF THE ABSORBER, EVAPORATOR, SO2 REDUCTION AND PURGE TREATMENT UNITS, WERE AVAILABLE FOR OPERATION FOR ESSENTIALLY THE ENTIRE PERIOD.					
						OPERATION OF THE FGD SYSTEM WAS LIMITED BY FAILURE OF THE BOOSTER BLOWER DRIVE TURBINE.					
						OPERATION OF THE FGD SYSTEM WAS LIMITED DUE, IN PART, TO THE INABILITY OF THE ISOLATION DAMPER TO OPERATE.					
7/78	SYSTEM	6.0		4.0	2.0			744			17
	** PROBLEMS/SOLUTIONS/COMMENTS										
						OPERATION OF THE FGD SYSTEM WAS LIMITED BY IMBALANCE OF THE BOOSTER BLOWE DUE TO INABILITY OF THE ISOLATION DAMPER TO OPERATE. THIS CONDITION COULD NOT BE CORRECTED UNTIL POWER DEMANDS PERMITTED A SHUT DOWN OF THE UNIT 11 BOILER. FLUE GAS BOOSTER BLOWER PROBLEMS INCLUDED LOW OIL PRESSURE, LEAKING BEARING OIL SEALS AND DRIVE TURBINE GOVERNOR MALFUNCTION.					
						RECURRING FLUCTUATIONS IN THE PRESSURE OF THE MAIN STEAM SUPPLY TO THE FG SYSTEM LIMITED FGD OPERATIONS.					
						THE FGD PROCESS FACILITIES WERE AVAILABLE FOR OPERATION FOR THE ENTIRE PERIOD.					
8/78	SYSTEM	98.0		98.0	98.0			744			707
	** PROBLEMS/SOLUTIONS/COMMENTS										
						THE UNIT 11 BOILER OPERATED CONTINUOUSLY ON HIGH SULFUR COAL THROUGHOUT THE PERIOD. THE FGD SYSTEM ACHIEVED FULL OPERATION ON THE FIRST DAY OF THE PERIOD. AFTER PROBLEMS WITH THE BOOSTER BLOWER WERE CORRECTED, IT REMAINED IN FULL OPERATION FOR THE BALANCE OF THE PERIOD WITH THE EXCEPTION OF ONE TWO-HOUR INTERRUPTION DUE TO AN ELECTRICAL MOTOR MALFUNCTION.					
						MINOR BOOSTER BLOWER PROBLEMS OCCURRED OVER THE PERIOD.					
9/78	SYSTEM	44.0		99.0	44.0			720			319
	** PROBLEMS/SOLUTIONS/COMMENTS										
						THE UNIT 11 BOILER OPERATED ON HIGH SULFUR COAL UNTIL SEPTEMBER 12 WHEN I WAS SHUT DOWN FOR AN ANNUAL OVERHAUL. THE BOILER REMAINED DOWN THROUGH THE END OF THE PERIOD. THE FGD SYSTEM CONTINUED IN FULL OPERATION UNTIL SEPTEMBER 12, WITH THE EXCEPTION OF ONE TWO-HOUR INTERRUPTION, AND WAS THEN SHUT DOWN CURRENTLY WITH THE BOILER.					
						A GOVERNOR MALFUNCTION OCCURRED ON THE SO2 COMPRESSOR DRIVE TURBINE CAUSING A TWO-HOUR OUTAGE ON THE FGD OPERATIONS.					
10/78	SYSTEM	44.0	73.0	73.0	44.0			744	506		369
	** PROBLEMS/SOLUTIONS/COMMENTS										
						THIS PERIOD COVERS SEPTEMBER 29 THROUGH NOVEMBER 2. FOLLOWING THE ANNUAL TURNAROUND, THE UNIT 11 BOILER RESTARTED ON OCTOBER 6. A NEW BASELINE TEST WAS RUN ON THE BOILER OCTOBER 7 THROUGH 12. BALANCING OF THE FLUE GAS BOOSTER BLOWER WAS THEN COMPLETED AFTER WHICH THE FGD SYSTEM WAS STARTED ON OCTOBER 18.					
11/78	SYSTEM	99.0	99.0	99.0	98.0			720	716		709

NORTHERN INDIANA PUB SERVICE: DEAN H. MITCHELL 11 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
		PERFORMANCE DATA									
	** PROBLEMS/SOLUTIONS/COMMENTS										
		PROBLEMS WERE ENCOUNTERED WITH THE SODIUM SULFATE PURGE DRYER WHICH NECESSITATED DISPOSING OF PART OF THE SULFATE PURGE TO THE BOTTOM ASH POND FOR A PORTION OF THE PERIOD.									
		THE UNIT 11 BOILER OPERATED CONTINUOUSLY ON HIGH SULFUR COAL EXCEPT FOR ONE THREE-HOUR OUTAGE FOR REPAIR OF A STEAM CONTROL VALVE. VARIATIONS IN THE PRESSURE OF THE STEAM SUPPLY TO FGD OCCURRED DUE TO HIGH SILICA IN THE BOILER MAKE-UP WATER.									
12/78	SYSTEM	64.0	72.0	72.0	64.0			744	642	462	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE BOILER WAS SHUT DOWN FROM DECEMBER 14 TO 17 TO CLEAN THE AIR PREHEATERS.									
		THE BOILER OPERATED ON HIGH SULFUR COAL DURING DECEMBER.									
		AN INSTRUMENT MALFUNCTION DUE TO FREEZING RESULTED IN THE PLUGGING OF A HEAT EXCHANGER IN THE SO2 REGENERATION UNIT. THE FGD SYSTEM WAS DOWN FOR THREE DAYS WHILE THE HEAT EXCHANGER WAS CLEANED.									
1/79	SYSTEM	90.0	28.0	90.0	28.0			744		198	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE BOILER OPERATED ON HIGH SULFUR COAL FROM JANUARY 2 THROUGH 14 AND LOW SULFUR COAL FROM JANUARY 15 THROUGH 31.									
		INTIGRATED OPERATION OF THE FGD SYSTEM CONTINUED TO JANUARY 10 WHEN THE SO2 REDUCTION UNIT WAS SHUT DOWN FOR REPAIR OF A SULFUR CONDENSER INCLUDING CORRECTIVE MEASURES TO AVOID FUTURE PROBLEMS WITH THE CONDENSER. THE ABSORPTION AND REGENERATION UNITS CONTINUED IN OPERATION TO JANUARY 29 WITH RECYCLE OF SO2 TO THE ABSORBER INLET. THE FGD SYSTEM REMAINED DOWN THROUGH JANUARY 31.									
2/79	SYSTEM	7.0	1.0	1.0	1.0			672	500	5	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE BOILER OPERATED ON LOW SULFUR COAL FEBRUARY 1 THROUGH 12 AND HIGH SULFUR COAL FEBRUARY 13 THROUGH MARCH 2. THE FGD SYSTEM REMAINED DOWN THROUGH FEBRUARY 22 FOR COMPLETION OF SULFUR CONDENSER REPAIRS FOLLOWED BY REPAIR OF EXPANSION JOINT LEAKS.									
		A POWER INTERRUPTION ON FEBRUARY 24 RESULTED IN LOSS OF SEAL WATER TO THE EVAPORATOR PUMP AND PACKING FAILURE. THE FGD SYSTEM REMAINED DOWN THROUGH MARCH 2.									
3/79	SYSTEM	47.0	43.0	44.0	43.0			744	716	308	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE BOILER OPERATED ON HIGH SULFUR COAL DURING THE MONTH.									
		THE FGD SYSTEM WAS SHUT DOWN DUE TO HIGH LEAKING IN THE EVAPORATOR CIRCULATING PUMP PACKING GLAND. THE PUMP SHAFT SLEEVE WAS REPLACED AND THE PUMP REALIGNED. THE SYSTEM WAS DOWN FOR ABOUT 16 DAYS.									
4/79	SYSTEM	73.0	73.0	73.0	73.0			720	722	527	

NORTHERN INDIANA PUB SERVICE: DEAN H. MITCHELL 11 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
		FGD OUTAGES IN THE EVAPORATOR SYSTEM RESULTED FROM HIGH VIBRATION IN THE CIRCULATING PUMP, PARTIAL PLUGGING OF THE HEATER TUBES AND A LEAK IN THE SO2 SUPERHEATER. FGD OUTAGES IN THE SO2 REDUCTION SYSTEM RESULTED FROM PLUGGING OF THE TAIL GAS LINE AND MALFUNCTION OF THE INCINERATOR COMBUSTION CONTROLS.									
5/79	SYSTEM	86.0	74.0	76.0	69.0			744	674	499	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		FGD OUTAGES IN THE EVAPORATOR SYSTEM RESULTED FROM A CONTINUATION OF THE CIRCULATING PUMP VIBRATION AND THE SO2 SUPERHEATER GASKET LEAK.									
		BOILER OUTAGES WERE REQUIRED FOR REPAIR OF A BOILER STEAM TUBE LEAK AND FOR REPAIR OF A STEAM STOP VALVE.									
6/79	SYSTEM	91.0	75.0	80.0	63.0			720	607	455	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UNIT 11 BOILER OPERATED PART OF THE PERIOD ON HIGH SULFUR COAL AND PART ON A MIXTURE OF HIGH AND MEDIUM SULFUR COALS.									
		AN OUTAGE WAS REQUIRED FOR REPAIR OF A REHEAT STOP VALVE AND THE OPERATING RATE WAS LIMITED DUE TO AN ID FAN BEARING PROBLEM AND A FD FAN FAILURE. LOW MAIN STEAM PRESSURE AND LOW SO2 IN THE FLUE GAS CAUSED FGD OUTAGES. FGD OUTAGES ALSO RESULTED FROM A FLUE LEAK, A PLUGGED WATER VALVE AND REPAIR OF AN EXPANSION JOINT.									
7/79	SYSTEM	90.0	80.0	82.0	79.0			744	673	538	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		UNIT 11 BOILER OPERATED ON HIGH SULFUR COAL. OUTAGES OCCURRED FOR REPACKING OF THE STEAM PRESSURE REGULATOR VALVE WHICH SUPPLIES FGD AND AN ELECTRICAL GROUND SPECIAL TESTING OF THE UNIT 11 FGD SYSTEM WAS CONDUCTED BY TRW FOR EPA FROM JULY 1 THROUGH 28 WHICH REQUIRED THAT THE BOILER RATE BE VARIED AND THAT THE SO2 REDUCTION UNIT BE DOWN FOR A PORTION OF THE PERIOD IN ADDITION TO THE FGD OUTAGE REQUIRED BY THE TRW TESTING, FGD OUTAGES RESULTED FROM INSPECTION OF THE BOOSTER BLOWER SPEED REDUCER AND HIGH FLOW RESISTANCE IN THE SO2 REDUCTION UNIT.									
8/79	SYSTEM	96.0	80.0	80.0	60.0			720	536	429	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING AUGUST THE UNIT 11 BOILER OPERATED ON HIGH SULFUR COAL. BOILER OUTAGES OCCURRED DUE TO FAILURE OF AN ELECTRICAL BUSS BREAKER AND WATER HAMMER IN A TURBINE REHEAT LINE.									
		THE FGD SYSTEM OUTAGES DURING AUGUST RESULTED FROM LOW OIL PRESSURE IN THE BOOSTER BLOWER LUBE SYSTEM AND HIGH FLOW RESISTANCE IN THE SO2 REDUCTION UNIT.									
9/79	SYSTEM	91.0	75.0	75.0	73.0			720	697	523	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING THE MONTH OF SEPTEMBER THE UNIT 11 BOILER OPERATED ON HIGH SULFUR COAL. BOILER OUTAGES OCCURRED DUE TO AN ELECTRICAL SYSTEM MALFUNCTION AND A STEAM LEAK.									

NORTHERN INDIANA PUB SERVICE: DEAN H. MITCHELL 11 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
		FGD OUTAGES DURING SEPTEMBER RESULTED FROM INSTRUMENT AND DRIVE TURBINE GOVERNOR PROBLEMS WITH THE BOOSTER BLOWER, A LEAK IN THE SO2 SUPERHEATER AND AN INTERRUPTION IN THE INSTRUMENT AIR SUPPLY TO THE SYSTEM.									
10/79	SYSTEM	81.0	72.0	72.0	71.0			744	594	428	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE BOILER OPERATED ON HIGH SULFUR COAL UNTIL OCTOBER 22 WHEN THE UNIT SHUTDOWN DUE TO A TURBINE BLADE FAILURE. IT WAS DECIDED TO START THE ANNUAL TURNAROUND AT THAT TIME.									
		FGD SYSTEM OUTAGES WERE REQUIRED FOR REPAIR OF THE BOOSTER BLOWER DRIVE GOVERNOR, AN ORFICE CONTACTOR CONTROL VALVE AND A GAS LEAK IN THE SO2 REDUCTION UNIT.									
11/79	SYSTEM	0.0			0.0			720	0	0	0.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE BOILER AND FGD SYSTEM ANNUAL TURNAROUND WAS IN PROGRESS THROUGHOUT THE PERIOD. THE FGD SYSTEM WAS UNAVAILABLE THE ENTIRE PERIOD.									
12/79	SYSTEM	0.0			0.0			744	0	0	0.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE TURNAROUND ON UNIT 11 WAS COMPLETED ON DECEMBER 14, HOWEVER, THE STEAM SUPPLY TO THE REGENERATION FACILITY WAS NOT AVAILABLE IN DECEMBER. THE FGD SYSTEM DID NOT OPERATE THE ENTIRE MONTH.									
1/80	SYSTEM	17.3			0.0			744	0	0	0.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE STEAM SUPPLY TO THE REGENERATION FACILITY WAS MADE AVAILABLE ON JANUARY 15. THE FGD SYSTEM WAS OPERATIONAL ON JANUARY 22 AFTER THE OVERHAUL OF THE BOOSTER BLOWER DRIVE WAS COMPLETED.									
		THE REGENERATION FACILITY WAS FORCED OUT SEVERAL TIMES DUE TO PROBLEMS WITH THE CONDENSATE RETURN.									
2/80	SYSTEM	46.3	27.0	26.5	23.3			696	600	162	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE BOILER WAS SHUT DOWN ON FEBRUARY 27 DUE TO A HYDROGEN LEAK.									
		THE FGD SYSTEM WAS FORCED OUT DUE TO CONTINUED PROBLEMS WITH THE CONDENSAT RETURN. GAS LEAKS IN THE FLUE AND VESSEL SHELL IN THE SO2 REDUCTION UNIT ALSO CAUSED THE SYSTEM TO GO DOWN.									
3/80	SYSTEM	75.4	20.4	24.9	14.5			744	529	108	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE BOILER WAS OPERATIONAL ON MARCH 1 AFTER THE HYDROGEN LEAKS WERE REPAIRED. THE BOILER WAS DOWN FROM MARCH 18 TO 23 SO THAT THE TURBINE STOP VALVES COULD BE PULLED AND THE HYDROGEN SEALS COULD BE INSPECTED.									
		THE FGD SYSTEM WAS FORCED OUT OF SERVICE WHEN A COMPRESSOR FAILED AND AGAIN LATER AFTER AN INSTRUMENT MALFUNCTION. THERE WAS A COMPLETE POWER IN THE FGD AREA WHICH FORCED THE SYSTEM DOWN FROM MARCH 26 THROUGH 27.									
4/80	SYSTEM	63.3	52.6	53.4	50.3			720	702	362	

NORTHERN INDIANA PUB SERVICE: DEAN H. MITCHELL 11 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
		FGD SYSTEM OPERATIONS DURING APRIL WERE INTERRUPTED BY SULFUR ACCUMULATION AND BLOCKAGE IN THE CLAUS CONVERTER UNIT.									
5/80	SYSTEM	62.8	23.5	26.4	15.5			744	490	115	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE FGD SYSTEM REGENERATION FACILITY EXPERIENCED A DRIVE MOTOR FAILURE ON THE EVAPORATOR CIRCULATING PUMP DURING MAY.									
6/80	SYSTEM	53.3	0.0	0.0	0.0			720	211	0	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE BOILER WAS OFF LINE MOST OF JUNE DUE TO LOW SYSTEM POWER DEMAND.									
		THE AVAILABILITY OF THE FGD SYSTEM WAS LIMITED BY PROBLEMS WITH THE BOOSTER BLOWER DRIVE AND LOOSENING OF A SUPPORT BEAM IN THE ABSORBER.									
7/80	SYSTEM	100.0	0.0		0.0			744	331	0	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE BOILER OPERATED ON LOW SULFUR COAL DURING JULY. THE BOILER WAS OFF LINE FOR APPROXIMATELY 17 DAYS DUE TO LOW SYSTEM POWER DEMAND.									
8/80	SYSTEM	83.9	65.6	65.6	31.0			744	352	231	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		FROM AUGUST 1 TO AUGUST 13 THE BOILER FIRED LOW SULFUR COAL OR WAS OPERATED AT LOW LOAD. FGD SYSTEM OPERATION WAS NOT NECESSARY DURING THIS TIME.									
		FROM AUGUST 14 TO AUGUST 31, HIGH SULFUR COAL WAS FIRED MAKING FGD SYSTEM OPERATION NECESSARY. PROBLEMS WITH THE BOOSTER BLOWER WERE ENCOUNTERED WHEN THE UTILITY ATTEMPTED TO BRING THE SYSTEM ON LINE. THE BLOWER EXPERIENCED LOW OIL PRESSURE CAUSING THE SYSTEM NOT TO BE OPERABLE UNTIL AUGUST 19.									
9/80	SYSTEM	68.6	53.1	53.1	45.1			720	612	325	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE BOOSTER BLOWER BEARING AND GOVERNOR REPAIRS ACCOUNTED FOR SOME OUTAGE TIME DURING SEPTEMBER.									
		THE SULFUR CONDENSERS IN THE SO2 REDUCTION UNIT WERE AN ADDITIONAL PROBLEM DURING SEPTEMBER.									
10/80	SYSTEM	97.0	90.1	90.1	75.0			744	616	555	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING OCTOBER A PROBLEM WAS ENCOUNTERED WITH A LEVEL INDICATOR ON THE FGD SYSTEM EVAPORATOR CAUSING 25 HOURS OF OUTAGE TIME.									
11/80	SYSTEM	100.0	93.9	93.9	86.2			720	661		

NORTHERN INDIANA PUB SERVICE: DEAN H. MITCHELL 11 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
		PERFORMANCE DATA									
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING NOVEMBER THE UTILITY REPORTED NO MAJOR PROBLEMS WERE ENCOUNTERED WITH THE FGD SYSTEM.									
12/80	SYSTEM	92.5	62.6	62.6	50.1			744	596	373	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE FGD SYSTEM WAS FORCED OUT OF SERVICE DUE TO A HIGH PRESSURE DROP IN THE SO2 REDUCTION CLAUS UNIT AND PROBLEMS WITH THE INCINERATOR INSTRUMENT.									
		DURING DECEMBER THE BOILER WAS OUT OF SERVICE FOR APPROXIMATELY 148 HOURS DUE TO CHANGE OVER TO LOW SULFUR COAL.									
1/81	SYSTEM	100.0	0.0		0.0			744	602	0	
2/81	SYSTEM	100.0	0.0		0.0			672		0	
3/81	SYSTEM	100.0	0.0		0.0			744		0	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE FGD SYSTEM WAS NOT CALLED UPON TO OPERATE DURING THE FIRST QUARTER 198 DUE TO THE BOILER OPERATING ON LOW SULFUR COAL. HOWEVER, THE FGD SYSTEM WAS AVAILABLE THROUGHOUT THE PERIOD.									
4/81	SYSTEM	100.0	0.0		0.0			720		0	
5/81	SYSTEM	100.0	0.0		0.0			744		0	
6/81	SYSTEM	100.0	0.0		0.0			720		0	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE FGD SYSTEM WAS NOT CALLED UPON TO OPERATE DURING THE SECOND QUARTER 1981 DUE TO THE BOILER OPERATING ON LOW SULFUR COAL. HOWEVER, THE FGD SYSTEM WAS AVAILABLE THROUGHOUT THE PERIOD.									
7/81	SYSTEM	100.0	0.0		0.0			744		0	
8/81	SYSTEM	100.0	0.0		0.0			744		0	
9/81	SYSTEM	100.0	0.0		0.0			720		0	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE D. H. MITCHELL FGD SYSTEM REMAINED INACTIVE DURING THE THIRD QUARTER 1981 AS LOW SULFUR COAL CONTINUED TO BE UTILIZED IN THE BOILER. CURRENTLY, THE UTILITY IS PERFORMING AN ECONOMIC AND PERFORMANCE EVALUATION OF UTILIZING LOW SULFUR COAL ON A REGULAR BASIS.									
10/81	SYSTEM	100.0	0.0		0.0			744		0	
11/81	SYSTEM	100.0	0.0		0.0			720		0	
12/81	SYSTEM	100.0	0.0		0.0			744		0	
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE UTILITY CONTINUED TO FIRE LOW SULFUR COAL MAKING OPERATION OF THE FGD SYSTEM UNNECESSARY DURING THE FOURTH QUARTER 1981.									
1/82	SYSTEM	100.0	0.0		0.0			744		0	

NORTHERN INDIANA PUB SERVICE: DEAN H. MITCHELL 11 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
		PERFORMANCE DATA									
2/82	SYSTEM	100.0	0.0		0.0			672		0	
3/82	SYSTEM	100.0	0.0		0.0			744		0	

** PROBLEMS/SOLUTIONS/COMMENTS

THE USE OF LOW SULFUR COAL DURING THE FIRST QUARTER 1982 MADE OPERATION OF THE FGD SYSTEM UNNECESSARY.

APPENDIX F
DESIGN AND PERFORMANCE DATA FOR DISCONTINUED DOMESTIC FGD SYSTEMS

COMPANY NAME	PACIFIC POWER & LIGHT	
PLANT NAME	JIM BRIDGER	
UNIT NUMBER	2A	
CITY	ROCK SPRINGS	
STATE	WYOMING	
REGULATORY CLASSIFICATION	B	
PARTICULATE EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	129.	(0.300 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	*****	
GROSS UNIT GENERATING CAPACITY - MW	550	
NET UNIT GENERATING CAPACITY W/FGD - MW	*****	
NET UNIT GENERATING CAPACITY WO/FGD - MW	509	
EQUIVALENT SCRUBBED CAPACITY - MW	100	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	COMBUSTION ENGINEERING	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	1283.57	(2720000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	*******	(**** F)
STACK HEIGHT - M	152.	(500 FT)
STACK SHELL	****	
STACK TOP DIAMETER - M	*******	(***** FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	SUBBITUMINOUS	
AVERAGE HEAT CONTENT - J/G	22330.	(9600 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		****
AVERAGE ASH CONTENT - %	11.00	
RANGE ASH CONTENT - %	5.0-16.0	
AVERAGE MOISTURE CONTENT - %	17.00	
RANGE MOISTURE CONTENT - %	12.0-24.0	
AVERAGE SULFUR CONTENT - %	0.56	
RANGE SULFUR CONTENT - %	0.2-0.9	
AVERAGE CHLORIDE CONTENT - %	********	
RANGE CHLORIDE CONTENT - %	****	
*** PARTICLE CONTROL		
** ESP		
NUMBER	1	
** PARTICLE SCRUBBER		
NUMBER	0	
GENERIC TYPE	NONE	
SPECIFIC TYPE	N/A	
TRADE NAME/COMMON NAME	N/A	
*** FGD SYSTEM		
** GENERAL DATA		
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT	
SO2 REMOVAL MODE	SPRAY DRYING	
PROCESS TYPE	LIME/SODIUM CARBONATE	
SYSTEM SUPPLIER	FLAKT	
A-E FIRM	FLAKT & PACIFIC POWER & LIGHT	
DEVELOPMENT LEVEL	DEMONSTRATION	
NEW/RETROFIT	RETROFIT	
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.30	
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	86.00	
CURRENT STATUS	8	
TERMINATION	1/1983	
INITIAL START-UP	1/1982	
CONTRACT AWARDED	12/1980	

PACIFIC POWER & LIGHT: JIM BRIDGER 2A (CONT.)

** DESIGN AND OPERATING PARAMETERS	
DESIGN CHLORIDE CONTENT - %	********
** QUENCHER/PRESATURATOR	
CONSTRUCTION MATERIAL GENERIC TYPE	NA
CONSTRUCTION MATERIAL SPECIFIC TYPE	NA
** ABSORBER	
NUMBER	1
GENERIC TYPE	SPRAY DRYER
SPECIFIC TYPE	NA
TRADE NAME/COMMON TYPE	HYDRAULIC PRESSURE NOZZLE
DIMENSIONS - FT	36 FT DIAMETER
SHELL GENERIC MATERIAL	NA
SHELL SPECIFIC MATERIAL	NA
SHELL MATERIAL TRADE NAME/COMMON TYPE	NA
LINER GENERIC MATERIAL	NA
LINER SPECIFIC MATERIAL	NA
LINER MATERIAL TRADE NAME/COMMON TYPE	NA
INLET GAS TEMPERATURE - C	121.1 (250 F)
SO2 REMOVAL EFFICIENCY - %	86.0
PARTICLE REMOVAL EFFICENCY - %	99.3
** MIST ELIMINATOR	
PRE-MIST ELIMINATOR/MIST ELIMINATOR	NA
GENERIC TYPE	NA
SPECIFIC TYPE	NA
TRADE NAME/COMMON TYPE	NA
CONSTRUCTION MATERIAL GENERIC TYPE	NA
CONSTRUCTION MATERIAL SPECIFIC TYPE	NA
** REHEATER	
GENERIC TYPE	NA
SPECIFIC TYPE	NA
TRADE NAME/COMMON TYPE	NA
CONSTRUCTION MATERIAL GENERIC TYPE	NA
CONSTRUCTION MATERIAL SPECIFIC TYPE	NA
** DAMPERS	
FUNCTION	NA
GENERIC TYPE	NA
SPECIFIC TYPE	NA
CONSTRUCTION MATERIAL GENERIC TYPE	NA
CONSTRUCTION MATERIAL SPECIFIC TYPE	NA
LINER GENERIC MATERIAL TYPE	NA
LINER SPECIFIC MATERIAL TYPE	NA
** DUCTWORK	
SHELL GENERIC MATERIAL TYPE	NA
SHELL SPECIFIC MATERIAL TYPE	NA
LINER GENERIC MATERIAL TYPE	NA
LINER SPECIFIC MATERIAL TYPE	NA
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	NONE
*** SLUDGE	
** TREATMENT	
METHOD	NA
DEVICE	NA
PROPRIETARY PROCESS	NA
** DISPOSAL	
NATURE	FINAL
TYPE	LANDFILL

PACIFIC POWER & LIGHT: JIM BRIDGER 2A (CONT.)

** WATER BALANCE
WATER LOOP TYPE CLOSED

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
1/82	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM COMMENCED INITIAL OPERATIONS IN JANUARY 1982.

2/82	SYSTEM							672			
3/82	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE FIRST QUARTER, THE SYSTEM WAS IN THE INITIAL DEBUGGING PHASE OF OPERATION.

4/82	SYSTEM							720			
5/82	SYSTEM							744			
6/82	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

INFORMATION FOR THE SECOND QUARTER IS NOT AVAILABLE AT THIS TIME.

7/82	SYSTEM							744			
8/82	SYSTEM							744			
9/82	SYSTEM							720			
10/82	SYSTEM							744			
11/82	SYSTEM							720			
12/82	SYSTEM							744			
1/83	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS SHUT DOWN DURING JANUARY 1983 DUE TO PROBLEMS WITH THE ASH REMOVAL SYSTEM AND ALSO DUE TO THE UTILITY OBTAINING A DISCHARGE PERMIT. THE UTILITY HAD BEEN STUDYING DRY SCRUBBING SYSTEMS BECAUSE OF ZERO DISCHARGE REGULATIONS. AS A RESULT OF THE PERMIT, THEY HAVE OPTED FO A WET SCRUBBER ON THE PLANNED BRIDGER FGD SYSTEMS.

APPENDIX F
DESIGN AND PERFORMANCE DATA FOR DISCONTINUED DOMESTIC FGD SYSTEMS

COMPANY NAME	PHILADELPHIA ELECTRIC	
PLANT NAME	EDDYSTONE	
UNIT NUMBER	1A	
CITY	EDDYSTONE	
STATE	PENNSYLVANIA	
REGULATORY CLASSIFICATION	C	
PARTICULATE EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	1395	
GROSS UNIT GENERATING CAPACITY - MW	120	
NET UNIT GENERATING CAPACITY W/FGD - MW	120	
NET UNIT GENERATING CAPACITY WO/FGD - MW	*****	
EQUIVALENT SCRUBBED CAPACITY - MW	120	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	COMBUSTION ENGINEERING	
BOILER TYPE	****	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	437.45	(927000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	157.2	(315 F)
STACK HEIGHT - M	76.	(249 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	5.6	(18.5 FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	BITUMINOUS	
AVERAGE HEAT CONTENT - J/G	31634.	(13600 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		****
AVERAGE ASH CONTENT - %	9.40	
RANGE ASH CONTENT - %	****	
AVERAGE MOISTURE CONTENT - %	5.90	
RANGE MOISTURE CONTENT - %	****	
AVERAGE SULFUR CONTENT - %	2.60	
RANGE SULFUR CONTENT - %	****	
AVERAGE CHLORIDE CONTENT - %	********	
RANGE CHLORIDE CONTENT - %	****	
*** PARTICLE CONTROL		
** MECHANICAL COLLECTOR		
NUMBER	1	
** ESP		
NUMBER	1	
** PARTICLE SCRUBBER		
NUMBER	2	
INITIAL START-UP DATE	9/1975	
GENERIC TYPE	VENTURI TOWER	
SPECIFIC TYPE	VARIABLE-THROAT/VERTICALLY-ADJUSTABLE ROD DECKS	
TRADE NAME/COMMON NAME	ROD SCRUBBER	
SUPPLIER	ENVIRONEERING	
DIMENSIONS - FT	14.0 X 25.0 X 53.0	
SHELL GENERIC MATERIAL	STAINLESS STEEL	
SHELL SPECIFIC MATERIAL	AUSTENITIC	
LINER GENERIC MATERIAL	NONE	
LINER SPECIFIC MATERIAL	N/A	
GAS CONTACTING DEVICE TYPE	NONE	
NUMBER OF CONTACTING ZONES	1	
L/G RATIO - LITER/CU.M	0.6	(4.8 GAL/1000ACF)
PRESSURE DROP - KPA	0.0	(0.1 IN-H2O)
INLET GAS FLOW RATE - CU.M/S	145.8	(309000 ACFM)
INLET GAS TEMPERATURE - C	157.2	(315 F)
** PARTICLE SCRUBBER		
NUMBER	1	
INITIAL START-UP DATE	9/1975	

PHILADELPHIA ELECTRIC: EDDYSTONE 1A (CONT.)

GENERIC TYPE	VENTURI TOWER	
SPECIFIC TYPE	VARIABLE-THROAT/ADJUSTABLE DRUM	
TRADE NAME/COMMON NAME	RADIAL FLOW VENTURI	
SUPPLIER	PEABODY-LURGI	
DIMENSIONS - FT	14.0 X 25.0 X 53.0	
SHELL GENERIC MATERIAL	STAINLESS STEEL	
SHELL SPECIFIC MATERIAL	AUSTENITIC	
LINER GENERIC MATERIAL	NONE	
LINER SPECIFIC MATERIAL	N/A	
GAS CONTACTING DEVICE TYPE	NONE	
NUMBER OF CONTACTING ZONES	1	
L/G RATIO - LITER/CU.M	0.6	(4.8 GAL/1000ACF)
PRESSURE DROP - KPA	0.0	(0.1 IN-H2O)
INLET GAS FLOW RATE - CU.M/S	145.8	(309000 ACFM)
INLET GAS TEMPERATURE - C	157.2	(315 F)

*** FGD SYSTEM

** GENERAL DATA

SALEABLE PRODUCT/THROWAWAY PRODUCT	SALEABLE PRODUCT
SO2 REMOVAL MODE	WET SCRUBBING
PROCESS TYPE	MAGNESIUM OXIDE
PROCESS ADDITIVES	NONE
SYSTEM SUPPLIER	UNITED ENGINEERS
A-E FIRM	UNITED ENGINEERS & CONSTRUCTORS
DEVELOPMENT LEVEL	DEMONSTRATION
NEW/RETROFIT	RETROFIT
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.00
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	90.00
CURRENT STATUS	8
TERMINATION	12/1979
COMMERCIAL START-UP	9/1975
INITIAL START-UP	9/1975
CONTRACT AWARDED	0/1973

** DESIGN AND OPERATING PARAMETERS

DESIGN CHLORIDE CONTENT - %	********

** QUENCHER/PRESATURATOR

CONSTRUCTION MATERIAL GENERIC TYPE	NR
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR

** ABSORBER

NUMBER	1	
GENERIC TYPE	PACKED TOWER	
SPECIFIC TYPE	GRID PACKING	
TRADE NAME/COMMON TYPE	N/A	
SUPPLIER	ENVIRONEERING, RILEY STOKER	
DIMENSIONS - FT	14.0 X 25.0 53.0	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	HIGH STRENGTH LOW ALLOY 'HSLA!	
SHELL MATERIAL TRADE NAME/COMMON TYPE	COR-TEN	
LINER GENERIC MATERIAL	ORGANIC	
LINER SPECIFIC MATERIAL	EPOXY	
LINER MATERIAL TRADE NAME/COMMON TYPE	FLAKELINE E	
GAS CONTACTING DEVICE TYPE	ROD DECKS	
NUMBER OF CONTACTING ZONES	2	
LIQUID RECIRCULATION RATE - LITER/S	843.	(13384 GPM)
L/G RATIO - L/CU.M	6.5	(48.5 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	2.5	(10.0 IN-H2O)
INLET GAS FLOW - CU. M/S	126.47	(268000 ACFM)
INLET GAS TEMPERATURE - C	51.7	(125 F)

** MIST ELIMINATOR

PRE-MIST ELIMINATOR/MIST ELIMINATOR	PRIMARY COLLECTOR
GENERIC TYPE	IMPINGEMENT
SPECIFIC TYPE	BAFFLE
TRADE NAME/COMMON TYPE	CLOSED VANE
CONFIGURATION	VERTICAL
NUMBER OF STAGES	2
NUMBER OF PASSES PER STAGE	2

PHILADELPHIA ELECTRIC: EDDYSTONE 1A (CONT.)

FREEBOARD DISTANCE - M	2.44	(8.0 FT)
CONSTRUCTION MATERIAL GENERIC TYPE	ORGANIC	
CONSTRUCTION MATERIAL SPECIFIC TYPE	FIBER-REINFORCED POLYESTER	
WASH WATER SOURCE	FRESH	
WASH FREQUENCY	INTERMITTENT	
** REHEATER		
NUMBER	1	
GENERIC TYPE	DIRECT COMBUSTION	
SPECIFIC TYPE	IN-LINE BURNER	
TRADE NAME/COMMON TYPE	OIL	
TEMPERATURE INCREASE - C	57.2	(103 F)
INLET FLUE GAS TEMPERATURE - C	51.7	(125 F)
CONSTRUCTION MATERIAL GENERIC TYPE	NR	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR	
** FANS		
NUMBER	3	
DESIGN	CENTRIFUGAL	
SUPPLIER	BUFFALO FORGE	
FUNCTION	UNIT	
APPLICATION	INDUCED DRAFT	
SERVICE	DRY	
FLUE GAS FLOW RATE - CU.M/S	126.47	(268000 ACFM)
FLUE GAS TEMPERATURE - C	107.2	(225 F)
CONSTRUCTION MATERIAL GENERIC TYPE	NR	
** DAMPERS		
FUNCTION	NR	
GENERIC TYPE	NR	
SPECIFIC TYPE	NR	
CONSTRUCTION MATERIAL GENERIC TYPE	NR	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR	
LINER GENERIC MATERIAL TYPE	NR	
LINER SPECIFIC MATERIAL TYPE	NR	
** DUCTWORK		
LOCATION	SCRUBBER INLET	
SHELL GENERIC MATERIAL TYPE	STAINLESS STEEL	
SHELL SPECIFIC MATERIAL TYPE	AUSTENITIC	
LINER GENERIC MATERIAL TYPE	NONE	
LINER SPECIFIC MATERIAL TYPE	N/A	
** DUCTWORK		
LOCATION	SCRUBBER OUTLET	
SHELL GENERIC MATERIAL TYPE	STAINLESS STEEL	
SHELL SPECIFIC MATERIAL TYPE	AUSTENITIC	
LINER GENERIC MATERIAL TYPE	NONE	
LINER SPECIFIC MATERIAL TYPE	N/A	
** REAGENT PREPARATION EQUIPMENT		
FUNCTION	SLAKER	
DEVICE	NR	
DEVICE TYPE	NR	

** PUMPS	
SERVICE	NUMBER
-------	------
ABSORBER RECIRCULATION	2

** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	THICKENER
NUMBER	1
DIMENSIONS - FT	40.0 DIA
OUTLET STREAM CHARACTERISTICS	25% SOLIDS
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	CENTRIFUGE
NUMBER	1

PHILADELPHIA ELECTRIC: EDDYSTONE 1A (CONT.)

*** SLUDGE

** TREATMENT

METHOD	DEWATERED	
DEVICE	N/A	
PROPRIETARY PROCESS	N/A	

** DISPOSAL

NATURE	N/A	
TYPE	NONE	
SITE TREATMENT	N/A	

** WATER BALANCE

WATER LOOP TYPE	OPEN	
MAKEUP WATER ADDITION - LITERS/S	8.3	(132 GPM)

** FGD SPARE CAPACITY INDICES

ABSORBER - %	0.0

** FGD SPARE COMPONENT INDICES

ABSORBER	0.0

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
11/74	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

THE SCRUBBING SYSTEM AT THIS PLANT CONSISTS OF THREE PARALLEL SCRUBBING TRAINS INCORPORATING THREE WET PARTICULATE SCRUBBERS AND ONE SO2 ABSORBER MODULE. THERE WAS A BRIEF OPERATING PERIOD ON THE PARTICULATE SCRUBBERS FROM MID-NOVEMBER 1974 TO MARCH 1975. PROBLEMS ENCOUNTERED CENTERED AROUN THE SCRUBBER BOOSTER FANS AND THE FLUE GAS AND LIQUID CONDITIONS. THE B-SIDE BOOSTER FAN DEVELOPED HIGH SHAFT VIBRATION WHEN STARTED FOR THE FIRST TIME. THIS PROBLEM WAS DESIGN-RELATED, INVOLVING AN EXCESSIVE CLEAR ANCE AREA BETWEEN THE SHAFT AND WHEELHUB. ALSO, EXTENSIVE CORROSION DEVELOPED IN THE C-SIDE PARTICLE SCRUBBER INTERNALS. THIS WAS CAUSED BY LOW SCRUBBING SOLUTION PH LEVELS AND CHLORIDE LEVELS AS HIGH AS 2000 PPM. THESE CONDITIONS COUPLED WITH THE THERMAL SHOCK OF A HOT START PROCEDURE CAUSED THE CORROSION. THIS PROBLEM WAS AMELIORATED BY CAUSTIC ADDITION, HIGHER BLOWDOWN AND EMPLOYING A COLD START PROCEDURE. AT APPROXIMATELY THIS TIME, A CHECKOUT OF THE SO2 SYSTEM WAS CONDUCTED. BLISTERING AND PEELING OF THE POLYURETHANE COATINGS WERE DETECTED AND CORRECTED BY RECOATING WITH FLAKEGLASS.

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			

PHILADELPHIA ELECTRIC: EDDYSTONE 1A (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
				PERFORMANCE DATA							
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE C-SIDE PARTICULATE SCRUBBER RESTARTED ON JULY 23, 1975. THE TWO OTHER TRAINS, B-SIDE AND A-SIDE, WERE PUT INTO OPERATION ON AUGUST 15 AND OCTOBER 2, RESPECTIVELY. THE SO2 ABSORBER MODULE IN THE C-SIDE SCRUBBING TRAIN WAS INITIALLY PLACED IN SERVICE OCTOBER 2, 1975. THE OLIN CHEMICAL MGO REGENERATION FACILITY FIRST PROCESSED MAGNESIUM SULFITE FROM THE EDDY STONE SCRUBBER ON OCTOBER 28, 1975. THE C-SIDE PARTICULATE SCRUBBER OPERA TED A TOTAL OF 2831 HOURS THROUGH JANUARY 31, 1976, FOR AN OPERABILITY OF 70%. THE B-SIDE TRAIN HAS OPERATED A TOTAL OF 1933 HOURS THROUGH JANUARY 31, 1976 FOR AN OPERABILITY OF 55%. THE A-SIDE TRAIN OPERA- TED A TOTAL OF 626 HOURS THROUGH JANUARY 31, 1976, FOR AN OPERABILITY OF 24%. THE C-SIDE SO2 ABSORBER WAS IN SERVICE A TOTAL OF 556 HOURS THROUGH DECEMBER 31, 1975, WITH AN OPERABILITY OF 33% SINCE START UP. PROBLEMS ENCOUNTERED IN THE OPERATION OF THE THREE SCRUBBING TRAINS INCLUDED UNDER-DESIGNED RECIRCULATION PUMPS, MALFUNCTION OF THE FLUE GAS BY-PASS DAMPER DRIVE UNITS AND FAILURE OF THE DOUBLE-BRICK REFRACTORY LINING IN THE REHEAT COMBUSTION CHAMBER.							
8/75	SYSTEM							744			
9/75	SYSTEM							720			
10/75	SYSTEM							744			
11/75	SYSTEM							720			
12/75	SYSTEM							744			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		OPERATION OF THE SO2 SCRUBBING SYSTEM AT EDDYSTONE WAS TEMPORARILY HALTED BECAUSE THE ACID PLANT REGENERATION FACILITY AT THE OLIN CHEMICAL SULFURI ACID PLANT IN PAULSBORO, NEW JERSEY PERMANENTLY CEASED OPERATIONS. THE UTILITY WAS INVESTIGATING ALTERNATIVE REGENERATION SITES. A MINIMUM PERIOD OF SIX MONTHS WAS REQUIRED FOR RELOCATION ONCE A CHOICE WAS MADE. THE UTILITY ANNOUNCED PLANS FOR RELOCATION OF THE REGENERATION FACILITY A THE ESSEX CHEMICAL PLANT IN NEWARK, NEW JERSEY.										
		THE PARTICULATE SCRUBBERS WERE CONTINUING TO OPERATE AND THESE UNITS WEREARE CONTINUING TO EXPERIENCE PROBLEMS WITH THE FANS, REHEAT BURNERS, DAMPERS AND EXPANSION JOINTS.									
1/76	SYSTEM							744			
2/76	SYSTEM							696			
3/76	SYSTEM							744			
4/76	SYSTEM							720			
5/76	SYSTEM							744			
6/76	SYSTEM							720			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		RESUMPTION OF SO2 SCRUBBING OPERATIONS WAS SCHEDULED FOR DECEMBER 1976. THE RELOCATION OF THE REGENERATION FACILITY WAS IN PROGRESS. THE PARTICULATE SCRUBBERS WERE OPERATIONAL. THE C-SIDE BOOSTER FAN DEVELOPED A MATERIALS FAILURE BETWEEN THE HUB AND SHAFT (IDENTICAL TO THE B-SIDE UNIT MENTIONED EARLIER).									
7/76	SYSTEM							744			

PHILADELPHIA ELECTRIC: EDDYSTONE 1A (CONT.)

PERIOD	MODULE	PERFORMANCE DATA: AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
8/76	SYSTEM							744			
9/76	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

ALL THREE BOOSTER FANS DOWNSTREAM OF THE REHEATERS DEVELOPED MATERIALS FAILURE BETWEEN THE HUB AND SHAFT (AS IDENTIFIED EARLIER FOR THE B-SIDE UNIT). THESE UNITS WERE RETURNED TO THE MANUFACTURER FOR MODIFICATIONS AND REPAIRS. ONE OF THE PARTICULATE SCRUBBERS WAS IN THE FLUE GAS STREAM. TO DATE, THE THREE WET PARTICULATE SCRUBBERS HAD ACHIEVED LITTLE SIMULTANEOUS SERVICE TIME.

10/76	SYSTEM							744			
11/76	SYSTEM							720			
12/76	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

MGO SCRUBBING OPERATIONS WERE SCHEDULED TO RESTART IN MAY 1977. REGENERATION FACILITY RELOCATION WAS BEING COMPLETED, AND MODIFICATIONS TO THE ID BOOSTER FANS BEING EFFECTED CONSISTED OF CONVERSION FROM A SLIP FIT TO A SHRINK FIT. THESE MODIFICATIONS WERE EXPECTED TO ELIMINATE RECURRING VIBRATION PROBLEMS.

1/77	SYSTEM							744			
2/77	SYSTEM							672			
3/77	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

THE MGO SCRUBBING SYSTEM AT EDDYSTONE 1A WAS STILL SCHEDULED FOR RESTART IN MAY 1977. THE START-UP OF THE NEW MAGNESIUM SULFITE REGENERATION FACILITY AT THE ESSEX CHEMICAL PLANT AT NEWARK, N.J. WAS ALSO SCHEDULED FOR MAY 1977. THE THREE PARALLEL VENTURI SCRUBBERS CONTROLLING PARTICULATE EMISSIONS ON EDDYSTONE 1 WENT BACK INTO SERVICE IN MARCH 1977.

4/77	SYSTEM							720			
5/77	SYSTEM							744		206	

** PROBLEMS/SOLUTIONS/COMMENTS

RESUMPTION OF MAGNESIUM OXIDE SCRUBBING OPERATIONS OCCURRED DURING THE REPORT PERIOD. THE UTILITY REPORTED THAT SO2 SCRUBBING OPERATIONS WERE NOT CONTINUOUS THROUGHOUT THE PERIOD. THE ABSORBER WAS IN SERVICE APPROXIMATELY 206 HOURS DURING MAY. REGENERATION OPERATIONS AT THE ESSEX FACILIT WERE NOT CONDUCTED DURING THE PERIOD. PECO PLANNED TO INITIATE SO2 RECOVERY AND MAGOX REGENERATION OPERATIONS DURING THE MONTH OF JUNE. THE SO MODULE CONTAINED TWO ABSORBER SECTIONS IN SERIES (EACH SECTION CONSISTING OF AN ADJUSTABLE ROD DECK WITH UNDERSPRAYS). ONLY ONE OF THE ABSORBER SECTIONS WAS BEING USED FOR SO2 REMOVAL. SO2 REMOVAL EFFICIENCY WAS NOT MEASURED. MAGNESIUM OXIDE LOSSES IN THE SYSTEM (ABSORPTION AND REGENERATION) WERE ESTIMATED AT 10%.

6/77	SYSTEM							720			
7/77	SYSTEM							744			

PERFORMANCE DATA

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

** PROBLEMS/SOLUTIONS/COMMENTS

FAILURE OF MINOR ANCILLIARY EQUIPMENT CAUSED SOME SCRUBBER SHUTDOWNS. LATER, THE BOILER ITSELF WAS SHUT DOWN. OVER THIS PERIOD THE ROTARY VALVE ON THE MAG SULFITE DRIER DISCHARGE PLUGGED REPEATEDLY. ALSO THE BELTS ON THE AGITATOR OF THE MAG-OX PRESLAKER FAILED.

8/77	SYSTEM							744			
9/77	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

THE ROTARY VALVE PROBLEM APPEARED TO BE SOLVED. CUMULATIVE OPERABILITY SINCE MAY WAS ESTIMATED TO BE ROUGHLY 33%. PECO REPORTED 131 HOURS OF CONTINUOUS OPERATION FOR THE SCRUBBER AND THICKENER CENTRIFUGE DRYING LOOP. DURING THE AUGUST-SEPTEMBER REPORT PERIOD CONTINUAL PROBLEMS WITH THE GLAND PACKING ON THE FGD SYSTEM CIRCULATION PUMPS (STUFFING BOX) WERE ENCOUNTERED. PECO CHANGED THE GLAND CONFIGURATION. THERE ALSO WAS A PROBLEM WITH HIGH SOLIDS FORMATION IN THE THICKENER.

10/77	SYSTEM		41.0					744			
11/77	SYSTEM		41.0					720			

** PROBLEMS/SOLUTIONS/COMMENTS

CUMULATIVE OPERABILITY FOR MAY THROUGH NOVEMBER 1977 WAS 39%. DURING THE OCTOBER-NOVEMBER PERIOD THE FGD SYSTEM ACHIEVED A 213 HOUR CONTINUOUS RUN. THIS WAS THE LONGEST CONTINUOUS RUN SINCE MAY 1977.

GLAND PACKING PROBLEMS PERSISTED AND MECHANICAL SEALS WERE BEING CONSIDERED AS POSSIBLE ALTERNATIVES. EVEN WITH HEAT TRACING THE SEAL WATER FROZE-UP CAUSING ROTAMETERS TO BURST. HIGH SOLIDS ACCUMULATION IN THE THICKENER WAS STILL A PROBLEM AREA.

12/77	SYSTEM		41.0					744			
1/78	SYSTEM							744		0	

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS SHUT DOWN DECEMBER 22 FOR A TURBINE OVERHAUL. DURING THE OUTAGE MAINTENANCE AND MINOR MODIFICATIONS WERE BEING MADE ON THE SCRUBBERS. THE UNIT WAS EXPECTED TO BE BACK ON LINE THE FIRST WEEK IN MARCH. THE CUMULATIVE OPERABILITY FACTOR FOR THE FOURTH QUARTER OF 1978 WAS 41%. DURING THIS PERIOD SOME OF THE HEAT TRACING FAILED AND OTHER PROBLEMS OCCURRED WHEN LINES FROZE AT THE ACID PLANT CAUSING THE FACILITY TO BE OPERATED INTERMITTENTLY. THE GLAND PACKING PROBLEMS HAD NOT BEEN SOLVED AND MECHANICAL SEALS WERE STILL BEING CONSIDERED.

THE UTILITY WAS STUDYING THE MAG-SULFIDE TO MAG-OXIDE RECOVERY EFFICIENCY

2/78	SYSTEM				0.0			672		0	
3/78	SYSTEM				0.0			744		0	

** PROBLEMS/SOLUTIONS/COMMENTS

THE TURBINE OVERHAUL CONTINUED DURING THE FEBRUARY-MARCH PERIOD. DURING THE SHUTDOWN PERIOD IT WAS FOUND THAT SOME HIGH PRESSURE STEAM TUBES WERE CRACKED, SO UNIT MAINTENANCE TOOK LONGER THAN EXPECTED. SOME MINOR FGD SYSTEM MODIFICATIONS WERE INCORPORATED IN THE COURSE OF

PHILADELPHIA ELECTRIC: EDDYSTONE 1A (CONT.)

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

THE SHUTDOWN PERIOD. START UP WAS EXPECTED IN MID-APRIL 1978.

4/78	SYSTEM				0.0			720		0	
5/78	SYSTEM				0.0			744		0	

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT CAME BACK ON LINE JUNE 1 AFTER AN EXTENSIVE SYSTEM MODIFICATION OUTAGE WHICH BEGAN DECEMBER 22. THE UNIT WAS EXPECTED BACK ON LINE IN MID APRIL, BUT THERE WAS A PROBLEM WITH A SUPER PRESSURE STEAM TURBINE.

6/78	SYSTEM		49.0					720			
7/78	SYSTEM		51.0					744			

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JUNE THE FGD SYSTEM ACHIEVED A 49% OPERABILITY. OPERABILITY FOR JULY WAS 51%. PROBLEMS OCCURRED IN LATE JUNE WITH THE MGSO3 SLURRY CIRCULATION PUMP WHEN THE UTILITY DISCOVERED THE RUBBER LINER WAS TORN AWAY. THERE WERE SOME PROBLEMS WITH THE MGO SECTION WHERE THE MGO MIXES WITH THE SYSTEM LIQUOR. FIRE BRICK WAS REMOVED FROM THE FLUID BED REACTOR CHAMBER TO REPLACE THE ACID BARRIER PLATES WHICH WERE FAILING. THE FIRE BRICK WAS THEN REPLACED. THE SLOW PIECE BY PIECE PROCEDURE WAS TIME CONSUMING AND ACCOUNTED FOR MOST OF THE REGENERABLE FACILTY DOWN TIME (MOST OF JUNE AND JULY). MAJOR PROBLEMS WERE SOLVED ON THE REGENERATIVE FACILITY OVER THE PERIOD RESULTING IN IMPROVED AVAILABILITY OF THE FACILITY.

8/78	SYSTEM		38.0		32.0			744	631	240	
9/78	SYSTEM		78.0		56.0			720	516	402	

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE MONTH OF AUGUST SCRUBBER CIRCULATING PIPING PROBLEMS WERE ENCOUNTERED. A BUTTERFLY CONTROL VALVE WAS NOT FULLY OPEN AND A SECTION OF PIPE DOWNSTREAM AT A 90 DEGREE BEND ERODED AWAY. TO CORRECT THE PROBLE THE BUTTERFLY VALVE WAS TAKEN OUT AND REPLACED WITH A RESTRICTION ORIFACE THE CIRCULATION PUMPING RATE WAS ALSO REDUCED.

THE UTILITY REPORTED THAT NO MAJOR PROBLEMS WERE ENCOUNTERED DURING THE MONTH OF SEPTEMBER. CERTAIN MECHANICAL PROBLEMS WERE RESOLVED WHICH RESULTED IN AN IMPROVEMENT IN THE OPERABILITY FIGURE.

10/78	SYSTEM		23.0					744			
11/78	SYSTEM							720			
12/78	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS SHUT DOWN FOR AN APPRECIABLE TIME DURING THE LAST QUARTER OF 1978 DUE TO MODIFICATIONS TO THE MGO SLAKING EQUIPMENT.

1/79	SYSTEM							744			
2/79	SYSTEM							672			
3/79	SYSTEM							744			
4/79	SYSTEM							720			

PHILADELPHIA ELECTRIC: EDDYSTONE 1A (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
				PERFORMANCE DATA							
5/79	SYSTEM							744			
6/79	SYSTEM							720			
7/79	SYSTEM							744			
8/79	SYSTEM							744			
9/79	SYSTEM							720			
10/79	SYSTEM							744			
11/79	SYSTEM							720			
12/79	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

INFORMATION FOR THIS UNIT HAD NOT BEEN AVAILABLE SINCE OCTOBER 1978.

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

** 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, WAS TERMINATED. THE SO2 REMOVAL EQUIPMENT WILL BE 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.

APPENDIX F
DESIGN AND PERFORMANCE DATA FOR DISCONTINUED DOMESTIC FGD SYSTEMS

COMPANY NAME	POTOMAC ELECTRIC POWER	
PLANT NAME	DICKERSON	
UNIT NUMBER	3A	
CITY	DICKERSON	
STATE	MARYLAND	
REGULATORY CLASSIFICATION	E	
PARTICULATE EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	688.	(1.600 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	548	
GROSS UNIT GENERATING CAPACITY - MW	190	
NET UNIT GENERATING CAPACITY W/FGD - MW	178	
NET UNIT GENERATING CAPACITY WO/FGD - MW	182	
EQUIVALENT SCRUBBED CAPACITY - MW	95	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	COMBUSTION ENGINEERING	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	278.42	(590000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	126.1	(259 F)
STACK HEIGHT - M	122.	(400 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	*******	(***** FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	BITUMINOUS	
AVERAGE HEAT CONTENT - J/G	27214.	(11700 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		****
AVERAGE ASH CONTENT - %	14.00	
RANGE ASH CONTENT - %	****	
AVERAGE MOISTURE CONTENT - %	********	
RANGE MOISTURE CONTENT - %	6.0-7.0	
AVERAGE SULFUR CONTENT - %	2.00	
RANGE SULFUR CONTENT - %	****	
AVERAGE CHLORIDE CONTENT - %	********	
RANGE CHLORIDE CONTENT - %	****	
*** PARTICLE CONTROL		
** MECHANICAL COLLECTOR		
NUMBER	0	
TYPE	NONE	
** FABRIC FILTER		
NUMBER	0	
TYPE	NONE	
** ESP		
NUMBER	1	
SUPPLIER	RESEARCH-COTTRELL	
PARTICLE REMOVAL EFFICENCY - %	97.5	
** PARTICLE SCRUBBER		
GENERIC TYPE	VENTURI TOWER	
SPECIFIC TYPE	VARIABLE-THROAT/TOP-ENTRY PLUMB BOB	
TRADE NAME/COMMON NAME	N/A	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	AISI 1110	
LINER GENERIC MATERIAL	ORGANIC	
LINER SPECIFIC MATERIAL	FIBER-REINFORCED POLYESTER	
GAS CONTACTING DEVICE TYPE	NONE	
*** FGD SYSTEM		
** GENERAL DATA		
SALEABLE PRODUCT/THROWAWAY PRODUCT	SALEABLE PRODUCT	
SO2 REMOVAL MODE	WET SCRUBBING	

POTOMAC ELECTRIC POWER: DICKERSON 3A (CONT.)

PROCESS TYPE	MAGNESIUM OXIDE	
PROCESS ADDITIVES	NONE	
SYSTEM SUPPLIER	GE ENVIRONMENTAL SERVICES	
A-E FIRM	GE ENVIRONMENTAL SERVICES	
DEVELOPMENT LEVEL	DEMONSTRATION	
NEW/RETROFIT	RETROFIT	
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.30	
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	90.00	
ENERGY CONSUMPTION - %	2.1	
CURRENT STATUS	8	
TERMINATION	8/1975	
COMMERCIAL START-UP	7/1974	
INITIAL START-UP	9/1973	
CONTRACT AWARDED	7/1971	
** DESIGN AND OPERATING PARAMETERS		
DESIGN CHLORIDE CONTENT - %	********	
** QUENCHER/PRESATURATOR		
CONSTRUCTION MATERIAL GENERIC TYPE	NR	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR	
** ABSORBER		
NUMBER	1	
GENERIC TYPE	VENTURI TOWER	
SPECIFIC TYPE	VARIABLE-THROAT/TOP-ENTRY PLUMB BOB	
TRADE NAME/COMMON TYPE	N/A	
SUPPLIER	GE ENVIRONMENTAL SERVICES	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	AISI 1110	
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A	
LINER GENERIC MATERIAL	ORGANIC	
LINER SPECIFIC MATERIAL	GLASS FLAKE-FILLED POLYESTER	
LINER MATERIAL TRADE NAME/COMMON TYPE	NR	
GAS CONTACTING DEVICE TYPE	NONE	
L/G RATIO - L/CU.M	5.3	(40.0 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	2.2	(9.0 IN-H2O)
SO2 REMOVAL EFFICIENCY - %	90.0	
** MIST ELIMINATOR		
PRE-MIST ELIMINATOR/MIST ELIMINATOR	PRIMARY COLLECTOR	
NUMBER PER SYSTEM	2	
GENERIC TYPE	IMPINGEMENT	
SPECIFIC TYPE	BAFFLE	
TRADE NAME/COMMON TYPE	CLOSED VANE	
NUMBER OF STAGES	3	
NUMBER OF PASSES PER STAGE	2	
DISTANCE BETWEEN VANES - CM	5.1	(2.00 IN)
VANE ANGLES - DEGREES	45	
PRESSURE DROP - KPA	0.2	(1.0 IN-H2O)
SUPERFICAL GAS VELOCITY - M/S	3.0	(10.0 FT/S)
CONSTRUCTION MATERIAL GENERIC TYPE	ORGANIC	
CONSTRUCTION MATERIAL SPECIFIC TYPE	FIBER-REINFORCED POLYESTER	
** REHEATER		
NUMBER	0	
GENERIC TYPE	NONE	
SPECIFIC TYPE	N/A	
TRADE NAME/COMMON TYPE	N/A	
CONSTRUCTION MATERIAL GENERIC TYPE	NONE	
CONSTRUCTION MATERIAL SPECIFIC TYPE	N/A	
** FANS		
NUMBER	1	
DESIGN	CENTRIFUGAL	
FUNCTION	UNIT	
APPLICATION	INDUCED DRAFT	
SERVICE	WET	
CONSTRUCTION MATERIAL GENERIC TYPE	HIGH ALLOY	

POTOMAC ELECTRIC POWER: DICKERSON 3A (CONT.)

** DAMPERS	
FUNCTION	NR
GENERIC TYPE	NR
SPECIFIC TYPE	NR
CONSTRUCTION MATERIAL GENERIC TYPE	NR
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR
LINER GENERIC MATERIAL TYPE	NR
LINER SPECIFIC MATERIAL TYPE	NR
** DUCTWORK	
SHELL GENERIC MATERIAL TYPE	NR
SHELL SPECIFIC MATERIAL TYPE	NR
LINER GENERIC MATERIAL TYPE	NR
LINER SPECIFIC MATERIAL TYPE	NR
** REAGENT PREPARATION EQUIPMENT	
FUNCTION	NR
DEVICE	NR
DEVICE TYPE	NR
** TANKS	
SERVICE	NUMBER
-------	------
REAGENT PREP PRODUCT	1
** PUMPS	
SERVICE	NUMBER
-------	------
NR	****
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	THICKENER
NUMBER	2
*** SLUDGE	
** TREATMENT	
METHOD	DEWATERED
DEVICE	N/A
PROPRIETARY PROCESS	N/A
** DISPOSAL	
NATURE	N/A
TYPE	NONE
SITE TREATMENT	N/A
** PROCESS CONTROL AND INSTRUMENTATION	
CHEMICAL PARAMETERS	PH, PRESSURE DROP
CONTROL LEVELS	PH 7
MONITOR LOCATION	IN SECOND STAGE SYSTEM
PROCESS CONTROL MANNER	AUTOMATIC
PROCESS CHEMISTRY MODE	FEEDBACK

PERFORMANCE DATA

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

** PROBLEMS/SOLUTIONS/COMMENTS

REFER TO THE PERFORMANCE UPDATE INFORMATION FOR DICKERSON 3 LOCATED IN SECTION 14.

APPENDIX F
DESIGN AND PERFORMANCE DATA FOR DISCONTINUED DOMESTIC FGD SYSTEMS

COMPANY NAME	PUBLIC SERVICE OF COLORADO	
PLANT NAME	VALMONT	
UNIT NUMBER	5A	
CITY	VALMONT	
STATE	COLORADO	
REGULATORY CLASSIFICATION	D	
PARTICULATE EMISSION LIMITATION - NG/J	43.	(0.100 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	274	
GROSS UNIT GENERATING CAPACITY - MW	166	
NET UNIT GENERATING CAPACITY W/FGD - MW	157	
NET UNIT GENERATING CAPACITY WO/FGD - MW	163	
EQUIVALENT SCRUBBED CAPACITY - MW	166	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	COMBUSTION ENGINEERING	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	436.98	(926000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	126.7	(260 F)
STACK HEIGHT - M	******	(**** FT)
STACK SHELL	NR	
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 - %	0.70	
RANGE SULFUR CONTENT - %	0.6-0.7	
AVERAGE CHLORIDE CONTENT - %	********	
RANGE CHLORIDE CONTENT - %	****	
*** PARTICLE CONTROL		
** MECHANICAL COLLECTOR		
NUMBER	1	
INLET FLUE GAS CAPACITY - CU.M/S	218.5	(463000 ACFM)
** FABRIC FILTER		
NUMBER	0	
TYPE	NONE	
** ESP		
NUMBER	1	
TYPE	COLD SIDE	
INLET FLUE GAS CAPACITY - CU.M/S	218.5	(463000 ACFM)
** PARTICLE SCRUBBER		
NUMBER	1	
INITIAL START-UP DATE	11/1971	
GENERIC TYPE	PACKED TOWER	
SPECIFIC TYPE	MOBILE BED PACKING	
TRADE NAME/COMMON NAME	TURBULENT CONTACT ABSORBER	
SUPPLIER	AIR CORRECTION DIVISION, UOP	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	AISI 1110	
LINER GENERIC MATERIAL	ORGANIC	
LINER SPECIFIC MATERIAL	NATURAL RUBBER	
GAS CONTACTING DEVICE TYPE	STAINLESS STEEL	
NUMBER OF CONTACTING ZONES	3	
L/G RATIO - LITER/CU.M	7.8	(58.3 GAL/1000ACF)
PRESSURE DROP - KPA	3.7	(15.0 IN-H2O)

PUBLIC SERVICE OF COLORADO: VALMONT 5A (CONT.)

SUPERFICIAL GAS VELOCITY - M/S	3.4	(11.0 FT/S)
INLET GAS FLOW RATE - CU.M/S	109.2	(231500 ACFM)
INLET GAS TEMPERATURE - C	132.8	(271 F).
SO2 REMOVAL EFFICENCY - %	45.0	
PARTICLE REMOVAL EFFICIENCY - %	96.0	

*** FGD SYSTEM

** GENERAL DATA

SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT
SO2 REMOVAL MODE	WET SCRUBBING
PROCESS TYPE	LIMESTONE/ALKALINE FLYASH
PROCESS ADDITIVES	NONE
SYSTEM SUPPLIER	UOP/PUBLIC SERVICE OF COLORADO
A-E FIRM	STEARNS-ROGER
DEVELOPMENT LEVEL	EXPERIMENTAL
NEW/RETROFIT	RETROFIT
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	95.00
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	85.00
ENERGY CONSUMPTION - %	3.6
CURRENT STATUS	8
TERMINATION	3/1975
INITIAL START-UP	10/1974
CONTRACT AWARDED	0/1972

** DESIGN AND OPERATING PARAMETERS

DESIGN CHLORIDE CONTENT - %	********

** QUENCHER/PRESATURATOR

CONSTRUCTION MATERIAL GENERIC TYPE	NR
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR

** ABSORBER

NUMBER	1
NUMBER OF SPARES	0
GENERIC TYPE	PACKED TOWER
SPECIFIC TYPE	MOBILE BED PACKING
TRADE NAME/COMMON TYPE	TURBULENT CONTACT ABSORBER
SUPPLIER	AIR CORRECTION DIVISION, UOP
SHELL GENERIC MATERIAL	CARBON STEEL
SHELL SPECIFIC MATERIAL	AISI 1110
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A
LINER GENERIC MATERIAL	ORGANIC
LINER SPECIFIC MATERIAL	SYNTHETIC RUBBER
LINER MATERIAL TRADE NAME/COMMON TYPE	NEOPRENE LS-576
SO2 REMOVAL EFFICIENCY - %	77.5

** MIST ELIMINATOR

PRE-MIST ELIMINATOR/MIST ELIMINATOR	PRIMARY COLLECTOR	
GENERIC TYPE	IMPINGEMENT	
SPECIFIC TYPE	BAFFLE	
TRADE NAME/COMMON TYPE	CLOSED VANE	
CONFIGURATION	HORIZONTAL	
NUMBER OF STAGES	2	
NUMBER OF PASSES PER STAGE	7	
PRESSURE DROP - KPA	0.1	(0.5 IN-H2O)
CONSTRUCTION MATERIAL GENERIC TYPE	STAINLESS STEEL	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR	
WASH WATER SOURCE	SUPERNATANT	

** REHEATER

NUMBER	1	
GENERIC TYPE	IN-LINE	
SPECIFIC TYPE	STEAM	
TRADE NAME/COMMON TYPE	NR	
TEMPERATURE INCREASE - C	36.1	(65 F)
CONSTRUCTION MATERIAL GENERIC TYPE	NR	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR	

PUBLIC SERVICE OF COLORADO: VALMONT 5A (CONT.)

** FANS		
DESIGN	CENTRIFUGAL	
FUNCTION	BOOSTER	
APPLICATION	FORCED DRAFT	
SERVICE	DRY	
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	
** DAMPERS		
FUNCTION	NR	
GENERIC TYPE	NR	
SPECIFIC TYPE	NR	
CONSTRUCTION MATERIAL GENERIC TYPE	NR	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR	
LINER GENERIC MATERIAL TYPE	NR	
LINER SPECIFIC MATERIAL TYPE	NR	
** DUCTWORK		
LOCATION	OUTLET	
SHELL GENERIC MATERIAL TYPE	CARBON STEEL	
SHELL SPECIFIC MATERIAL TYPE	AISI 1110	
LINER GENERIC MATERIAL TYPE	NONE	
LINER SPECIFIC MATERIAL TYPE	N/A	
** REAGENT PREPARATION EQUIPMENT		
FUNCTION	WET BALL MILL	
DEVICE	NR	
DEVICE TYPE	NR	
** TANKS		
SERVICE	NUMBER	
-------	------	
REAGENT PREP PRODUCT	2	
ABSORBER RECYCLE	4	
THICKENER OVERFLOW	1	
** PUMPS		
SERVICE	NUMBER	
-------	------	
NR	****	
** SOLIDS CONCENTRATING/DEWATERING		
DEVICE	THICKENER	
*** SLUDGE		
** TREATMENT		
METHOD	BLEED	
DEVICE	N/A	
PROPRIETARY PROCESS	N/A	
** DISPOSAL		
NATURE	FINAL	
TYPE	POND	
SITE TREATMENT	NONE	
** WATER BALANCE		
WATER LOOP TYPE	CLOSED	
EVAPORATION WATER LOSS - LITER/S	5.5	(88 GPM)

PUBLIC SERVICE OF COLORADO: VALMONT 5A (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
				PERFORMANCE DATA							
10/74	SYSTEM										

** PROBLEMS/SOLUTIONS/COMMENTS

REFER TO PERFORMANCE UPDATE INFORMATION FOR VALMONT 5 LOCATED IN SECTION 14 OF THIS REPORT.

APPENDIX F
DESIGN AND PERFORMANCE DATA FOR DISCONTINUED DOMESTIC FGD SYSTEMS

COMPANY NAME	SOUTHERN CALIFORNIA EDISON	
PLANT NAME	MOHAVE	
UNIT NUMBER	1A	
CITY	LAUGHLIN	
STATE	NEVADA	
REGULATORY CLASSIFICATION	D	
PARTICULATE EMISSION LIMITATION - NG/J	28.	(0.064 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	64.	(0.150 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	1580	
GROSS UNIT GENERATING CAPACITY - MW	790	
NET UNIT GENERATING CAPACITY W/FGD - MW	790	
NET UNIT GENERATING CAPACITY WO/FGD - MW	790	
EQUIVALENT SCRUBBED CAPACITY - MW	170	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	COMBUSTION ENGINEERING	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	********	(******* ACFM)
BOILER FLUE GAS TEMPERATURE - C	132.2	(270 F)
STACK HEIGHT - M	152.	(500 FT)
STACK SHELL	NR	
STACK TOP DIAMETER - M	*******	(***** FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	****	
AVERAGE HEAT CONTENT - J/G	26749.	(11500 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		11000-12000
AVERAGE ASH CONTENT - %	10.00	
RANGE ASH CONTENT - %	****	
AVERAGE MOISTURE CONTENT - %	********	
RANGE MOISTURE CONTENT - %	****	
AVERAGE SULFUR CONTENT - %	0.40	
RANGE SULFUR CONTENT - %	****	
AVERAGE CHLORIDE CONTENT - %	********	
RANGE CHLORIDE CONTENT - %	****	
*** PARTICLE CONTROL		
** MECHANICAL COLLECTOR		
NUMBER	0	
TYPE	NONE	
** FABRIC FILTER		
NUMBER	0	
TYPE	NONE	
** ESP		
NUMBER	1	
SUPPLIER	RESEARCH-COTTRELL	
PARTICLE REMOVAL EFFICENCY - %	97.2	
** PARTICLE SCRUBBER		
NUMBER	0	
GENERIC TYPE	NONE	
SPECIFIC TYPE	N/A	
TRADE NAME/COMMON NAME	N/A	
SHELL GENERIC MATERIAL	N/A	
SHELL SPECIFIC MATERIAL	N/A	
LINER GENERIC MATERIAL	N/A	
LINER SPECIFIC MATERIAL	N/A	
GAS CONTACTING DEVICE TYPE	N/A	
*** FGD SYSTEM		

SOUTHERN CALIFORNIA EDISON: MOHAVE 1A (CONT.)

** GENERAL DATA		
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT	
SO2 REMOVAL MODE	WET SCRUBBING	
PROCESS TYPE	LIMESTONE	
SYSTEM SUPPLIER	AIR CORRECTION DIVISION, UOP	
DEVELOPMENT LEVEL	PROTOTYPE	
NEW/RETROFIT	RETROFIT	
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	97.20	
ENERGY CONSUMPTION - %	0.0	
CURRENT STATUS	8	
TERMINATION	7/1975	
COMMERCIAL START-UP	1/1974	
INITIAL START-UP	1/1974	
** DESIGN AND OPERATING PARAMETERS		
DESIGN CHLORIDE CONTENT - %	********	
** QUENCHER/PRESATURATOR		
CONSTRUCTION MATERIAL GENERIC TYPE	NR	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR	
** ABSORBER		
NUMBER	1	
GENERIC TYPE	PACKED TOWER	
SPECIFIC TYPE	MOBILE BED PACKING	
TRADE NAME/COMMON TYPE	TURBULENT CONTACT ABSORBER	
SUPPLIER	AIR CORRECTION DIVISION, UOP	
DIMENSIONS - FT	18.0 X 40.0 X 90.0	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	AISI 1110	
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A	
LINER GENERIC MATERIAL	ORGANIC	
LINER SPECIFIC MATERIAL	NATURAL RUBBER	
LINER MATERIAL TRADE NAME/COMMON TYPE	BLACK NATURAL RUBBER	
GAS CONTACTING DEVICE TYPE	PLASTIC/RUBBER MOBILE BALLS	
NUMBER OF CONTACTING ZONES	4	
L/G RATIO - L/CU.M	11.1	(83.0 GAL/1000 ACF)
SUPERFICAL GAS VELOCITY - M/SEC	3.8	(12.6 FT/S)
INLET GAS FLOW - CU. M/S	212.35	(450000 ACFM)
SO2 REMOVAL EFFICIENCY - %	95.0	
PARTICLE REMOVAL EFFICENCY - %	93.0	
** MIST ELIMINATOR		
PRE-MIST ELIMINATOR/MIST ELIMINATOR	PRIMARY COLLECTOR	
GENERIC TYPE	NR	
SPECIFIC TYPE	NR	
TRADE NAME/COMMON TYPE	NR	
CONSTRUCTION MATERIAL GENERIC TYPE	NR	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR	
WASH FREQUENCY	CONTINUOUS	
** REHEATER		
NUMBER	1	
GENERIC TYPE	IN-LINE	
SPECIFIC TYPE	STEAM	
TRADE NAME/COMMON TYPE	NR	
TEMPERATURE INCREASE - C	30.6	(55 F)
INLET FLUE GAS TEMPERATURE - C	51.7	(125 F)
CONSTRUCTION MATERIAL GENERIC TYPE	NR	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR	
** FANS		
NUMBER	1	
DESIGN	CENTRIFUGAL	
FUNCTION	BOOSTER	
APPLICATION	NR	
SERVICE	NR	
CONSTRUCTION MATERIAL GENERIC TYPE	NR	

SOUTHERN CALIFORNIA EDISON: MOHAVE 1A (CONT.)

** DAMPERS	
FUNCTION	NR
GENERIC TYPE	NR
SPECIFIC TYPE	NR
CONSTRUCTION MATERIAL GENERIC TYPE	NR
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR
LINER GENERIC MATERIAL TYPE	NR
LINER SPECIFIC MATERIAL TYPE	NR
** DUCTWORK	
SHELL GENERIC MATERIAL TYPE	NR
SHELL SPECIFIC MATERIAL TYPE	NR
LINER GENERIC MATERIAL TYPE	NR
LINER SPECIFIC MATERIAL TYPE	NR
** REAGENT PREPARATION EQUIPMENT	
FUNCTION	WET BALL MILL
DEVICE	COMPARTMENTED
DEVICE TYPE	NR
NUMBER	1
** TANKS	
SERVICE	NUMBER
-------	------
REAGENT PREP PRODUCT	1
ABSORBER RECYCLE	1
** PUMPS	
SERVICE	NUMBER
-------	------
NR	****
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	CENTRIFUGE
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	THICKENER
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	VACUUM FILTER
*** SLUDGE	
** TREATMENT	
METHOD	FIXATION
DEVICE	PUG MILL
PROPRIETARY PROCESS	CONVERSION SYSTEMS 'POZ-O-TEC!
** DISPOSAL	
NATURE	FINAL
TYPE	POND
LOCATION	ON-SITE
SITE TRANSPORTATION METHOD	TRUCK
SITE TREATMENT	NR

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
10/74	SYSTEM							744			

SOUTHERN CALIFORNIA EDISON: MOHAVE 1A (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

TWO PROTOTYPE SULFUR DIOXIDE ABSORBER MODULES WERE INSTALLED IN 1973 AT THE MOHAVE GENERATING STATION. THE VERTICAL MODULE, A UNIVERSAL OIL PRODUCTS TURBULENT CONTACT ABSORBER (TCA) WAS TESTED IN TWO MODES; FIRST AS A TCA UNIT, FROM NOVEMBER 2, 1974 TO APRIL 30, 1975, AND SECOND AS A POLY-GRID PACKED ABSORBER (PPA), WHEN THE "PING PONG BALLS" WERE REPLACED WITH A PLASTIC "EGGCRATE" PACKING WITH TESTING CONTINUOUS TO JULY 2, 1975.

STARTUP OF THE MOHAVE 1A EXPERIMENTAL SYSTEM COMMENCED ON OCTOBER 31, 1974 AND OPERATED WITH AN AVAILABILITY OF 72% THROUGH EIGHT MONTHS OF TESTING.

THROUGH THE EIGHT MONTHS OF OPERATION, THE SYSTEM WAS OUT OF SERVICE APPROXIMATELY 1585 HOURS. THE OUTAGE TIME WAS CAUSED BY NECESSARY REPAIRS TO THE GRIDS, NOZZLES, TRAP-OUT TRAY AND TO REPAIR/REALIGN PPA PACKING. ADDITIONAL OUTAGE TIME WAS NECESSARY TO REDISTRIBUTE THE TCA BALLS, CLEAN SCALE FROM THE SCRUBBER INTERNALS, CORRECT BOOSTER FAN TRIP PROBLEMS, CONDUCT INSPECTIONS FOR EXTENDED OPERATIONS AND REMOVE A HARDHAT FROM THE THICKENER.

SYSTEM OPERATIONS WERE TERMINATED ON JULY 2, 1975. UP TO THIS TIME, THE SYSTEM LOGGED 4228 HOURS OF OPERATION.

APPENDIX F
DESIGN AND PERFORMANCE DATA FOR DISCONTINUED DOMESTIC FGD SYSTEMS

COMPANY NAME	SOUTHERN CALIFORNIA EDISON	
PLANT NAME	MOHAVE	
UNIT NUMBER	2A	
CITY	LAUGHLIN	
STATE	NEVADA	
REGULATORY CLASSIFICATION	D	
PARTICULATE EMISSION LIMITATION - NG/J	28.	(0.064 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	64.	(0.150 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	1580	
GROSS UNIT GENERATING CAPACITY - MW	790	
NET UNIT GENERATING CAPACITY W/FGD - MW	790	
NET UNIT GENERATING CAPACITY WO/FGD - MW	790	
EQUIVALENT SCRUBBED CAPACITY - MW	160	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	COMBUSTION ENGINEERING	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	********	(******* ACFM)
BOILER FLUE GAS TEMPERATURE - C	132.2	(270 F)
STACK HEIGHT - M	152.	(500 FT)
STACK SHELL	NR	
STACK TOP DIAMETER - M	*******	(***** FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	****	
AVERAGE HEAT CONTENT - J/G	26749.	(11500 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		11000-12000
AVERAGE ASH CONTENT - %	10.00	
RANGE ASH CONTENT - %	****	
AVERAGE MOISTURE CONTENT - %	********	
RANGE MOISTURE CONTENT - %	****	
AVERAGE SULFUR CONTENT - %	0.40	
RANGE SULFUR CONTENT - %	****	
AVERAGE CHLORIDE CONTENT - %	********	
RANGE CHLORIDE CONTENT - %	****	
*** PARTICLE CONTROL		
** MECHANICAL COLLECTOR		
NUMBER	0	
TYPE	NONE	
** FABRIC FILTER		
NUMBER	0	
TYPE	NONE	
** ESP		
NUMBER	1	
SUPPLIER	RESEARCH-COTTRELL	
PARTICLE REMOVAL EFFICENCY - %	97.2	
** PARTICLE SCRUBBER		
NUMBER	0	
GENERIC TYPE	NONE	
SPECIFIC TYPE	N/A	
TRADE NAME/COMMON NAME	N/A	
SHELL GENERIC MATERIAL	N/A	
SHELL SPECIFIC MATERIAL	N/A	
LINER GENERIC MATERIAL	N/A	
LINER SPECIFIC MATERIAL	N/A	
GAS CONTACTING DEVICE TYPE	N/A	
*** FGD SYSTEM		

SOUTHERN CALIFORNIA EDISON: MOHAVE 2A (CONT.)

** GENERAL DATA		
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT	
SO2 REMOVAL MODE	WET SCRUBBING	
PROCESS TYPE	LIME	
SYSTEM SUPPLIER	SO. CALIFORNIA EDISON/STEARNS-	
A-E FIRM	STEARNS-ROGER	
DEVELOPMENT LEVEL	PROTOTYPE	
NEW/RETROFIT	RETROFIT	
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	97.20	
ENERGY CONSUMPTION - %	0.0	
CURRENT STATUS	8	
TERMINATION	2/1975	
COMMERCIAL START-UP	11/1973	
INITIAL START-UP	11/1973	
** DESIGN AND OPERATING PARAMETERS		
DESIGN CHLORIDE CONTENT - %	********	
** QUENCHER/PRESATURATOR		
CONSTRUCTION MATERIAL GENERIC TYPE	NR	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR	
** ABSORBER		
NUMBER	1	
GENERIC TYPE	SPRAY TOWER	
SPECIFIC TYPE	OPEN CROSSCURRENT SPRAY	
TRADE NAME/COMMON TYPE	HORIZONTAL SPRAY CHAMBER	
SUPPLIER	SO. CALIFORNIA EDISON/STEARNS-ROGER	
DIMENSIONS - FT	15.0 X 30.0 X 60.0	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	AISI 1110	
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A	
LINER GENERIC MATERIAL	NR	
LINER SPECIFIC MATERIAL	NR	
LINER MATERIAL TRADE NAME/COMMON TYPE	NR	
GAS CONTACTING DEVICE TYPE	NONE	
NUMBER OF CONTACTING ZONES	4	
L/G RATIO - L/CU.M	4.0	(30.0 GAL/1000 ACF)
SUPERFICAL GAS VELOCITY - M/SEC	6.6	(21.6 FT/S)
INLET GAS FLOW - CU. M/S	212.35	(450000 ACFM)
SO2 REMOVAL EFFICIENCY - %	95.0	
PARTICLE REMOVAL EFFICENCY - %	93.0	
** MIST ELIMINATOR		
PRE-MIST ELIMINATOR/MIST ELIMINATOR	PRIMARY COLLECTOR	
GENERIC TYPE	NR	
SPECIFIC TYPE	NR	
TRADE NAME/COMMON TYPE	NR	
CONFIGURATION	VERTICAL	
NUMBER OF STAGES	1	
CONSTRUCTION MATERIAL GENERIC TYPE	NR	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR	
** REHEATER		
NUMBER	1	
GENERIC TYPE	INDIRECT HOT AIR	
SPECIFIC TYPE	EXTERNAL HEAT EXCHANGER	
TRADE NAME/COMMON TYPE	STEAM TUBE BUNDLE	
TEMPERATURE INCREASE - C	30.6	(55 F)
INLET FLUE GAS TEMPERATURE - C	48.9	(120 F)
CONSTRUCTION MATERIAL GENERIC TYPE	NR	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR	
** FANS		
NUMBER	1	
DESIGN	CENTRIFUGAL	
FUNCTION	BOOSTER	
APPLICATION	NR	
SERVICE	NR	
CONSTRUCTION MATERIAL GENERIC TYPE	NR	

SOUTHERN CALIFORNIA EDISON: MOHAVE 2A (CONT.)

** DAMPERS	
FUNCTION	NR
GENERIC TYPE	NR
SPECIFIC TYPE	NR
CONSTRUCTION MATERIAL GENERIC TYPE	NR
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR
LINER GENERIC MATERIAL TYPE	NR
LINER SPECIFIC MATERIAL TYPE	NR
** DUCTWORK	
SHELL GENERIC MATERIAL TYPE	NR
SHELL SPECIFIC MATERIAL TYPE	NR
LINER GENERIC MATERIAL TYPE	NR
LINER SPECIFIC MATERIAL TYPE	NR
** REAGENT PREPARATION EQUIPMENT	
FUNCTION	SLAKER
DEVICE	NR
DEVICE TYPE	NR
** PUMPS	
SERVICE	NUMBER
-------	------
NR	****
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	NR
*** SLUDGE	
** TREATMENT	
METHOD	FIXATION
DEVICE	MIX TANK
PROPRIETARY PROCESS	DRAVO 'CALCILOX!
** DISPOSAL	
NATURE	FINAL
TYPE	POND
SITE TREATMENT	CLAY LINING
** WATER BALANCE	
WATER LOOP TYPE	CLOSED

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
11/73	SYSTEM										

** PROBLEMS/SOLUTIONS/COMMENTS

TWO PROTOTYPE SULFUR DIOXIDE ABSORBER MODULES WERE INSTALLED IN 1973 AT TH MOHAVE GENERATING STATION. A FOUR-STAGE HORIZONTAL CROSSFLOW SPRAY SCRUBBER WAS INSTALLED ON UNIT 2.

IN NOVEMBER 1973 THE UTILITY OPERATED THE FGD SYSTEM AT MOHAVE 2A IN A SHORT SERIES OF STARTUP TESTS THAT ENDED ON JANUARY 16, 1974 WHEN A FORMAL TEST PROGRAM WAS INITIATED TO ACCESS PERFORMANCE AND RELIABILITY CHARACTERISTICS OF THE SCRUBBING SYSTEM.

DURING THE 13 MONTHS OF EXPERIMENTAL OPERATION THE SYSTEM EXPERIENCED A NUMBER OF PROBLEMS WHICH ACCOUNTED FOR APPROXIMATELY 1757 HOURS OF OUTAGE TIME. THESE OUTAGES WERE CAUSED BY PUMP REPAIRS, HOPPER LEAKS, BOOSTER FAN BALANCE PROBLEMS, MODIFICATIONS AND REPAIR OF THE PLASTIC MIST ELIMINATOR BLADES, SPRAY NOZZLE REPLACEMENT, GAS INLET FLOW DISTRIBUTION

SOUTHERN CALIFORNIA EDISON: MOHAVE 2A (CONT.)

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

MODIFICATIONS, SLAKING WATER MODIFICATIONS FOR SCALE PREVENTION, AN INSPECTION FOR EXTENDED OPERATIONS AND REMOVAL OF A HARDHAT FROM THE THICKENER.

THE TEST PROGRAM WAS TERMINATED ON FEBRUARY 9, 1975 FOLLOWING 5927 HOURS OF OPERATION. THE MODULE WAS SUBSEQUENTLY DISMANTLED, TRANSPORTED, AND REASSEMBLED AT THE FOUR CORNERS PLANT OF ARIZONA PUBLIC SERVICE WHERE ADDITIONAL TESTING WAS CONDUCTED AND COMPLETED (DECEMBER 1976).

APPENDIX F
DESIGN AND PERFORMANCE DATA FOR DISCONTINUED DOMESTIC FGD SYSTEMS

COMPANY NAME	ST. JOE ZINC	
PLANT NAME	G.F. WEATON	
UNIT NUMBER	1	
CITY	MONACA	
STATE	PENNSYLVANIA	
REGULATORY CLASSIFICATION	D	
PARTICULATE EMISSION LIMITATION - NG/J	43.	(0.100 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	516.	(1.200 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	120	
GROSS UNIT GENERATING CAPACITY - MW	60	
NET UNIT GENERATING CAPACITY W/FGD - MW	*****	
NET UNIT GENERATING CAPACITY WO/FGD - MW	*****	
EQUIVALENT SCRUBBED CAPACITY - MW	60	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	COMBUSTION ENGINEERING	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	****	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	75.03	(159000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	148.9	(300 F)
STACK HEIGHT - M	23.	(75 FT)
STACK SHELL	FIBERGLASS	
STACK TOP DIAMETER - M	3.2	(10.5 FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	BITUMINOUS	
AVERAGE HEAT CONTENT - J/G	29075.	(12500 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		****
AVERAGE ASH CONTENT - %	11.50	
RANGE ASH CONTENT - %	****	
AVERAGE MOISTURE CONTENT - %	********	
RANGE MOISTURE CONTENT - %	****	
AVERAGE SULFUR CONTENT - %	2.00	
RANGE SULFUR CONTENT - %	2.0-4.5	
AVERAGE CHLORIDE CONTENT - %	0.20	
RANGE CHLORIDE CONTENT - %	****	
*** PARTICLE CONTROL		
** ESP		
NUMBER	2	
TYPE	COLD SIDE	
INLET FLUE GAS TEMPERATURE - C	148.9	(300 F)
PARTICLE REMOVAL EFFICENCY - %	99.6	
** PARTICLE SCRUBBER		
NUMBER	0	
GENERIC TYPE	NONE	
SPECIFIC TYPE	N/A	
TRADE NAME/COMMON NAME	N/A	
SHELL GENERIC MATERIAL	N/A	
SHELL SPECIFIC MATERIAL	N/A	
LINER GENERIC MATERIAL	N/A	
LINER SPECIFIC MATERIAL	N/A	
GAS CONTACTING DEVICE TYPE	N/A	
*** FGD SYSTEM		
** GENERAL DATA		
SALEABLE PRODUCT/THROWAWAY PRODUCT	SALEABLE PRODUCT	
SO2 REMOVAL MODE	WET SCRUBBING	
PROCESS TYPE	CITRATE	
SYSTEM SUPPLIER	MORRISON & KNUDSEN/U.S.B.M.	
A-E FIRM	MORRISON & KNUDSEN	
DEVELOPMENT LEVEL	PROTOTYPE	
NEW/RETROFIT	RETROFIT	
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.60	

ST. JOE ZINC: G.F. WEATON 1 (CONT.)

UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	90.00
CURRENT STATUS	8
TERMINATION	9/1982
COMMERCIAL START-UP	1/1980
INITIAL START-UP	11/1979
CONTRACT AWARDED	0/1977
** DESIGN AND OPERATING PARAMETERS	
DESIGN CHLORIDE CONTENT - %	********
** QUENCHER/PRESATURATOR	
CONSTRUCTION MATERIAL GENERIC TYPE	NR
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR
** ABSORBER	
NUMBER	1
GENERIC TYPE	PACKED TOWER
SPECIFIC TYPE	FIXED BED PACKING
TRADE NAME/COMMON TYPE	N/A
DIMENSIONS - FT	26.0 DIA X 85.0
SHELL GENERIC MATERIAL	CARBON STEEL
SHELL SPECIFIC MATERIAL	AISI 1110
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A
LINER GENERIC MATERIAL	ORGANIC
LINER SPECIFIC MATERIAL	VINLY ESTER
LINER MATERIAL TRADE NAME/COMMON TYPE	NR
GAS CONTACTING DEVICE TYPE	INTALOX SADDLE
NUMBER OF CONTACTING ZONES	1
LIQUID RECIRCULATION RATE - LITER/S	284. (4500 GPM)
INLET GAS FLOW - CU. M/S	73.62 (156000 ACFM)
INLET GAS TEMPERATURE - C	48.9 (120 F)
SO2 REMOVAL EFFICIENCY - %	90.0
** MIST ELIMINATOR	
PRE-MIST ELIMINATOR/MIST ELIMINATOR	PRIMARY COLLECTOR
NUMBER PER SYSTEM	2
GENERIC TYPE	IMPINGEMENT
SPECIFIC TYPE	BAFFLE
TRADE NAME/COMMON TYPE	CLOSED VANE
CONSTRUCTION MATERIAL GENERIC TYPE	ORGANIC
CONSTRUCTION MATERIAL SPECIFIC TYPE	POLYVINYL CHLORIDE
** REHEATER	
NUMBER	1
GENERIC TYPE	INDIRECT HOT AIR
SPECIFIC TYPE	EXTERNAL HEAT EXCHANGER
TRADE NAME/COMMON TYPE	STEAM TUBE BUNDLE
CONSTRUCTION MATERIAL GENERIC TYPE	NR
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR
** FANS	
NUMBER	1
DESIGN	CENTRIFUGAL
FUNCTION	BOOSTER
APPLICATION	FORCED DRAFT
SERVICE	DRY
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL
** DAMPERS	
FUNCTION	NR
GENERIC TYPE	NR
SPECIFIC TYPE	NR
CONSTRUCTION MATERIAL GENERIC TYPE	NR
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR
LINER GENERIC MATERIAL TYPE	NR
LINER SPECIFIC MATERIAL TYPE	NR
** DUCTWORK	
SHELL GENERIC MATERIAL TYPE	NR
SHELL SPECIFIC MATERIAL TYPE	NR
LINER GENERIC MATERIAL TYPE	NR

ST. JOE ZINC: G.F. WEATON 1 (CONT.)

LINER SPECIFIC MATERIAL TYPE	NR
** REAGENT PREPARATION EQUIPMENT	
FUNCTION	MIX TANK
DEVICE	N/A
DEVICE TYPE	AGITATED TANK
** TANKS	
SERVICE	NUMBER
SALEABLE BYPRODUCT	3
REAGENT PREP PRODUCT	1
MAKEUP WATER	1
** PUMPS	
SERVICE	NUMBER
SULFUR SLURRY	2
LEAN SOLUTION	2
****	1
SULFUR TRANSFER	1
SCRUBBER RECIRCULATION	4
SULFUR LOADING	1
RICH CITRATE SOLUTION	2
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	NONE
*** SALEABLE BYPRODUCTS	
NATURE	ELEMENTAL SULFUR
QUALITY - %	99.5
*** SLUDGE	
** TREATMENT	
METHOD	N/A
DEVICE	N/A
PROPRIETARY PROCESS	N/A
** DISPOSAL	
NATURE	N/A
TYPE	NONE
SITE TREATMENT	N/A
** WATER BALANCE	
WATER LOOP TYPE	CLOSED
** FGD SPARE CAPACITY INDICES	
ABSORBER - %	0.0
** FGD SPARE COMPONENT INDICES	
ABSORBER	0.0

PERFORMANCE DATA

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

ST. JOE ZINC: G.F. WEATON 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
		SINCE START-UP IN NOVEMBER THE UNIT HAS BEEN DOWN DUE TO MECHANICAL PROBLEMS.									
		THE ELECTRIC MOTOR IN THE SCRUBBER LIQUOR RECYCLE UNIT HAS BEEN A PROBLEM SINCE START-UP.									
		LEAKS HAVE BEEN ENCOUNTERED IN THE PIPING OF THE PRESCRUBBER SOLUTION. SOME OF THE PIPING FAILURES WERE A RESULT OF FREEZING WEATHER CONDITIONS.									
		BECAUSE OF THE SMELTER SHUT DOWN AT ST. JOE ZINC, THE UNIT HAS BEEN OPERATING AT A LOAD OF NO MORE THAN 20 TO 30 MW.									
1/80	SYSTEM							744			
2/80	SYSTEM							696			
3/80	SYSTEM							744			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE SYSTEM IS STILL GOING THROUGH THE DEBUGGING PHASE OF OPERATION. SOME EQUIPMENT PROBLEMS HAVE OCCURRED, ESPECIALLY WITH THE HYDROGEN SULFIDE GENERATOR AND HEAT EXCHANGERS, ONE OF WHICH HAD TO BE REMOVED AND RETURNED TO THE MANUFACTURER. NO OPERATING HOURS WERE LOGGED DURING THE FIRST QUARTER OF 1980 BRINGING THE TOTAL SYSTEM OPERATING HOURS TO DATE TO 42.									
4/80	SYSTEM							720			
5/80	SYSTEM							744			
6/80	SYSTEM							720			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE GEORGE F. WHEATON STATION HAS BEEN OPERATING AT A REDUCED LOAD OF 20 TO 30 MW SINCE DECEMBER, 1979 DUE TO THE SHUTDOWN OF THE ST. JOE ZINC CO. SMELTER. ALTHOUGH A NUMBER OF TRIAL RUNS OF THE CITRATE DEMONSTRATION PLANT HAVE BEEN MADE DURING THE PAST SIX MONTHS, MECHANICAL BREAKDOWNS OF EQUIPMENT AND PROBLEMS RELATED TO LOW TEMPERATURE OPERATION HAVE PREVENTED CONTINUOUS OPERATION TO OBTAIN MEANINGFUL DATA. ST. JOE IS ATTEMPTING TO NEGOTIATE A POWER SALES AGREEMENT THAT WILL PERMIT FULL UTILIZATION OF THE STATION CAPACITY AND ALSO PROVIDE DESIGN FLUE GAS QUANTITIES TO THE DEMONSTRATION PLANT. OPERATION OF THE POWER PLANT AT THE DESIGN RATES IS REQUIRED FOR ACCEPTANCE AND DEMONSTRATION TESTING.									
7/80	SYSTEM							744			
8/80	SYSTEM							744			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE CITRATE PROCESS DID NOT OPERATE DURING THE MONTHS OF JULY AND AUGUST 1980.									
		NEGOTIATIONS TO PERMIT THE POWER PLANT TO OPERATE AT HIGHER RATES AND ALLOW THE DEMONSTRATION PLANT TEST PROGRAM TO PROCEED AS PLANNED ARE CONTINUING.									
9/80	SYSTEM	11.9	11.9	11.9	11.9			720	720	86	36.7

ST. JOE ZINC: G.F. WEATON 1 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

STARTUP BEGAN LATE IN SEPTEMBER DUE TO A LONG DOWN PERIOD NECESSARY TO MAK REPAIRS AND REMOVE ALL BUT TWO FEET OF THE PACKING FROM THE ABSORBER TOWER THIS WAS NECESSARY DUE TO SULFUR BLOCKAGE OF THE PACKING CAUSED BY POOR SULFUR FLOTATION, WHICH IS THOUGHT TO BE DUE TO LOW TEMPERATURES OCCA-SIONED BY RUNNING THE PLANT AT ONLY ABOUT ONE THIRD THE DESIGN RATE. THE PLANT IS STILL OPERATING AT REDUCED RATES.

DURING SEPTEMBER NUMEROUS FAILURES OF THE RUBBER LINED PRE-SCRUBBER PIPING CAUSED SOME OUTAGE TIME.

FAILURE OF SEVERAL PUMPS CAUSED ADDITIONAL OUTAGE TIME.

DURING SEPTEMBER FAILURE OF SEVERAL AGITATORS OCCURRED.

FAILURE OF THREE HEAT EXCHANGERS WAS EXPERIENCED CAUSING ADDITIONAL DOWN TIME.

AN UNDERSIZED STEAM SUPPLY LINE TO THE PLANT HAD TO BE REPLACED.

REPAIRS WERE MADE TO THE PLASTIC LININGS OF SEVERAL STEEL SOLUTION TANKS.

LEAKS IN THE SULFUR MELTERS AND THE TEFLON LINED PIPES AROUND THE MELTER CIRCUIT CAUSED ADDITIONAL OUTAGE TIME.

10/80	SYSTEM	37.5	37.5	37.5	37.5			744	744	279	41.0

** PROBLEMS/SOLUTIONS/COMMENTS

DURING OCTOBER THE PLANT CONTINUED TO OPERATE AT LOW CAPACITY DUE TO LACK OF DEMAND. THE SO2 ABSORPTION VARIED FROM 84% TO 94% WITH ALL EQUIPMENT FUNCTIONAL. THE ABSORBER CONTINUED TO OPERATE WITH ONLY TWO FEET OF PACK-ING IN THE VESSEL.

TROUBLES WITH THE SULFUR FLOTATION CONTINUED DURING OCTOBER CAUSING SOME OUTAGE TIME.

A SYSTEM OUTAGE WAS DUE TO A DAMAGED REACTOR AGITATOR SEAL CAUSING ONE OF THE REACTORS TO BE SHUT DOWN AND BY-PASSED. WHEN THIS OCCURRED SO2 ABSORP TION FELL TO 72%.

PROBLEMS WERE ENCOUNTERED WHEN THE RUBBER LINED PRESCRUBBER PIPING FAILED.

11/80	SYSTEM	13.9	13.9	13.9	13.9			720	720	100	43.0

** PROBLEMS/SOLUTIONS/COMMENTS

DURING NOVEMBER AN ANNUAL BOILER INSPECTION OF THE HYDROGEN SULFITE STEAM GENERATOR DRUM WAS PERFORMED.

THE RUBBER LINED PRESCRUBBER PIPING WAS REPAIRED DURING NOVEMBER.

A HEATER WAS INSTALLED FOR THE SCRUBBER WATER ADDITION DURING THE MONTH.

THE NEUTRALIZER SUMP PUMP WAS CLEANED AND PUT BACK IN OPERATION.

DURING NOVEMBER EXTENSIVE WATER DILUTION OF THE CITRATE SOLUTION DURING DOWNTIME CAUSED THE SO2 ABSORPTION TO BE LOWER THAN OCTOBER. IT VARIED FROM 71% TO 82%. THE PLANT CAPACITY FACTOR WAS UP A LITTLE DURING THE MONTH.

12/80	SYSTEM	24.9	24.9	24.9	24.9			744	744	185	46.0

ST. JOE ZINC: G.F. WEATON 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PERFORMANCE DATA PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
1/81	SYSTEM	0.0	0.0		0.0			744	744	0	51.0

** PROBLEMS/SOLUTIONS/COMMENTS

DURING DECEMBER WATER DILUTION CONTINUED TO BE A PROBLEM AS THE GAS TEMPERATURES WERE NOT SUFFICIENTLY HIGH ENOUGH TO EVAPORATE ENOUGH WATER. TH SO2 ABSORPTION WAS POOR, ABOUT 65%, DUE TO THE CITRATE SOLUTION BEING TOO DILUTE.

ON DECEMBER 8, 1981 A REGENERATION REACTOR AGITATOR SHAFT BROKE RESULTING IN THE LOSS OF ONE HALF OF THE REGENERATION SYSTEM. THIS CAUSED THE SO2 ABSORPTION TO DECREASE. THE SYSTEM WAS SHUT DOWN ON DECEMBER 12, 1981 AFTER LEAKS DEVELOPED IN THE SCRUBBER RECIRCULATION LINES.

THE DEMONSTRATION PLANT WILL REMAIN SHUT DOWN UNTIL THE ABSORBER IS CONVERTED TO A SPRAY TOWER AND REPAIRS ARE MADE TO BOTH REGENERATION REACTOR AGITATORS.

2/81	SYSTEM	0.0	0.0		0.0			672	672	0	54.0

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JANUARY THE CITRATE PROCESS DEMONSTRATION PLANT DID NOT OPERATE. DURING THIS TIME ALL THE SOLUTION TO THE MAIN STORAGE TANKS WAS DRAINED TO PREVENT FREEZE UP. A STEAM COIL WAS INSTALLED IN THE CITRATE STORAGE TANK TO PREVENT FREEZE UP. PLANS ARE BEING MADE FOR THE MODIFICATION OF THE ABSORBER TO A SPRAY TOWER.

3/81	SYSTEM	0.0	0.0		0.0			744	744	0	60.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE CITRATE PROCESS DEMONSTRATION PLANT DID NOT OPERATE DURING FEBRUARY. REPAIRS TO THE REACTOR AGITATORS BEGAN AND PARTS FOR THE SPRAY TOWER MODIFICATION OF THE ABSORBER WERE FABRICATED. OPERATION OF THE DEMONSTRATION PLANT WILL RESUME WHEN THE REPAIRS AND MODIFICATIONS ARE COMPLETED.

4/81	SYSTEM	10.6	10.6	10.6	10.6			720	719	76	52.9

** PROBLEMS/SOLUTIONS/COMMENTS

THE MARCH PROCESS DEMONSTRATION PLANT DID NOT OPERATE DURING MARCH. THE MODIFICATION OF THE ABSORBER WAS COMPLETED. OPERATION OF THE PLANT IS PLANNED TO RESUME IN APRIL.

THE FGD SYSTEM OPERATED FOR 76 HOURS DURING APRIL. AVERAGE SO2 ABSORPTION WAS 91%. OPERATION OF THE SPRAY TOWER WAS CONSIDERED A SUCCESS ALTHOUGH THE OPERATION TIME WAS SHORT. SULFUR FLOTATION AND RECOVERY WERE IMPROVED OVER PREVIOUS RUNS. THE RUN WAS TERMINATED BECAUSE OF LEAKING PACKING GLANDS ON THE PRESATURATOR PUMPS AND FAILURE OF ONE OF THE H2S GENERATOR VESSELS. UPON SHUTDOWN IT WAS DISCOVERED THAT ANOTHER VESSEL HAD BEEN WEAKENED BY EXCESSIVE HEAT AND CORROSION AND WOULD REQUIRE REPLACEMENT. THE SYSTEM IS SHUTDOWN PENDING REPLACEMENT OF THE MODULES. MODIFICATION OF THE SCRUBBER PUMPS IS ALSO BEING PERFORMED TO GIVE MORE RELIABLE SERVICE.

5/81	SYSTEM	0.0	0.0		0.0			744	668	0	66.0

ST. JOE ZINC: G.F. WEATON 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE SYSTEM REMAINED OFF-LINE DURING MAY PENDING REPLACEMENT OF THE MODULES									
6/81	SYSTEM	0.0	0.0	0.0	0.0			720	720	0	61.3
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE CITRATE PROCESS DEMONSTRATION PLANT DID NOT OPERATE DURING JUNE. IT IS TO REMAIN SHUT DOWN UNTIL TWO NEW PROCESS VESSELS CAN BE FABRICATED AND INSTALLED. DURING THE SHUTDOWN, ALL FOUR OF THE PRE-SCRUBBER CIRCULATING PUMPS WILL BE MODIFIED AND TWO HZS GENERATORS (WHICH HAD DEVELOPED LEAKS) WILL BE REPLACED. A NUMBER OF VALVES WILL ALSO BE REPLACED.									
7/81	SYSTEM	0.0	0.0	0.0	0.0			744	375	0	59.0
8/81	SYSTEM	0.0	0.0	0.0	0.0			744	743	0	54.3
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE CITRATE PROCESS DEMONSTRATION PLANT REMAINED SHUTDOWN THROUGH JULY AND AUGUST.									
9/81	SYSTEM	4.9	5.3	4.9	4.9			720	666	35	61.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE CITRATE DEMONSTRATION PLANT OPERATED A TOTAL OF 35 HOURS IN SEPTEMBER. ONE OPERATING PERIOD OF 10 HOURS WAS TERMINATED BECAUSE OF FAILURE OF THE ABSORBER LEVEL CONTROL INSTRUMENT. THE SECOND OPERATING PERIOD OF 25 HOUR WAS TERMINATED BECAUSE OF A LEAK IN THE SULFUR FEED LINE TO THE H2S GENERATOR. PROBLEMS WITH TRANSFER OF SULFUR TO THE H2S GENERATOR WERE HOLD ING UP OPERATION OF THE PLANT.									
10/81	SYSTEM	12.1	12.1	12.1	12.1			744	744	90	67.1
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING OCTOBER A CERAMIC COATED STAINLESS STEEL NOZZLE ON THE VENTURI FAILED AND WAS REPLACED.									
		THE ABSORBER IS NOW OPERATING AS A SIMPLE SPRAY TOWER DUE TO CONTINUAL PLUGGING OF THE ABSORBER PACKING.									
		LEAKS IN THE SCRUBBER COOLER REQUIRED THAT THE UNIT BE TAKEN OUT OF SERVICE. OPERATIONS ARE EXPECTED TO RESUME IN NOVEMBER.									
11/81	SYSTEM	55.1	55.1	55.1	55.1			720	720	397	66.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
		DURING NOVEMBER UNIT 1 WAS STARTED UP ABOUT MIDWAY IN THE MONTH, AND UNIT WAS SHUT DOWN. OPERATION OF UNIT 1 IS EXPECTED TO PROVIDE THE DEMONSTRA- TION PLANT WITH STRONGER AND HOTTER FLUE GAS AND SHOULD IMPROVE OPERATION.									
12/81	SYSTEM	1.2	1.2	1.2	1.2			744	744	9	68.9
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE CITRATE PLANT OUTAGES WERE DUE TO SULFUR PUMPING DIFFICULTIES AND TO SULFUR PLUGGING IN THE REGENERATION GAS DISTRIBUTION SYSTEM.									
		SOME INSTRUMENTATION PROBLEMS WERE CAUSED BY COLD WEATHER.									

ST. JOE ZINC: G.F. WEATON 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
				PERFORMANCE DATA							
				LINING FAILURES IN SOME PIPING CAUSED DOWN TIME DURING THE MONTH.							
1/82	SYSTEM	6.2	6.2	6.2	6.2			744	744	46	74.2
	** PROBLEMS/SOLUTIONS/COMMENTS										
				THE CITRATE PROCESS DEMONSTRATION PLANT OPERATED FOR 46.5 HOURS IN EARLY JANUARY, BUT WAS SHUTDOWN THE REST OF THE MONTH DUE MOSTLY BECAUSE OF COLD WEATHER.							
				SULFUR PUMPING PROBLEMS CONTINUED BUT SULFUR FLOTATION AND RECOVERY SHOWED IMPROVEMENT BECAUSE OF MODIFICATIONS MADE IN DECEMBER.							
2/82	SYSTEM	23.5	23.5	23.5	23.5			672	672	158	79.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
				THE CITRATE PROCESS DEMONSTRATION PLANT OPERATED FOR 158 HOURS IN EARLY FEBRUARY. THE SYSTEM WAS SHUT DOWN THE REST OF THE MONTH TO MAKE REPAIRS TO A REACTOR AGITATOR SEAL AND TO CLEAN OUT PARTIAL SULFUR PLUGGING IN THE H2S GAS LINE TO THE REACTORS.							
				THE ABSORBER SPRAY NOZZLES WERE CLEANED DURING THE MONTH DUE TO PLUGGING WITH SCRAP PLASTIC.							
				THE VENTURI SCRUBBER NOZZLES WERE REPLACED BECAUSE OF BROKEN SWIRL VANES.							
				THE NEUTRAULIZER PIT PUMPS WERE OUT OF SERVICE FOR PART OF THE MONTH.							
3/82	SYSTEM	22.3	22.3	22.3	22.3			744	744	166	73.0
	** PROBLEMS/SOLUTIONS/COMMENTS										
				AFTER 166 HOURS OF OPERATION IN MARCH, THE SYSTEM WAS SHUT DOWN DUE TO A CITRATE SOLUTION PROBLEM.							
				DUE TO CONTINUING LINING FAILURES THE UTILITY DECIDED TO COMPLETELY RELINE ONE OF THE REGENERATION REACTORS AND THE DOWNCOMER.							
				AN EXPANSION JOINT ON THE FLUE GAS LINE TO THE VENTURI SCRUBBER HAD TO BE REPLACED DURING THE MONTH.							
				FURTHER MODIFICATIONS WERE MADE TO THE FLOTATION TANK TO IMPORVE SULFUR FLOTATION AND RECOVERY.							
4/82	SYSTEM	2.7	2.7	2.7	2.7			720	720	20	79.3
	** PROBLEMS/SOLUTIONS/COMMENTS										
				THE CITRATE PROCESS DEMONSTRATION PLANT OPERATED FOR 19.5 HOURS IN APRIL. RELINING OF THE REGENERATION REACTOR WAS COMPLETED AND A NEW FLUE GAS DUCT EXPANSION JOINT WAS INSTALLED. DELAYS IN STARTUP WERE DUE TO AN ASSORTMEN OF PROBLEMS WITH PUMPS, AGITATORS, AND VALVES. THE PLANT IS OPERATING WITH NO PACKING IN THE ABSORBER TOWER UNTIL PROBLEMS WITH SULFUR FLOTATION ARE RESOLVED.							
5/82	SYSTEM	35.9	35.9	35.9	35.9			744	744	267	
	** PROBLEMS/SOLUTIONS/COMMENTS										
				THE CITRATE PROCESS DEMONSTRATION PLANT OPERATED FOR 267 HOURS IN MAY. THE PLANT WAS SHUT DOWN ONCE BECAUSE OF MAINTENANCE BEING PERFORMED ON THE UNIT AND ONCE BECAUSE OF PLUGGING AND SULFUR HANDLING PROBLEMS. THE PLANT CONTINUES TO OPERATE WITHOUT PACKING IN THE ABSORBER TOWER DUE TO							

ST. JOE ZINC: G.F. WEATON 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
				SULFUR FLOTATION STILL NOT SATISFACTORY. OTHER PROBLEMS DURING THE MONTH INCLUDED TANK LINING FAILURES, VALVE FAILURES, AND FAILURE OF A SILICON CARBIDE VENTURI SCRUBBER NOZZLE.							
6/82	SYSTEM	7.7	7.7	7.7	7.7			720	720	55	77.1
	** PROBLEMS/SOLUTIONS/COMMENTS										
				DELAYS IN OPERATION WERE CAUSED BY THE NEED TO REPAIR THE REGENERATION REACTOR LININGS.							
				THE BALANCING OF A MAIN FLUE GAS FAN ALSO DELAYED OPERATIONS DURING JUNE.							
				A PLANT SHUTDOWN WAS CAUSED BY SULFUR PLUGGING OF THE H2S GAS LINES TO THE REGENERATION REACTORS WHICH RESULTED IN A PRESSURE BUILDUP.							
				OPERATION OF THE PLANT WAS HINDERED BY INEFFICIENT SULFUR RECOVERY EQUIPMENT.							
7/82	SYSTEM	25.1	25.2	25.2	25.1			744	740	187	78.5
	** PROBLEMS/SOLUTIONS/COMMENTS										
				DELAYS IN OPERATION WERE CAUSED BY THE NEED TO RELINE A KNOCKOUT VESSEL.							
				THE REPLACEMENT OF A VENTURI SCRUBBER NOZZLE ALSO CAUSED DELAYS DURING JULY.							
				A CLEANING OF THE H2S GAS INLET LINES TO THE REGENERATION REACTORS ACCOUNTED FOR DOWN TIME DURING JULY.							
				THE NEED TO REPLACE A TANK RUPTURE DISC CAUSED A PLANT SHUTDOWN DURING JULYU.							
				MAJOR REVISIONS WERE STILL NEEDED FOR THE SULFUR FLOTATION EQUIPMENT.							
				THE UTILITY ALSO EXPERIENCED PROBLEMS WITH THE H2S GENERATOR PRODUCT COOLERS.							
8/82	SYSTEM	42.7	42.7	42.7	42.7			744	744	318	77.1
	** PROBLEMS/SOLUTIONS/COMMENTS										
				REPAIRS ON LEVEL CONTROL DEVICES CAUSED A PLANT SHUTDOWN DURING AUGUST.							
				REVISIONS WERE MADE ON THE H2S GAS DISTRIBUTION SYSTEM DURING AUGUST.							
				OPERATION OF THE PLANT REMAINED HINDERED BY INEFFECIENT SULFUR RECOVERY EQUIPMENT.							
				THE PREVIOUSLY PACKED ABSORBER TOWER WAS OPERATED AS AN OPEN SPRAY TOWER ABSORBER DUE TO POTENTIAL SULFUR PLUGGING PROBLEMS.							
				DURING SEPTEMBER THE UTILITY DECIDED TO SHUTDOWN THE CITRATE PROCESS DEMONSTRATION PLANT AND COMPLY WITH ENVIRONMENTAL REQUIREMENTS BY BURNING LOW SULFUR COAL.							

APPENDIX F
DESIGN AND PERFORMANCE DATA FOR DISCONTINUED DOMESTIC FGD SYSTEMS

COMPANY NAME	TENNESSEE VALLEY AUTHORITY	
PLANT NAME	SHAWNEE	
UNIT NUMBER	10A	
CITY	PADUCAH	
STATE	KENTUCKY	
REGULATORY CLASSIFICATION	E	
PARTICULATE EMISSION LIMITATION - NG/J	43.	(0.100 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	516.	(1.200 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	1750	
GROSS UNIT GENERATING CAPACITY - MW	10	
NET UNIT GENERATING CAPACITY W/FGD - MW	10	
NET UNIT GENERATING CAPACITY WO/FGD - MW	*****	
EQUIVALENT SCRUBBED CAPACITY - MW	10	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	****	
BOILER TYPE	****	
BOILER SERVICE LOAD	****	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	********	(******* ACFM)
BOILER FLUE GAS TEMPERATURE - C	*******	(**** F)
STACK HEIGHT - M	******	(**** FT)
STACK SHELL	NR	
STACK TOP DIAMETER - M	*******	(***** FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	BITUMINOUS	
AVERAGE HEAT CONTENT - J/G	******	(****** BTU/LB)
RANGE HEAT CONTENT - BTU/LB		****
AVERAGE ASH CONTENT - %	********	
RANGE ASH CONTENT - %	****	
AVERAGE MOISTURE CONTENT - %	********	
RANGE MOISTURE CONTENT - %	****	
AVERAGE SULFUR CONTENT - %	2.90	
RANGE SULFUR CONTENT - %	****	
AVERAGE CHLORIDE CONTENT - %	********	
RANGE CHLORIDE CONTENT - %	****	
*** PARTICLE CONTROL		
** PARTICLE SCRUBBER		
GENERIC TYPE	PACKED TOWER	
SPECIFIC TYPE	MOBILE BED PACKING	
TRADE NAME/COMMON NAME	TURBULENT CONTACT ABSORBER	
SHELL GENERIC MATERIAL	NR	
SHELL SPECIFIC MATERIAL	NR	
LINER GENERIC MATERIAL	NR	
LINER SPECIFIC MATERIAL	NR	
GAS CONTACTING DEVICE TYPE	PLASTIC SPHERES	
*** FGD SYSTEM		
** GENERAL DATA		
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT	
SO2 REMOVAL MODE	WET SCRUBBING	
PROCESS TYPE	LIME/LIMESTONE	
PROCESS ADDITIVES	VARIABLE - TEST FACILITY	
SYSTEM SUPPLIER	AIR CORRECTION DIVISION, UOP	
A-E FIRM	BECHTEL	
DEVELOPMENT LEVEL	PROTOTYPE	
NEW/RETROFIT	RETROFIT	
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	90.00	
CURRENT STATUS	8	
TERMINATION	7/1982	
INITIAL START-UP	4/1972	

TENNESSEE VALLEY AUTHORITY: SHAWNEE 10A (CONT.)

** DESIGN AND OPERATING PARAMETERS		
DESIGN CHLORIDE CONTENT - %	********	
** QUENCHER/PRESATURATOR		
CONSTRUCTION MATERIAL GENERIC TYPE	NR	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR	
** ABSORBER		
NUMBER	1	
GENERIC TYPE	PACKED TOWER	
SPECIFIC TYPE	MOBILE BED PACKING	
TRADE NAME/COMMON TYPE	TURBULENT CONTACT ABSORBER	
SUPPLIER	AIR CORRECTION DIVISION, UOP	
SHELL GENERIC MATERIAL	NR	
SHELL SPECIFIC MATERIAL	NR	
SHELL MATERIAL TRADE NAME/COMMON TYPE	NR	
LINER GENERIC MATERIAL	NR	
LINER SPECIFIC MATERIAL	NR	
LINER MATERIAL TRADE NAME/COMMON TYPE	NR	
GAS CONTACTING DEVICE TYPE	PLASTIC/RUBBER MOBILE BALLS	
NUMBER OF CONTACTING ZONES	3	
DISTANCE BETWEEN GAS CONTACTING ZONES - CM	12.7	(5.0IN)
INLET GAS FLOW - CU. M/S	16.52	(35000 ACFM)
INLET GAS TEMPERATURE - C	148.9	(300 F)
** MIST ELIMINATOR		
PRE-MIST ELIMINATOR/MIST ELIMINATOR	PRIMARY COLLECTOR	
NUMBER PER SYSTEM	1	
GENERIC TYPE	IMPINGEMENT	
SPECIFIC TYPE	BAFFLE	
TRADE NAME/COMMON TYPE	CLOSED VANE	
CONSTRUCTION MATERIAL GENERIC TYPE	NR	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR	
WASH WATER SOURCE	SUPERNATANT	
WASH FREQUENCY	INTERMITTENT	
** REHEATER		
GENERIC TYPE	DIRECT COMBUSTION	
SPECIFIC TYPE	NR	
TRADE NAME/COMMON TYPE	OIL	
CONSTRUCTION MATERIAL GENERIC TYPE	NR	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR	
** FANS		
DESIGN	CENTRIFUGAL	
FUNCTION	BOOSTER	
APPLICATION	INDUCED DRAFT	
SERVICE	DRY	
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	
** DAMPERS		
FUNCTION	NR	
GENERIC TYPE	NR	
SPECIFIC TYPE	NR	
CONSTRUCTION MATERIAL GENERIC TYPE	NR	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR	
LINER GENERIC MATERIAL TYPE	NR	
LINER SPECIFIC MATERIAL TYPE	NR	
** DUCTWORK		
SHELL GENERIC MATERIAL TYPE	NR	
SHELL SPECIFIC MATERIAL TYPE	NR	
LINER GENERIC MATERIAL TYPE	NR	
LINER SPECIFIC MATERIAL TYPE	NR	
** REAGENT PREPARATION EQUIPMENT		
FUNCTION	NR	
DEVICE	NR	
DEVICE TYPE	NR	

TENNESSEE VALLEY AUTHORITY: SHAWNEE 10A (CONT.)

** TANKS	
SERVICE	NUMBER
-------	------
ABSORBER RECYCLE	****
** PUMPS	
SERVICE	NUMBER
-------	------
NR	****
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	CENTRIFUGE
NUMBER	1
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	THICKENER
NUMBER	1
*** SLUDGE	
** TREATMENT	
METHOD	DEWATERED
DEVICE	N/A
PROPRIETARY PROCESS	N/A
** DISPOSAL	
NATURE	FINAL
TYPE	LANDFILL
SITE TREATMENT	NONE
** WATER BALANCE	
WATER LOOP TYPE	CLOSED
** FGD SPARE CAPACITY INDICES	
ABSORBER - %	0.0
** FGD SPARE COMPONENT INDICES	
ABSORBER	0.0

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
0/81	SYSTEM										

** PROBLEMS/SOLUTIONS/COMMENTS

REFER TO THE PERFORMANCE UPDATE INFORMATION FOR SHAWNEE 10B.

APPENDIX F
DESIGN AND PERFORMANCE DATA FOR DISCONTINUED DOMESTIC FGD SYSTEMS

COMPANY NAME	TENNESSEE VALLEY AUTHORITY	
PLANT NAME	SHAWNEE	
UNIT NUMBER	10B	
CITY	PADUCAH	
STATE	KENTUCKY	
REGULATORY CLASSIFICATION	E	
PARTICULATE EMISSION LIMITATION - NG/J	43.	(0.100 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	516.	(1.200 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	1750	
GROSS UNIT GENERATING CAPACITY - MW	10	
NET UNIT GENERATING CAPACITY W/FGD - MW	10	
NET UNIT GENERATING CAPACITY WO/FGD - MW	*****	
EQUIVALENT SCRUBBED CAPACITY - MW	10	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	****	
BOILER TYPE	****	
BOILER SERVICE LOAD	****	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	********	(******* ACFM)
BOILER FLUE GAS TEMPERATURE - C	*******	(**** F)
STACK HEIGHT - M	******	(**** FT)
STACK SHELL	NR	
STACK TOP DIAMETER - M	*******	(***** FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	BITUMINOUS	
AVERAGE HEAT CONTENT - J/G	******	(****** BTU/LB)
RANGE HEAT CONTENT - BTU/LB		****
AVERAGE ASH CONTENT - %	********	
RANGE ASH CONTENT - %	****	
AVERAGE MOISTURE CONTENT - %	********	
RANGE MOISTURE CONTENT - %	****	
AVERAGE SULFUR CONTENT - %	2.90	
RANGE SULFUR CONTENT - %	****	
AVERAGE CHLORIDE CONTENT - %	********	
RANGE CHLORIDE CONTENT - %	****	
*** PARTICLE CONTROL		
** PARTICLE SCRUBBER		
NUMBER	1	
INITIAL START-UP DATE	4/1972	
GENERIC TYPE	VENTURI TOWER	
SPECIFIC TYPE	VARIABLE-THROAT/TOP-ENTRY PLUMB BOB	
TRADE NAME/COMMON NAME	N/A	
SUPPLIER	GE ENVIRONMENTAL SERVICES	
SHELL GENERIC MATERIAL	NR	
SHELL SPECIFIC MATERIAL	NR	
LINER GENERIC MATERIAL	NR	
LINER SPECIFIC MATERIAL	NR	
GAS CONTACTING DEVICE TYPE	NONE	
INLET GAS FLOW RATE - CU.M/S	1.7	(3500 ACFM)
INLET GAS TEMPERATURE - C	148.9	(300 F)
*** FGD SYSTEM		
** GENERAL DATA		
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT	
SO2 REMOVAL MODE	WET SCRUBBING	
PROCESS TYPE	LIME/LIMESTONE	
PROCESS ADDITIVES	VARIABLE - TEST FACILITY	
SYSTEM SUPPLIER	GE ENVIRONMENTAL SERVICES	
A-E FIRM	BECHTEL	
DEVELOPMENT LEVEL	PROTOTYPE	
NEW/RETROFIT	RETROFIT	
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	90.00	
CURRENT STATUS	8	

TENNESSEE VALLEY AUTHORITY: SHAWNEE 10B (CONT.)

TERMINATION	7/1982	
INITIAL START-UP	4/1972	
** DESIGN AND OPERATING PARAMETERS		
DESIGN CHLORIDE CONTENT - %	********	
** QUENCHER/PRESATURATOR		
CONSTRUCTION MATERIAL GENERIC TYPE	NR	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR	
** ABSORBER		
NUMBER	1	
GENERIC TYPE	SPRAY TOWER	
SPECIFIC TYPE	OPEN COUNTERCURRENT SPRAY	
TRADE NAME/COMMON TYPE	N/A	
SUPPLIER	GE ENVIRONMENTAL SERVICES	
SHELL GENERIC MATERIAL	NR	
SHELL SPECIFIC MATERIAL	NR	
SHELL MATERIAL TRADE NAME/COMMON TYPE	NR	
LINER GENERIC MATERIAL	NR	
LINER SPECIFIC MATERIAL	NR	
LINER MATERIAL TRADE NAME/COMMON TYPE	NR	
GAS CONTACTING DEVICE TYPE	NONE	
INLET GAS FLOW - CU. M/S	16.52	(35000 ACFM)
INLET GAS TEMPERATURE - C	148.9	(300 F)
** MIST ELIMINATOR		
PRE-MIST ELIMINATOR/MIST ELIMINATOR	PRIMARY COLLECTOR	
NUMBER PER SYSTEM	1	
GENERIC TYPE	IMPINGEMENT	
SPECIFIC TYPE	BAFFLE	
TRADE NAME/COMMON TYPE	CLOSED VANE	
CONSTRUCTION MATERIAL GENERIC TYPE	NR	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR	
** REHEATER		
GENERIC TYPE	DIRECT COMBUSTION	
SPECIFIC TYPE	NR	
TRADE NAME/COMMON TYPE	OIL	
CONSTRUCTION MATERIAL GENERIC TYPE	NR	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR	
** FANS		
DESIGN	CENTRIFUGAL	
FUNCTION	BOOSTER	
APPLICATION	INDUCED DRAFT	
SERVICE	DRY	
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	
** DAMPERS		
FUNCTION	NR	
GENERIC TYPE	NR	
SPECIFIC TYPE	NR	
CONSTRUCTION MATERIAL GENERIC TYPE	NR	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR	
LINER GENERIC MATERIAL TYPE	NR	
LINER SPECIFIC MATERIAL TYPE	NR	
** DUCTWORK		
SHELL GENERIC MATERIAL TYPE	NR	
SHELL SPECIFIC MATERIAL TYPE	NR	
LINER GENERIC MATERIAL TYPE	NR	
LINER SPECIFIC MATERIAL TYPE	NR	
** REAGENT PREPARATION EQUIPMENT		
FUNCTION	NR	
DEVICE	NR	
DEVICE TYPE	NR	

TENNESSEE VALLEY AUTHORITY: SHAWNEE 10B (CONT.)

** TANKS

SERVICE	NUMBER
ABSORBER RECYCLE	****
SPARGER/OXIDIZER	****
NR	****

** PUMPS

SERVICE	NUMBER
NR	****

** SOLIDS CONCENTRATING/DEWATERING

DEVICE	NR

*** SLUDGE

** TREATMENT

METHOD	DEWATERED
DEVICE	N/A
PROPRIETARY PROCESS	N/A

** DISPOSAL

NATURE	FINAL
TYPE	LANDFILL
SITE TREATMENT	NONE

** WATER BALANCE

WATER LOOP TYPE	CLOSED

** FGD SPARE CAPACITY INDICES

ABSORBER - %	0.0

** FGD SPARE COMPONENT INDICES

ABSORBER	0.0

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
0/72	SYSTEM										

** PROBLEMS/SOLUTIONS/COMMENTS

IN JUNE 1968, THE EPA INITIATED A PROGRAM TO TEST PROTOTYPE LIME AND LIMESTONE SYSTEMS FOR REMOVAL OF SULFUR DIOXIDE AND PARTICULATE MATTER FROM COAL FIRED BOILER FLUE GASES. THE PROGRAM WAS CARRIED OUT IN A TEST FACILITY INCORPORATED INTO THE FLUE GAS DUCTWORK OF UNIT 10, A COAL-FIRED BOILER AT THE TVA SHAWNEE POWER STATION, PADUCAH, KENTUCKY. TVA IS THE CONSTRUCTION AND FACILITY OPERATOR, AND BECHTEL CORP. IS CONTRACTOR, TEST DIRECTOR AND REPORT WRITER.

THE TEST FACILITY CONSISTS OF THREE PARALLEL SCRUBBING SYSTEMS OF PROTOTYPE SIZE, TREATING PART OF THE FLUE GAS FROM THE BOILER. EACH SCRUBBER TRAIN IS CAPABLE OF TREATING APPROXIMATELY 30,000 ACFM OR THE EQUIVALENT OF APPROXIMATELY 10 MW OF POWER PLANT GENERATING CAPACITY.

THREE PARALLEL WET SCRUBBING SYSTEMS WERE SELECTED FOR THE TEST PROJECT: 1) A VENTURI WITH A SPRAY TOWER AFTER ABSORBER, 2) A TURBULENT CONTACT ABSORBER (TCA), AND 3) A MARBLE-BED ABSORBER. THE VENTURI SYSTEM, MANUFACTURED BY CHEMICAL CONSTRUCTION CO., CONTAINS AN ADJUSTABLE THROAT THAT PERMITS CONTROL AND VARIATION OF PRESSURE DROP OVER A WIDE RANGE OF FLOW CONDITIONS. THE TCA UNIT, MANUFACTURED BY UNIVERSAL OIL PRODUCTS, INCORPORATES A FLUIDIZED BED OF LOW DENSITY PLASTIC SPHERES THAT ARE FREE TO MOVE BETWEEN RETAINING GRIDS. THE MARBLE BED ABSORBER, SUPPLIED BY COMBUSTION ENGINEERING CO., USES A PACKING OF 3 TO 4 INCH GLASS MARBLE SPHERES AND A TURBULENT LAYER OF LIQUID AND GAS ABOVE THE MARBLE LAYER TO

TENNESSEE VALLEY AUTHORITY: SHAWNEE 10B (CONT.)

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

ENHANCE MASS TRANSFER.

IN JUNE 1974, THE EPA BEGAN A 3-YEAR ADVANCED TEST PROGRAM AT THE SHAWNEE FACILITY WITH THESE MAJOR GOALS: (1) CONTINUATION OF LONG-TERM TESTING, WITH EMPHASIS PLACED UPON THE RELIABLE OPERATION OF MIST ELIMINATION SYSTEMS AT INCREASED GAS VELOCITY, (2) INVESTIGATION OF ADVANCED PROCESS AND EQUIPMENT DESIGN VARIATIONS FOR IMPROVING EQUIPMENT RELIABILITY AND PROCESS ECONOMICS, AND (3) LONG-TERM RELIABILITY TESTING ON PROMISING PROCESS AND EQUIPMENT DESIGN VARIATIONS.

THE TWO PARALLEL SCRUBBING SYSTEMS OPERATING DURING THE ADVANCED PROGRAM ARE THE VENTURI/SPRAY TOWER SYSTEM AND THE TCA UNIT. OPERATION OF THE MARBLE-BED ABSORBER UNIT HAS BEEN PERMANENTLY DISCONTINUED.

EACH OF THE SCRUBBING SYSTEMS CONTAINS ITS OWN SLURRY HANDLING FACILITIES AND CAN TREAT APPROXIMATELY 30,000 ACFM OF GAS AT 300 F CONTAINING 1800 TO 4000 PPM OF SULFUR DIOXIDE AND 2 TO 4 GRAINS/SCF OF PARTICULATE MATTER BOILER 10 NORMALLY BURNS A HIGH-SULFUR BITUMINOUS COAL.

FROM JUNE 1974 TO JANUARY 1976, MIST ELIMINATION AND LIMESTONE UTILIZATION TESTS WERE CONDUCTED AT THE SHAWNEE FACILITY. DURING THIS TEST PERIOD THE VENTURI/SPRAY TOWER SYSTEM WAS OPERATED ON BOTH LIME AND LIMESTONE AND THE TCA SYSTEM WITH LIMESTONE. TESTING WAS PERFORMED UNDER A CLOSED WATER OPERATION MODE. DURING THIS PERIOD THE SLURRY SOLIDS CONTAINED APPROXIMATELY 40 TO 50% (BY WEIGHT) FLY ASH BECAUSE OF RELATIVELY HIGH GAS INLET PARTICULATE LOADING. THIS TESTING PROGRAM IS SCHEDULED TO RUN THROUGH TO FEBRUARY 1978.

ADDITIONAL INFORMATION AND DATA CONCERNING THE DETAILS OF THE ADVANCE TEST PROGRAM ARE PRESENTED IN THE PERFORMANCE HISTORY THAT FOLLOWS.

9/75	SYSTEM				720					

** PROBLEMS/SOLUTIONS/COMMENTS

THIS EXPERIMENTAL EPA-FUNDED OPERATION IS PROCEEDING WITH THE TEST PROGRAM. TWO ABSORBER MODULES ARE CURRENTLY OPERATIONAL (10 MW EACH). THE MARBLE-BED ABSORBER IS STILL INOPERATIVE (SINCE JULY 1973). CURRENT EXPERIMENTS ARE RELATED TO THE MIST ELIMINATOR SECTION.

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

** PROBLEMS/SOLUTIONS/COMMENTS

RECENT TESTING AT SHAWNEE HAS SHOWN THAT THE CHEVRON MIST ELIMINATORS IN BOTH THE SPRAY TOWER AND THE TCA CAN BE KEPT FREE OF SOLIDS BUILDUP AT HIGH ALKALI UTILIZATION (GREATER THAN 90%), USING ONLY INTERMITTANT WASHING WITH AVAILABLE RAW WATER. THIS HIGH UTILIZATION IS NORMALLY ACHIEVED WITH LIME. IT HAS BEEN ACHIEVED WITH LIMESTONE AT REDUCED SCRUBBER INLET SLURRY PH (ABOUT 5.2) AND WITH THREE EFFLUENT TANKS IN SERIES TO SIMULATE A PLUG-FLOW REACTOR. TESTING IS CONTINUING TO DETERMINE THE EFFECTS OF PROCESS VARIABLES ON MIST ELIMINATOR PERFORMANCE AND LIMESTONE UTILIZATION. FUTURE PLANS INCLUDE: (1) FACTORIAL TESTING WITH LIME AND LIMESTONE TO DETERMINE THE EFFECTS OF PROCESS VARIABLES ON SO2 REMOVAL AND (2) TESTING THE OXIDATION OF SLUDGE TO GYPSUM IN THE VENTURI/SPRAY TOWER SYSTEM USING AIR SPARGING OF AN ACIDIFIED SLURRY BLEED STREAM.

1/76	SYSTEM				744					
2/76	SYSTEM				696					

TENNESSEE VALLEY AUTHORITY: SHAWNEE 10B (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE ADVANCED TEST PROGRAM IS CONTINUING. HIGHLIGHTS OF THE PROGRAM ARE AS FOLLOWS: EVALUATE SCRUBBER OPERABILITY DURING VARIABLE LOAD OPERATION. CONTINUE LONG-TERM RELIABILITY TESTING. INVESTIGATE METHODS FOR IMPROVING WASTE SOLIDS SEPARATION. CONTINUE SLUDGE OXIDATION AND SLUDGE FIXATION STUDY PROGRAMS. EVALUATE SYSTEM PERFORMANCE AT REDUCED FLY ASH LOADING. DETERMINE THE PRACTICAL UPPER LIMITS OF SO2 REMOVAL EFFICIENCY. EVALUATE ADDITION OF MAGNESIUM ION TO THE SCRUBBING SLURRY. CHARACTERIZE ALL STACK GAS EMISSION COMPONENTS. EVALUATE MATERIALS OF CONSTRUCTION OF ALL SCRUBBER AND PLANT-RELATED COMPONENTS. DEVELOPE A COMPUTER PROGRAM FOR DESIGN AND COST ANALYSIS OF FULL-SCALE LIME/LIMESTONE SYSTEM.								
3/76	SYSTEM							744			
4/76	SYSTEM							720			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		BECHTEL REPORTED THAT THE FACTORIAL TEST PROGRAM, EVALUATING THE PERFORMANCE OF THE LIME/LIMESTONE SCRUBBING SYSTEMS WITH AND WITHOUT MAGNESIUM ADDITION, HAS BEEN COMPLETED. CURRENTLY TESTING IS PROCEEDING ON THE EVALUATION OF SYSTEM PERFORMANCE AS A FUNCTION OF LOW RESIDENCE TIMES (1.5 TO 5.0 MINUTES) IN THE RECYCLE TANKS. IN ADDITION, A FLY ASH-FREE DUCT IS BEING INSTALLED AT THE TEST FACILITY, TO ENABLE EVALUATION OF THE SYSTEM PERFORMANCE IN THE ABSENCE OF FLY ASH.								
5/76	SYSTEM							744			
6/76	SYSTEM							720			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE TEST DIRECTOR, BECHTEL, PROVIDED THE FOLLOWING INPUT CONCERNING THE OPERATION OF THE EXPERIMENTAL SCRUBBING SYSTEMS DURING MAY AND JUNE. THE EFFECT OF MGO ADDITION WAS EXPLORED IN BOTH SCRUBBER SYSTEMS. RESULTS INDICATE MAGNESIUM ION IN THE SCRUBBER SLURRY LIQUOR ENHANCES SO2 REMOVAL AND CAN DEPRESS SULFATE SUPERSATURATION. IT WAS FOUND THAT THE MAGNESIUM ION CONCENTRATION HAD TO EXCEED THE EQUIVALENT CHLORIDE ION CONCENTRATION TO HAVE AN EFFECT ON SO2 REMOVAL. IN THE TCA UNIT, WITH LIMESTONE SLURRY, SO2 REMOVAL WAS INCREASED FROM 75 TO 95% BY INCREASING THE MAGNESIUM ION CONCENTRATION TO 9,000 PPM IN EXCESS OF EQUIVALENT CHLORIDE ION. TO ACHIEVE THIS CONCENTRATION MAGNESIUM WAS ADDED AT A RATE EQUAL TO 6% BY WEIGHT OF LIMESTONE ADDITION RATE. IN THE VENTURI/SPRAY TOWER SYSTEM, WITH LIME SLURRY, SO2 REMOVAL WAS INCREASED FROM 75 TO 90% BY INCREASING THE MAGNESIUM ION CONCENTRATION TO 2,000 PPM IN EXCESS OF EQUIVALENT CHLORIDE ION. THE MAGNESIUM OXIDE ADDITION RATE WAS 2% BY WEIGHT OF THE LIME ADDITION RATE. BOTH SCRUBBING SYSTEMS OPERATED IN THE SUBSATURATED SULFATE MODE WHEN MAGNESIUM OXIDE WAS ADDED. INLET SO2 CONCENTRATIONS DURING THE TESTS AVERAGE APPROXIMATELY 3,000 PPM DURING THESE TESTS. FOLLOWING THE TEST BLOCKS MENTIONED ABOVE, BOTH SCRUBBERS BEGAN OPERATING WITH LIME SLURRY SCRUBBING SOLUTIONS, THE TCA SYSTEM ON FLUE GAS CONTAINING FLY ASH AND THE VENTURI/SPRAY TOWER SYSTEM ON FLY ASH-FREE FLUE GAS.								
7/76	SYSTEM							744			
8/76	SYSTEM							744			

TENNESSEE VALLEY AUTHORITY: SHAWNEE 10B (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

EXPERIMENTAL OPERATION OF THE EPA/TVA ALKALI SCRUBBING TEST FACILITY CONTINUED DURING THE JULY AND AUGUST. BECHTEL, THE TEST DIRECTOR PROVIDED THE FOLLOWING INPUT CONCERNING THE OPERATION OF THE PROTOTYPE TEST UNITS.
VENTURI/SPRAY TOWER SYSTEM: THIS SYSTEM RAN OFF FLY ASH-FREE FLUE GAS USING A LIME SLURRY SCRUBBING SOLUTION. NO SIGNIFICANT DIFFERENCES IN SO2 REMOVAL, GYPSUM SATURATION AND SULFITE OXIDATION WERE DETECTED (VS FLY ASH-LADEN FLUE GAS). ONE DIFFERENCE NOTED WAS THE FILTER CAKE SOLIDS CONTENT WHICH WAS APPROXIMATELY 10% LOWER FOR THE FLY ASH-FREE SLUDGE (40 TO 50% SOLIDS) VERSUS THE FLY ASH-LADEN SLUDGE 50 TO 60% SOLIDS
IN ADDITION, OPERATION IN A LOW RESIDENCE TIME MODE (3 MINUTES) WAS EXPLORED. SCALE-FREE OPERATION WAS ACHIEVED IN THIS MODE UNDER THE FOLLOWING CONDITIONS: 8% SOLIDS (NO FLY ASH) IN THE RECIRCULATED SLURRY, PH OF THE SCRUBBER LIQUID INLET WAS 8.0, SUPERFICIAL GAS VELOCITY OF 9.4 FT/SEC, AND A TOTAL LIQUID-TO-GAS RATIO (L-G) OF 7.1 GAL/MCF. SOME SCALE FORMATION OCCURRED WHEN THE SOLIDS CONTENT OF THE RECIRCULATED SLURRY DROPPED BELOW THE 4% LEVEL.
TCA SYSTEM: THIS SYSTEM OPERATED ON FLY ASH-LADEN FLUE GAS USING A LIME SLURRY SCRUBBING SOLUTION INNOCULATED WITH MAGNESIUM OXIDE. GYPSUM SUBSATURATION OPERATION WAS ACHIEVED UNDER THE FOLLOWING CONDITIONS: MAGNESIUM ION CONCENTRATION EXCEEDED THE CHLORIDE ION CONCENTRATION BY 2000 PPM, SUPERFICIAL GAS VELOCITY WAS 12.5 FT/SEC., L/G WAS 50. THE SCRUBBING SOLUTION INLET PH WAS 7.0, AND RESIDENCE TIME WAS 4 MINUTES. THE SO2 REMOVAL EFFICIENCY WAS APPROXIMATELY 90%. WHEN L/G WAS REDUCED TO 37, WHILE ALL OTHER CONDITIONS REMAINED CONSTANT, SEVERE GYPSUM SCALE FORMATION RESULTED. INCREASING THE EFFECTIVE MAGNESIUM CONCENTRATION TO 4000 PPM AND THE SCRUBBER LIQUID INLET PH TO 8.0 DID NOT AMELIORATE THE SCALE PROBLEM. PRESENTLY THE VENTURI/SPRAY TOWER SYSTEM IS OPERATING ON FLY ASH-FREE FLUE GAS WITH MAGNESIUM OXIDE-INNOCULATED LIME SCRUBBING SLURRY.

9/76	SYSTEM						720			
10/76	SYSTEM						744			

** PROBLEMS/SOLUTIONS/COMMENTS

IN SEPTEMBER AND OCTOBER 1976 THE VENTURI/SPRAY SYSTEM WAS OPERATED WITH FLY ASH-FREE FLUE GAS USING LIME SLURRY WITH MGO ADDITION. TYPICAL TEST CONDITIONS WERE 9.4 FT/SEC SPRAY TOWER GAS VELOCITY, 21 GAL/MCF VENTURI L/G, 50 GAL/MCF SPRAY TOWER L/G, 8% SLURRY SOLIDS (FLY ASH FREE), 3 MINUTES RESIDENCE TIME, 7.0 SCRUBBER INLET PH, AND 2000 PPM EFFECTIVE MAGNESIUM ION CONCENTRATION (I.E., EXCESS OVER EQUIVALENT CHLORIDE ION). RESULTS WERE NOT CONSISTENT AT THESE CONDITIONS. DURING ONE PERIOD, SCRUBBING INLET LIQUOR GYPSUM SATURATION AVERAGED 85% WITH 80% SO2 REMOVAL EFFICIENCY AND SOME GYPSUM SCALE FORMATION. IN A LATER PERIOD, AT SEEMINGLY IDENTICAL TEST CONDITIONS GYPSUM SATURATIONS DROPPED TO 10% WITH 98% SO2 REMOVAL AND THE SCRUBBER DESCALED. A SEVEN-WEEK PROGRAM OF INTENSIVE FLUE GAS CHARACTERIZATION TESTING WAS STARTED IN MID-OCTOBER ON THE VENTURI/SPRAY TOWER SYSTEM. THESE TESTS ARE BEING MADE TO MEASURE SIMULATANEOUS INLET AND OUTLET FLUE GAS PARTICULATE MASS LOADING, PARTICULATE SIZE DISTRIBUTION AND GASEOUS SO3 CONCENTRATION. THE TCA SYSTEM CONTINUED TO OPERATE DURING THIS PERIOD ON FLY ASH-LADEN FLUE GAS USING LIME SLURRY WITH ADDED MGO. THE TEST RESULTS SO FAR INDICATED THAT THE DEGREE OF SULFATE (GYPSUM) SATURATION IS A SENSITIVE FUNCTION OF THE EFFLUENT RESIDENCE TIME CONDITIONS: GAS VELOCITY 12.5 FT/SEC, L/G OF 50, PH OF 7.0, 2000 PPM OF MG ION, AND 8% SOLIDS. AT THESE CONDITIONS GYPSUM SATURATIONS WERE 95, 50, AND 92%, AT RESIDENCE TIMES OF 3, 4, AND 12 MINUTES, RESPECTIVELY. FURTHER TESTS WERE RUN AT 37 GAL/MCF L/G, AND 8.0 INLET PH WITH OTHER CONDITIONS THE SAME. DURING THESE TESTS GYPSUM SATIONS WERE 95, 95, 50, AND 90% AT 3, 4, 5.4, AND 16 MINUTES RESIDENCE TIMES, RESPECTIVELY.

TENNESSEE VALLEY AUTHORITY: SHAWNEE 10B (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
11/76	SYSTEM							720			
12/76	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

FROM MID-OCTOBER THROUGH EARLY DECEMBER AN INTENSIVE FLUE GAS CHARACTERIZATION TESTING PROGRAM WAS CONDUCTED ON THE VENTURI/SPRAY TOWER SYSTEM WITH LIME SLURRY. OVER THE RANGE TESTED, OUTLET PARTICULATE MASS LOADING WAS FOUND TO BE INDEPENDENT OF SLURRY COMPOSITION (8 TO 15% SUSPENDED SOLIDS, 3,000 TO 16,000 PPM DISSOLVED SOLIDS), GAS FLOW RATE (20,000 TO 35,000, ACFM), SPRAY TOWER LIQUID RATE (0 TO 1,400 GPM) AND VENTURI PRESSURE DROP (3 TO 9 INCHES H2O). WITH 4 TO 6 GR/DSCF PARTICULAT MATTER IN THE INLET, TYPICAL OUTLET LOADINGS WERE 0.02 TO 0.04 GR/DSCF. WHEN OPERATING WITH FLUE GAS FROM THE ELECTROSTATIC PRECIPITATOR (.1 TO .4 GR/DSCF TO THE SCRUBBER), THE SCRUBBER OUTLET LOADING AVERAGED 0.005 GR/DSCF. THUS, ENTRAINED SLURRY FROM THE MIST ELIMINATOR MUST HAVE BEEN LESS THAN 0.005 GR/DSCF. SIZE DISTRIBUTION DATA ARE STILL BEING ANALYZED. SULFURIC ACID MIST VALUES WERE APPROXIMATELY 2 TO 25 PPM AT THE SCRUBBER INLET AND REMOVALS HAVE BEEN ABOUT 50 TO 75%.
DURING THE REMAINDER OF DECEMBER THE VENTURI/SPRAY TOWER SYSTEM WAS DOWN FOR MODIFICATIONS FOR TWO-STAGE OXIDATION TESTING.
DURING NOVEMBER THE TCA WAS OPERATING WITH FLY ASH-CONTAINING FLUE GAS US ING LIME SLURRY WITHOUT ADDED MAGNESIUM OXIDE. OPERATING CONDITIONS WERE 12.5 FT/SEC GAS VELOCITY, 50 GAL/MCF L/G, 8.0 SCRUBBER INLET PH, AND 8 TO 15% SLURRY SOLIDS. AT THESE CONDITIONS THE SO2 REMOVAL WAS ABOUT 80%.
FLY ASH-FREE LIMESTONE TESTS WITHOUT MAGNESIUM OXIDE ADDITION BEGAN ON THE TCA SYSTEM IN LATE NOVEMBER. TYPICAL OPERATING CONDITIONS WERE 12.5 FT/SEC GAS VELOCITY, 50 GAL/MCF L/G, AND 1.1 TO 1.2 STOICHIOMETRIC RATIO. AT THE SAME STOICHIOMETRY, THE PH OF THE FLY ASH-FREE SLURRY WAS 0.2 TO 0.3 UNITS HIGHER THAN OBSERVED IN PREVIOUS RUNS WITH FLY ASH.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
1/77	SYSTEM							744			
2/77	SYSTEM							672			

** PROBLEMS/SOLUTIONS/COMMENTS

THE VENTURI/SPRAY TOWER SYSTEM HAS BEEN OPERATED IN A TWO-SERIES-SCRUBBER MODE WITH FORCED OXIDATION SINCE EARLY JANUARY 1977 AFTER SYSTEM MODIFICATIONS TO ALLOW OPERATION OF THE VENTURI AND SPRAY TOWER WITH INDEPENDENT SLURRY RECIRCULATION LOOPS. SULFITE OXIDATION WAS CARRIED OUT IN AN 8 FT DIAMETER VENTURI (PRE-SCRUBBER) EFFLUENT HOLD TANK WHICH HAD AN AIR SPARGER WITH 130-1/8 INCH HOLES IMMERSED IN 18 FT OF SLURRY. THE SPRAY TOWER (AFTER SCRUBBER) FUNCTIONED AS A PRIMARY SO2 ABSORBER.
TYPICAL OPERATION CONDITIONS, USING LIMESTONE SLURRY, WERE 6.7 FT/SEC SPRAY TOWER GAS VELOCITY, 20-30 GAL/MCF VENTURI L/G, 70 GAL/MCF SPRAY TOWER L/G 15% SOLIDS (WITH FLY ASH) IN VENTURI RECIRCULATED SLURRY, 4.5-5 VENTURI INLET (OXIDATION TANK) PH, AND 11.3 MINUTES OXIDATION TANK RESIDENCE TIME (BASED ON 600 GPM SLURRY FLOW TO VENTURI). DURING THESE TESTS, AVERAGE OVERALL SULFITE OXIDATION RANGED FROM 93 TO 99% AT AIR STOICHIOMETRIC RATIO OF 1.0 TO 4.7 LB-ATOMS OXYGEN/LB-MOLE SO2 ABSORBED. CORRESPONDING AVERAGE OXIDATION IN THE SPRAY TOWER RANGED FROM 10 TO 16% AVERAGE OVERALL LIMESTONE UTILIZATION RANGED FROM 83 TO 96%. NO SCALING WAS EXPERIENCED IN EITHER SCRUBBER. AVERAGE FILTER CAKE SOLIDS WERE 79 TO 86% BY WEIGHT COMPARED WITH 55 TO 65% WITHOUT FORCED OXIDATION. SLURRY SOLIDS SETTLING RATE RANGED 0.5 TO 1.4 CM/MIN, 5 TO 10 TIMES FASTER THAN THAT FOR UNOXIDIZED SLURRY. FINAL SETTLED DENSITY RANGED 65 TO 80% SOLIDS COMPARED WITH 45 TO 60% FOR SLURRY WITHOUT FORCED OXIDATION.
FLY ASH-FREE LIMESTONE TESTING ON THE TCA SYSTEM WAS COMPLETED IN EARLY FEBRUARY. THE PH OF THE FLY ASH-FREE SLURRY WAS 0.2 TO 0.3 UNITS HIGHER

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

THAN OBSERVED IN PREVIOUS RUNS WITH FLY ASH. IN ADDITION THE FLY ASH-FREE SLURRY APPEARED TO HAVE INFERIOR SOLIDS DEWATERING CHARACTERISTICS. FOR EXAMPLE THE CENTRIFUGE CAKE SOLIDS AVERAGED ABOUT 50% COMPARED WITH ABOUT 60% FOR SLUDGE CONTAINING FLY ASH.
INTENSIVE FLUE GAS CHARACTERIZATION TESTING WITH LIMESTONE SLURRY ON THE TCA SYSTEM BEGAN IN EARLY FEBRUARY AND ENDED IN EARLY MARCH 1977. PRELIMINARY ANALYSIS OF THE DATA SHOWED AN OUTLET MASS LOADING OF 0.4-0.8 GR/DSCF FLY ASH AND 0.02-0.03 GR/DSCF FOR FLUE GAS WITHDRAWN DOWNSTREAM O THE ESP. IT WAS ESTIMATED THAT THESE OUTLET MASS LOADINGS CONTAINED ABOUT 0.03 GR/DSCF FLY ASH, 0.02 GR/DSCF REENTRAINED SLURRY SOLIDS AND 0.015 ENTRAINED DISSOLVED SOLIDS (WHEN A CONTINUOUS MIST ELIMINATOR UNDER WASH WAS USED). THESE VALUES VARY DEPENDING ON THE MIST ELIMINATOR WASH SCHEME AND GAS FLOW RATE.

3/77	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

DURING MARCH THE VENTURI/SPRAY TOWER WAS TESTED WITH LIME SLURRY AND FLY ASH LADEN FLUE GAS IN A TWO-STAGE SCRUBBER MODE WITH FORCED OXIDATION. OPERATION WITH LIME WAS SIMILAR TO THE PREVIOUSLY REPORTED LIMESTONE OPERATION WITH GREATER THAN 95% OXIDATION AT AN AIR STOICHIOMETRIC RATIO OF 1.5 LB-ATOMS OXYGEN/LB-MOLE SO2 ABSORBED WITH A SIMPLE AIR SPARGER IN VENTURI HOLD TANK. SLURRY SOLIDS SETTLING RATE VARIED FROM 0.6 TO 1.9 CM/MIN (A 5 TO 10-FOLD ENHANCEMENT OVER UNOXIDIZED SLURRY) AND FILTER CAKE SOLIDS RANGED FROM 74 TO 88% (COMPARED TO 45 TO 60% WITH UNOXIDIZED SLURRY).
TWO MAJOR DIFFERENCES BETWEEN LIME AND LIMESTONE WERE OBSERVED IN A TWO-STAGE FORCED OXIDATION SYSTEM. TO MAINTAIN PH CONTROL IT WAS NECESSARY TO FEED LIME TO BOTH STAGES. WITH LIMESTONE, FEED TO THE SECOND STAGE ONLY WAS ADEQUATE. TO MAINTAIN 80% SO2 REMOVAL, IT WAS NECESSARY TO OPERATE WITH A HIGHER SLURRY SOLIDS CONCENTRATION IN THE SPRAY TOWER LOOP WITH LIMESTONE (15%) THAN WITH LIME (6%), RESULTING IN A TIGHTER WATER BALANCE WITH LIMESTONE AND INADEQUATE WATER TO FLUSH THE MIST ELIMINATOR.
PRELIMINARY LIMESTONE TYPE AND GRIND TESTS MADE ON THE TCA SYSTEM DURING MARCH INDICATED THAT SO2 REMOVAL IS IMPROVED BY THE USE OF FINER GROUND LIMESTONE. SO2 REMOVAL WITH EQUIVALENTLY GROUND FREDONIA WHITE AND LONGVIEW, ALABAMA LIMSTONES WAS THE SAME. BLEEDSTREAM FORCED OXIDATION TESTS ARE BEING CONDUCTED WITH A PENBERTHY ELL-3 INJECTOR IN A CLOSED LOOP AROUND A BLEED STREAM HOLD TANK. INITIAL TESTS WERE UNSUCESSFUL DUE TO HIGH PH OF 7 TO 8 IN THE HOLD TANK. BY LOWERING THE HOLD TANK PH TO 5 OR 6, SULFITE OXIDATIONS OF UP TO 98% WERE ACHIEVED.

4/77	SYSTEM							720			
5/77	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT 10 BOILER WAS SHUT DOWN FOR A SCHEDULED TWO-MONTH MAINTENANCE OUTAGE. BECAUSE OF THE BOILER OUTAGE, THE SHAWNEE SCRUBBERS DID NOT OPERATE DURING APRIL OR MAY.

6/77	SYSTEM							720			
7/77	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

SCRUBBER OPERATION RESUMED ON JUNE 15 AFTER A 10-WEEK SCHEDULED MAINTENANCE OUTAGE ON THE BOILER.
THE VENTUR/SPRAY TOWER SYSTEM CONTINUED TO OPERATED WITH TWO SCRUBBER STAGES AND FORCED OXIDATION BY MEANS OF AN AIR SPARGING RING IN THE VENTURI HOLD TANK. IN JUNE AND JULY, OPERATION WAS WITH LIME SLURRY AND FLY

TENNESSEE VALLEY AUTHORITY: SHAWNEE 10B (CONT.)

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

ASH-FREE FLUE GAS. THE SYSTEM PERFORMED WELL WITH LITTLE DIFFERENCE FROM THE PREVIOUS LIME SLURRY TEST BLOCK WHEN THERE WAS FLY ASH IN THE FLUE GAS. TYPICAL RESULTS WERE ABOUT 97% SULFITE OXIDATION AT AN AIR STOICHOMETRY OF 1.6 LB-ATOMS OXYGEN/LB-MOLE SO2 ABSORBED AN OXIDATION TANK PH OF 5.5. TYPICAL SOLIDS SETTLING RATE WAS ABOUT 2 CM/MIN (AN ORDER OF MAGNITUDE BETTER THAN WITH UNOXIDIZED SLURRY) AND FILTER CAKE SOLIDS AVERAGED ABOUT 80% (COMPARED WITH 45 TO 60% WITH UNOXIDIDED SLURRY).
THE TCA SYSTEM OPERATED WITH FORCED OXIDATION IN THE HOLD TANK ACHIEVED B CIRCULATING SLURRY THROUGH AN AIR EDUCTOR. IN JUNE AND JULY, OPERATION WA WITH LIMESTONE SLURRY AND FLY ASH IN THE FLUE GAS. SULFITE OXIDATION WAS POOR IN THE INITIAL TEST (LESS THAN 90%) MAINLY BECAUSE OF INADEQUATE AIR/SLURRY CONTACT IN THE HOLD TANK. BY INCREASING AGITATOR SPEED(T 68 RPM), HOLD TANK SLURRY LEVEL (TO 12 FT) AND DECREASING PH (TO LESS THA 5.5) IN THE SLURRY TO THE EDUCTOR, SULFITE OXIDATION OF 90% WAS CONSISTANTLY ACHIEVED AT AN AIR STOICHIOMETRY OF ABOUT 4.5 LB-ATOMS OXYGEN/LB-MOLE SO2 ABSORBED. WASTE SOLIDS PROPERTIES WERE ENHANCED WITH OXIDATION TO ABOUT THE SAME EXTENT AS OBSERVED IN THE VENTURI/SPRAY TOWER SYSTEM. ADDITIONAL TESTING WILL BE DIRECTED TOWARD ACHIEVING 90% OR BETTE SULFITE OXIDATION AT A REDUCED AIR STOICHIOMETRY.

8/77	SYSTEM							744			
9/77	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

THE VENTURI/SPRAY TOWER SYSTEM CONTINUED TO OPERATE WITH TWO SCRUBBING STAGES AND FORCED OXIDATION USING AN AIR SPARGER IN THE VENTURI HOLD TANK OPERATION DURING AUGUST AND SEPTEMBER WAS WITH LIMESTONE SLURRY AND FLUE GAS WITH LOW FLY ASH LOADING (FLUE GAS FROM DOWNSTREAM OF THE ESP). THE SYSTEM PERFORMED WELL AT 4.5 TO 5.0 OXIDATION PH, WITH LITTLE DIFFERENCE FROM THE PREVIOUS LIMESTONE TESTS WHEN THE FLUE GAS HAD FLY ASH LOADING. (THE PREVIOUS TESTS HAD BEEN MADE ONLY AT OXIDATION PH OF 4.5 AND 5.0). FOR THE AUGUST AND SEPTEMBER TESTS, THE OXIDATION PH WAS FURTHER INCREASE TO 5.5, APPROACHING THE PH IN THE SPRAY TOWER. THIS CAUSED SOME DIFFICULTIES IN THE OXIDATION PH CONTROL AND WIDER FLUCTUATIONS IN VENTURI AND SPRAY TOWER LIMSTONE STOICHIOMETRIC RATIOS. HOWEVER NEAR COMPLETE OXIDATION WAS STILL ACHIEVED AT THE HIGHER PH. TYPICAL RESULTS WERE BETTER THA 97% SULFITE OXIDATION AT AN AIR STOICHIOMETRY OF 1.7 ATOMS OXYGEN/MOLE SO2 ABSORBED AND AN OXIDATION PH OF 5.5. THE FILTER CAKE SOLIDS CONTENT AVERAGED BETTER THAN 85%. TESTS WERE ALSO CONDUCTED WITHOUT THE DESUPERSATURATION TANK IN THE VENTURI SLURRY LOOP AND WITH THE OXIDATION TANK LEVEL DROPPED FROM 18 TO 14 FT WITHOUT ADVERSE EFFECTS.
DURING AUGUST AND SEPTEMBER THE TCA SYSTEM WAS OPERATED MOSTLY IN A TWO-TANK FORCE OXIDATION MODE USING AN AIR EDUCTOR. THE TCA EFFLUENT (LIMESTONE SLURRY WITH A HIGH FLY ASH LOADING) WAS COLLECTED IN A SMALL LOW-PH SLURRY HOLD TANK WHERE LIMESTONE WAS ADDED THUS TAKING ADVANTAGE OF THE LOW PH SLURRY THROUGH THE AIR EDUCTOR FOR IMPROVED SULFITE OXIDATION AND HIGH PH SLURRY TO TCA FOR BETTER SO2 REMOVAL.
TESTS WERE MADE BOTH WITH THE AIR EDUCTOR MOUNTED ON TOP OF THE EFFLUENT HOLD TANK WITH DOWNWARD SLURRY DISCHARGE TO THE BOTTOM OF THE TANK. AVERAGE SULFITE OXIDATION RANGE FROM 93 TO 98% AT ABOUT 2.5 AIR STOICHIOMETRY AND 5.2 EDUCTOR INLET PH. DURING TWO OF THE RUNS MADE IN AUGUST WHEN THE ROTARY DRUM FILTER WAS USED THE FILTER CAKE SOLIDS CONTENT AVERAGED 85 AND 88%.
A TEN-DAY RUN WAS MADE IN SEPTEMBER ON THE TCA SYSTEM WITH AUTOMATIC LIME STONE FEED CONTROL BASED ON STOICHIOMETRY. THE LIMESTONE SLURRY FEED RATE WAS CONTROLLED BY THE FLUE GAS FLOW RATE AND THE INLET SO2 CONCENTRATION. THE CONTROL SYSTEM WORKED WELL ACCORDING TO THE SPECIFICATIONS.

10/77	SYSTEM							744			
11/77	SYSTEM							720			

TENNESSEE VALLEY AUTHORITY: SHAWNEE 10B (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

THE VENTURI/SPRAY TOWER SYSTEM CONTINUED TO OPERATE WITH TWO SCRUBBING STAGES AND FORCED OXIDATION IN THE VENTURI HOLD TANK. IN OCTOBER, THE FOL LOWING IMPROVEMENTS WERE MADE WITH NO SIGNIFICANT DROP IN OXIDATION EF- FICIENCY WITH SATISFACTORY SO2 REMOVAL EFFICIENCY:
THE SPRAY TOWER GAS VELOCITY WAS INCREASED FROM 6.7 TO 9.4 FT/SEC.
THE OXIDATION TANK LEVEL WAS DROPPED FROM 18 TO 14 FT.
THE AIR SPARGER RING CONTAINING 40 14-INCH DIAMETER HOLES, WAS RE- PLACED WITH A SINGLE 3-INCH DIAMETER PIPE DISCHARGING DOWNWARD AT THE CENTER OF THE OXIDATION TANK 3 INCHES FROM THE BOTTOM.
WITH AIR DISCHARGED FROM AN OPEN-ENDED PIPE IT WAS APPARENT THAT THE AIR DISPERSION IN THE OXIDATION TANK WAS ACCOMPLISHED MAINLY BY THE TURBINE AGITATOR RATHER THAN THE SPARGER. IN NOVEMBER, A ONE-MONTH RELIABILITY TEST WAS STARTED ON THE VENTURI/SPRAY TOWER SYSTEM USING FORCED OXIDATION WITH TWO SCRUBBER STAGES AND LIMESTONE SLURRY WITH HIGH FLY ASH LOADING. THE FLUE GAS RATE TO THE SCRUBBER SYSTEM WAS VARIED ACCORDING TO THE BOIL ER LOAD WHICH RANGED BETWEEN 100 AND 155 MW. TEST CONDITIONS WERE SELECTE TO MEET THE EPA NEW SOURCE PERFORMANCE STANDARDS OF 1.2 LBS SO2 AND 0.1 LB PARTICULATE PER MILLION BTU. THIS RUN WAS STILL IN PROGRESS AT THE END OF NOVEMBER. ON THE TCA SYSTEM, FORCED OXIDATION WITH A SINGLE SCRUBBER STAGE USING AN AIR EDUCTOR WAS DISCONTINUED IN EARLY OCTOBER AFTER A HOLE ERODED THROUGH THE EDUCTOR BODY. FORCED OXIDATION TESTING WILL BE RESUMED IN EARLY DECEMBER AFTER AN AIR SPARGER IS INSTALLED. DURING THE OCTOBER- NOVEMBER PERIOD, A ONE-MONTH RELIABILITY TEST WITHOUT FORCED OXIDATION WAS CONDUCTED ON THE TCA SYSTEM WITH LIMESTONE SLURRY, FLUE GAS WITH HIGH FLY ASH LOADING, THREE HOLD TANKS IN SERIES, AND 7.5 INCHES STATIC HEIGHT OF NITRILE FOAM SPHERES IN EACH OF 3 BEDS IN THE TCA. GAS RATE TO THE SCRUBBER WAS VARIED WITH BOILER LOAD AND STOICHIOMETRIC RATIO WAS CON- TROLLED BY AN AUTOMATIC LIMESTONE FEED SYSTEM. CONDITIONS WERE SELECTED T MEET THE EPA NEW SOURCE PERFORMANCE STANDARDS AT A LOW STOICHIOMTRIC RATI OF 1.2 MOLES CA/MOLE SO2 ABSORBED. THE AVERAGE SO2 REMOVAL FOR THE ENTIRE RUN WAS 86% AT 2800 PPM WHICH WAS BETTER THAN THE 83% RE- QUIRED TO MEET THE EMISSIONS STANDARD. HOWEVER, THE STANDARD WAS FREQUENT LY EXCEEDED FOR PERIODS GREATER THAN THE 3 HOURS ALLOWED BY THE EPA REGU- LATIONS. AVERAGE OUTLET PARTICULATE MASS LOADING WAS 0.043 GRAIN/SCF DRY WHICH WAS BETTER THAN THE 0.052 GRAIN/SCF DRY (AT 30% EXCESS AIR) RE- QUIRED TO MEET THE STANDARD. THE RANGE OF THE OUTLET MASS LOADING WAS 0.026 TO 0.069 GRAIN/SCF DRY.

12/77	SYSTEM							744			
1/78	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

A LIMESTONE RELIABILITY TEST ON THE VENTURI/SPRAY TOWER SYSTEM WAS COMPLETED IN MID-DECEMBER, 1977 AFTER 965 OPERATING HOURS. THE TEST WAS CONDUCTED WITH TWO SCRUBBER LOOPS WITH FORCED OXIDATION IN THE FIRST (VENTURI) LOOP. THE FLUE GAS FLOW RATE WAS VARIED ACCORDING TO THE BOILER LOAD WHICH RANGED BETWEEN 100 AND 155 MW.
TEST CONDITIONS WERE SELECTED TO MEET THE EPA NEW SOURCE PERFORMANCE STAN DARDS OF 1.2 LB SO2 AND 0.1 LB PARTICULATE PER MILLION BTU. THE OPERATING RELIABILITY OF THE SYSTEM WAS DEMONSTRATED. HOWEVER, DUE TO WIDE VARIATIO IN THE INLET SO2 CONCENTRATION (2500-3400 PPM) AND THE SLOW SYSTEM RE- SPONSE TIME THE SO2 EMISSION STANDARD WAS FREQUENTLY EXCEEDED FOR PERIODS GREATER THAN THE THREE HOURS ALLOWED BY EPA REGULATIONS. AVERAGE SO2 RE- MOVAL FOR THE ENTIRE RUN WAS 86% AT 2950 PPM AVERAGE INLET SO2 WHICH WAS HIGHER THAN THE 84% REQUIRED TO MEET THE STANDARD FOR 2800 PPM INLET SO2. THE OUTLET PARTICULATE LOADING RANGED FROM 0.021 TO 0.063 GRAIN/DRY SCF, WITH A RUN AVERAGE OF 0.042 GRAIN/DRY SCF. THESE VALUES COMPARE WITH LOADING OF 0.052 GR/DRY SCF OR LESS REQUIRED TO MEET THE EPA PARTICULATE STANDARD, ASSUMING 30% TOTAL BOILER EXCESS AIR.

TENNESSEE VALLEY AUTHORITY: SHAWNEE 10B (CONT.)

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

ANOTHER RELIABILITY RUN ON THE VENTURI/SPRAY TOWER SYSTEM WAS STARTED IN MID DECEMBER USING LIME SCRUBBING. THE RUN WAS COMPLETED IN JANUARY 1978. WITH THE EXCEPTION OF HIGHER SPRAY TOWER INLET PH AND HIGHER ALKALI UTILI ZATION INHERENT WITH THE LIME SYSTEM, THE OPERATING CONDITIONS AND THE TEST RESULTS WERE SIMILAR TO THOSE OF THE LIMESTONE RELIABILITY RUN.

ON THE TCA SYSTEM, TWO RUNS WERE MADE WITH THE NITRILE FOAM SPHERES RE- PLACED BY A 46 INCH HEIGHT (23 LAYERS) OF CEILCOTE PACKING SUPPORT PLATES AT FULL GAS FLOW RATE OF 30,000 ACFM, THE SO2 REMOVAL FOR THE CEILCOTE PLATES WAS SLIGHTLY LESS THAN THAT OF A 3-BED, 4-GRID TCA WITH FIVE INCHE OF STATIC SPHERE HEIGHT PER BED. HOWEVER, AT 18,000 ACFM THE SO2 REMOVAL FOR THE CEILCOTE PLATES WAS A FEW PERCENTAGE POINTS HIGHER THAN THAT EX- PERIENCED WITH THE TCA BEDS.

FORCED OXIDATION TESTS WERE CONDUCTED ON THE TCA SYSTEM WITH AN AIR SPARG ER USING LIMESTONE SLURRY WITH HIGH FLY ASH LOADING. BOTH ONE-TANK (AIR SPARGING AND LIMESTONE ADDITION IN THE SAME TANK) AND TWO-TANK (AIR SPARG ING IN THE FIRST TANK AND LIMESTONE ADDITION IN THE SECOND) CONFIGURATION WERE USED. NEAR COMPLETE SULFITE OXIDATION WAS ACHIEVED IN BOTH CONFIGURA TIONS AT AN AIR STOICHIOMETRY OF 1.8 ATOMS OXYGEN/MOLE SO2 ABSORBED AND OXIDATION PH OF 5.4-5.7. THE OXIDATION TANK LEVEL WAS 18 FT.

2/78	SYSTEM							672			
3/78	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

MAJOR SYSTEM DOWNTIMES DURING THE PERIOD INCLUDEDD JANUARY 26 THROUGH FEB RUARY 4 FOR THE VENTURI/SPRAY TOWER AND JANUARY 26 THROUGH FEBRUARY 2 FOR THE TCA SYSTEM DUE TO FREEZING WEATHER, AND MARCH 6 THROUGH MARCH 17 FOR BOTH SYSTEMS DUE TO BOILER OUTAGE.
THE EFFECT OF THE SLURRY LEVEL IN THE AIR SPARGED OXIDATION TANK WAS IN- VESTIGATED IN THE TWO SCRUBBER LOOP VENTURI/SPRAY TOWER SYSTEM WHICH IS OPERATING ON LIME SLURRY WITH HIGH FLY ASH LOADING. NEAR COMPLETE SULFITE OXIDATION (98%) WAS ACHIEVED WITH 14 FT AND 18 FT OXIDATION TANK LEVELS AT AN AIR STOICHIOMETRIC RATIO OF 1.8 ATOMS OXYGEN/MOLE SO2 AB- SORBED. AN AIR STOICHIOMETRIC RATIO UP TO ABOUT 3.8 WAS NEEDED TO YIELD NEAR COMPLETE OXIDATION WHEN THE TANK LEVEL WAS DROPPED TO 10 FEET.
A NEW TEST BLOCK WAS STARTED ON MARCH 1 ON THE VENTURI/SPRAY TOWER SYSTEM MAGNESIUM OXIDE WAS ADDED TO THE SPRAY TOWER SLURRY LOOP IN A TWO SCRUBBE LOOP OPERATION WITH FORCED OXIDATION IN THE VENTURI LOOP. THE SYSTEM WAS OPERATED IN A LIMESTONE SLURRY MODE WITH HIGH FLY ASH LOADING. THE PRIMAR OBJECTIVE OF MAGNESIUM ADDITION IS TO IMPROVE THE SO2 REMOVAL EFFICIENCY. BECAUSE OF THE SHORTAGE OF COAL CAUSED BY THE LOCAL MINERS' STRIKE, COALS FROM DIFFERENT SOURCES WERE BURNED IN THE BOILER. AS A RESULT, INLET SO2 CONCENTRATION FLUCTUATED AS MUCH AS TENFOLD (350-3500 PPM) CAUSING PRO- BLEMS IN SYSTEM CONTROL.
TCA WAS OPERATED WITH BOTH LIME AND LIMESTONE AND WITH MEGNESIUM OXIDE AD DITION. FLUE GAS WITH HIGH FLY ASH LOADING WAS USED. THESE TESTS WERE CON DUCTED PRIMARILY TO RESOLVE SOME OF THE INCONSISTENT RESULTS OBTAINED DURING EARLIER LIME/MGO AND LIMESTONE/MGO TEST MADE IN APRIL THROUGH NOVEMBER 1976. AIR LEAKAGE THROUGH THE SCRUBBER DOWNCOMER WAS SUSPECTED IN SOME OF THOSE EARLIER RUNS, RESULTING IN HIGHER-THAN-NORMAL SULFITE OXIDATION AND GYPSUM SATURATION. TEST RESULTS SO FAR WERE INCONCLUSIVE DUE TO THE FLUTUATION IN INLET SO2 AND CONTROL PROBLEMS MENTIONED ABOVE.

4/78	SYSTEM							720			
5/78	SYSTEM							744			

TENNESSEE VALLEY AUTHORITY: SHAWNEE 10B (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

THE VENTURI/SPRAY TOWER SYSTEM CONTINUED TO OPERATE THROUGH EARLY MAY WIT MGO ADDITION AND WITH TWO SCRUBBER LOOPS. THE SYSTEM WAS OPERATED WITH LIMESTONE SLURRY AND WITH HIGH FLY ASH LOADING. MGO WAS ADDED TO THE SPRA TOWER SLURRY LOOP TO MAINTAIN AN EFFECTIVE MG++ ION CONCENTRATION OF 5000 PPM (ABOUT 8000 PPM IN THE VENTURI SLURRY LOOP) TO IMPROVE THE SO2 REMOVA EFFICIENCY IN THE SPRAY TOWER. OXIDATION WAS FORCED IN THE VENTURI SLURRY HOLD TANK. UNDER TYPICAL OPERATING CONDITONS, THE OVERALL SO2 REMOVAL WAS 96% AT 2300 PPM INLET SO2 CONCETRATION, COMPARED TO 86%
REMOVAL AT 1600 PPM INLET SO2 WITHOUT MGO ADDITION. SO2 REMOVAL BY VENTUR ALONE WAS 30%, ABOUT THE SAME AS THE CASE WITHOUT MGO ADDITION.
NEAR COMPLETE SULFITE OXIDATION COULD BE ACHIEVED AT AN
AIR STOICHIOMETRIC RATIO AS LOW AS 1.3 ATOMS OXYGEN/MOLE OF SO2 ABSORBED, IN THE SAME ORDER AS THE CASE WITHOUT MGO ADDITION.
FORCED OXDATION WAS ALSO CONDUCTED ON THE LIMESTONE SLURRY BLEED STREAM FROM THE VENTURI/SPRAY TOWER SYSTEM. A SINGLE EFFLUENT HOLD TANK WAS USED FOR BOTH VENTURI AND SPRAY TOWER. MGO WAS ADDED TO THE EFFLUENT HOLD TANK TO MAINTAIN AN EFFECTIVE MG++ ION CONCENTRATION OF 5000 PPM. A SLURRY STREAM WAS TAKEN FROM THE SCRUBBER DOWNCOMER AND SENT TO AN OXIDATION TAN INTO WHICH AIR WAS SPARGED. A RECYCLE STREAM OF ABOUT 30 GPM WAS SENT BAC FROM THE OXIDATION TANK TO THE EFFLUENT HOLD TANK TO CONTROL PH IN THE OXIDATION TANK AND TO PROVIDE GYPSUM SEEDS IN THE SCRUBBER SLURRY. FINAL SYSTEM BLEED WAS WITHDRAWN FROM THE OXIDATION TANK. AT AVERAGE OXIDATION TANK PH OF 6, SULFITE OXIDATION AVERAGED 98%. FILTER CAKE SOLIDS CONTENT WAS 85%, SIMILAR TO THAT OBTAINED WITH TWO SCRUBBER LOOP OPERATIONS. HOWEVER, THE SLURRY SOLIDS SETTLING RATE WAS ONLY ABOUT 0.4 CM/MIN, COMPARED TO ABOUT 0.8 CM/MIN FOR THE TWO LOOP OPERATION. SETTLING RATE FOR UNOXIDIZED SLURRY CONTAINING MAGNESIUM ION NORMALLY DID NOT EXCEED 0.1 CM/MIN WITH 50 TO 60% FILTER CAKE SOLIDS.
TCA CONTINUED TO OPERATE WITH MGO ADDITION WITH BOTH LIME AND LIMESTONE SCRUBBING. FLUE GAS WITH HIGH FLY ASH LOADING WAS USED. THE INTENT OF THE TESTS WAS TO CLARIFY SOME OF THE INCONSISTANT RESULTS OBTAINED DURING EARLIER RUNS MADE IN APRIL-NOVEMBER 1976, DURING WHICH SCRUBBER DOWNCOMER AIR LEAKAGE WAS SUSPECTED IN SOME OF THE TESTS. IN GENERAL, TEST RUNS MAD IN 1976 HAD HIGHER SO2 CONCENTRATION, MOSTLY GREATER THAN 3000 PPM, WHILE THE RECENT RUNS HAD ONLY ABOUT 2500 PPM. AT THE HIGHER INLET SO2 AND THE HIGHER RESULTANT SO2 MAKE-PER-PASS, THE 1976 TESTS OPERATED EITHER UNSATU RATED OR SUPERSATURATED WITH RESPECT TO GYPSUM, DEPENDING ON THE SULFITE OXIDATION LEVEL. SEVERE GYPSUM SCALING OCCURRED WHEN THE OPERATION WAS UNDER GYPSUM-SATURATED MODE. IN THE RECENT RUNS, OPERATION WAS MOSTLY UNDER GYPSUM-SATURATED MODE. HOWEVER, BECAUSE OF THE LOWER INLET SO2 AND LOWER SO2 MAKE-PER-PASS, THE GYPSUM SATURATION LEVELS WERE NOT HIGH ENOUG TO CAUSE ANY SIGNIFICANT SCALING.

6/78	SYSTEM							720		
7/78	SYSTEM							744		

** PROBLEMS/SOLUTIONS/COMMENTS

FORCED OXIDATION FEED STREAM FROM THE VENTURI/SPRAY TOWER SYSTEM CONTINUED THROUGH MID-JUNE. TWO TEST RUNS WERE MADE IN WHICH MGO WAS ADDED TO MAINTAIN AN EFFECTIVE MG++ CONCENTRATION OF 5000 PPM IN THE SCRUBBER SLURRY AND NO RECYCLE STREAM WAS SENT BACK FROM THE OXIDATION TANK (8 FT DIAMTER AND 18 FT TANK LEVEL) TO THE EFFLUENT HOLD TANK. AVERAGE SULFITE OXIDATION WAS 96% OR HIGHER AT AN AIR STOICHIOMETRIC RATIO OF 1.6 ATOMS OXYGEN/MOLE SO2 ABSORBED. THE OXIDATION TANK PH WAS 5.4 TO 5.6 ONLY 0.2 UNITS HIGHER THAN THE EFFLUENT HOLD TANK PH. THE FILTER CAKE SOLIDS WAS 85% AND THE SOLIDS SETTLING RATE WAS 0.4 TO 0.5 CM/MIN.
BOTH SCRUBBER SYSTEMS WERE SHUT DOWN FOR TWO WEEKS FROM JUNE 19 DUE TO A BOILER OUTAGE SCHEDULED FOR RE-ROUTING THE FLUF GAS DUCT FROM THE 800 FT STACK TO THE NO. 11 SMALL STACK.

TENNESSEE VALLEY AUTHORITY: SHAWNEE 10B (CONT.)

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

FOLLOWING THE BOILER OUTAGE BOTH SCRUBBER SYSTEMS STARTED ON NEW LIME AND LIMESTONE TEST BLOCKS IN WHICH ADIPIC ACID, AN ORGANIC PH BUFFER, WAS ADDED TO THE SCRUBBER SLURRY TO IMPROVE SO2 REMOVAL EFFICIENCY.
INITIAL TEST RUNS WERE CONDUCTED WITHOUT ADIPIC ACID ADDITION TO ESTABLIS THE BASE CASE SO2 REMOVAL IN BOTH LIME AND LIMESTONE SCRUBBING FOR BOTH SCRUBBING SYSTEMS. THE VENTURI/SPRAY TOWER SYSTEM WAS OPERATED WITH TWO-SCRUBBER-LOOP CONFIGURATIONS WITH FORCED OXIDATION IN THE FIRST LOOP WHILE THE TCA WAS OPERATED IN A ONE-SCRUBBER-LOOP SCHEME WITHOUT FORCED OXIDATION.
PRELIMINARY RESULTS SHOWED THAT 96 TO 99% SO2 REMOVAL WAS CONSISTANTLY ACHIEVED IN THE VENTUR/SPRAY TOWER SYSTEM OPERATING WITH ABOUT 160 PPM AND 1400 PPM ADIPIC ACID IN THE VENTURI AND SPRAY TOWER RESPECTIVELY. THESE SO2 REMOVALS COMPARE VERY FAVORABLY WITH THE 66% REMOVAL FOR THE BASE CASE LIME RUN WITHOUT ADIPIC ACID. ON THE TCA SYSTEM, A LIME RUN WITH ABOUT 400 PPM ADIPIC ACID GAVE ABOUT 80% SO2 REMOVAL, COMPARED TO 67% FOR THE BASE CASE RUN.

8/78	SYSTEM							744			
9/78	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

TESTING WITH ADIPIC ACID AS ADDITIVE FOR IMPROVING SO2 REMOVAL EFFICIENCY CONTINUED THROUGH AUGUST AND SEPTEMBER. BOTH VENTURI/SPRAY TOWER AND TCA SYSTEMS WERE OPERATED ON LIMESTONE SLURRY WITH HIGH FLY ASH LOADING DURIN THIS PERIOD. THE TCA WAS OPERATED WITHOUT FORCED OXIDATION AND THE VENTUR SPRAY TOWER WITH TWO-SCRUBBER-LOOP FORCED OXIDATION. AS IN THE LIME TESTS WITH ADIPIC ACID ADDITION CONDUCTED IN JULY SIGNIFICANT IMPROVEMENT IN SO REMOVAL EFFICIENCY WAS ALSO OBSERVED IN THE LIMSTONE TESTS. UNDER TYPICAL OPERATION, SO2 REMOVAL HIGHER THAN 90% COULD BE ACHIEVED BY THE VENTURI/SPRAY TOWER WITH ABOUT 2100 PPM AND 1500 PPM ADIPIC ACID IN THE VENTURI AND SPRAY TOWER RESPECTIVELY. UNDER THE SAME OPERATING CONDITONS BUT WITHOUT ADIPIC ACID, THE SO2 REMOVAL WAS ONLY 57%. THE SULFITE OXIDATION EFFICIENCY AND WASTE SLUDGE DEWATERING PROPERTIES DID NOT APPEA TO BE AFFECTED BY THE PRESENCE OF ADIPIC ACID.
IN THE TCA, HIGHER THAN 90% SO2 REMOVALS WERE OBTAINED WITH 750 TO 1500 PPM ADIPIC ACID COMPARED TO 71% REMOVAL FOR A BASE CASE RUN WITHOUT ADIPIC ACID.
IN BOTH SCRUBBING SYSTEMS THE PH IN THE SCRUBBER SLURRY NEEDS TO BE HIGHE THAN ABOUT 5.0, THE UPPER PH BUFFER POINT OF ADIPIC ACID, FOR THIS ADDITIVE TO BE FULLY EFFECTIVE.
DETERIORATION OR DECOMPOSITION OF ADIPIC ACID APPARENTLY TAKES PLACE IN THE SCRUBBER. ACTUAL FEED RATES OF ADIPIC ACID WERE 2 TO 3 TIMES HIGHER THAN COULD BE ACCOUNTED FOR IN THE SYSTEM DISCHARGE SLUDGE.

10/78	SYSTEM							744			
11/78	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

A ONE MONTH LONG-TERM RELIABILITY RUN WAS CONDUCTED ON BOTH THE VENTURI/SPRAY TOWER AND TCA SYSTEMS USING LIMESTONE SLURRY WITH ADIPIC ACID AS AN ADDITIVE FOR ENHANCING SO2 REMOVAL EFFICIENCY. STEADY-STATE SO2 REMOVAL IN BOTH RUNS WAS CONSISTANTLY HIGH IN THE RANGE OF 96 TO 99% UNDER TYPICAL OPERATING CONDITIONS. THE VENTURI/SPRAY TOWER SYSTEM WAS OPERATED WITH TWO-SCRUBBER-LOOP FORCED OXIDATION. ADIPIC ACID CONCENTRATIONS WERE 1500 PPM IN THE TCA AND THE SPRAY TOWER, AND 2400 PPM IN THE VENTURI. BOT SCRUBBER SYSTEMS OPERATED FREE OF SCALING AND PLUGGING.
LONG-TERM TESTS BEGAN IN MID-NOVEMBER TO COMPARE CONVENTIONAL LIME SCRUBBING WITH ADVANCED LIMSTONE SCRUBBING USING CHEMICAL ADDITIVES AND FORCED OXIDATION. EACH TEST WILL LAST ONE MONTH OR LONGER. THE VENTURI/SPRAY TOW ER SYSTEM IS BEING OPERATED WITH TWO-SCRUBBER-LOOP FORCED OXIDATION AND

TENNESSEE VALLEY AUTHORITY: SHAWNEE 10B (CONT.)

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

LIMESTONE SLURRY AND ADIPIC ACID ADDITION. THE TCA SYSTEM IS BEING OPERATED WITH LIME SLURRY (NO ADDITIVES) AND WITHOUT FORCED OXIDATION. DURING THESE TESTS CONTINUOUS SO2 EMISSIONS MONITORING PROCEDURES WILL BE ASSESSED.

12/78	SYSTEM							744			
1/79	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

LONG-TERM TESTS ON BOTH SCRUBBER SYSTEMS. WHICH BEGAN IN MID-NOVEMBER 197 WERE COMPLETED NEAR THE END OF JANUARY 1979. THESE TESTS WERE CONDUCTED TO COMPARE CONVENTIONAL LIME SCRUBBING WITH ADVANCED LIMESTONE SCRUBBING USING CHEMICAL ADDITIVES AND FORCED OXIDATION. THE VENTURI/SPRAY TOWER WAS OPERATED WITH TWO-SCRUBBER-LOOP FORCED OXIDATION AND WITH LIMESTONE SLURRY AND ADIPIC ACID ADDITION. THE TCA SYSTEM WAS OPERATED WITH LIME SLURRY (NO ADDITIVE) AND WITHOUT FORCED OXIDATION. DURING THESE TESTS CONTINUOUS SO2 EMISSIONS MONITORING PROCEDURES WERE ASSESSED.

2/79	SYSTEM							672			
3/79	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

ONE TEST RUN WAS CONDUCTED ON EACH OF THE TWO SCRUBBER SYSTEMS IN EARLY FEBRUARY TO PROVIDE SAMPLES FOR LEVEL 1 BIOASSY TESTING BY LITTON BIONETICS CORPORATION UNDER CONTRACT WITH EPA. ACTUAL SAMPLING OF SLURRIES AND CONDENSATES FROM THE SCRUBBER AND OXIDATION TANK OFF-GASES WAS PERFORMED BY BATTELLE COLUMBUS LABORATORY. FOR THIS PURPOSE, THE TCA WAS OPERATED WITH LIMESTONE/FLYASH SLURRY AS A BASE CASE, AND THE VENTURI/SPRAY TOWER WAS OPERATED WITH LIMESTONE/FLYASH SLURRY AND WITH ADIPIC ACID ADDITIVE AND TWO-SCRUBBER-LOOP FORCED OXIDATION.
A SERIES OF TESTS WAS CONDUCTED ON THE VENTURI/SPRAY TOWER SYSTEM FROM MID-FEBRUARY THROUGH THE END OF MARCH TO SIMULATE THE PLANNED TVA WIDOWS CREEK UNIT 8 FULL-SCALE, TWO-SCRUBBER-LOOP FORCED-OXIDATION SCHEME. SPECIAL WIDOWS CREEK LIMESTONE (STONEMAN) AND COAL (PITTSBURGH MIDWAY) WERE USED AT SHAWNEE DURING THESE TESTS. NEAR COMPLETE SULFITE OXIDATION WAS ACHIEVED AT OXIDATION TANK PH UP TO 6.0 AND AN AIR STOICHIOMETRY AS LOW AS 1.5 ATOMS OXYGEN/ MOLE SO2 ABSORBED. EXPECTED SLURRY CARRY-OVER FROM THE FIRST TO THE SECOND SCRUBBER LOOP AT WIDOWS CREEK WAS SIMULATED BY AN ARTIFICIAL BACKMIX STREAM OF UP TO 65 GPM.
A NEW LIME/ADIPIC ACID TEST BLOCK WITH AND WITHOUT FORCED OXIDATION BEGAN IN EARLY FEBRUARY ON THE SINGLE-LOOP TCA SYSTEM USING FLUE GAS WITH HIGH FLYASH LOADINGS. AT TCA INLET PH OF 7.0, 2400 TO 2900 PPM INLET SO2, L/G OF 50 GAL/ MCF, AND 15 INCHES TOTAL STATIC BED HEIGHT OF 1-7/8 INCH NITRILE FOAM SPHERES, SO2 REMOVALS WERE 83, 93, AND 97% WITH ZERO, 600, AND 1200 PPM ADIPIC ACID, RESPECTIVELY, WITHOUT FORCED OXIDATION. SO2 REMOVAL REMAINED HIGH AT 91% WITH 1200 PPM ADIPIC ACID WHEN L/G WAS REDUCED FROM 50 TO 37 GAL/MCF. WHEN OXIDATION WAS FORCED WITH ABOUT 1.8 AIR STOICHIOMETRY, NEAR COMPLETE SULFITE OXIDATION WAS ACHIEVED AT OXIDATION TANK PH (TCA INLET PH) UP TO ABOUT 5.5, AND 1200 PPM ADIPIC ACID. SO2 REMOVAL ABOVE 90% WAS OBTAINED AT TCA INLET PH AS LOW AS 5.0 WITH FORCED OXIDATION.

4/79	SYSTEM							720			
5/79	SYSTEM							744			

TENNESSEE VALLEY AUTHORITY: SHAWNEE 10B (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

A SERIES OF BLEED STREAM OXIDATION TESTS USING LIMESTONE AND ADIPIC ACID WAS CONDUCTED ON THE VENTURI/SPRAY TOWER DURING THE MONTH OF APRIL. NEAR COMPLETE SULFITE OXIDATION WAS ACHIEVED UNDER CONDITIONS OF EITHER LOW FLUE GAS THROUGHPUT, WHICH RESULTED IN LOW BLEED RATES AND SUBSEQUENTLY HIGHER RESIDENCE TIMES IN THE OXIDATION TANK, OR RECIRCULATION AT LIQUOR BACK TO THE EFFLUENT HOLD TANK WHICH ARTIFICIALLY MAINTAINED A LOW PH IN THE OXIDATION TANK.
DURING THE MONTH OF APRIL, THE TCA WAS OPERATED WITH LIMESTONE, ADIPIC ACID AND FORCED OXIDATION USING A SINGLE TANK. AT AIR STOICHIOMETRIC RATIOS OF 1.7-2.0 ATOMS OXYGEN/MOLE SO2 ABSORBED, AN UNUSUAL SET OF CONDITIONS WAS ENCOUNTERED DURING WHICH THE LIQUID SULFITE ION LEVEL INCREASED TO A RANGE OF 800 TO 1700 PPM AND THE DEMAND FOR LIMESTONE TO MAINTAIN THE SCRUBBER INLET PH AT 5.1 INCREASED TO A RANGE OF 1.8 TO 4.0 MOLES LIMESTONE/MOLE SO2 ABSORBED. THE CAUSE HAS NOT YET BEEN DETERMINED ALTHOUGH IT WAS FOUND THAT THE SITUATION COULD BE ALLEVIATED BY EITHER INCREASING THE AIR STOICHIOMETRY TO GREATER THAN 2.2, OR BY MOVING THE LIMESTONE FEED TO A SECOND TANK DOWNSTREAM OF THE OXIDATION TANK.
BOILER NO. 10 WENT DOWN ON MAY 5TH FOR A SCHEDULED 6 WEEK BOILER OUTAGE. DURING THIS PERIOD, THE VENTURI/SPRAY TOWER WILL BE DOWN BUT THE TCA IS BEING OPERATED ON FLUE GAS FROM BOILER NO. 9 THROUGH THE NEWLY INSTALLED DUCT. DURING THIS PERIOD, THE TCA WILL COMPLETE A SERIES OF LIMESTONE/ADIPIC ACID FACTORIAL TESTS WITH AND WITHOUT FORCED OXIDATION.

6/79	SYSTEM							720			
7/79	SYSTEM							744			
8/79	10A			96.7	78.6						
	10B			93.6	73.0						
	SYSTEM							744			
9/79	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

BOILER NO. 10 WAS RESTARTED ON JULY 6, 1979 AFTER NINE WEEKS OF SCHEDULED MAINTENANCE OUTAGE.

LIMESTONE FACTORIAL TESTING WITH ADIPIC ACID ADDITION ON THE VENTURI/SPRAY TOWER SYSTEM CONTINUED THROUGHOUT THE THIRD QUARTER. THESE TESTS WERE MADE WITH TWO-LOOP OPERATION WITH FORCED OXIDATION AND SPRAY TOWER ONLY OPERATION WITHOUT FORCED OXIDATION, BOTH UNDER CLOSED-LOOP CONDITIONS. OPEN-LIQUOR-LOOP TESTS WITH TWO-LOOP OPERATION AND WITHOUT FORCED OXIDATIO WERE ALSO CONDUCTED TO COMPARE THE RESULTS WITH "FRESH" ADIPIC ACID AGAINST THOSE WITH "AGED" ACID OBTAINED UNDER CLOSED-LIQUOR-LOOP CONDITIONS.

DURING THE THIRD QUARTER, ADDITIONAL LIMESTONE FACTORIAL TESTS WITH ADIPIC ACID WERE CONDUCTED ON THE TCA SYSTEM TO SUPPLEMENT THOSE MADE IN MAY AND JUNE. IN ADDITION, A SERIES OF LIMESTONE TESTS WITHOUT ADIPIC ACID WERE PERFORMED USING A SINGLE TANK TO INVESTIGATE THE EFFECT OF AIR STOICHIOMETRY AND OXIDATION TANK AGITATOR SPEED ON SULFITE OXIDATION. IN A SIMILAR SERIES OF TESTS CONDUCTED IN APRIL BUT WITH ADIPIC ACID, AN UNUSUAL SET OF CONDITIONS WAS ENCOUNTERED WHICH GAVE HIGH LIQUOR SULFITE CONCENTRATION (800-1700 PPM) AND DEMANDED HIGH LIMESTONE STOICHIOMETRY (1.8-4.0 MOLES CA/MOLE SO2 ABSORBED) TO MAINTAIN A SCRUBBER INLET PH OF 5.1. THESE PHENOMENA WERE ALSO OBSERVED DURING TESTS WITHOUT ADIPIC ACID. INSUFFICIENT SULFITE OXIDATION RATE (CAUSED BY REDUCED AIR STOICHIOMETRY AND/OR REDUCED AGITATION IN THE OXIDATION TANK) AND DECREASED AMOUNT OF SOLID CASO3 SEEDS WERE BELIEVED TO CAUSE HIGH SULFITE SUPERSATURATION (HIGH SULFITE CONCENTRATIONS) AND THE RESULTANT BLINDING OF LIMESTONE BY

TENNESSEE VALLEY AUTHORITY: SHAWNEE 10B (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
				PERFORMANCE DATA							
			SULFITE (HIGH LIMESTONE STOICHIOMETRY).								
10/79	10A			99.8	58.7						
	10B			96.5	55.6						
	SYSTEM							744			
11/79	10A				0.0						
	10B			99.7	94.7						
	SYSTEM							720			
12/79	10A				0.0						
	10B			98.4	74.9						
	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

THE TRAP-OUT FUNNEL, WHICH HAD BEEN INSTALLED EARLIER IN THE SPRAY TOWER TO SEPARATE VENTURI AND SPRAY TOWER SLURRIES FOR TWO-SCRUBBER-LOOP OPERATION, WAS REMOVED IN EARLY OCTOBER.

THE SYSTEM WAS OPERATED THROUGHOUT THE FOURTH QUARTER IN A CONVENTIONAL MODE IN WHICH THE VENTURI AND SPRAY TOWER USED A COMMON HOLD TANK. ADDITIONAL FACTORIAL TESTS WERE CONDUCTED IN THIS MODE OF OPERATION THROUGH MID-DECEMBER USING LIMESTONE/ADIPIC ACID SLURRY WITHOUT FORCED OXIDATION. A NEW TEST BLOCK WAS INITIATED IN MID-DECEMBER TO OPTIMIZE THE LEVELS OF PH AND ADIPIC ACID CONCENTRATION AT A DESIRED DEGREE OF SO2 REMOVAL WITH LIMESTONE SCRUBBING AND WITHOUT FORCED OXIDATION. IT HAS BEEN OBSERVED THAT THE DECOMPOSITION RATE OF ADIPIC ACID IS DECREASED WITH REDUCING PH.

THE TESTING ON THE EFFECTS OF AIR STOICHIOMETRY AND OXIDATION TANK AGITATO SPEED ON SULFITE OXIDATION WAS CONCLUDED ON THE TCA SYSTEM IN MID-OCTOBER. THE TCA SYSTEM WAS TEMPORARILY TRANSFERRED TO TVA/UOP EPRI IN MID-OCTOBER FOR THE DEMONSTRATION OF THE DOWA BASIC ALUMINUM SULFATE SCRUBBING PROCESS

1/80	SYSTEM							744			
2/80	10A				0.0						
	10B			100.0	81.5						
	SYSTEM							696			
3/80	10A				0.0						
	10B			99.0	54.7						
	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE FIRST QUARTER OF 1980, ONLY THE VENTURI/SPRAY TOWER SYSTEM WAS OPERATED. THE TCA SYSTEM CONTINUED TO OPERATE DURING THE QUARTER ON DOWA BASIC ALUMINUM SULFATE PROCESS UNDER EPRI/UOP/TVA SPONSORSHIP.
THE LIMESTONE/ADIPIC ACID TEST SERIES ON THE VENTURI/SPRAY TOWER SYSTEM, WHICH HAD BEEN INITIATED IN MID-DECEMBER TO INVESTIGATE THE RELATIONSHIP BETWEEN THE SLURRY PH AND THE ADIPIC ACID CONSUMPTION (DEGRADATION) RATE, WAS COMPLETED IN MID-FEBRUARY. THE TESTS WERE CONDUCTED WITHOUT FORCED OXIDATION AND WITH A SINGLE HOLD TANK. AT THE SCRUBBER INLET PH OF 4.6 TO 5.0, ESSENTIALLY ALL OF THE ADIPIC ACID ADDED WAS ACCOUNTED FOR IN THE LIQUID PHASE OF THE WASTE SLUDGE DISCHARGED FROM THE SYSTEM. AT THE SCRUBBER INLET PH 5.25 AND 5.5, THE ADIPIC ACID UNACCOUNTED FOR WERE 6% AND 26% , RESPECTIVELY. THEREFORE, IT APPEARS THAT THE ADIPIC ACID (OR CARBOXYLIC ACID) DEGRADATION TAKES PLACE AT SCRUBBER INLET PH ABOVE ABOUT 5.1 UNDER CONDITIONS ASKED.
A SERIES OF LIMESTONE/ADIPIC ACID TESTS WERE CONDUCTED FROM MID-FEBRUARY TO EARLY MARCH USING THE VENTURI SCRUBBER ONLY WITH A SINGLE TANK AND WITHOUT FORCED OXIDATION TO INVESTIGATE THE SO2 REMOVAL CAPABILITY OF THE VENTURI AT 5.1 INLET PH AND HIGH ADIPIC ACID CONCENTRATION. AT 4000 PPM

TENNESSEE VALLEY AUTHORITY: SHAWNEE 10B (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
		ADIPIC ACID, L/G OF 21 GAL/MCF, AND 8.3 INCHES H20 PRESSURE DROP, SO2 REMOVAL WAS 65% WITH 2200 PPM INLET SO2 CONCENTRATION. FORCED OXIDATION USING A SINGLE TANK WITH LIMESTONE/ADIPIC ACID SLURRY ON THE VENTURI/SPRAY TOWER SYSTEM BEGAN IN MID-MARCH. AS IN THE CORRESPONDIN TEST SERIES CONDUCTED ON TCA IN APRIL 1979, LIMESTONE BLINDING BY CALCIUM SULFITE OCCURRED. SOLUTION OF THE PROBLEM CAN BE EXPECTED BY USING TWO TANKS IN SERIES WITH FORCED OXIDATION IN THE FIRST TANK AND LIMESTONE ADDITION IN THE SECOND. THIS MODE IS PLANNED ON BEING DEMONSTRATED NEXT QUARTER.									
4/80	SYSTEM							720			
5/80	10A				0.0						
	10B			96.2	84.8						
	SYSTEM							744			
6/80	10A				0.0						
	10B			95.4	37.1						
	SYSTEM							720			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		THE VENTURI/SPRAY TOWER SYSTEM (TRAIN 100) WAS SHUT DOWN FROM MAY 28 THROUGH JUNE 17 FOR CONVERSION TO A SPRAY TOWER-ONLY SYSTEM BY THE PHYSICA REMOVAL OF THE VENTURI SECTION. THE SPRAY TOWER-ONLY TESTING BEGAN JUNE 17 ON A SERIES OF LIMESTONE FACTORIAL TESTS, BOTH WITH AND WITHOUT FORCED OXIDATION, TO CHARACTERIZE THE EFFECTS OF LIQUID-TO-GAS RATIO AND SLURRY PH ON SO2 REMOVAL IN THE SPRAY TOWER (THE FIRST SPRAY TOWER-ONLY TESTING AT SHAWNEE).									
7/80	10A			96.4	51.1						
	10B			97.2	88.3						
	SYSTEM							744			
8/80	10A		94.2	94.2	94.2						
	10B			99.1	42.2						
	SYSTEM							744	744		
9/80	10A			89.9	88.8						
	10B			94.0	93.1						
	SYSTEM							720			
	** PROBLEMS/SOLUTIONS/COMMENTS										
		TRAIN 100 WAS AGAIN SHUT DOWN FROM AUGUST 11-28 FOR MODIFICATION OF THE SLURRY PIPING AND INTERNAL HEADERS TO INCREASE THE SLURRY FLOW CAPACITY FROM 1600 TO 2400 GPM. TESTING RESUMED ON AUGUST 28 ON ANOTHER LIMESTONE FACTORIAL TEST SERIES WITH AND WITHOUT FORCED OXIDATION, BUT AT HIGHER LIQUID-TO-GAS RATIOS (UP TO 150 GAL/MCF AT 20,000 ACFM AT 300 F GAS RATE AND 2400 GPM MAXIMUM SLURRY FLOW RATE). THIS TEST SERIES IS EXPECTED TO BE COMPLETED BY MID OCTOBER. TESTING OF THE TCA SYSTEM (TRAIN 200) RESUMED ON JULY 15 AFTER THE SYSTEM HAD BEEN RESTORED FROM THE DOWA PROCESS OPERATING MODE. AS PART OF THE EPA FULL-SCALE ADIPIC ACID DEMONSTRATION PROGRAM, THE SYSTEM HAD BEEN USED THROUGHOUT THE THIRD QUARTER TO SIMULATE THE OPERATION OF THE FULL-SCALE TCA UNITS OPERATING WITH LIMESTONE/ADIPTIC ACID SLURRY AT THE SOUTHWEST STATION OF THE SPRINGFIELD CITY UTILITIES, AT SPRINGFIELD MISSOURI. TESTS HAVE BEEN CONDUCTED BOTH WITH AND WITHOUT FORCED OXIDATION TO GENERATE INFORMATION USEFUL FOR THE FULL-SCALE DEMONSTRATION.									
10/80	10A			96.5	85.9						
	10B			99.4	88.0						
	SYSTEM							744			

TENNESSEE VALLEY AUTHORITY: SHAWNEE 10B (CONT.)

PERIOD	MODULE	PERFORMANCE DATA AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
11/80	10A			98.1	86.9						
	10B			99.6	64.3						
	SYSTEM							720			
12/80	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

THE LIMESTONE FACTORIAL TEST SERIES WITH AND WITHOUT FORCED OXIDATION ON THE SPRAY TOWER SYSTEM (TRAIN 100) WAS COMPLETED ON OCTOBER 11, 1980. THIS WAS FOLLOWED BY A LIMESTONE FACTORIAL SERIES WITH ADIPIC ACID ADDITION, WITH AND WITHOUT FORCED OXIDATION, TO INVESTIGATE THE EFFECTS OF ADIPIC ACID CONCENTRATION, PH, AND L/G ON SO2 REMOVAL. A LONG-TERM (UP TO 2000 HOURS) SPRAY TOWER DEMONSTRATION TEST BEGAN ON DECEMBER 26. THE LONG-TERM RUN IS BEING OPERATED WITH LIMESTONE ENHANCED WITH 1300 PPM ADIPIC ACID AT A PH OF 5.0 AND WITH FORCED OXIDATION TO DEMONSTRATE LONG-TERM RELIABILITY AND BETTER THAN 90% SO2 REMOVAL AND LIMESTONE UTILIZATION

SIMULATION OF THE SPRINGFIELD CITY UTILITIES' FULL-SCALE TCA ON TRAIN 200 WAS COMPLETED ON NOVEMBER 16. ADIPIC ACID-ENHANCED LIMESTONE SCRUBBING TESTS WITH AND WITHOUT FORCED OXIDATION WERE CONDUCTED TO GENERATE INFORMATION USEFUL FOR THE EPA FULL-SCALE ADIPIC ACID DEMONSTRATION PROJECT NOW UNDER WAY.

TRAIN 200 WAS SHUT DOWN DURING THE WEEK OF NOVEMBER 17 TO INSTALL "GLITSCH GRID" PACKING IN PLACE OF THE MOBILE SPHERES. SHORT TESTS WERE CONDUCTED THROUGH THE END OF THE FOURTH QUARTER TO CHARACTERIZE THE PACKING PRESSURE DROP, SCALING AND PLUGGING POTENTIAL, AND SO2 REMOVAL PERFORMANCE.

DOE IS ASSUMING SHAWNEE PROGRAM RESPONSIBILITY IN JANUARY 1981. TRAIN 200 IS TO BE SHUT DOWN IN JANUARY 1981 DUE TO LACK OF FUNDS. TRAIN 300 (COCURRENT SCRUBBER) HAD BEEN IDLE SINCE JULY 7, 1980. CONTINUED OPERATION OF TRAIN 100 INTO 1981 IS PLANNED.

1/81	SYSTEM							744			
2/81	SYSTEM							672			
3/81	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

A LONG-TERM RELIABILITY TEST (RUN 917-1A) THAT WAS STARTED DECEMBER 26, 1980, ON THE SPRAY TOWER SYSTEM (TRAIN 100) WAS COMPLETED MARCH 13, 1981, AFTER 1688 ONSTREAM HOURS. THE DAILY AVERAGE SO2 REMOVAL RANGED FROM 92% TO 94%.
THE LONG-TERM TEST WAS CONDUCTED WITH LIMESTONE SLURRY ENHANCED WITH 1300 TO 1700 PPM ADIPIC ACID, WITH TWO-TANK CONFIGURATION, AND WITH FORCED OXIDATION. THE SCRUBBER INLET PH WAS CONTROLLED AT 5.0-5.1. THE SLURRY RECIRCULATION RATE WAS CONSTANT AT 2400 GPM, AND THE FLUE GAS FLOW RATE WAS VARIED BETWEEN 20,000 TO 35,000 ACFM (300 F) TO SIMULATE A TYPICAL DAILY BOILER LOAD CYCLE. THE L/G RANGE CORRESPONDING TO THE VARYING GAS FLOW WAS 85 TO 150 GAL/MCF. LIMESTONE UTILIZATION WAS ABOUT 92%. SULFITE OXIDATION AVERAGED 99.8% AND THE FILTER CAKE SOLIDS CONTENT AVERAGED 87%.
THE SYSTEM OPERATED 1688 HOURS OUT OF A POSSIBLE 1766 HOURS (EXCLUDING 84 HOURS BOILER RELATED OUTAGE), OR 95.6% OF AVAILABLE TIME. THERE WAS NO SIGN OF SCALING OR PLUGGING WITHIN THE SPRAY TOWER OR THE MIST ELIMINATOR.

AFTER THE LONG-TERM TEST, ADDITIONAL LIMESTONE/ADIPIC ACID FACTORIAL TESTS INCLUDING TESTS TO INVESTIGATE THE EFFECT OF SPRAY HEADER POSITION, WERE CONDUCTED ON TRAIN 100 DURING THE REMAINDER OF THE FIRST QUARTER 1981.

TENNESSEE VALLEY AUTHORITY: SHAWNEE 10B (CONT.)

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

TRAIN 200 (TCA) HAS BEEN SHUT DOWN SINCE JANUARY 7, 1981, AFTER TESTING WITH GLITSCH GRID PACKING.

TRAIN 300 (COCURRENT SCRUBBER) REMAINED IDLE DURING THE PERIOD.

4/81 SYSTEM 720

5/81 SYSTEM 744

** PROBLEMS/SOLUTIONS/COMMENTS

EPA TESTING CONCLUDED AT THE END OF MARCH. DURING THE MONTHS OF MAY AND JUNE, TESTING WAS CONDUCTED UNDER DOE SUPERVISION.

6/81 SYSTEM 720

** PROBLEMS/SOLUTIONS/COMMENTS

DOE TESTING CONCLUDED IN MAY. TESTING WAS RESUMED BY TVA ON JUNE 1 AND WILL LAST THROUGH DECEMBER 15, 1981. THE FOLLOWING FOUR TESTS ARE PLANNED

1) ADVANCED TESTING OF A GRID TOWER SCRUBBER SYSTEM INCLUDING FORCED OXIDATION AND ADIPIC ACID ADDITIVE: SHAWNEE TEST FACILITY TRAIN 200, JUN 1-JULY 15, 1981.
2) ADVANCED TESTING OF A SPRAY TOWER SCRUBBER SYSTEM INCLUDING FORCED OXI DATION AND ADIPIC ACID ADDITIVE: SHAWNEE TEST FACILITY TRAIN 100, JULY 17-AUGUST 19, 1981.
3) MIST ELIMINATOR WASH TESTS AND WATER BALANCE STUDIES FOR A FULL-SCALE SPRAY TOWER SCRUBBER SYSTEM: SHAWNEE TEST FACILITY TRAIN 100, SEPTEMBER-OCTOBER 1981.
4) MIST ELIMINATOR WASH TESTS AND WATER BALANCE STUDIES FOR A FULL-SCALE SCRUBBER SYSTEM: SHAWNEE TEST FACILITY TRAIN 300, NOVEMBER 2-DECEMBER 15, 1981.

7/81 SYSTEM 744

** PROBLEMS/SOLUTIONS/COMMENTS

LIMESTONE TESTING ON THE GRID TOWER (TRAIN 200) BEGAN JUNE 1 AND ENDED ON JULY 15. TESTING WAS DIVIDED INTO BASE CASE OPERATION, LATER EXPANDED TO INCLUDE FORCED OXIDATION WITH AND WITHOUT ADIPIC ACID ADDITIVE, AND FINALL CONDUCTED WITH FORCED OXIDATION, ADIPIC ACID ADDITIVE, AND GRID TOWER PACK ING. TVA TEST CONCLUSIONS WERE AS FOLLOWS:

THE REDUCTION OF SO2 EMISSIONS FROM 7 LB/106 BTU (3.5% S COAL, 10,000 BTU/LB) TO 0.9 LB/106 BTU (87 PERCENT REMOVAL) IS ESTIMATED TO BE WITH IN THE CAPABILITY OF A CONVENTIONAL GRID TOWER SCRUBBER IF IMPROVEMENT ARE MADE IN THREE CATEGORIES: BEGIN USING ADIPIC ACID ADDITIVE, OPTIMIZE LIMESTONE STOICHIOMETRY, AND USE ABSORBER GRID PACKING. THESE CONCLUSIONS ARE BASED ON 10 MW TESTING AT SHAWNEE.

TO MEET AN SO2 REMOVAL OF 87 PERCENT, ONE MUST DESIGN THE CONTROL SYSTEM FOR 92 PERCENT REMOVAL TO AVOID HAVING MORE THAN ONE EXCEEDANCE OF THE 0.9 LB LIMIT PER YEAR. A REMOVAL OF 92 PERCENT CAN BE ACHIEVED BY ADOPTING THE IMPROVEMENTS SUGGESTED ABOVE.

THE USE OF GRID PACKING AND THE OPTIMIZATION OF LIMESTONE STOICHIOMETR ALONE DID NOT ACHIEVE COMPLIANCE AT 0.9 LB SO2 WHILE BURNING 7 BL SO2 COALS, BUT WOULD ALLOW THE USE OF CHEAPER HIGHER SULFUR COALS AS A SHORT-TERM MEASURE IF FORCED OXIDATION IS NOT PRACTICED.

THE PRACTICE OF FORCED OXIDATION OF SCRUBBER SLUDGE AND THE CONSEQUENT RECYCLING OF PROCESS LIQUOR DIRECTLY BACK TO THE SCRUBBER WOULD PERMIT THE USE OF ADIPIC ACID ADDITIVE, WHICH IN CONJUNCTION WITH OTHER IMPROVEMENTS MENTIONED ABOVE SHOULD BRING ABOUT SUBSTANTIAL SAVINGS FROM THE FIRING OF RELATIVELY CHEAP COALS EMITTING SO2 UP TO 7 LBS/106 BTU WHILE MAINTAINING COMPLIANCE.

FOR THE JUNE-JULY 1981 SHAWNEE TESTS, SO2 LEVELS IN THE RAW FLUE GAS T THE TRAIN 200 ABSORBER, THOUGH LOWER THAN THE EXPECTED APPROXIMATE 280

TENNESSEE VALLEY AUTHORITY: SHAWNEE 10B (CONT.)

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

PPM FOR 7 LB COAL, WERE COMPENSATED BY THE LACK OF AN UPSTREAM VENTURI AT SHAWNEE.

8/81 SYSTEM 744

** PROBLEMS/SOLUTIONS/COMMENTS

LIMESTONE TESTING ON THE SPRAY TOWER (TRAIN 100) BEGAN JULY 17 AND ENDED ON AUGUST 19. THE PRIMARY OBJECTIVE OF SPRAY TOWER TESTING WAS TO DEFINE SCRUBBER OPERATING CONDITIONS THAT PERMIT THE USE OF LESS EXPENSIVE, HIGHE SULFUR (7 LB SO2/106 BTU; 3.5% S; 10,000BTU/LB) COAL AT A SELECTED COMMERCIAL POWER PLANT USED AS A MODEL, WHILE SIMULTANEOUSLY REMAINING IN COMPLI ANCE WITH SO2 EMISSIONS OF 0.9 LB SO2/106 BTU ON A 24-HOUR BASIS. THE TES PROGRAM WAS IMPLEMENTED IN THREE PHASES: TESTS WITH UNOXIDIZED SLURRY, WITH FORCED OXIDATION, AND WITH FORCED OXIDATION PLUS ADIPIC ACID. TVA TEST CONCLUSIONS WERE AS FOLLOWS:

BASED ON THE TRAIN 100 TEST RESULTS, SO2 EMISSIONS AS LOW AS 0.9 LB SO /106 BTU ARE CONSISTENTLY UNLIKELY ON A 24-HOUR BASIS WITH THE FULL-SCALE MODEL WHEN OPERATING WITHOUT ADIPIC ACID USING 7 LB SO2/106 BTU COAL. HOWEVER, IF THE SO2 REMOVAL PREDICTION OF 35 PERCENT FOR THE FULL-SCALE MODEL VENTURI USING SHAWNEE EPA TEST PROGRAM DATA IS CORRECT, TEST PROGRAM OBJECTIVES CAN BE MET BY OPERATING AT A LIMESTON STOICHIOMETRY OF 1.2 MOLES CA/MOLE INLET SO2 AND 1000 PPM ADIPIC ACID.

9/81 SYSTEM 720

10/81 SYSTEM 744

** PROBLEMS/SOLUTIONS/COMMENTS

MIST ELIMINATOR TESTING USING A HORIZONTAL CHEVRON DESIGN IN A VERTICAL DUCT WAS CONDUCTED ON TRAIN 100 DURING THE MONTHS OF SEPTEMBER AND OCTOBER TESTS WERE PERFORMED TO DETERMINE A MIOST ELIMINATOR WASH TECHNIQUE THAT WOULD MAINTAIN THE WATER BALANCE OF A SIMULATED FULL-SCALE SPRAY TOWER SCRUBBING SYSTEM. THE MAJOR TEST OBJECTIVES WERE:

1) DETERMINE WATER REQUIREMENTS UTILIZING TRAIN 100 COMPONENTS (MIST ELIM INATOR, CLARIFIER, SPRAY TOWER, ETC.).
2) ADJUST WATER REQUIREMENTS TO MAXIMIZE RAW WATER AVAILABLE AT THE MIST ELIMINATOR FOR WASH PURPOSES WHILE RETAINING MAJOR OPERATING CONDI-TIONS.
3) CONDUCT A SERIES OF WASH TESTS WITH VARIOUS WASH RATES, FREQUENCIES, AND MEDIA WHILE USING AVAILABLE WASH WATER AT THE MIST ELIMINATOR.
4) RECOMMEND THE MOST EFFECTIVE MIST ELIMINATOR WASH SCHEME FOR THE FULL-SCALE SPRAY TOWER SYSTEM.

TWO WASH SCHEMES WERE CHOSEN FOR TESTING BASED ON THE REQUIREMENT THAT THE NOT REQUIRE SCRUBBER DOWNTIME: (1) A BLEND OF RECYCLE AND FRESH WATER; AN (2) INTERMITTENT WASHING USING RECYCLE WATER AND FRESH WATER, WITH NO WAS HING AFTER THE FRESH WATER WASH. DURING TESTING IT WAS CONCLUDED THAT BOT OF THE SCHEMES WERE SUCCESSFUL FOR TESTS OF ABOUT 160 HOURS IN DURATION. WHILE MAINTAINING A CLOSED-LOOP WATER BALANCE, THE BOTTOM OF THE MIST ELIM INATOR WAS WASHED AT A RATE OF 15 GPM WITH A BLEND OF 49 PERCENT FRESH WATER AND 51 PERCENT RECYCLE WATER. UNDER SIMILAR SCRUBBER CONDITIONS, A WASH USING 15 GPM OF RECYCLE WATER (CONSISTING OF ABOUT 70 PERCENT RECYCLE WATER AND 30 PERCENT FRESH WATER) FOR 3 MINUTES WAS FOLLOWED IMMEDIATELY WITH 15 GPM OF FRESH WATER FOR 1 MINUTE AND NO WASH FOR 1 MINUTE BEFORE REPEATING THE CYCLE. THE LATTER SCHEME DID NOT USE ALL OF THE AVAILABLE FRESH MAKEUP WATER AS INDICATED BY THE WATER BALANCE. ALSO, THIS LATTER SCHEME WAS USED AND WAS SUCCESSFUL WHEN SIMULATING POSSIBLE FUTURE OPERA-TING CONDITIONS OF FULL-SCALE SPRAY TOWER SCRUBBER SUCH AS FORCED OXIDATIO WITH AND WITHOUT ADIPIC ACID ADDITION.

11/81 SYSTEM 720

12/81 SYSTEM 744

TENNESSEE VALLEY AUTHORITY: SHAWNEE 10B (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

MIST ELIMINATOR TESTING USING A VERTICAL CHEVRON DESIGN IN A HORIZONTAL DUCT WAS CONDUCTED ON TRAIN 300 FROM NOVEMBER 2 THROUGH DECEMBER 15. THRE MIST ELIMINATOR WASH SCHEMES WERE TESTED DURING THIS PERIOD. THESE SCHEME USED RAW WATER IN INTERMITTENT WASH PATTERNS, IN WHICH DIFFERENT SECTIONS OF THE MIST ELIMINATOR FACES WERE WASHED FOR A GIVEN DURATION IN A STAG-GERED, CYCLIC MANNER. THE WASH SCHEMES USED DIFFERENT WASH DURATIONS AND LAG TIMES BETWEEN WASHINGS.

MAJOR DESIGN PARAMETERS OF THE FULL-SCALE SYSTEM ARE AS FOLLOWS:

1) A CLOSED WATER LOOP.
2) A HORIZONTALLY ORIENTED FLUE-GAS EXIT DUCT WITH TWO MIST ELIMINATOR UNITS, USED IN SERIES, MOUNTED VERTICALLY IN THE DUCT.

TVA TEST CONCLUSIONS WERE AS FOLLOWS:

1) THE BEST MIST ELIMINATOR WASH SCHEME HAD A 1-MINUTE WASH CYCLE WITH A LAG TIME OF 9 MINUTES BETWEEN WASHES (COMPARED TO A 2-MINUTE WASH CYCL WITH A 17-MINUTE LAG TIME). IT WAS ASSUMED THAT DURING A LONGER LAG TIME BETWEEN WASHES, A THICKER LAYER OF SOLIDS IS DEPOSITED ON THE MIS ELIMINATOR BLADES WHICH CANNOT BE ENTIRELY CLEANED DURING THE NEXT WAS CYCLES.
2) A BALANCE OF WATER INPUTS AND LOSSES COULD NOT BE MAINTAINED DURING TESTING AT SHAWNEE. WATER BALANCE PROBLEMS MAY BE INDICATED FOR A FULL-SCALE FGD SYSTEM. PROVISION MUST BE MADE FOR SURPLUS WATER; THIS MAY INCLUDE BLENDING RAW MIST ELIMINATOR WASH WATER WITH RECYLED PRO-CESS WATER TO REDUCE WATER INPUTS TO THE SYSTEM, OR MAKING ALLOWANCE FOR DUMPING OF EXCESS WATER.
3) POOR GAS VELOCITY DISTRIBUTION WAS ENCOUNTERED DURING THE TEST PROGRAM SOME LOCAL AREAS HAD VERY HIGH VELOCITIES WHILE OTHER AREAS HAD NEGA-TIVE VELOCITIES INDICATING SWIRLONG. FULL-SCALE VENTURI/ABSORBER SCRUBBERS WITH HORIZONTAL FLUE-GAS EXIT DUCTS SHOULD HAVE MIST ELIM-INATOR UNITS FAR ENOUGH DOWNSTREAM FROM BENDS IN THE DUCTS TO ALLOW AN EVEN FLOW PATTERN TO DEVELOP.

UOP INITIATED DOWA TESTING ON THE GRID TOWER (TRAIN 200) DURING DECEMBER.

1/82	SYSTEM							744			
2/82	SYSTEM							672			
3/82	SYSTEM							744			
4/82	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

THE DOWA PROCESS IS A DUAL-ALKALI FLUE GAS DESULFURIZATION (FGD) PROCESS WHICH UTILIZES BASIC ALUMINUM SULFATE SOLUTION FOR SO2 ABSORPTION AND LIME STONE FOR REGENERATION OF THE ABSORBENT. THE PROCESS WAS DEVELOPED BY THE DOWA MINING COMPANY OF TOKYO, JAPAN, AND IS MARKETED IN THE UNITED STATES. UNDER AN EXCLUSIVE LICENSE ARRANGEMENT BY THE AIR CORRECTION DIVISION OF UOP, INC. THE PROCESS IS NOW IN COMMERCIAL OPERATION IN JAPAN AT AN OIL-FIRED BOILER, SMELTERS, AND SULFURIC ACID PLANTS.

SHAWNEE TRAIN 200, A LIMESTONE SCRUBBER SYSTEM, WAS MODIFIED TO THE DOWA CONFIGURATION AND A FOUR-MONTH TEST PROGRAM WAS CONDUCTED. THIS PROGRAM CONSISTED OF ONE MONTH OF START-UP/SHAKEDOWN RELATED ACTIVITIES FOLLOWED B THREE MONTHS OF TESTING AT VARIOUS FLUE GAS FLOW RATES.

THE OBJECTIVE OF THE TEST PROGRAM WAS TO DEMONSTRATE TOTALLY INTEGRATED OPERATION OF THE DOWA PROCESS FOR SULFUR DIOXIDE REMOVAL FROM FLUE GAS GEN ERATED BY A COAL-FIRED UTILITY BOILER. SPECIFICALLY:

1) TO DEMONSTRATE THE SO2 REMOVAL EFFICIENCY AND RELIABILITY OF THE DOWA PROCESS OVER A RANGE OF OPERATING CONDITIONS SIMULATING TYPICAL POWER PLANT OPERATION.
2) TO VERIFY DESIGN PARAMETERS FOR SCALE-UP TO A FULL-SCALE FGD SYSTEM.
3) TO EVALUATE THE PHYSICAL PROPERTIES OF THE GYPSUM BYPRODUCT.

TENNESSEE VALLEY AUTHORITY: SHAWNEE 10B (CONT.)

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

4) TO DEMONSTRATE THE PERFORMANCE OF THE ALUMINUM REGENERATION SYSTEM.
5) TO SIMULATE PERFORMANCE OF THE DOWA PROCESS AT DESIGN FLUE GAS FLOW RATES OF SPECIFIC INTEREST TO TVA.

UOP TEST CONCLUSIONS/RECOMMENDATIONS WERE AS FOLLOWS:

1) THE DOWA PROCESS HAS DEMONSTRATED ITS ABILITY TO RELIABLY REMOVE SO2 FROM COAL DERIVED FLUE GAS OVER A RANGE OF OPERATING CONDITIONS SIMULATING TYPICAL POWER PLANT OPERATION.
2) DESIGN PARAMETERS TO BE USED IN DESIGNING A FULL-SCALE DOWA FGD SYSTEM HAVE BEEN VERIFIED.
3) THE PHYSICAL PROPERTIES OF THE BYPRODUCT GYPSUM HAVE BEEN INVESTIGATED UOP IS PERFORMING FURTHER LABORATORY TEST WORK TO OPTIMIZE THE USE OF FILTRATE AND FRESH WATER TO FURTHER IMPROVE THE QUALITY OF THE GYPSUM CAKE.
4) THE PERFORMANCE OF THE ALUMINUM REGENERATION SYSTEM HAS DEMONSTRATED ITS ABILITY TO CONTROL THE CONCENTRATION OF SOLUBLE IMPURITIES WITHIN RANGE ACCEPTABLE TO THE DOWA PROCESS.
5) NINETY PERCENT SO2 REMOVAL WAS NOT DEMONSTRATED AT 12.5 FT/SEC ABSORBE VELOCITY.
6) THE DOWA PROCESS RELIABLY TREATED THE FLUE GAS CONTAINING HIGH (0.4-0. GR/DSCF) FLY ASH LOADINGS WITHOUT DETRIMENTAL EFFECTS ON THE PROCESS.
7) UOP FEELS THE TEST RESULTS FROM THIS PROGRAM, COUPLED WITH THE PROCESS RELIABILITY DEMONSTRATED THROUGHOUT THIS WORK, REINFORCES THEIR CONFIDENCE IN OFFERING THE DOWA PROCESS ON A COMMERCIAL FULL-SCALE BASIS.

5/82	SYSTEM							744		
6/82	SYSTEM							720		
7/82	SYSTEM							744		

** PROBLEMS/SOLUTIONS/COMMENTS

TVA SODIUM THIOSULFATE TESTING ON THE SPRAY TOWER (TRAIN 100) BEGAN IN MAY AND CONTINUED UNTIL THE END OF JULY.

THE SPECIFIC TEST OBJECTIVES WERE TO ESTABLISH THE OPTIMUM CONCENTRATION O THIOSULFATE ION IN LIMESTONE SLURRY LIQUOR TO PREVENT SULFATE SCALING AT SPECIFIC RUN CONDITIONS NEAR THOSE OF TYPICAL SPRAY TOWER SCRUBBERS; TO MEASURE SCRUBBER (SPRAY TOWER) SYSTEM PERFORMANCE UNDER TEST CONDITIONS WITH AND WITHOUT THIOSULFATE ADDITIVE; AND TO INVESTIGATE THE SOLUTION CHEMISTRY OF THIOSULFATE ION IN LIMESTONE SLURRY. THIS INFORMATION SHOULD ASSIST SCRUBBER OPERATIONS PERSONNEL IN MAINTAINING BETTER CONTROL OVER TH SCRUBBER WHEN USING THE ADDITIVE.

TVA TEST CONCLUSIONS AND RECOMMENDATIONS WERE AS FOLLOWS:

FOR TEST CONDITIONS USED IN THESE EXPERIMENTS (PH = 5.8, LIQUID-TO-GAS RATIO (L/G) = 65 GAL/1000 ACF FLUE GAS, CONSTANT SLURRY RETENTION TIME IN THE SPRAY TOWER LOOP), 100 PPM OF THIOSULFATE ION IN THE SPRAY TOWER SLURR WAS EFFECTIVE IN LOWERING THE SULFATE SATURATION TO A VALUE OF APPROXIMATE 50%. UNDER THESE TEST CONDITIONS, SULFATE SCALING WAS NOT OBSERVED BECAUSE LOW NATURAL SULFITE ION OXIDATION WAS INSUFFICIENT TO PERMIT SULFATE ION SUPERSATURATION IN THE SPRAY TOWER, CAUSING SULFATE SCALING. SULFATE ION SATURATION RATIO IN THE SLURRY LIQUOR WAS USED AS A ROUGH INDEX OF SULFATE SCALING TENDENCY. IN THE RANGE OF TEST CONCENTRATIONS, SODIUM THIOSULFATE ADDITIVE DID NOT APPEAR TO AFFECT SULFUR DIOXIDE REMOVA BY THE SPRAY TOWER. METASTABLE CHEMICAL SPECIES IN THE SPRAY TOWER SLURRY WERE IDENTIFIED AS POLYTHIONATE IONS, WHICH BY MEANS OF A REVERSIBLE REACTION, MAY BE FORMED FROM THIOSULFATE ION. A LABORATORY METHOD WAS DEVELOPED TO IDENTIFY POLYTHIONATE IONS, AND MEASUREMENT OF THIOSULFATE ION CON CENTRATION TOGETHER WITH DECOMPOSITION PRODUCTS BASED ON THIS NEW METHOD O ANALYSIS IS NOW POSSIBLE.

THE 100 PPM EFFECTIVE THIOSULFATE ION CONCENTRATION SHOULD BE CONFIRMED FO

TENNESSEE VALLEY AUTHORITY: SHAWNEE 10B (CONT.)

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

OTHER TEST CONDITIONS, INCLUDING VARYING LIQUID-TO-GAS RATIOS. FURTHER TESTING SHOULD ALSO INCLUDE COMPREHENSIVE CHEMICAL ANALYSES AT OTHER POINT IN THE SPRAY TOWER SYSTEM TO DETERMINE IF THIOSULFATE ION CAN BE REGENERATED UNDER BASIC CONDITIONS. A METHOD FOR THE DETERMINATION OF THIOSULFAT IN SLURRY SOLIDS SHOULD BE DEVELOPED SINCE CURRENTLY AVAILABLE METHODS ARE INADEQUATE.

8/82	SYSTEM							744			
9/82	SYSTEM							720			
10/82	SYSTEM							744			
11/82	SYSTEM							720			
12/82	SYSTEM							744			
1/83	SYSTEM							744			
2/83	SYSTEM							672			
3/83	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

TEST OPERATIONS ON BOTH 10A AND 10B WERE DISCONTINUED LATE LAST YEAR. AT THE PRESENT TIME, NO FURTHER TESTING IS SCHEDULED FOR EITHER TEST FACILITY TVA PROGRESS REPORTS CONCERNING PAST SODIUM THIOSULFATE TESTS AND ALIKE WILL BE AVAILABLE FOR RELEASE DURING THE NEXT UPDATE PERIOD.

IN MARCH 1983, TVA IN CONJUNCTION WITH RESEARCH COTTRELL AND ROCKWELL INTERNATIONAL INITIATED TESTING ON TWO PILOT LIME/SPRAY DRYING SYSTEMS AT THE SHAWNEE TEST FACILITY. EACH PILOT CONSISTS OF A SINGLE ATOMIZER FOLLOWED BY A FABRIC FILTER FOR PARTICULATE REMOVAL. EACH SYSTEM WILL TREAT APPROXIMATELY 5000 ACFM OF FLUE GAS OR THE EQUIVALENT OF 1.0 TO 3.0 MW OF POWER PLANT GENERATING CAPACITY.

APPENDIX F
DESIGN AND PERFORMANCE DATA FOR DISCONTINUED DOMESTIC FGD SYSTEMS

COMPANY NAME	TENNESSEE VALLEY AUTHORITY	
PLANT NAME	SHAWNEE	
UNIT NUMBER	10C	
CITY	PADUCAH	
STATE	KENTUCKY	
REGULATORY CLASSIFICATION	D	
PARTICULATE EMISSION LIMITATION - NG/J	43.	(0.100 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	516.	(1.200 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	1750	
GROSS UNIT GENERATING CAPACITY - MW	10	
NET UNIT GENERATING CAPACITY W/FGD - MW	*****	
NET UNIT GENERATING CAPACITY WO/FGD - MW	*****	
EQUIVALENT SCRUBBED CAPACITY - MW	10	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	BABCOCK & WILCOX	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	********	(******* ACFM)
BOILER FLUE GAS TEMPERATURE - C	*******	(**** F)
STACK HEIGHT - M	244.	(800 FT)
STACK SHELL	NR	
STACK TOP DIAMETER - M	*******	(***** FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	BITUMINOUS	
AVERAGE HEAT CONTENT - J/G	******	(****** BTU/LB)
RANGE HEAT CONTENT - BTU/LB		****
AVERAGE ASH CONTENT - %	********	
RANGE ASH CONTENT - %	****	
AVERAGE MOISTURE CONTENT - %	********	
RANGE MOISTURE CONTENT - %	****	
AVERAGE SULFUR CONTENT - %	2.90	
RANGE SULFUR CONTENT - %	****	
AVERAGE CHLORIDE CONTENT - %	********	
RANGE CHLORIDE CONTENT - %	****	
*** PARTICLE CONTROL		
** PARTICLE SCRUBBER		
GENERIC TYPE	PACKED TOWER	
SPECIFIC TYPE	MOBILE BED PACKING	
TRADE NAME/COMMON NAME	TURBULENT CONTACT ABSORBER	
SHELL GENERIC MATERIAL	NR	
SHELL SPECIFIC MATERIAL	NR	
LINER GENERIC MATERIAL	NR	
LINER SPECIFIC MATERIAL	NR	
GAS CONTACTING DEVICE TYPE	PLASTIC SPHERES	
*** FGD SYSTEM		
** GENERAL DATA		
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT	
SO2 REMOVAL MODE	WET SCRUBBING	
PROCESS TYPE	LIME/LIMESTONE	
SYSTEM SUPPLIER	COMBUSTION ENGINEERING	
A-E FIRM	BECHTEL	
DEVELOPMENT LEVEL	PROTOTYPE	
NEW/RETROFIT	RETROFIT	
CURRENT STATUS	8	
TERMINATION	7/1973	
INITIAL START-UP	4/1972	
** DESIGN AND OPERATING PARAMETERS		
DESIGN CHLORIDE CONTENT - %	********	

TENNESSEE VALLEY AUTHORITY: SHAWNEE 10C (CONT.)

** QUENCHER/PRESATURATOR	
CONSTRUCTION MATERIAL GENERIC TYPE	NR
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR
** ABSORBER	
GENERIC TYPE	PACKED TOWER
SPECIFIC TYPE	STATIC BED PACKING
TRADE NAME/COMMON TYPE	MARBLE-BED SCRUBBER
SHELL GENERIC MATERIAL	NR
SHELL SPECIFIC MATERIAL	NR
SHELL MATERIAL TRADE NAME/COMMON TYPE	NR
LINER GENERIC MATERIAL	NR
LINER SPECIFIC MATERIAL	NR
LINER MATERIAL TRADE NAME/COMMON TYPE	NR
GAS CONTACTING DEVICE TYPE	GLASS MARBLES
INLET GAS FLOW - CU. M/S	14.16 (30000 ACFM)
** MIST ELIMINATOR	
PRE-MIST ELIMINATOR/MIST ELIMINATOR	NR
GENERIC TYPE	NR
SPECIFIC TYPE	NR
TRADE NAME/COMMON TYPE	NR
CONSTRUCTION MATERIAL GENERIC TYPE	NR
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR
** REHEATER	
GENERIC TYPE	DIRECT COMBUSTION
SPECIFIC TYPE	NR
TRADE NAME/COMMON TYPE	OIL
CONSTRUCTION MATERIAL GENERIC TYPE	NR
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR
** FANS	
DESIGN	CENTRIFUGAL
FUNCTION	BOOSTER
APPLICATION	INDUCED DRAFT
SERVICE	DRY
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL
** DAMPERS	
FUNCTION	NR
GENERIC TYPE	NR
SPECIFIC TYPE	NR
CONSTRUCTION MATERIAL GENERIC TYPE	NR
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR
LINER GENERIC MATERIAL TYPE	NR
LINER SPECIFIC MATERIAL TYPE	NR
** DUCTWORK	
SHELL GENERIC MATERIAL TYPE	NR
SHELL SPECIFIC MATERIAL TYPE	NR
LINER GENERIC MATERIAL TYPE	NR
LINER SPECIFIC MATERIAL TYPE	NR
** REAGENT PREPARATION EQUIPMENT	
FUNCTION	NR
DEVICE	NR
DEVICE TYPE	NR
** PUMPS	
SERVICE	NUMBER
-------	------
NR	****
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	VACUUM FILTER

*** SLUDGE

TENNESSEE VALLEY AUTHORITY: SHAWNEE 10C (CONT.)

** TREATMENT

METHOD	DEWATERED
DEVICE	N/A
PROPRIETARY PROCESS	N/A

** DISPOSAL

NATURE	FINAL
TYPE	LANDFILL
SITE TREATMENT	NONE

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
4/72	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

IN JUNE 1968, THE EPA INITIATED A PROGRAM TO TEST PROTOTYPE WET LIME AND LIMESTONE SCRUBBING SYSTEMS FOR REMOVAL OF SULFUR DIOXIDE AND PARTICLE MATTER FROM FLUE GAS. THREE PARALLEL WET SCRUBBER SYSTEMS WERE SELECTED FOR THE TEST PROJECT: 1) A VENTURI WITH A SPRAY TOWER AFTER THE ABSORBER; 2) A TURBULENT CONTACT ABSORBER (TCA); AND 3) A MARBLE-BED ABSORBER.
THE MARBLE-BED ABSORBER TESTED ON SHAWNEE 10C USED A PACKING OF 3/4 INCH GLASS MARBLE SPHERES AND A TURBULENT LAYER OF LIQUID AND GAS ABOVE THE MARBLE LAYER TO ENHANCE MASS TRANSFER.
THE TEST FACILITY WAS DESIGNED SO THAT MODIFICATIONS AND VARIATIONS OF SCRUBBER INTERNALS AND PIPING COULD BE READILY EMPLOYED FOR EACH SCRUBBER SYSTEM.

THE MARBLE BED ABSORBER AT SHAWNEE 10C COMMENCED OPERATIONS IN APRIL 1972.

THIS MARBLE-BED ABSORBER WAS DISCONTINUED EARLY IN THE TEST PROGRAM, JULY 1973, BECAUSE OF CONTINUED OPERATING PROBLEMS WITH NOZZLE FAILURE AND SUBSEQUENT PLUGGING OF THE MARBLE-BED.

APPENDIX F
DESIGN AND PERFORMANCE DATA FOR DISCONTINUED DOMESTIC FGD SYSTEMS

COMPANY NAME	UNION ELECTRIC	
PLANT NAME	MEREMAC	
UNIT NUMBER	2	
CITY	N/A	
STATE	MISSOURI	
REGULATORY CLASSIFICATION	****	
PARTICULATE EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	4135	
GROSS UNIT GENERATING CAPACITY - MW	140	
NET UNIT GENERATING CAPACITY W/FGD - MW	125	
NET UNIT GENERATING CAPACITY WO/FGD - MW	*****	
EQUIVALENT SCRUBBED CAPACITY - MW	140	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	****	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	********	(******* ACFM)
BOILER FLUE GAS TEMPERATURE - C	*******	(**** F)
STACK HEIGHT - M	******	(**** FT)
STACK SHELL	NR	
STACK TOP DIAMETER - M	*******	(***** FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	****	
AVERAGE HEAT CONTENT - J/G	******	(****** BTU/LB)
RANGE HEAT CONTENT - BTU/LB		****
AVERAGE ASH CONTENT - %	********	
RANGE ASH CONTENT - %	****	
AVERAGE MOISTURE CONTENT - %	********	
RANGE MOISTURE CONTENT - %	****	
AVERAGE SULFUR CONTENT - %	3.40	
RANGE SULFUR CONTENT - %	****	
AVERAGE CHLORIDE CONTENT - %	********	
RANGE CHLORIDE CONTENT - %	****	
*** PARTICLE CONTROL		
** PARTICLE SCRUBBER		
GENERIC TYPE	PACKED TOWER	
SPECIFIC TYPE	STATIC BED PACKING	
TRADE NAME/COMMON NAME	MARBLE-BED SCRUBBER	
SHELL GENERIC MATERIAL	NR	
SHELL SPECIFIC MATERIAL	NR	
LINER GENERIC MATERIAL	NR	
LINER SPECIFIC MATERIAL	NR	
GAS CONTACTING DEVICE TYPE	PLASTIC SPHERES	
*** FGD SYSTEM		
** GENERAL DATA		
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT	
SO2 REMOVAL MODE	WET SCRUBBING	
PROCESS TYPE	LIMESTONE	
SYSTEM SUPPLIER	COMBUSTION ENGINEERING	
DEVELOPMENT LEVEL	FULL SCALE	
NEW/RETROFIT	RETROFIT	
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.00	
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	83.00	
CURRENT STATUS	8	
TERMINATION	0/1969	
INITIAL START-UP	3/1968	
CONTRACT AWARDED	0/1967	

UNION ELECTRIC: MEREMAC 2 (CONT.)

** DESIGN AND OPERATING PARAMETERS	
DESIGN CHLORIDE CONTENT - %	********
** QUENCHER/PRESATURATOR	
CONSTRUCTION MATERIAL GENERIC TYPE	NR
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR
** ABSORBER	
GENERIC TYPE	PACKED TOWER
SPECIFIC TYPE	STATIC BED PACKING
TRADE NAME/COMMON TYPE	MARBLE-BED SCRUBBER
SHELL GENERIC MATERIAL	NR
SHELL SPECIFIC MATERIAL	NR
SHELL MATERIAL TRADE NAME/COMMON TYPE	NR
LINER GENERIC MATERIAL	NR
LINER SPECIFIC MATERIAL	NR
LINER MATERIAL TRADE NAME/COMMON TYPE	NR
** MIST ELIMINATOR	
PRE-MIST ELIMINATOR/MIST ELIMINATOR	NR
GENERIC TYPE	NR
SPECIFIC TYPE	NR
TRADE NAME/COMMON TYPE	NR
CONSTRUCTION MATERIAL GENERIC TYPE	NR
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR
** REHEATER	
GENERIC TYPE	NR
SPECIFIC TYPE	NR
TRADE NAME/COMMON TYPE	NR
CONSTRUCTION MATERIAL GENERIC TYPE	NR
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR
** FANS	
DESIGN	NR
FUNCTION	NR
APPLICATION	NR
SERVICE	NR
CONSTRUCTION MATERIAL GENERIC TYPE	NR
** DAMPERS	
FUNCTION	NR
GENERIC TYPE	NR
SPECIFIC TYPE	NR
CONSTRUCTION MATERIAL GENERIC TYPE	NR
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR
LINER GENERIC MATERIAL TYPE	NR
LINER SPECIFIC MATERIAL TYPE	NR
** DUCTWORK	
SHELL GENERIC MATERIAL TYPE	NR
SHELL SPECIFIC MATERIAL TYPE	NR
LINER GENERIC MATERIAL TYPE	NR
LINER SPECIFIC MATERIAL TYPE	NR
** REAGENT PREPARATION EQUIPMENT	
FUNCTION	WET BALL MILL
DEVICE	NR
DEVICE TYPE	NR

** PUMPS	
SERVICE	NUMBER
-------	------
NR	****
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	NR

UNION ELECTRIC: MEREMAC 2 (CONT.)

*** SLUDGE

** TREATMENT

METHOD	NR
DEVICE	NR
PROPRIETARY PROCESS	NR

** DISPOSAL

NATURE	FINAL
TYPE	NR
SITE TREATMENT	NR

** WATER BALANCE

WATER LOOP TYPE	CLOSED

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
3/68	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

THE FIRST COMMERCIAL SCRUBBER APPLICATION ON A UTILITY COAL-FIRED BOILER OCCURRED AT THIS STATION IN EARLY 1968.

THE PROBLEMS ENCOUNTERED DURING OPERATION OF THIS SYSTEM INCLUDED BOILER TUBE FOULING BECAUSE OF THE CLOSE TUBE SPACING, WIDESPREAD SCALING, SEVERE CORROSION, INEFFICIENT MIST ELIMINATOR AND PROBLEMS WITH WASTE DISPOSAL.

THE SCRUBBING PROGRAM WAS EVENTUALLY TERMINATED AND THE INSTALLATION WAS ABANDONED.