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**OAK RIDGE
NATIONAL
LABORATORY**

MARTIN MARIETTA

**Utility FGD Survey
January–December 1988**

Volume 2

**Design Performance Data for
Operating FGD Systems
(Part 1 of 3)**

S. L. Hance
R. S. McKibben
F. M. Jones

**MANAGED BY
MARTIN MARIETTA ENERGY SYSTEMS, INC.
FOR THE UNITED STATES
DEPARTMENT OF ENERGY**

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UTILITY FGD SURVEY
JANUARY - DECEMBER 1988

VOLUME 2

DESIGN PERFORMANCE DATA FOR
OPERATING FGD SYSTEMS
(Part 1 of 3)

by

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USE OF THIS REPORT

This report is the first fully compiled edition since the January-December 1987 issue released in December 1989, which contains more complete design and performance data from individual FGD system startup dates through the end of 1988. This report supersedes all previous issues. Volume 1 includes several categorical 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 1988, future (December 1998) 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."

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 systems in operation, systems under construction, and systems planned. The current total FGD-controlled capacity in the United States is 67,091 MW.

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SECTION 13
DESIGN AND PERFORMANCE
FOR OPERATIONAL DOMESTIC FGD SYSTEMS

SECTION 13

DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	ALABAMA ELECTRIC	
PLANT NAME	LOWMAN	
UNIT NUMBER	2	
CITY	LEROY	
STATE	ALABAMA	
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	301.	(0.700 LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	525	
GROSS UNIT GENERATING CAPACITY - MW	255	
NET UNIT GENERATING CAPACITY W/FGD - MW	233	
NET UNIT GENERATING CAPACITY WO/FGD - MW	241	
EQUIVALENT SCRUBBED CAPACITY - MW	179	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	RILEY STOKER	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	449.72	(953000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	143.9	(291 F)
STACK HEIGHT - M	122.	(400 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	5.0	(16.5 FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	BITUMINOUS	
AVERAGE HEAT CONTENT - J/G	27679.	(11900 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		11800-12000
AVERAGE ASH CONTENT - %	12.00	
RANGE ASH CONTENT - %	11.0-13.0	
AVERAGE MOISTURE CONTENT - %	7.00	
RANGE MOISTURE CONTENT - %	4.0-10.0	
AVERAGE SULFUR CONTENT - %	1.40	
RANGE SULFUR CONTENT - %	1.3-1.5	
AVERAGE CHLORIDE CONTENT - %	0.04	
RANGE CHLORIDE CONTENT - %	****	
*** PARTICLE CONTROL		
** MECHANICAL COLLECTOR		
NUMBER	0	
TYPE	NONE	
** ESP		
NUMBER	1	
NUMBER OF SPARES	0	
TYPE	HOT SIDE	
SUPPLIER	RESEARCH-COTTRELL	
INLET FLUE GAS CAPACITY - CU.M/S	449.7	(953000 ACFM)
INLET FLUE GAS TEMPERATURE - C	143.9	(291 F)
PRESSURE DROP - KPA	0.1	(1. IN-H2O)
** 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		

ILITY FGD SURVEY: JANUARY - DECEMBER 1988

ABAMA ELECTRIC: LOWMAN 2 (CONT.)

** GENERAL DATA		
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT	
SO2 REMOVAL MODE	WET SCRUBBING	
PROCESS TYPE	LIMESTONE	
PROCESS ADDITIVES	NONE	
SYSTEM SUPPLIER	PEABODY PROCESS SYSTEMS	
A-E FIRM	BURNS & MCDONNELL	
DEVELOPMENT LEVEL	FULL SCALE	
NEW/RETROFIT	NEW	
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.50	
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	59.50	
ENERGY CONSUMPTION - %	3.1	
CURRENT STATUS	1	
COMMERCIAL START-UP	9/1978	
INITIAL START-UP	9/1978	
CONTRACT AWARDED	8/1975	
* DESIGN AND OPERATING PARAMETERS		
DESIGN COAL SULFUR CONTENT - %	1.80	
DESIGN COAL HEAT CONTENT - J/G	29075.0	(12500 BTU/LB)
DESIGN COAL ASH CONTENT - %	10.00	
DESIGN MOISTURE CONTENT - %	8.00	
DESIGN CHLORIDE CONTENT - %	0.04	
SPACE REQUIREMENTS - SQ M	4645.0	(50000 SQ FT)
OPER. & MAINT. REQUIREMENT - MANHR/DAY	72.0	
* QUENCHER/PRESATURATOR		
NUMBER	2	
TYPE	SPRAY	
INLET GAS FLOW - CU. M/S	127.41	(270000 ACFM)
INLET GAS TEMPERATURE - C	143.9	(291 F)
LIQUID RECIRCULATION RATE - LITERS/S	35.	(550 GPM)
CONSTRUCTION MATERIAL GENERIC TYPE	HIGH ALLOY	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NICKEL BASE/CHROMIUM-IRON-COPPER-MOLYBDENUM	
* ABSORBER		
NUMBER	2	
NUMBER OF SPARES	0	
GENERIC TYPE	SPRAY TOWER	
SPECIFIC TYPE	OPEN COUNTERCURRENT SPRAY	
TRADE NAME/COMMON TYPE	N/A	
SUPPLIER	PEABODY PROCESS SYSTEMS	
DIMENSIONS - FT	24.0 DIA 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	GLASS FLAKE-FILLED POLYESTER	
LINER MATERIAL TRADE NAME/COMMON TYPE	RESISTA-FLAKE 1151	
GAS CONTACTING DEVICE TYPE	NONE	
NUMBER OF CONTACTING ZONES	6	
LIQUID RECIRCULATION RATE - LITER/S	1259.	(19980 GPM)
L/G RATIO - L/CU.M	9.9	(74.0 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	1.0	(4.0 IN-H2O)
SUPERFICAL GAS VELOCITY - M/SEC	3.0	(10.0 FT/S)
INLET GAS FLOW - CU. M/S	127.41	(270000 ACFM)
INLET GAS TEMPERATURE - C	54.4	(130 F)
SO2 REMOVAL EFFICIENCY - %	85.0	
PARTICLE REMOVAL EFFICIENCY - %	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	SHAH-HEIL	
CONFIGURATION	HORIZONTAL	

ALABAMA ELECTRIC: LOWMAN 2 (CONT.)

NUMBER OF STAGES	1	
NUMBER OF PASSES PER STAGE	1	
FREEBOARD DISTANCE - M	1.22	(4.0 FT)
PRESSURE DROP - KPA	0.1	(0.5 IN-H ₂ O)
SUPERFICIAL GAS VELOCITY - M/S	3.0	(10.0 FT/S)
CONSTRUCTION MATERIAL GENERIC TYPE	ORGANIC	
CONSTRUCTION MATERIAL SPECIFIC TYPE	POLYPHENYLENE	
WASH WATER SOURCE	MAKEUP	
WASH FREQUENCY	INTERMITTENTLY	
** REHEATER		
NUMBER	1	
GENERIC TYPE	BYPASS	
SPECIFIC TYPE	COLD SIDE	
TRADE NAME/COMMON TYPE	N/A	
LOCATION	ABSORBER OUTLET DUCT	
PERCENT GAS BYPASSED - AVG	30.0	
TEMPERATURE INCREASE - C	26.7	(48 F)
INLET FLUE GAS FLOW RATE - CU. M/S	134.92	(285900 ACFM)
INLET FLUE GAS TEMPERATURE - C	143.9	(291 F)
OUTLET FLUE GAS TEMPERATURE - C	81.1	(178 F)
CONSTRUCTION MATERIAL GENERIC TYPE	HIGH ALLOY	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NICKEL BASE/CHROMIUM-IRON-MOLYBDENUM	
** FANS		
NUMBER	2	
NUMBER OF SPARKS	0	
DESIGN	CENTRIFUGAL	
SUPPLIER	PEABODY PROCESS SYSTEMS	
FUNCTION	UNIT	
APPLICATION	FORCED DRAFT	
SERVICE	DRY	
FLUE GAS FLOW RATE - CU.M/S	225.10	(477000 ACFM)
FLUE GAS TEMPERATURE - C	143.9	(291 F)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	
** DAMPERS		
NUMBER	2	
FUNCTION	SHUT-OFF	
GENERIC TYPE	GUILLOTINE	
MANUFACTURER	MOSSER	
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR	
LINER GENERIC MATERIAL TYPE	HIGH ALLOY	
LINER SPECIFIC MATERIAL TYPE	NICKEL BASE/CHROMIUM-IRON-COPPER-MOLYBDENUM	
** DAMPERS		
NUMBER	2	
FUNCTION	SHUT-OFF	
GENERIC TYPE	GUILLOTINE	
MANUFACTURER	MOSSER	
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR	
LINER GENERIC MATERIAL TYPE	HIGH ALLOY	
LINER SPECIFIC MATERIAL TYPE	NICKEL BASE/CHROMIUM-IRON-COPPER-MOLYBDENUM	
** DAMPERS		
NUMBER	2	
FUNCTION	CONTROL	
GENERIC TYPE	LOUVER	
MANUFACTURER	MOSSER	
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR	
LINER GENERIC MATERIAL TYPE	NONE	
LINER SPECIFIC MATERIAL TYPE	N/A	
** DUCTWORK		
LOCATION	SCRUBBER INLET	
CONFIGURATION	RECTANGULAR	
DIMENSIONS	7 FT X 12 FT	
SHELL GENERIC MATERIAL TYPE	CARBON STEEL	

ILITY FGD SURVEY: JANUARY - DECEMBER 1988

ABAMA ELECTRIC: LOWMAN 2 (CONT.)

SHELL SPECIFIC MATERIAL TYPE	AISI 1110
LINER GENERIC MATERIAL TYPE	NONE
LINER SPECIFIC MATERIAL TYPE	N/A
* DUCTWORK	
LOCATION	SCRUBBER OUTLET TO STACK
CONFIGURATION	RECTANGULAR
DIMENSIONS	5.5 FT X 12 FT AND 13 FT X 16 FT
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
SHELL SPECIFIC MATERIAL TYPE	AISI 1110
LINER GENERIC MATERIAL TYPE	ORGANIC
LINER SPECIFIC MATERIAL TYPE	FLUOROELASTOMER
* REAGENT PREPARATION EQUIPMENT	
FUNCTION	WET BALL MILL
DEVICE	COMPARTMENTED
DEVICE TYPE	NR
MANUFACTURER	KENNEDY VAN SAUN
NUMBER	1
FULL LOAD DRY FEED CAPACITY - M.TONS/HR	9.1 (10 TPH)
PRODUCT QUALITY - % SOLIDS	35.0
* TANKS	
SERVICE	NUMBER
-----	-----
ABSORBER RECYCLE	1
MIST ELIMINATOR WASH	1
LIMESTONE SLURRY STORAGE	1
HYDROCLONE UNDERFLOW	****
MILL RECYCLE SUMP	1
WASTE SLURRY SUMP	1
* PUMPS	
SERVICE	NUMBER
-----	-----
ABSORBER RECIRCULATION	6
LIMESTONE MILL SLURRY RECIRCULATION	2
LIMESTONE SLURRY FEED	2
MIST ELIMINATOR WASH	3
WASTE SLURRY	2
SUPERNATE RETURN	1
* SOLIDS CONCENTRATING/DEWATERING	
DEVICE	NONE
* SALEABLE BYPRODUCTS	
NATURE	NONE
DISPOSITION	N/A
* SLUDGE	
FULL LOAD SLUDGE QUANTITY - M.TONS/HR (DRY)	5.6 (6.2 TPH)
% CASO3 - DRY	17.0
% CASO4 - DRY	70.0
% CAOH2 - DRY	0.0
% CACO3 - DRY	5.0
% ASH - DRY	1.0
% OTHER COMPOUNDS - DRY	7.0
* TREATMENT	
METHOD	BLEED
DEVICE	N/A
PROPRIETARY PROCESS	N/A
* DISPOSAL	
NATURE	FINAL
TYPE	POND
LOCATION	ON-SITE

ALABAMA ELECTRIC: LOWMAN 2 (CONT.)

SITE TRANSPORTATION METHOD	PIPELINE
SITE TREATMENT	CLAY LINING
SITE DIMENSIONS	34.8 ACRE X 25 FT
SITE SERVICE LIFE - YRS	20
** PROCESS CONTROL AND INSTRUMENTATION	
CHEMICAL PARAMETERS	PH
PHYSICAL VARIABLES	PERCENT SOLIDS
CONTROL LEVELS	PH 5.8-6.0
MONITOR TYPE	TBI
MONITOR LOCATION	RECYCLE TANK
PROCESS CONTROL MANNER	AUTOMATIC
PROCESS CHEMISTRY MODL	FEEDBACK
** WATER BALANCE	
WATER LOOP TYPE	CLOSED
EVAPORATION WATER LOSS - LITER/S	10.5 (166 GPM)
SLUDGE HYDRATION WATER LOSS - LITER/S	0.3 (4 GPM)
POND SEEPAGE/RUNOFF WATER LOSS - LITERS/S	0
RECEIVING WATER STREAM	TOMBIGBEE RIVER
MAKEUP WATER ADDITION - LITERS/S	9.9 (157 GPM)
SOURCE OF MAKEUP WATER	COOLING TOWER BLOWDOWN
** CHEMICALS AND CONSUMPTION	
FUNCTION	ABSORBENT
NAME	LIMESTONE
PRINCIPAL CONSTITUENT	95% CaCO ₃
SOURCE/SUPPLIER	ALLIED PRODUCTS CO.
CONSUMPTION	3.5 TPH 1.1 MOL/MOL SO ₂
UTILIZATION - %	90.0
POINT OF ADDITION	BALL MILL
** FGD SPARE CAPACITY INDICES	
ABSORBER - %	0.0
** FGD SPARE COMPONENT INDICES	
ABSORBER	0.0

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

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

9/78	A		81.4		20.7					
	B		63.9		16.3					
	SYSTEM	81.4	72.7		18.5		720	183	133	

** PROBLEMS/SOLUTIONS/COMMENTS

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

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

** PROBLEMS/SOLUTIONS/COMMENTS

BOILER SHUTDOWN.

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

11/78	A		82.4		78.2					
	B		49.3		46.8					
	SYSTEM	88.9	65.9		62.5		720	684	450	

ILITY FGD SURVEY: JANUARY - DECEMBER 1988

ABAMA ELECTRIC: LOWMAN 2 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

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

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

/78	A		97.6	91.8			
	B		93.2	87.6			
	SYSTEM	97.8	95.4	89.7	744	700	658

** PROBLEMS/SOLUTIONS/COMMENTS

DOWNTIME DURING DECEMBER WAS NOT ATTRIBUTABLE TO THE FGD SYSTEM.

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

** PROBLEMS/SOLUTIONS/COMMENTS

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

/79	A		95.0	42.0			
	B		96.3	42.6			
	SYSTEM	98.4	95.7	42.3	672	297	284

/79	A		93.1	92.2			
	B		94.4	93.6			
	SYSTEM	94.5	93.8	92.9	744	737	691

/79	A		100.0	40.6			
	B		100.0	40.6			
	SYSTEM	100.0	100.0	40.6	720	292	292

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY HAS REPORTED THAT NO UNUSUAL PROBLEMS HAVE OCCURRED.

/79	A		48.8	47.6			
	B		58.9	57.4			
	SYSTEM	92.7	53.9	52.5	744	725	391

/79	A		1.8	1.0			
	B		95.4	51.8			
	SYSTEM	98.3	48.6	26.4	720	391	190

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE FGD SYSTEM OPERATED WELL DURING MAY AND JUNE WITH THE EXCEPTION OF DOWN TIME REQUIRED TO REPLACE THE MIST ELIMINATORS. THE MIST ELIMINATORS WERE DEFORMED DURING A TEMPERATURE EXCURSION.

7/79	A		21.0	16.5			
	B		70.9	55.9			
	SYSTEM	93.0	46.0	36.2	744	587	270

3/79	A		88.9	67.6			
	B		24.9	19.0			
	SYSTEM	99.2	56.9	43.3	744	566	322

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

ALABAMA ELECTRIC: LOWMAN 2 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

THE SCRUBBER WAS NOT OPERATED FOR ABOUT 6 HOURS DUE TO A NECESSARY
 ADJUSTMENT TO THE MODICON CONTROLLER.

THE SCRUBBER WAS BYPASSED FOR ABOUT 37 HOURS DUE TO AN ESP OUTAGE.

9/79	A		83.3		68.3			
	B		21.8		17.9			
	SYSTEM	100.0	52.6		43.1	720	591	311

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE SYSTEM WAS AVAILABLE AT ALL TIMES DURING
 SEPTEMBER.

10/79	SYSTEM	100.0		0.0		744	0	0
-------	--------	-------	--	-----	--	-----	---	---

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT NO. 2 GENERATOR WAS DOWN THE ENTIRE MONTH OF OCTOBER.

11/79	SYSTEM	100.0		0.0		720	0	0
-------	--------	-------	--	-----	--	-----	---	---

** PROBLEMS/SOLUTIONS/COMMENTS

THE GENERATOR REMAINED DOWN THROUGH NOVEMBER.

12/79	A		22.6		4.0			
	B		6.0		1.1			
	SYSTEM	96.7	14.3		2.6	744	133	19

** PROBLEMS/SOLUTIONS/COMMENTS

THE OPERABILITY OF THE FGD UNIT WAS LOW DUE TO THE START-UP OF THE BOILER.

THE FGD SYSTEM WAS NOT AVAILABLE FOR 24 HOURS DUE TO A RUPTURED WASTE
 SLURRY LINE.

1/80	A		35.8		21.1			
	B		56.7		33.5			
	SYSTEM	90.7	46.3		27.3	744	439	203

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JANUARY UNIT 2 WAS UNAVAILABLE 69 HOURS DUE TO REPAIRS NEEDED ON
 AN ABRADED EXPANSION JOINT AND A RUPTURED WASTE SLURRY LINE.

2/80	A		84.3		84.3			
	B		74.7		74.7			
	SYSTEM	99.3	79.5		79.5	696	696	554

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT 2 FGD SYSTEM OPERATED ALL BUT 5 HOURS DURING FEBRUARY, IN WHICH
 TIME THE BOILER WAS BEING BROUGHT ON-LINE.

3/80	A		81.6		75.0			
	B		79.4		73.0			
	SYSTEM	100.0	80.5		74.0	744	684	551

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

ABAMA ELECTRIC: LOWMAN 2 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

NO FGD SYSTEM PROBLEMS WERE ENCOUNTERED DURING MARCH. THE FGD SYSTEM WAS AVAILABLE 100% OF THE TIME.

/80	A		61.3		61.3				
	B		86.6		86.5				
	SYSTEM	100.0	74.0		73.9		720	719	532

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT FOR THE MONTH OF APRIL THE SYSTEM WAS AVAILABLE 100% OF THE TIME.

/80	A		34.9		34.7				
	B		92.8		92.2				
	SYSTEM	100.0	63.9		63.5		744	739	472

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS AVAILABLE 100% OF THE MONTH OF MAY.

/80	A	100.0	88.0	100.0	11.0				
	B	0.0	0.0	0.0	0.0				
	SYSTEM	50.0	44.0	50.0	5.5		720	90	40 7.0

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE B WAS OUT OF SERVICE THE ENTIRE MONTH OF JUNE DUE TO A DAMAGED DAMPER DRIVE MOTOR.

MODULE A WAS AVAILABLE FOR OPERATION THE ENTIRE MONTH, BUT WAS NEEDED ONLY 79 HOURS.

/80	A	100.0	97.6	100.0	54.5				
	B	0.0	0.0	0.0	0.0				
	SYSTEM	50.0	48.8	50.0	27.3		744	415	203 26.7

** PROBLEMS/SOLUTIONS/COMMENTS

THE B-MODULE REMAINED OUT OF SERVICE THROUGH JULY DUE TO THE DAMAGED DAMPER DRIVE MOTOR.

THE A-MODULE OPERATED ON AN AS NEEDED BASIS WITH NO PROBLEMS.

3/80	A	100.0	84.0	84.0	18.3				
	B	0.0	0.0	0.0	0.0				
	SYSTEM	50.0	42.0	42.0	9.2		744	162	68 14.9

** PROBLEMS/SOLUTIONS/COMMENTS

DURING AUGUST MODULE B REMAINED OUT OF SERVICE DUE TO DAMAGED DAMPER OPERATOR MOTORS.

2/80	A	100.0	78.4	78.4	45.4				
	B	0.0	0.0	0.0	0.0				
	SYSTEM	50.0	39.2	39.2	22.7		720	417	164 42.8

** PROBLEMS/SOLUTIONS/COMMENTS

DURING SEPTEMBER MODULE B DID NOT OPERATE DUE TO A BURNED-UP DAMPER DRIVE MOTOR.

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

ALABAMA ELECTRIC: LOWMAN 2 (CONT.)

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

10/80	A	100.0	0.0		0.0				
	B	0.0	0.0		0.0				
	SYSTEM	50.0	0.0		0.0	744	0	0	0.0

** PROBLEMS/SOLUTIONS/COMMENTS

DURING OCTOBER THE UNIT WAS OUT OF SERVICE FOR A TURBINE/GENERATOR INSPECTION.

REPAIR ON MODULE B DAMPER MOTOR DRIVE CONTINUED THROUGHOUT THE MONTH.

11/80	A	100.0	74.3	74.3	15.5				
	B	0.0	0.0	0.0	0.0				
	SYSTEM	50.0	37.2	37.2	7.8	720	150	56	10.0

12/80	A	100.0	90.5	90.5	86.4				
	B	62.4	62.9	62.9	60.1				
	SYSTEM	81.2	76.7	76.7	73.2	744	710	545	45.9

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE B DAMPER REPAIRS WERE COMPLETED BY MID-DECEMBER. THE UTILITY REPORTED THAT NO OTHER MAJOR PROBLEMS WERE ENCOUNTERED DURING THE FOURTH QUARTER 1980.

1/81	SYSTEM					744			
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2/81	SYSTEM					672			
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3/81	SYSTEM					744			
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** PROBLEMS/SOLUTIONS/COMMENTS

INFORMATION FOR THE FIRST QUARTER 1981 WAS NOT AVAILABLE AT THIS TIME.

4/81	SYSTEM					720			
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5/81	SYSTEM					744			
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6/81	SYSTEM					720			
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** PROBLEMS/SOLUTIONS/COMMENTS

INFORMATION FOR THE SECOND QUARTER 1981 WAS NOT AVAILABLE.

7/81	SYSTEM					744			
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** PROBLEMS/SOLUTIONS/COMMENTS

INFORMATION FOR THE MONTH OF JULY WAS NOT AVAILABLE AT THIS TIME.

8/81	A	100.0	51.6	100.0	51.6				
	B	96.5	87.7	100.0	87.7				
	SYSTEM	96.2	69.7	100.0	69.7	744	744	518	51.8

9/81	A	100.0	99.9	100.0	49.9				
	B	95.1	95.2	100.0	92.0				
	SYSTEM	97.6	70.9	100.0	70.9	720	720	511	6.2

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

ALABAMA ELECTRIC: LOWMAN 2 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE MONTHS OF AUGUST AND SEPTEMBER.

8/81	A	16.9	3.5	3.5	0.6				
	B	16.9	99.6	99.6	16.8				
	SYSTEM	16.9	51.5	51.5	8.7	744	125	65	4.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT AND THE FGD SYSTEM WERE OUT OF SERVICE FOR MOST OF OCTOBER FOR SCHEDULED MAINTENANCE.

10/81	A	41.2	89.4	89.6	41.1				
	B	41.2	68.9	86.9	31.7				
	SYSTEM	41.2	79.1	88.2	36.4	720	331	262	22.9

** PROBLEMS/SOLUTIONS/COMMENTS

DURING NOVEMBER THE SCHEDULED MAINTENANCE STARTED IN OCTOBER WAS COMPLETED

11/81	A	100.0	97.1	100.0	96.8				
	B	100.0	10.7	100.0	10.7				
	SYSTEM	100.0	53.9	100.0	53.8	744	742	400	42.8

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING DECEMBER.

12/81	A	93.3	93.4	93.4	93.4				
	B	93.3	0.6	0.8	0.6				
	SYSTEM	93.3	45.5	47.1	45.5	744	744	350	46.8

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JANUARY THE LIMESTONE FEED SYSTEM FROZE CAUSING AN UNAVAILABILITY OF LIMESTONE SLURRY TO THE FGD SYSTEM.

1/82	A	100.0	98.3	100.0	81.5				
	B	100.0	0.0		0.0				
	SYSTEM	100.0	49.1	100.0	40.7	672	557	274	38.2

** PROBLEMS/SOLUTIONS/COMMENTS

DURING FEBRUARY NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED.

2/82	A	78.2	48.5	66.9	44.0				
	B	98.6	52.7	97.3	47.8				
	SYSTEM	88.4	50.6	82.1	45.9	744	675	342	38.4

** PROBLEMS/SOLUTIONS/COMMENTS

DURING MARCH THE MODULE A HYDROCLONE MALFUNCTIONED CAUSING SOME OUTAGE TIME.

3/82	A	84.3	74.2	82.5	74.0				
	B	86.0	43.8	99.7	43.8				
	SYSTEM	85.1	59.0	91.1	58.9	720	718	424	54.0

4/82	A	100.0	84.2	100.0	20.7				
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UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

ALABAMA ELECTRIC: LOWMAN 2 (CONT.)

-----PERFORMANCE DATA-----										
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	B	100.0	93.7	100.0	23.0					
	SYSTEM	100.0	88.9	100.0	21.9		744	183	163	14.2
** PROBLEMS/SOLUTIONS/COMMENTS										
NO MAJOR FGD-RELATED PROBLEMS WERE REPORTED DURING THE MONTHS OF APRIL AND MAY.										
6/82	SYSTEM	99.2	99.5	99.5	99.5		720	720	716	52.8
** PROBLEMS/SOLUTIONS/COMMENTS										
THE UTILITY REPORTED EXPERIENCING PROBLEMS WITH THE 2A OUTLET DAMPER DURING JUNE.										
7/82	SYSTEM	100.0	100.0	100.0	100.0		744	744	744	58.0
** PROBLEMS/SOLUTIONS/COMMENTS										
THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING JULY.										
8/82	SYSTEM	90.2	88.8	88.8	88.8		744	744	661	57.9
** PROBLEMS/SOLUTIONS/COMMENTS										
THE UTILITY REPORTED EXPERIENCING PROBLEMS WITH THE 2A AND 2B DAMPERS DURING AUGUST.										
9/82	SYSTEM	97.8	97.1	97.1	97.8		720	664	704	48.0
** PROBLEMS/SOLUTIONS/COMMENTS										
THE 2A DAMPERS WERE OUT OF SERVICE DURING PART OF SEPTEMBER FOR REPAIRS.										
THE SCRUBBER WAS TAKEN OUT OF SERVICE DURING PART OF SEPTEMBER WHILE THE PRECIPITATOR WAS TURNED OFF.										
10/82	SYSTEM	0.0			0.0		744	0	0	0.0
** PROBLEMS/SOLUTIONS/COMMENTS										
THE UTILITY REPORTED THAT THE BOILER WAS SHUT DOWN DURING OCTOBER.										
11/82	SYSTEM	74.7	98.4	98.4	73.9		720	540	532	49.1
** PROBLEMS/SOLUTIONS/COMMENTS										
A BROKEN DAMPER CHAIN RESULTED IN DOWN TIME DURING NOVEMBER.										
12/82	SYSTEM	95.2	95.0	95.0	90.8		744	711	676	48.2
** PROBLEMS/SOLUTIONS/COMMENTS										
THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING DECEMBER.										
1/83	SYSTEM	100.0	100.0	100.0	100.0		744	744	744	59.2
** PROBLEMS/SOLUTIONS/COMMENTS										
NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED BY THE UTILITY DURING JANUARY.										
2/83	SYSTEM	100.0	99.4	99.4	93.2		672	630	626	66.5

ILITY FGD SURVEY: JANUARY - DECEMBER 1988

ABAMA ELECTRIC: LOWMAN 2 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE UNIT WAS SHUT DOWN DURING PART OF FEBRUARY.

/83	SYSTEM	100.0	100.0	100.0	100.0	744	744	744	74.6
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** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED BY THE UTILITY DURING MARCH.

/83	SYSTEM	89.7	98.1	98.1	82.0	720	602	591	60.6
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/83	SYSTEM				0.0	744	0	0	
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/83	SYSTEM				0.0	720	0	0	
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** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE BOILER WAS SHUT DOWN DURING MAY AND JUNE FOR A SCHEDULED MAINTENANCE OUTAGE.

/83	A	83.9	73.6		62.9				
	B	83.9	22.6		19.4				
	SYSTEM	83.9	48.1		41.1	744	637	306	51.3

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING JULY.

/83	A	96.9	78.3		78.2				
	B	100.0	21.7		21.7				
	SYSTEM	98.5	50.0		49.9	744	743	372	65.8

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE A WAS OUT OF SERVICE DURING PART OF AUGUST FOR PRESATURATOR MAINTENANCE.

/83	A	100.0	25.7		25.4				
	B	100.0	73.8		73.1				
	SYSTEM	100.0	49.8		49.3	720	712	355	51.9

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING SEPTEMBER.

/83	A	81.5	13.1		10.8				
	B	81.5	97.4		80.5				
	SYSTEM	81.5	55.2	55.2	45.6	744	615	340	53.3

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD-RELATED PROBLEMS WERE REPORTED DURING OCTOBER.

/83	SYSTEM				0.0	720	0	0	0.0
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UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

ALABAMA ELECTRIC: LOWMAN 2 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS OFF LINE DURING NOVEMBER FOR A SCHEDULED FALL OUTAGE.

12/83	A	0.0	0.0		0.0				
	B	0.0	0.0		0.0				
	SYSTEM	0.0	0.0	0.0	0.0	744	149	0	9.9

** PROBLEMS/SOLUTIONS/COMMENTS

SUB-FREEZING WEATHER CONDITIONS FORCED THE FGD SYSTEM OUT OF SERVICE DURING DECEMBER. PIPING ASSOCIATED WITH LIMESTONE SLURRY FEED AND REAGENT PREPARATION HAD FROZEN, PLUGGED, AND/OR BURSTED.

1/84	A	45.4	18.8		18.8				
	B	80.0	62.5		62.5				
	SYSTEM	62.7	40.6	40.6	40.6	744	744	302	55.2

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE ABSORBER WAS INOPERABLE DUE TO FROZEN PIPES.

THE UTILITY REPORTED LIMESTONE FEED AND BALL MILL PROBLEMS DURING JANUARY.

2/84	A	100.0	81.4		81.4				
	B	100.0	90.5		90.5				
	SYSTEM	100.0	85.9	85.9	85.9	696	696	598	62.4

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING FEBRUARY.

3/84	A	31.9	85.5		30.2				
	B	31.9	84.7		29.9				
	SYSTEM	31.9	85.1	30.1	30.1	744	263	224	25.1

** PROBLEMS/SOLUTIONS/COMMENTS

THE ABSORBER WAS REMOVED FROM SERVICE DURING MARCH TO HELP DRY OUT THE STACK.

THE UTILITY REPORTED THAT A UNIT TURBINE OUTAGE INSPECTION OCCURRED.

4/84	A	0.0			0.0				
	B	0.0			0.0				
	SYSTEM	0.0			0.0	720	0	0	0.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED A UNIT SHUT DOWN DUE TO A TURBINE OUTAGE.

5/84	A	12.9	3.4		0.8				
	B	12.9	54.3		12.2				
	SYSTEM	12.9	28.8	6.5	6.5	744	167	48	10.4

** PROBLEMS/SOLUTIONS/COMMENTS

THE ABSORBER WAS DOWN SEVERAL DAYS DURING MAY TO ALLOW HOT FLUE GAS TO DRY THE STACK.

6/84	A	100.0	77.0		77.0				
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ILITY FGD SURVEY: JANUARY - DECEMBER 1988

ABAMA ELECTRIC: LOWMAN 2 (CONT.)

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

	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL	PER SO2 PART.	BOILER HOURS	FGD HOURS	CAP. FACTOR
B	100.0	53.7		53.7					
SYSTEM	100.0	65.3	65.3	65.3		720	720	470	61.2

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING JUNE.

/84 A	100.0	75.3		75.3					
B	100.0	98.2		98.2					
SYSTEM	100.0	86.7		86.7		744	744	645	64.2

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD-RELATED PROBLEMS ENCOUNTERED BY THE UTILITY DURING JULY.

/84 A	100.0	83.7		83.7					
B	100.0	91.4		91.4					
SYSTEM	100.0	87.6		87.6		744	744	651	62.1

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE MONTH OF AUGUST.

'/84 A	96.4	48.3		47.9					
B	99.6	88.1		87.3					
SYSTEM	98.0	68.2		67.6		720	714	487	55.3

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE A WAS SHUT DOWN IN SEPTEMBER TO CLEAN PLUGGED MIST ELIMINATOR.

1/84 A	100.0	96.6		96.7					
B	100.0	95.0		95.1					
SYSTEM	100.0	95.8		95.9		744	745	714	83.3

1/84 A	100.0	85.0		85.0					
B	99.4	52.5		52.5					
SYSTEM	99.7	68.7		68.7		720	720	495	55.3

2/84 A	87.6	91.6		78.8					
B	67.7	12.4		10.7					
SYSTEM	77.7	52.0		44.7		744	630	333	40.7

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED HAVING PROBLEMS WITH THE MODULE B OUTLET DAMPER DURING THE FOURTH QUARTER OF 1984. THE MOTOR DRIVE, DRIVE CHAIN, AND SHAFT BEARINGS WERE REPAIRED.

1/85 A	86.0	78.5	78.5	71.9					
B	86.0	49.4	49.4	45.3					
SYSTEM	86.0	63.9	63.9	58.6		744	682	436	50.9

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS OUT OF SERVICE THROUGH THE MONTH OF JANUARY DUE TO FROZEN PIPE LINES.

2/85 A	100.0	60.7	60.7	60.7					
B	100.0	57.0	57.0	57.0					
SYSTEM	100.0	58.9	58.9	58.9		672	672	396	48.2

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

ALABAMA ELECTRIC: LOWMAN 2 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

NO PROBLEMS WERE ENCOUNTERED DURING THE MONTH OF FEBRUARY, 1985.

3/85	A	29.2	27.1	27.1	8.9				
	B	29.2	82.2	82.2	27.1				
	SYSTEM	29.2	54.6	54.6	18.0	744	245	134	17.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS OUT OF SERVICE DURING THE MONTH DUE TO A BOILER OUTAGE.

4/85	A	97.8	89.5	89.5	89.3				
	B	99.9	62.9	62.9	62.8				
	SYSTEM	98.8	76.2	76.2	76.0	720	719	548	82.6

** PROBLEMS/SOLUTIONS/COMMENTS

ABSORBER A WAS TAKEN OUT OF SERVICE FOR SPRAY NOZZLE CLEANING.

5/85	A	100.0	39.6	39.6	39.6				
	B	100.0	71.6	71.6	71.6				
	SYSTEM	100.0	55.6	55.6	55.6	744	744	414	60.7

6/85	A	99.4	91.0	91.0	91.0				
	B	99.7	89.3	89.3	89.3				
	SYSTEM	99.6	90.2	90.2	90.2	720	720	649	80.5

7/85	A	98.7	67.5	67.5	67.5				
	B	98.4	89.4	89.4	89.4				
	SYSTEM	98.5	78.4	78.4	78.4	744	744	583	80.8

8/85	A	100.0	85.4	85.4	85.4				
	B	100.0	81.1	81.1	81.1				
	SYSTEM	100.0	83.3	83.3	83.3	744	744	619	83.8

** PROBLEMS/SOLUTIONS/COMMENTS

NO FGD SYSTEM PROBLEMS WERE ENCOUNTERED MAY THROUGH AUGUST 1985.

9/85	A	63.9	95.9	95.9	63.9				
	B	63.5	76.1	76.1	50.7				
	SYSTEM	63.7	86.0	86.0	57.3	720	480	412	49.5

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS OUT OF SERVICE FOR THE REGULAR FALL OUTAGE. THE OUTAGE BEGAN ON THE 20TH OF SEPTEMBER 1985 AND CONTINUED THROUGH THE END OF THE MONTH.

10/85	A	62.9	73.0	73.0	50.4				
	B	62.9	49.0	49.0	33.8				
	SYSTEM	62.9	61.0	61.0	42.1	744	513	313	61.2

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS REMOVED FROM SERVICE IN ORDER TO INSPECT SPRAY NOZZLES AND MIST ELIMINATORS.

11/85	A	100.0	95.5	95.5	95.5				
	B	100.0	75.4	75.4	75.4				
	SYSTEM	100.0	85.5	85.5	85.5	720	720	616	83.8

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

ALABAMA ELECTRIC: LOWMAN 2 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

NO PROBLEMS WERE ENCOUNTERED DURING THE MONTH OF NOVEMBER 1985.

11/85	A	99.6	66.6	66.6	66.6				
	B	99.6	78.5	78.5	78.5				
	SYSTEM	99.6	72.5	72.5	72.5	744	744	539	70.3

** PROBLEMS/SOLUTIONS/COMMENTS

THE ABSORBERS WERE TAKEN OUT OF SERVICE AFTER PH CONTROL WAS LOST AS A RESULT OF A PLUGGED/FROZEN LIMESTONE SLURRY FEED LINE.

12/85	A	99.7	84.3		84.3				
	B	100.0	78.6		78.6				
	SYSTEM	99.9	81.4		81.4	744	744	606	62.0
1/86	A	100.0	14.6		14.6				
	B	100.0	74.3		74.3				
	SYSTEM	100.0	44.5		44.5	672	672	299	53.4
5/86	A	100.0	23.4		9.7				
	B	100.0	29.8		12.4				
	SYSTEM	100.0	26.6		11.1	744	310	82	23.0

** PROBLEMS/SOLUTIONS/COMMENTS

NO FGD SYSTEM PROBLEMS WERE ENCOUNTERED JANUARY THROUGH MARCH 1986. FGD SYSTEM UTILIZATION DURING THE MONTH OF MARCH WAS LIMITED DUE TO THE BURNING OF LOW SULFUR COMPLIANCE COAL.

4/86	A	99.9	57.6		52.0				
	B	99.9	32.2		29.1				
	SYSTEM	99.9	44.9		40.6	720	651	292	65.8
5/86	A	100.0	42.4		42.4				
	B	100.0	64.1		64.1				
	SYSTEM	100.0	53.3		53.3	744	744	396	59.4
6/86	A	100.0	88.5		88.5				
	B	100.0	81.0		81.0				
	SYSTEM	100.0	84.8		84.8	720	720	611	72.8
7/86	A	98.7	91.3		91.3				
	B	98.9	87.2		87.2				
	SYSTEM	98.8	89.2		89.2	744	744	664	74.7
8/86	A	100.0	78.6		78.6				
	B	98.8	56.3		56.3				
	SYSTEM	99.4	67.4		67.4	744	744	502	70.8
9/86	A	100.0	49.7		49.7				
	B	100.0	45.1		45.1				
	SYSTEM	100.0	47.4		47.4	720	720	341	69.1

** PROBLEMS/SOLUTIONS/COMMENTS

NO FGD SYSTEM PROBLEMS WERE ENCOUNTERED DURING THE SECOND AND THIRD QUARTERS OF 1986.

10/86	A		56.0		56.1				
	B		46.1		46.1				
	SYSTEM		51.0		51.1	744	745	380	69.4

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

ALABAMA ELECTRIC: LOWMAN 2 (CONT.)

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

11/86	A		26.6		7.9						
	B		21.8		6.5						
	SYSTEM		24.2		7.2			720	214	52	15.7
12/86	A		0.7		0.7						
	B		5.7		5.7						
	SYSTEM		3.2		3.2			744	744	24	57.7

** PROBLEMS/SOLUTIONS/COMMENTS

HIGH SYSTEM AVAILABILITIES DURING THE FOURTH QUARTER OF 1986 WERE DUE IN PART TO BURNING LOW SULFUR COMPLIANCE COAL AND A SCHEDULED ONE MONTH BOILER MAINTENANCE OUTAGE. NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE PERIOD.

1/87	A	100.0	14.1		14.1						
	B	100.0	11.7		11.7						
	SYSTEM	100.0	12.9		12.9			744	744	96	61.3
2/87	A	100.0	29.2		29.2						
	B	100.0	43.0		43.0						
	SYSTEM	100.0	36.1		36.1			672	672	242	56.5
3/87	A	100.0	70.0		70.0						
	B	100.0	93.6		93.6						
	SYSTEM	100.0	81.8		81.8			744	744	608	70.0
4/87	A	99.9	55.4		18.5						
	B	99.9	75.2		25.1						
	SYSTEM	99.9	65.3		21.8			720	240	157	20.7
5/87	A	100.0	78.9		77.6						
	B	100.0	62.5		61.5						
	SYSTEM	100.0	70.7		69.5			744	731	517	58.6

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED NO MAJOR FGD-RELATED PROBLEMS DURING THE PERIOD OF JANUARY THROUGH MAY 1987.

6/87	A	91.8	91.1		91.1						
	B	91.8	33.1		33.1						
	SYSTEM	91.8	62.1		62.1			720	720	447	65.9

** PROBLEMS/SOLUTIONS/COMMENTS

IN JUNE THE LIMESTONE BALL MILL WAS OUT OF SERVICE FOR REPAIRS. NO LIMESTONE SLURRY WAS AVAILABLE.

7/87	A	100.0	74.5		74.5						
	B	100.0	71.9		71.9						
	SYSTEM	100.0	73.2		73.2			744	744	545	72.6
8/87	A	100.0	81.7		81.7						
	B	100.0	77.5		77.5						
	SYSTEM	100.0	79.6		79.6			744	744	592	76.9

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED NO MAJOR FGD-RELATED PROBLEMS DURING THE MONTHS OF JULY AND AUGUST.

9/87	A	99.4	63.2		63.2						
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UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

LABAMA ELECTRIC: LOWMAN 2 (CONT.)

-----PERFORMANCE DATA-----										
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	B	99.4	93.6		93.6					
	SYSTEM	99.4	78.4		78.4		720	720	565	66.7

** PROBLEMS/SOLUTIONS/COMMENTS

AN ELECTRICAL PROBLEM PREVENTED THE SUPERNATANT PUMPS FROM RUNNING.
SUPERNATANT WAS UNAVAILABLE FOR FGD SYSTEM USE.

10/87	A	100.0	0.9		55.3					
	B	100.0	1.0		61.4					
	SYSTEM	100.0	1.0		58.4		744	607	434	48.6
11/87	A	100.0	71.4		29.7					
	B	100.0	64.5		26.9					
	SYSTEM	100.0	67.9		28.3		720	300	204	23.5

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED NO MAJOR FGD-RELATED PROBLEMS DURING THE MONTHS OF
OCTOBER AND NOVEMBER 1987.

12/87	A	95.4	29.8		29.8					
	B	95.4	85.4		85.4					
	SYSTEM	95.4	57.6		57.6		744	744	428	61.1

** PROBLEMS/SOLUTIONS/COMMENTS

AN AGITATOR GEAR FAILURE FORCED THE FGD SYSTEM OUT OF SERVICE IN
DECEMBER. THE LIMESTONE SLURRY MAKEUP WAS UNAVAILABLE.

1/88	A	100.0	89.9		89.9					
	B	100.0	81.2		81.2					
	SYSTEM	100.0	85.6		85.6		744	744	637	69.8

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED NO MAJOR FGD-RELATED PROBLEMS DURING THE MONTH
OF JANUARY.

2/88	A	68.5	67.3		67.3					
	B	68.5	61.0		61.0					
	SYSTEM	68.5	64.2		64.2		696	696	447	63.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE LIMESTONE BALL MILL WAS OUT OF SERVICE FOR REPAIRS CAUSING A SHORTAGE
IN LIMESTONE SLURRY.

3/88	A	98.7	85.1		85.1					
	B	98.7	87.8		87.8					
	SYSTEM	98.7	86.4		86.4		744	744	643	70.4

4/88	A		77.3		29.7					
	B		93.8		36.0					
	SYSTEM		85.5		32.9		720	277	237	27.7

5/88	A		46.3		46.3					
	B		68.7		68.7					
	SYSTEM		57.5		57.5		744	744	428	60.6

5/88	A		39.8		39.8					
	B		95.1		95.1					
	SYSTEM		67.4		67.4		720	720	485	77.0

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

ALABAMA ELECTRIC: LOWMAN 2 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED NO MAJOR FGD-RELATED PROBLEMS DURING THE PERIOD
 MARCH THROUGH JUNE.

7/88	A	87.8		70.1				
	B	87.8		9.1				
	SYSTEM	87.8		39.6	744	295	78.1	

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS OUT OF SERVICE PART OF JULY DUE TO A LIMESTONE SLURRY
 SHORTAGE. THE LIMESTONE BALL MILL WAS OUT OF SERVICE FOR REPAIRS.

8/88	A	100.0	23.5	23.5				
	B	100.0	87.6	87.6				
	SYSTEM	100.0	55.6	55.6	744	744	413	82.6

9/88	A	100.0	52.7	52.7				
	B	100.0	73.3	73.3				
	SYSTEM	100.0	63.0	63.0	720	720	454	73.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED NO MAJOR FGD-RELATED PROBLEMS DURING THE MONTHS
 OF AUGUST AND SEPTEMBER.

10/88	A	100.0	8.5	3.6				
	B	100.0	87.6	37.7				
	SYSTEM	100.0	48.0	20.7	744	320	154	34.8

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS OFF-LINE MOST OF OCTOBER DUE TO A SCHEDULED MAINTENANCE
 OUTAGE.

11/88	A	100.0	72.7	72.7				
	B	100.0	31.5	31.5				
	SYSTEM	100.0	52.1	52.1	720	720	375	70.6

12/88	A	100.0	62.8	62.8				
	B	100.0	83.4	83.4				
	SYSTEM	100.0	73.1	73.1	744	744	544	75.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED NO MAJOR FGD-RELATED PROBLEMS DURING THE MONTHS
 OF NOVEMBER AND DECEMBER.

SECTION 13
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	ALABAMA ELECTRIC	
PLANT NAME	LOWMAN	
UNIT NUMBER	3	
CITY	LEROY	
STATE	ALABAMA	
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	301.	(0.700 LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	525	
GROSS UNIT GENERATING CAPACITY - MW	255	
NET UNIT GENERATING CAPACITY W/FGD - MW	233	
NET UNIT GENERATING CAPACITY WO/FGD - MW	241	
EQUIVALENT SCRUBBED CAPACITY - MW	179	

** UNIT DATA - BOILER AND STACK

BOILER SUPPLIER	RILEY STOKER	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	449.72	(953000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	143.9	(291 F)
STACK HEIGHT - M	122.	(400 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	5.0	(16.5 FT)

** FUEL DATA

FUEL TYPE	COAL	
FUEL GRADE	BITUMINOUS	
AVERAGE HEAT CONTENT - J/G	27679.	(11900 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		11800-12000
AVERAGE ASH CONTENT - %	12.00	
RANGE ASH CONTENT - %	11.0-13.0	
AVERAGE MOISTURE CONTENT - %	7.00	
RANGE MOISTURE CONTENT - %	4.0-10.0	
AVERAGE SULFUR CONTENT - %	1.40	
RANGE SULFUR CONTENT - %	1.3-1.5	
AVERAGE CHLORIDE CONTENT - %	0.04	
RANGE CHLORIDE CONTENT - %	****	

*** PARTICLE CONTROL

** MECHANICAL COLLECTOR

NUMBER	0
TYPE	NONE

** ESP

NUMBER	1	
NUMBER OF SPARES	0	
TYPE	HOT SIDE	
SUPPLIER	RESEARCH-COTTRELL	
INLET FLUE GAS CAPACITY - CU.M/S	449.7	(953000 ACFM)
INLET FLUE GAS TEMPERATURE - C	143.9	(291 F)
PRESSURE DROP - KPA	0.1	(1. IN-H2O)
PARTICLE REMOVAL EFFICIENCY - %	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

ILITY FGD SURVEY: JANUARY - DECEMBER 1988

ABAMA ELECTRIC: LOWMAN 3 (CONT.)

* GENERAL DATA

SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT
SO2 REMOVAL MODE	WET SCRUBBING
PROCESS TYPE	LIMESTONE
PROCESS ADDITIVES	NONE
SYSTEM SUPPLIER	PEABODY PROCESS SYSTEMS
A-E FIRM	BURNS & MCDONNELL
DEVELOPMENT LEVEL	FULL SCALE
NEW/RETROFIT	NEW
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.50
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	59.50
ENERGY CONSUMPTION - %	3.1
CURRENT STATUS	1
COMMERCIAL START-UP	6/1979
INITIAL START-UP	6/1979
CONTRACT AWARDED	8/1975

* DESIGN AND OPERATING PARAMETERS

DESIGN COAL SULFUR CONTENT - %	1.80	
DESIGN COAL HEAT CONTENT - J/G	29075.0	(12500 BTU/LB)
DESIGN COAL ASH CONTENT - %	10.00	
DESIGN MOISTURE CONTENT - %	8.00	
DESIGN CHLORIDE CONTENT - %	0.04	
SPACE REQUIREMENTS - SQ M	4645.0	(50000 SQ FT)
OPER. & MAINT. REQUIREMENT - MANHR/DAY	72.0	

* QUENCHER/PRESATURATOR

NUMBER	2	
TYPE	SPRAY	
INLET GAS FLOW - CU. M/S	127.41	(270000 ACFM)
INLET GAS TEMPERATURE - C	143.9	(291 F)
LIQUID RECIRCULATION RATE - LITERS/S	35.	(550 GPM)
CONSTRUCTION MATERIAL GENERIC TYPE	HIGH ALLOY	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NICKEL BASE/CHROMIUM-IRON-COPPER-MOLYBDENUM	

* ABSORBER

NUMBER	2	
NUMBER OF SPARES	0	
GENERIC TYPE	SPRAY TOWER	
SPECIFIC TYPE	OPEN COUNTERCURRENT SPRAY	
TRADE NAME/COMMON TYPE	N/A	
SUPPLIER	PEABODY PROCESS SYSTEMS	
DIMENSIONS - FT	24.0 DIA 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	GLASS FLAKE-FILLED POLYESTER	
LINER MATERIAL TRADE NAME/COMMON TYPE	RESISTA-FLAKE 1151	
GAS CONTACTING DEVICE TYPE	NONE	
NUMBER OF CONTACTING ZONES	6	
LIQUID RECIRCULATION RATE LITER/S	1259.	(19980 GPM)
L/G RATIO - L/CU.M	9.9	(74.0 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	1.0	(4.0 IN-H2O)
SUPERFICIAL GAS VELOCITY - M/SEC	3.0	(10.0 FT/S)
INLET GAS FLOW - CU. M/S	127.41	(270000 ACFM)
INLET GAS TEMPERATURE - C	54.4	(130 F)
SO2 REMOVAL EFFICIENCY - %	85.0	
PARTICLE REMOVAL EFFICIENCY - %	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	SHAH-HEIL
CONFIGURATION	HORIZONTAL

ALABAMA ELECTRIC: LOWMAN 3 (CONT.)

NUMBER OF STAGES	1	
NUMBER OF PASSES PER STAGE	1	
FREEBOARD DISTANCE - M	1.22	(4.0 FT)
PRESSURE DROP - KPA	0.1	(0.5 IN-H ₂ O)
SUPERFICIAL GAS VELOCITY - M/S	3.0	(10.0 FT/S)
CONSTRUCTION MATERIAL GENERIC TYPE	ORGANIC	
CONSTRUCTION MATERIAL SPECIFIC TYPE	POLYPHENYLENE	
WASH WATER SOURCE	MAKEUP	
WASH FREQUENCY	INTERMITTENTLY	
** REHEATER		
NUMBER	1	
GENERIC TYPE	BYPASS	
SPECIFIC TYPE	COLD SIDE	
TRADE NAME/COMMON TYPE	N/A	
LOCATION	ABSORBER OUTLET DUCT	
PERCENT GAS BYPASSED - AVG	30.0	
TEMPERATURE INCREASE - C	26.7	(48 F)
INLET FLUE GAS FLOW RATE - CU. M/S	134.92	(285900 ACFM)
INLET FLUE GAS TEMPERATURE - C	143.9	(291 F)
OUTLET FLUE GAS TEMPERATURE - C	81.1	(178 F)
CONSTRUCTION MATERIAL GENERIC TYPE	HIGH ALLOY	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NICKEL BASE/CHROMIUM-IRON-MOLYBDENUM	
** FANS		
NUMBER	2	
NUMBER OF SPARES	0	
DESIGN	CENTRIFUGAL	
SUPPLIER	PEABODY PROCESS SYSTEMS	
FUNCTION	UNIT	
APPLICATION	FORCED DRAFT	
SERVICE	DRY	
FLUE GAS FLOW RATE - CU.M/S	225.10	(477000 ACFM)
FLUE GAS TEMPERATURE - C	143.9	(291 F)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	
** DAMPERS		
NUMBER	2	
FUNCTION	SHUT-OFF	
GENERIC TYPE	GUILLOTINE	
MANUFACTURER	MOSSER	
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR	
LINER GENERIC MATERIAL TYPE	HIGH ALLOY	
LINER SPECIFIC MATERIAL TYPE	NICKEL BASE/CHROMIUM-IRON-COPPER-MOLYBDENUM	
** DAMPERS		
NUMBER	2	
FUNCTION	SHUT-OFF	
GENERIC TYPE	GUILLOTINE	
MANUFACTURER	MOSSER	
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR	
LINER GENERIC MATERIAL TYPE	HIGH ALLOY	
LINER SPECIFIC MATERIAL TYPE	NICKEL BASE/CHROMIUM-IRON-COPPER-MOLYBDENUM	
** DAMPERS		
NUMBER	2	
FUNCTION	CONTROL	
GENERIC TYPE	LOUVER	
MANUFACTURER	MOSSER	
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR	
LINER GENERIC MATERIAL TYPE	NONE	
LINER SPECIFIC MATERIAL TYPE	N/A	
** DUCTWORK		
LOCATION	SCRUBBER INLET	
CONFIGURATION	RECTANGULAR	
DIMENSIONS	7 FT X 12 FT	
SHELL GENERIC MATERIAL TYPE	CARBON STEEL	

ILITY FGD SURVEY: JANUARY - DECEMBER 1988

ABAMA ELECTRIC: LOWMAN 3 (CONT.)

SHELL SPECIFIC MATERIAL TYPE	AISI 1110
LINER GENERIC MATERIAL TYPE	NONE
LINER SPECIFIC MATERIAL TYPE	N/A
* DUCTWORK	
LOCATION	SCRUBBER OUTLET TO STACK
CONFIGURATION	RECTANGULAR
DIMENSIONS	5.5 FT X 12 FT AND 13 FT X 16 FT
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
SHELL SPECIFIC MATERIAL TYPE	AISI 1110
LINER GENERIC MATERIAL TYPE	ORGANIC
LINER SPECIFIC MATERIAL TYPE	FLUOROELASTOMER
* REAGENT PREPARATION EQUIPMENT	
FUNCTION	WET BALL MILL
DEVICE	COMPARTMENTED
DEVICE TYPE	NR
MANUFACTURER	KENNEDY VAN SAUN
NUMBER	1
FULL LOAD DRY FEED CAPACITY - M.TONS/HR	9.1 (10 TPH)
PRODUCT QUALITY - % SOLIDS	35.0
* TANKS	
SERVICE	NUMBER
-----	-----
ABSORBER RECYCLE	1
MIST ELIMINATOR WASH	1
LIMESTONE SLURRY STORAGE	1
HYDROCLONE UNDERFLOW	****
MILL RECYCLE SUMP	1
WASTE SLURRY SUMP	1
* PUMPS	
SERVICE	NUMBER
-----	-----
ABSORBER RECIRCULATION	6
LIMESTONE MILL SLURRY RECIRCULATION	2
LIMESTONE SLURRY FEED	2
MIST ELIMINATOR WASH	3
WASTE SLURRY	2
SUPERNATE RETURN	1
* SOLIDS CONCENTRATING/DEWATERING	
DEVICE	NONE
* SALEABLE BYPRODUCTS	
NATURE	NONE
DISPOSITION	N/A
* SLUDGE	
FULL LOAD SLUDGE QUANTITY - M.TONS/HR (DRY)	5.6 (6.2 TPH)
% CASO3 - DRY	17.0
% CASO4 - DRY	70.0
% CAOH2 - DRY	0.0
% CACO3 - DRY	5.0
% ASH - DRY	1.0
% OTHER COMPOUNDS - DRY	7.0
* TREATMENT	
METHOD	BLEED
DEVICE	N/A
PROPRIETARY PROCESS	N/A
* DISPOSAL	
NATURE	FINAL
TYPE	POND
LOCATION	ON-SITE

ALABAMA ELECTRIC: LOWMAN 3 (CONT.)

SITE TRANSPORTATION METHOD	PIPELINE
SITE TREATMENT	CLAY LINING
SITE DIMENSIONS	34.8 ACRE X 25 FT
SITE SERVICE LIFE - YRS	20
** PROCESS CONTROL AND INSTRUMENTATION	
CHEMICAL PARAMETERS	PH
PHYSICAL VARIABLES	PERCENT SOLIDS
CONTROL LEVELS	PH 5.8-6.0
MONITOR TYPE	TBI
MONITOR LOCATION	RECYCLE TANK
PROCESS CONTROL MANNER	AUTOMATIC
PROCESS CHEMISTRY MODE	FEEDBACK
** WATER BALANCE	
WATER LOOP TYPE	CLOSED
EVAPORATION WATER LOSS - LITER/S	10.5 (166 GPM)
SLUDGE HYDRATION WATER LOSS - LITER/S	0.3 (4 GPM)
POND SEEPAGE/RUNOFF WATER LOSS - LITERS/S	0
RECEIVING WATER STREAM	TOMBIGBEE RIVER
MAKEUP WATER ADDITION - LITERS/S	9.9 (157 GPM)
SOURCE OF MAKEUP WATER	COOLING TOWER BLOWDOWN
** CHEMICALS AND CONSUMPTION	
FUNCTION	ABSORBENT
NAME	LIMESTONE
PRINCIPAL CONSTITUENT	95% CaCO ₃
SOURCE/SUPPLIER	ALLIED PRODUCTS CO.
CONSUMPTION	3.5 TPH 1.1 MOL/MOL SO ₂
UTILIZATION - %	90.0
POINT OF ADDITION	BALL MILL
** FGD SPARE CAPACITY INDICES	
ABSORBER - %	0.0
** FGD SPARE COMPONENT INDICES	
ABSORBER	0.0

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

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO ₂ PART.	PER BOILER HOURS	FGD HOURS	CAP. FACTOR
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7/79	A		23.7		9.4				
	B		27.8		11.0				
	SYSTEM	72.7	25.8		10.2		744	295	76

**** PROBLEMS/SOLUTIONS/COMMENTS**

THE FGD SYSTEM IS CURRENTLY UNDERGOING SHAKEDOWN/DEBUGGING OPERATIONS.

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

**** PROBLEMS/SOLUTIONS/COMMENTS**

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

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

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

ILITY FGD SURVEY: JANUARY - DECEMBER 1988

ABAMA ELECTRIC: LOWMAN 3 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

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

1/79	A		82.7		82.7			
	B		90.9		90.9			
	SYSTEM	99.5	86.8		86.8	744	744	646

** PROBLEMS/SOLUTIONS/COMMENTS

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

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

1/79	A		78.6		78.6			
	B		89.3		89.3			
	SYSTEM	96.7	84.0		84.0	720	720	605

** PROBLEMS/SOLUTIONS/COMMENTS

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

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

2/79	A		78.4		68.7			
	B		87.6		76.8			
	SYSTEM	100.0	83.0		72.8	744	652	541

** PROBLEMS/SOLUTIONS/COMMENTS

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

1/80	A		69.2		30.5			
	B		45.4		20.0			
	SYSTEM	100.0	57.3		25.3	744	328	188

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JANUARY UNIT 3 WAS AVAILABLE THE ENTIRE MONTH.

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

** PROBLEMS/SOLUTIONS/COMMENTS

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

3/80	SYSTEM	100.0			0.0	744	0	0 0.0
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** PROBLEMS/SOLUTIONS/COMMENTS

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

4/80	SYSTEM				0.0	720	0	0 0.0
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UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

ALABAMA ELECTRIC: LOWMAN 3 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

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

5/80	A		8.3		0.7				
	B		0.0		0.0				
	SYSTEM	95.8	4.2		0.3	744	60	5	

** PROBLEMS/SOLUTIONS/COMMENTS

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

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

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

** PROBLEMS/SOLUTIONS/COMMENTS

NO FGD SYSTEM-RELATED PROBLEMS WERE ENCOUNTERED DURING JUNE.

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

** PROBLEMS/SOLUTIONS/COMMENTS

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

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

** PROBLEMS/SOLUTIONS/COMMENTS

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

9/80	A	90.6	91.4	91.4	46.8				
	B	90.6	73.7	73.7	37.8				
	SYSTEM	90.6	82.4	82.4	42.2	720	369	304	32.4

10/80	A	97.4	68.4	68.4	68.4				
	B	97.4	60.9	60.9	60.9				
	SYSTEM	97.4	63.4	63.4	63.4	744	744	472	69.4

11/80	A	99.3	83.6	83.6	83.6				
	B	99.3	87.9	87.9	87.9				
	SYSTEM	99.3	85.7	85.7	85.7	720	720	617	55.4

** PROBLEMS/SOLUTIONS/COMMENTS

DURING SEPTEMBER THROUGH NOVEMBER PROBLEMS WERE ENCOUNTERED WITH THE PROGRAMABLE CONTROLLER. THE UTILITY REPLACED THE CENTRAL PROCESSING UNIT IN OCTOBER AND IN NOVEMBER A NEW PROGRAM WAS RUN. THE UTILITY REPORTED THAT NO OTHER MAJOR FGD-RELATED PROBLEMS WERE EXPERIENCED DURING THIS TIME.

12/80	A	100.0	88.8	88.8	88.8				
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UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

ALABAMA ELECTRIC: LOWMAN 3 (CONT.)

-----PERFORMANCE DATA-----										
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PER PART.	BOILER HOURS	FG, HOURS	CAP. FACTOR
	B	100.0	66.0	66.0	66.0					
	SYSTEM	100.0	77.4	77.4	77.4		744	744	576	41.2

** PROBLEMS/SOLUTIONS/COMMENTS

NO PROBLEMS WERE ENCOUNTERED WITH THE UNIT OR THE FGD SYSTEM DURING DECEMBER.

12/81 SYSTEM 744

11/81 SYSTEM 672

10/81 SYSTEM 744

** PROBLEMS/SOLUTIONS/COMMENTS

INFORMATION FOR THE FIRST QUARTER 1981 WAS NOT AVAILABLE AT THIS TIME.

9/81 SYSTEM 720

8/81 SYSTEM 744

7/81 SYSTEM 720

** PROBLEMS/SOLUTIONS/COMMENTS

INFORMATION FOR THE SECOND QUARTER 1981 WAS NOT AVAILABLE.

6/81 SYSTEM 744

** PROBLEMS/SOLUTIONS/COMMENTS

INFORMATION FOR THE MONTH OF JULY WAS NOT AVAILABLE AT THIS TIME.

5/81	A	87.6	56.4	100.0	56.0				
	B	99.6	50.6	100.0	50.3				
	SYSTEM	93.6	53.5	100.0	53.1	744	739	395	45.0

4/81	A	30.1	99.7	100.0	24.1				
	B	30.1	99.7	100.0	26.8				
	SYSTEM	30.1	99.7	100.0	25.4	720	217	183	18.5

** PROBLEMS/SOLUTIONS/COMMENTS

DURING SEPTEMBER LOW SYSTEM UTILIZATION WAS DUE TO THE FACT THAT THE UNIT AND THE FGD SYSTEM WERE SHUTDOWN FOR SCHEDULED REPAIRS.

3/81	A	96.8	40.2	92.4	39.5				
	B	96.8	76.0	95.9	74.8				
	SYSTEM	96.8	58.1	94.1	57.2	744	732	425	62.8

1/81	A	99.2	95.3	98.9	74.5				
	B	99.2	56.5	98.1	44.2				
	SYSTEM	99.2	75.9	98.5	59.3	720	563	427	43.4

2/81	A	95.6	87.8	95.2	87.7				
	B	95.6	15.4	77.6	15.4				
	SYSTEM	95.6	51.6	86.4	51.5	744	743	383	48.1

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE FOURTH QUARTER THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED.

ALABAMA ELECTRIC: LOWMAN 3 (CONT.)

-----PERFORMANCE DATA-----										
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
1/82	A	93.3	78.6	91.9	76.2					
	B	93.3	14.7	67.9	14.2					
	SYSTEM	93.3	46.6	79.9	45.2		744	721	336	45.7
** PROBLEMS/SOLUTIONS/COMMENTS										
DURING JANUARY THE LIMESTONE FEED SYSTEM FROZE CAUSING AN UNAVAILABILITY OF LIMESTONE SLURRY TO THE FGD SYSTEM.										
2/82	A	98.7	61.8	97.9	61.8					
	B	98.7	45.9	97.2	45.9					
	SYSTEM	98.7	53.8	97.5	53.8		672	672	362	51.7
3/82	A	100.0	86.6	100.0	86.6					
	B	100.0	13.4	100.0	13.4					
	SYSTEM	100.0	50.0	100.0	50.0		744	744	372	45.1
** PROBLEMS/SOLUTIONS/COMMENTS										
NO MAJOR FGD-RELATED PROBLEMS WERE REPORTED FOR THE MONTHS OF FEBRUARY AND MARCH.										
4/82	A	98.7	63.5	97.1	41.3					
	B	98.9	40.8	96.0	26.5					
	SYSTEM	98.8	52.2	96.5	33.9		720	468	244	26.9
5/82	A	98.8	98.8	98.8	98.3					
	B	99.2	99.2	99.0	79.3					
	SYSTEM	99.0	99.0	98.9	88.8		744	744	661	78.9
** PROBLEMS/SOLUTIONS/COMMENTS										
DURING APRIL AND MAY NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED.										
6/82	SYSTEM	100.0	100.0	100.0	100.0		720	720	720	68.4
** PROBLEMS/SOLUTIONS/COMMENTS										
THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING JUNE.										
7/82	SYSTEM	100.0	99.4	99.4	99.4		744	744	740	64.7
** PROBLEMS/SOLUTIONS/COMMENTS										
MODULE A WAS OUT OF SERVICE DURING PART OF JULY DUE TO DAMPER PROBLEMS.										
8/82	SYSTEM	100.0	95.3	95.3	95.3		744	744	709	67.4
** PROBLEMS/SOLUTIONS/COMMENTS										
THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING AUGUST.										
9/82	SYSTEM	100.0	99.7	99.7	99.7		720	720	718	57.3
** PROBLEMS/SOLUTIONS/COMMENTS										
NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED BY THE UTILITY DURING SEPTEMBER.										
10/82	SYSTEM	100.0	100.0	100.0	100.0		744	744	744	76.3

ILITY FGD SURVEY: JANUARY - DECEMBER 1988

ABAMA ELECTRIC: LOWMAN 3 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED BY THE UTILITY
 DURING OCTOBER.

/82	SYSTEM	100.0	98.5	98.5	36.2	720	265	261	24.6
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** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE SCRUBBER WAS TAKEN OUT OF SERVICE DURING
 NOVEMBER WHILE THE PRECIPITATOR WAS OUT OF SERVICE.

/82	SYSTEM	100.0	91.5	91.5	49.0	744	398	365	24.1
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** PROBLEMS/SOLUTIONS/COMMENTS

MODULE A WAS OUT OF SERVICE DURING PART OF DECEMBER DUE TO PLUGGED INLET
 NOZZLES.

/83	SYSTEM	100.0	99.6	99.6	66.6	744	498	496	30.9
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** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS SHUT DOWN DURING PART OF JANUARY FOR A SCHEDULED OUTAGE.

THE 3A QUENCHER EXPERIENCED LOW FLOW PROBLEMS DURING JANUARY.

/83	SYSTEM	0.0			0.0	672	0	0	0.0
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** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS SHUT DOWN DURING FEBRUARY FOR A SCHEDULED OUTAGE.

/83	SYSTEM	0.0			0.0	744	0	0	0.0
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** PROBLEMS/SOLUTIONS/COMMENTS

THE SCHEDULED SHUTDOWN CONTINUED THROUGH MARCH.

/83	SYSTEM	16.1	66.5	66.5	16.3	720	177	118	14.6
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** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT MAKE-UP WATER LINES WERE REPAIRED DURING APRIL.

/83	SYSTEM	100.0	100.0	100.0	100.0	744	744	744	81.3
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/83	SYSTEM	99.9	99.4	99.4	99.4	720	720	716	78.8
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** PROBLEMS/SOLUTIONS/COMMENTS

MODULE A WAS OUT OF SERVICE DURING PART OF JUNE FOR MAINTENANCE.

/83	A	100.0	85.0		84.7				
	B	100.0	99.9		99.6				
	SYSTEM	100.0	92.4		92.2	744	742	686	71.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED
 DURING JULY.

/83	A	97.7	40.6		40.6				
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ALABAMA ELECTRIC: LOWMAN 3 (CONT.)

-----PERFORMANCE DATA-----											
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART. HOURS	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	B	100.0	59.5		59.5						
	SYSTEM	98.9	50.1		50.1			744	744	373	63.0
** PROBLEMS/SOLUTIONS/COMMENTS											
MODULE A WAS OUT OF SERVICE DURING PART OF AUGUST FOR PRESATURATOR MAINTENANCE.											
9/83	A	70.1	32.4		22.7						
	B	70.1	66.6		46.7						
	SYSTEM	70.1	49.5		34.7			720	505	250	34.4
** PROBLEMS/SOLUTIONS/COMMENTS											
THE UNIT WAS SHUT DOWN DURING SEPTEMBER FOR A SCHEDULED FALL OUTAGE.											
10/83	A	18.0	57.7		11.7						
	B	18.0	64.8		13.2						
	SYSTEM	18.0	61.3	61.3	12.5			744	151	93	11.7
** PROBLEMS/SOLUTIONS/COMMENTS											
THE UNIT WAS DOWN DURING MOST OF OCTOBER FOR A SCHEDULED FALL OUTAGE.											
11/83	A	77.9	69.4		69.4						
	B	82.4	61.0		61.0						
	SYSTEM	80.1	65.2	65.2	65.2			720	720	470	66.0
** PROBLEMS/SOLUTIONS/COMMENTS											
BROKEN LIMESTONE FEED LINES WERE REPORTED DURING NOVEMBER.											
A FOUR-HOUR OUTAGE OCCURRED DURING NOVEMBER FOR MAINTENANCE ON THE LIMESTONE PREPARATION EQUIPMENT.											
THE UTILITY REPORTED PROBLEMS PLACING MODULE A IN SERVICE DURING NOVEMBER DUE TO COMPUTER-RELATED PROBLEMS.											
THE FGD SYSTEM WAS OUT OF SERVICE FOR FIVE DAYS DURING NOVEMBER TO DRY OUT THE STACK.											
12/83	A	85.2	63.7		63.7						
	B	91.5	72.9		72.9						
	SYSTEM	88.4	68.3	68.3	68.3			744	744	508	68.1
** PROBLEMS/SOLUTIONS/COMMENTS											
THE UTILITY REPORTED PROBLEMS WITH AN INLET DAMPER AT MODULE A DURING DECEMBER.											
SUB-FREEZING WEATHER CONDITIONS FORCED THE FGD SYSTEM OUT OF SERVICE DURING DECEMBER CAUSING FROZEN, PLUGGED, AND/OR BURSTED PIPE LINES.											
INCLEMENT WEATHER FORCED THE LIMESTONE PREPARATION EQUIPMENT OUT OF SERVICE DURING DECEMBER.											
1/84	A	74.2	74.2		74.2						
	B	25.3	0.0		0.0						
	SYSTEM	49.7	37.1	37.1	37.1			744	744	276	51.3

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

ALABAMA ELECTRIC: LOWMAN 3 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE ABSORBER WAS INOPERABLE DURING JANUARY DUE TO FROZEN PIPES.

MECHANICAL PROBLEMS WITH MODULE B DISCHARGE DAMPER OCCURRED IN JANUARY.

LIMESTONE FEED AND BALL MILL PROBLEMS WERE REPORTED DURING THE MONTH.

'84	A	47.0	95.9		46.5				
	B	0.0	0.0		0.0				
	SYSTEM	23.5	47.9	23.2	23.2	696	337	162	22.8

** PROBLEMS/SOLUTIONS/COMMENTS

MECHANICAL PROBLEMS CONTINUED ON THE MODULE B DISCHARGE DAMPER DURING FEBRUARY.

'84	A	55.2	58.4		40.3				
	B	59.7	48.5		33.4				
	SYSTEM	57.5	53.4	36.8	36.8	744	513	274	40.9

** PROBLEMS/SOLUTIONS/COMMENTS

THE 3B DISCHARGE DAMPER WAS INOPERABLE IN MARCH DUE TO MECHANICAL PROBLEMS.

MODULE A WAS INOPERABLE DUE TO A PLUGGED HYDROCLONE.

'84	A	73.8	72.6		72.5				
	B	73.8	48.8		48.7				
	SYSTEM	73.8	60.7	60.6	60.6	720	719	436	73.8

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS OUT OF SERVICE DURING PART OF APRIL TO ALLOW HOT FLUE GAS TO DRY THE STACK. WATER CARRYOVER HAD COLLECTED IN THE BASE OF THE STACK MAKING IT DIFFICULT TO MAINTAIN ADEQUATE TEMPERATURES ABOVE DEW POINT.

'84	A	98.5	94.0		92.6				
	B	98.5	74.1		73.0				
	SYSTEM	98.5	84.1	82.8	82.8	744	733	616	73.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE ABSORBER WAS UNAVAILABLE IN MAY DUE TO THE REPLACEMENT OF MAKE-UP WATER VALVES AND THE ROTATION OF MAKE-UP WATER NOZZLES.

'84	A	100.0	82.4		82.4				
	B	99.4	77.1		77.1				
	SYSTEM	99.7	79.7	79.7	79.7	720	720	574	67.9

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING JUNE.

'84	SYSTEM	96.8	91.3		91.3	744	744	679	65.7
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UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

ALABAMA ELECTRIC: LOWMAN 3 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT MODULE B WAS DOWN PART OF JULY TO CLEAN THE PLUGGED MIST ELIMINATOR. THIS MODULE WAS ALSO OUT OF SERVICE FOR INTERFACE TRAY REPAIRS.

8/84	A	99.6	91.6	91.6				
	B	99.6	93.3	93.3				
	SYSTEM	99.6	92.4	92.4	744	744	688	63.8
9/84	A	92.4	72.7	67.2				
	B	92.4	74.4	68.8				
	SYSTEM	92.4	73.6	68.0	720	666	480	51.6

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE MONTHS OF AUGUST AND SEPTEMBER.

10/84	A	32.5	80.7	28.0				
	B	19.5	40.6	14.1				
	SYSTEM	26.0	60.7	21.1	744	259	157	28.8

** PROBLEMS/SOLUTIONS/COMMENTS

ABSORBER B WAS DOWN PART OF OCTOBER DUE TO A BROKEN OUTLET DAMPER DRIVE SHAFT.

11/84	A	100.0	65.0	65.0				
	B	98.1	69.1	69.1				
	SYSTEM	99.0	67.0	67.0	720	720	482	55.4

** PROBLEMS/SOLUTIONS/COMMENTS

WORK ON THE OUTLET DAMPER FOR MODULE B WAS COMPLETED DURING THE MONTH OF NOVEMBER.

12/84	A	100.0	24.2	24.2				
	B	100.0	93.6	93.6				
	SYSTEM	100.0	58.9	58.9	744	744	438	51.3

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING DECEMBER.

1/85	A	77.2	77.1	77.1				
	B	70.8	51.5	51.5				
	SYSTEM	74.0	64.3	64.3	744	744	478	60.7

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS OUT OF SERVICE DURING PART OF THE MONTH AS A RESULT OF SUBFREEZING WEATHER AND FROZEN SLURRY LINES.

2/85	A	100.0	16.0	16.0				
	B	100.0	94.0	94.0				
	SYSTEM	100.0	55.0	55.0	672	672	370	46.5

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

ALABAMA ELECTRIC: LOWMAN 3 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

NO PROBLEMS WERE REPORTED BY THE UTILITY FOR THE MONTH OF FEBRUARY.

5/85	A	87.9	63.6	63.6	59.2				
	B	87.9	84.5	84.5	78.7				
	SYSTEM	87.9	74.1	74.1	68.9	744	693	513	59.1

** PROBLEMS/SOLUTIONS/COMMENTS

THE SCRUBBING SYSTEM WAS TAKEN OUT OF SERVICE FOR A SHORT TIME SO THAT A LIMESTONE SLURRY FEED TANK COULD BE EMPTIED AND INSPECTED.

THE SCRUBBER WAS SHUTDOWN JUST PRIOR TO A SCHEDULED BOILER SHUTDOWN IN ORDER TO ALLOW THE STACK TO DRY OUT.

6/85	A	2.7	100.0	100.0	2.7				
	B	0.0	0.0	0.0	0.0				
	SYSTEM	1.4	50.0	50.0	1.4	720	20	10	1.6

** PROBLEMS/SOLUTIONS/COMMENTS

THE SCRUBBING SYSTEM WAS OUT OF SERVICE DURING MOST OF THE MONTH FOR A SCHEDULED UNIT OUTAGE.

5/85	A	98.0	93.4	93.4	93.4				
	B	98.8	14.5	14.5	14.5				
	SYSTEM	98.4	54.0	54.0	54.0	744	744	401	58.2

** PROBLEMS/SOLUTIONS/COMMENTS

INLET WASH NOZZLE CLEANING ACCOUNTED FOR A BRIEF FGD SYSTEM OUTAGE TIME DURING THE MONTH.

5/85	A	100.0	83.6	83.6	83.6				
	B	100.0	73.7	73.7	73.7				
	SYSTEM	100.0	78.6	78.6	78.6	720	720	566	75.9

** PROBLEMS/SOLUTIONS/COMMENTS

NO FGD SYSTEM PROBLEMS WERE REPORTED BY THE UTILITY FOR THE MONTH OF JUNE.

7/85	A	99.7	94.2	94.2	94.1				
	B	99.7	49.3	49.3	49.2				
	SYSTEM	99.7	71.8	71.8	71.7	744	743	533	75.2

** PROBLEMS/SOLUTIONS/COMMENTS

A BOILER TRIP OCCURRED DURING THE MONTH ACCOUNTING FOR THE BRIEF DOWNTIME. NO FGD SYSTEM PROBLEMS WERE REPORTED.

8/85	A	100.0	97.9	97.9	97.9				
	B	100.0	55.5	55.5	55.5				
	SYSTEM	100.0	76.7	76.7	76.7	744	744	570	77.7

** PROBLEMS/SOLUTIONS/COMMENTS

NO FGD SYSTEM PROBLEMS WERE REPORTED BY THE UTILITY FOR THE MONTH OF AUGUST.

9/85	A	99.9	50.0	50.0	50.0				
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UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

ALABAMA ELECTRIC: LOWMAN 3 (CONT.)

-----PERFORMANCE DATA-----											
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART. HOURS	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	B	99.9	75.1	75.1	75.1						
	SYSTEM	99.9	62.6	62.6	62.6			720	720	451	80.6
** PROBLEMS/SOLUTIONS/COMMENTS											
THE SCRUBBING SYSTEM SHUT ITSELF DOWN DURING THE MONTH. NO PROBLEMS WERE DISCOVERED AND THE SYSTEM WAS QUICKLY PUT BACK INTO SERVICE.											
10/85	A	30.8	83.1	83.1	29.6						
	B	30.8	17.8	17.8	6.3						
	SYSTEM	30.8	50.4	50.4	17.9			744	265	134	28.2
11/85	A	0.0			0.0						
	B	0.0			0.0						
	SYSTEM	0.0			0.0			720	0	0	0.0
** PROBLEMS/SOLUTIONS/COMMENTS											
THE UNIT WAS TAKEN OFF LINE FOR A MAJOR TURBINE INSPECTION IN OCTOBER. THE OUTAGE CONTINUED THROUGH NOVEMBER.											
12/85	A	80.4	21.1	21.1	18.4						
	B	80.4	71.3	71.3	62.1						
	SYSTEM	80.4	46.2	46.2	40.2			744	647	299	51.8
** PROBLEMS/SOLUTIONS/COMMENTS											
THE FGD SYSTEM WAS REMOVED FROM SERVICE FOLLOWING A BOILER TRIP. THE SYSTEM WAS NOT RETURNED TO SERVICE UNTIL THE BOILER HAD STABILIZED.											
1/86	A	100.0	47.4		47.4						
	B	100.0	62.5		62.5						
	SYSTEM	100.0	54.9		54.9			744	744	409	55.6
2/86	A	100.0	88.7		88.7						
	B	100.0	1.1		1.1						
	SYSTEM	100.0	44.9		44.9			672	672	302	49.3
** PROBLEMS/SOLUTIONS/COMMENTS											
NO FGD SYSTEM-RELATED PROBLEMS WERE REPORTED FOR JANUARY OR FEBRUARY.											
3/86	A	98.8	39.0		39.0						
	B	85.9	60.4		60.3						
	SYSTEM	92.3	49.7		49.6			744	743	369	63.8
** PROBLEMS/SOLUTIONS/COMMENTS											
THE 3B INLET AND OUTLET DAMPERS WERE TAKEN OUT OF SERVICE TO REPAIR THE DRIVE MECHANISMS.											
A BALL MILL REDUCER GEAR FAILURE FORCED THE FGD SYSTEM OUT OF SERVICE FOR 9 HOURS IN MARCH. THE LIMESTONE SLURRY MAKEUP WAS UNAVAILABLE.											
4/86	A	99.9	90.9		13.0						
	B	99.9	22.3		3.2						
	SYSTEM	99.9	56.6		8.1			720	103	58	9.0
5/86	A		75.1		73.8						
	B		24.8		24.4						
	SYSTEM		50.0		49.1			744	731	365	52.7

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

ALABAMA ELECTRIC: LOWMAN 3 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS SHUT DOWN AND THE WASH WATER TANK WAS DRAINED SO THAT
 A WASH WATER PUMP SUCTION VALVE COULD BE REPLACED.

1/86	A	99.9	78.0	78.0				
	B	100.0	74.8	74.8				
	SYSTEM	99.9	76.4	76.4	720	720	550	67.6
7/86	A	59.5	46.0	45.2				
	B	59.5	52.9	52.1				
	SYSTEM	59.5	49.4	48.7	744	732	362	73.5

** PROBLEMS/SOLUTIONS/COMMENTS

THE MAINFRAME CONTROLLER INSTRUMENTATION EXPERIENCED PROBLEMS THAT
 CAUSED THE SCRUBBING SYSTEM TO SHUT DOWN ON SEVERAL OCCASIONS IN
 JULY.

1/86	A	100.0	67.7	66.3				
	B	100.0	39.8	38.9				
	SYSTEM	100.0	53.7	52.6	744	728	391	64.0
2/86	A	100.0	44.4	43.7				
	B	100.0	18.0	17.7				
	SYSTEM	100.0	31.2	30.7	720	709	221	59.2

** PROBLEMS/SOLUTIONS/COMMENTS

NO FGD SYSTEM-RELATED PROBLEMS WERE REPORTED FOR THE MONTHS OF AUGUST
 OR SEPTEMBER.

1/86	A		15.3	8.4				
	B		7.6	4.2				
	SYSTEM		11.5	6.3	744	405	47	30.6
1/86	A		54.6	51.5				
	B		5.0	4.7				
	SYSTEM		29.8	28.1	720	678	202	67.2

** PROBLEMS/SOLUTIONS/COMMENTS

A BROKEN SUPERNATANT LINE WAS THE CAUSE OF THE LOWER NOVEMBER
 AVAILABILITY.

2/86	SYSTEM		2.2	2.2	744	742	16	50.9
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** PROBLEMS/SOLUTIONS/COMMENTS

LOW SULFUR COAL WAS BURNED PERIODICALLY THROUGHOUT THE FOURTH QUARTER
 OF 1986. THIS ACCOUNTS FOR THE LOW OPERABILITY AND UTILIZATION NUMBERS
 COMPARED TO THE HIGH AVAILABILITY AND RELIABILITY OF THE FGD SYSTEM.
 ALSO THE ANNUAL FALL OUTAGE BEGAN IN DECEMBER.

1/87	A	99.2	29.0	29.0				
	B	100.0	0.3	0.3				
	SYSTEM	99.6	14.6	14.6	744	744	109	56.3
2/87	A	100.0	37.8	37.8				
	B	100.0	36.1	36.1				
	SYSTEM	100.0	36.9	36.9	672	672	248	

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

ALABAMA ELECTRIC: LOWMAN 3 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED NO MAJOR FGD-RELATED PROBLEMS DURING THE MONTHS OF
 JANUARY AND FEBRUARY 1987.

3/87	A	84.1						
	B	84.1						
	SYSTEM	84.1				744	164	10.1

** PROBLEMS/SOLUTIONS/COMMENTS

THE INLET DAMPER WAS TAKEN OUT OF SERVICE TO REPAIR THE SHAFT, CHAIN,
 AND BEARINGS.

4/87	A	99.9	74.3	66.9				
	B	99.9						
	SYSTEM	99.9	74.3	66.9		720	648	482 62.8

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED NO MAJOR FGD-RELATED PROBLEMS DURING APRIL.

5/87	A	97.7	94.1	93.8				
	B	90.2	19.3	19.2				
	SYSTEM	94.0	56.7	56.5		744	741	421 56.8

** PROBLEMS/SOLUTIONS/COMMENTS

THE 3B MODULE WAS OUT OF SERVICE DUE TO PLUGGED INLET WASHER NOZZLES.

6/87	A	90.3	76.0	76.0				
	B	93.9	47.2	47.2				
	SYSTEM	92.1	61.6	61.6		720	720	443 62.1

** PROBLEMS/SOLUTIONS/COMMENTS

THE LIMESTONE BALL MILL WAS OUT OF SERVICE FOR REPAIRS CAUSING A SHORTAGE
 OF LIMESTONE SLURRY.

THE 3A MODULE WAS OUT OF SERVICE DUE TO PLUGGED INLET WASHER NOZZLES.

7/87	A	100.0	86.9	86.9				
	B	100.0	54.0	54.0				
	SYSTEM	100.0	70.4	70.4		744	744	524 70.5

8/87	A	99.9	81.1	81.1				
	B	99.9	78.6	78.6				
	SYSTEM	99.9	79.8	79.8		744	744	594 74.4

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED NO MAJOR FGD-RELATED PROBLEMS DURING THE MONTHS OF
 JULY AND AUGUST.

9/87	A	99.4	48.3	48.3				
	B	99.4	73.0	73.0				
	SYSTEM	99.4	60.6	60.6		720	720	437 61.2

** PROBLEMS/SOLUTIONS/COMMENTS

AN ELECTRICAL PROBLEM PREVENTED THE SUPERNATANT PUMPS FROM RUNNING.
 SUPERNATANT WAS UNAVAILABLE FOR FGD SYSTEM USE .

ILITY FGD SURVEY: JANUARY - DECEMBER 1988

ABAMA ELECTRIC: LOWMAN 3 (CONT.)

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

/87	A	100.0	98.7	37.9				
	B	100.0	92.6	35.6				
	SYSTEM	100.0	95.6	36.7	744	286	273	29.4

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED NO MAJOR FGD-RELATED PROBLEMS DURING OCTOBER.

/87	A	99.7	99.1	98.9				
	B	57.5	59.5	59.4				
	SYSTEM	78.6	79.3	79.1	720	719	570	72.5

** PROBLEMS/SOLUTIONS/COMMENTS

THE INLET ISOLATION DAMPERS WERE TAKEN OUT OF SERVICE TO REPAIR THE DRIVE MECHANISMS.

/87	A	94.0	93.9	93.9				
	B	0.1	0.0	0.0				
	SYSTEM	47.0	47.0	47.0	744	744	349	56.7

** PROBLEMS/SOLUTIONS/COMMENTS

AN AGITATOR GEAR REDUCER FAILURE FORCED THE FGD SYSTEM OUT OF SERVICE IN DECEMBER. THE LIMESTONE SLURRY MAKEUP WAS UNAVAILABLE.

/88	A	100.0	100.0	100.0				
	B							
	SYSTEM	100.0	100.0	100.0	744	744	744	66.3

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE MONTH OF JANUARY.

/88	A	78.6	69.4	65.4				
	B	17.1	18.1	17.1				
	SYSTEM	47.8	43.8	41.2	696	656	287	53.3

** PROBLEMS/SOLUTIONS/COMMENTS

PROBLEMS WITH THE LIMESTONE BALL MILL CAUSED A SHORTAGE IN SLURRY.

THE 3B ABSORBER INLET ISOLATION DAMPER DRIVE REQUIRED REPAIR.

/88	A	100.0	39.4	22.8				
	B	100.0	67.5	39.2				
	SYSTEM	100.0	53.5	31.0	744	431	231	31.2

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS OFF-LINE IN MARCH FOR APPROXIMATELY 2-3 WEEKS FOR A SCHEDULED MAINTENANCE OUTAGE.

/88	A		83.4	59.5				
	B		81.8	58.4				
	SYSTEM		82.6	58.9	720	514	424	56.9

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS SHUTDOWN FOR 6 HOURS IN APRIL DUE TO USING ELECTRICAL POWER TO OPERATE MAKE-UP WATER SUPERNATE PUMPS.

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

ALABAMA ELECTRIC: LOWMAN 3 (CONT.)

-----PERFORMANCE DATA-----										
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
5/88	A		94.6		94.6					
	B		2.1		2.1					
	SYSTEM		48.4		48.4		744	744	360	54.9
6/88	A		5.1		5.1					
	B		95.1		95.1					
	SYSTEM		50.1		50.1		720	720	361	72.3
** PROBLEMS/SOLUTIONS/COMMENTS										
THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE MONTHS OF APRIL AND JUNE.										
7/88	A	88.3	56.4		56.4					
	B	88.3	20.1		20.1					
	SYSTEM	88.3	38.2		38.2		744	744	285	75.9
** PROBLEMS/SOLUTIONS/COMMENTS										
THE UNIT WAS OUT OF SERVICE FOR PART OF JULY DUE TO A LIMESTONE SLURRY SHORTAGE. THE LIMESTONE BALL MILL WAS OUT OF SERVICE FOR REPAIRS.										
8/88	A	99.7	47.4		47.4					
	B	99.7	54.8		54.8					
	SYSTEM	99.7	51.1		51.1		744	744	380	78.0
** PROBLEMS/SOLUTIONS/COMMENTS										
THE FGD SYSTEM WAS OUT OF SERVICE DURING AUGUST DUE TO REPAIRS TO MAKE-UP WATER LINE.										
9/88	A		32.7		32.7					
	B		74.5		74.5					
	SYSTEM		53.6		53.6		720	720	386	68.5
** PROBLEMS/SOLUTIONS/COMMENTS										
THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE MONTH OF SEPTEMBER.										
10/88	A	61.2	51.1		32.2					
	B	61.2	84.0		53.0					
	SYSTEM	61.2	67.6		42.6		744	470	317	50.2
** PROBLEMS/SOLUTIONS/COMMENTS										
THE FGD SYSTEM WAS OFF-LINE PART OF OCTOBER TO DRAIN AND REPAIR THE LIMESTONE STORAGE TANK.										
11/88	A	100.0	8.8		6.0					
	B	100.0	74.2		50.5					
	SYSTEM	100.0	41.5		28.2		720	490	203	40.5
** PROBLEMS/SOLUTIONS/COMMENTS										
THE UNIT WAS OFF-LINE IN OCTOBER AND NOVEMBER FOR A SCHEDULED UNIT MAINTENANCE OUTAGE.										
12/88	A	100.0	66.1		66.1					
	B	100.0	53.6		53.6					
	SYSTEM	100.0	59.8		59.8		744	744	445	70.4

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

LABAMA ELECTRIC: LOWMAN 3 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED NO MAJOR FGD-RELATED PROBLEMS DURING THE MONTH
OF DECEMBER.

SECTION 13
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	ALAMITO CO	
PLANT NAME	SPRINGERVILLE	
UNIT NUMBER	1	
CITY	SPRINGERVILLE	
STATE	ARIZONA	
REGULATORY CLASSIFICATION	D	
PARTICULATE EMISSION LIMITATION - NG/J	43.	(0.100 LB/MMBTU)
SO ₂ EMISSION LIMITATION - NG/J	516.	(1.200 LB/MMBTU)
SO _x EMISSION LIMITATION - NG/J	*****	(***** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	*****	
GROSS UNIT GENERATING CAPACITY - MW	400	
NET UNIT GENERATING CAPACITY W/FGD - MW	370	
NET UNIT GENERATING CAPACITY WO/FGD - MW	383	
EQUIVALENT SCRUBBED CAPACITY - MW	360	
* UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	COMBUSTION ENGINEERING	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	*****	(***** ACFM)
BOILER FLUE GAS TEMPERATURE - C	*****	(**** F)
STACK HEIGHT - M	152.	(500 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	*****	(***** FT)
* FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	SUBBITUMINOUS	
AVERAGE HEAT CONTENT - J/G	19771.	(8500 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		8500-8900
AVERAGE ASH CONTENT - %	20.00	
RANGE ASH CONTENT - %	14.5-20.0	
AVERAGE MOISTURE CONTENT - %	20.00	
RANGE MOISTURE CONTENT - %	20.0-23.0	
AVERAGE SULFUR CONTENT - %	0.61	
RANGE SULFUR CONTENT - %	0.5-0.7	
AVERAGE CHLORIDE CONTENT - %	*****	
RANGE CHLORIDE CONTENT - %	****	
* PARTICLE CONTROL		
* MECHANICAL COLLECTOR		
NUMBER	0	
TYPE	NONE	
* FABRIC FILTER		
NUMBER	1	
PRESSURE DROP - KPA	1.5	(6.0 IN-H ₂ O)
TYPICAL GAS/CLOTH RATIO - M/MIN	0.6	(1.9 FT/MIN)
* 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	
SO ₂ REMOVAL MODE	SPRAY DRYING	
PROCESS TYPE	LIME/SPRAY DRYING	
PROCESS ADDITIVES	NONE	
SYSTEM SUPPLIER	JOY MFG/NIRO ATOMIZER	

ALAMITO CO: SPRINGVILLE 1 (CONT.)

A-E FIRM	BECHTEL	
DEVELOPMENT LEVEL	FULL SCALE	
NEW/RETROFIT	NEW	
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.90	
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	70.00	
ENERGY CONSUMPTION - %	3.3	
CURRENT STATUS	1	
COMMERCIAL START-UP	6/1985	
INITIAL START-UP	2/1985	
CONTRACT AWARDED	12/1979	
** DESIGN AND OPERATING PARAMETERS		
DESIGN COAL SULFUR CONTENT - %	0.70	
DESIGN CHLORIDE CONTENT - %	*****	
** QUENCHER/PRESATURATOR		
CONSTRUCTION MATERIAL GENERIC TYPE	NR	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR	
** ABSORBER		
NUMBER	3	
GENERIC TYPE	SPRAY DRYER	
SPECIFIC TYPE	CROSSFLOW	
TRADE NAME/COMMON TYPE	ROTARY ATOMIZER	
SUPPLIER	JOY MFG/NIRO ATOMIZER	
DIMENSIONS - FT	46 FT DIAMETER	
SHELL GENERIC MATERIAL	NR	
SHELL SPECIFIC MATERIAL	NR	
SHELL MATERIAL TRADE NAME/COMMON TYPE	NR	
LINER GENERIC MATERIAL	NONE	
LINER SPECIFIC MATERIAL	N/A	
LINER MATERIAL TRADE NAME/COMMON TYPE	N/A	
GAS CONTACTING DEVICE TYPE	NONE	
INLET GAS TEMPERATURE - C	124.4	(256 F)
SO2 REMOVAL EFFICIENCY - %	61.0	
PARTICLE REMOVAL EFFICIENCY - %	99.9	
** 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		
NUMBER	0	
GENERIC TYPE	BYPASS	
SPECIFIC TYPE	N/A	
TRADE NAME/COMMON TYPE	N/A	
PERCENT GAS BYPASSED - AVG	10.0	
CONSTRUCTION MATERIAL GENERIC TYPE	NONE	
CONSTRUCTION MATERIAL SPECIFIC TYPE	N/A	
** FANS		
DESIGN	NR	
FUNCTION	NR	
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	

ILITY FGD SURVEY: JANUARY - DECEMBER 1988

AMITO CO: SPRINGERVILLE 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 SLAKER
 DEVICE NR
 DEVICE TYPE NR

* PUMPS
 SERVICE NUMBER

 NA ****

* SOLIDS CONCENTRATING/DEWATERING
 DEVICE NONE

* SALEABLE BYPRODUCTS
 NATURE NONE
 DISPOSITION N/A

* SLUDGE

* TREATMENT
 METHOD UNSTABILIZED
 DEVICE N/A
 PROPRIETARY PROCESS N/A

* DISPOSAL
 NATURE FINAL
 TYPE LANDFILL
 SITE TREATMENT NONE

* WATER BALANCE
 WATER LOOP TYPE CLOSED

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

/85 SYSTEM 672

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY ANNOUNCED THAT INITIAL OPERATIONS AT THE SPRINGERVILLE 1
 FACILITY COMMENCED IN FEBRUATY 1985. THE PLANT WENT THROUGH STARTUP AND
 SHUTDOWN OPERATIONS ALL OF FEBRUARY.

/85 SYSTEM 744

/85 SYSTEM 720

** PROBLEMS/SOLUTIONS/COMMENTS

THE PLANT WAS REPORTEDLY DOWN ALL OF MARCH AND APRIL DUE TO A SCHEDULED
 TURBINE/BOILER OUTAGE.

/85 SYSTEM 744

/85 SYSTEM 720

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

ALAMITO CO: SPRINGVILLE 1 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

THE PLANT CAME BACK ON LINE IN MAY AND WAS DECLARED COMMERCIAL DURING JUNE 1985.

7/85	SYSTEM	744
8/85	SYSTEM	744
9/85	SYSTEM	720
10/85	SYSTEM	744
11/85	SYSTEM	720
12/85	SYSTEM	744

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED OUTAGES WERE ENCOUNTERED DURING THE MONTHS OF JULY THROUGH DECEMBER. HOWEVER, SEVERAL MODIFICATIONS TO THE SLURRY HANDLING SYSTEM WERE REQUIRED DUE TO INCREASED INLET FLUE GAS TEMPERATURES TO SPRAY DRYER. ADDITIONAL SLURRY AND SOLIDS HANDLING (FLYASH) HAD TO BE INCREASED TO REDUCE INLET FLUE GAS TEMPERATURES CAUSED BY BURNING A "DIFFERENT THAN DESIGN" COAL.

1/86	SYSTEM	774
2/86	SYSTEM	672

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD-RELATED OUTAGES WERE ENCOUNTERED DURING THE MONTHS OF JANUARY OR FEBRUARY 1986.

3/86	SYSTEM	774
4/86	SYSTEM	720
5/86	SYSTEM	774

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS SHUTDOWN IN MARCH FOR A MINOR 5-WEEK SCHEDULED MAINTENANCE OUTAGE BUT REMAINED DOWN UNTIL MAY DUE TO LACK IN POWER DEMAND.

6/86	SYSTEM	720
7/86	SYSTEM	774
8/86	SYSTEM	774
9/86	SYSTEM	720
10/86	SYSTEM	774

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT EXPERIENCED A SECOND RESERVE SHUTDOWN IN OCTOBER DUE TO THE LACK OF POWER DEMAND. THIS HAS BEEN LARGELY DUE TO THE STARTUP OF NUCLEAR CAPACITY AND THE DROP IN OIL PRICES. MOST OF THE POWER GENERATED BY THE UTILITY IS SOLD TO CALIFORNIA WHICH HAS STANDBY GAS AND OIL CAPACITY.

11/86	SYSTEM	720
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ILITY FGD SURVEY: JANUARY - DECEMBER 1982

AMITO CO: SPRINGERVILLE 1 (CONT.)

-----PERFORMANCE DATA-----
R100 MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION % REMOVAL PER BOILER FGD CAP.
SO2 PART. HOURS HOURS HOURS FACTOR

/86 SYSTEM

774

** PROBLEMS/SOLUTIONS/COMMENTS

FGD MODIFICATIONS DURING 1986 INCLUDED INCREASING THE FLYASH RECYCLE SYSTEM. NO MAJOR FGD-RELATED OUTAGES FOR 1986 WERE REPORTED. FGD SYSTEM AVAILABILITY WAS REPORTED TO BE GREATER THAN 99%. THE UNIT OPERATED 5255 HOURS, WAS AVAILABLE FOR APPROXIMATELY 82%, AND HAD A CAPACITY FACTOR OF 37.5%.

/87 SYSTEM

744

/87 SYSTEM

672

/87 SYSTEM

744

/87 SYSTEM

720

/87 SYSTEM

744

/87 SYSTEM

720

/87 SYSTEM

744

/87 SYSTEM

744

/87 SYSTEM

720

/87 SYSTEM

744

/87 SYSTEM

720

/87 SYSTEM

744

** PROBLEMS/SOLUTIONS/COMMENTS

INFORMATION WAS UNAVAILABLE FOR THE MONTHS OF JANUARY TO DECEMBER 1987.

/88 SYSTEM

774

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE UNIT WAS OFF-LINE FOR THREE DAYS IN JANUARY DUE TO BOILER TUBE REPAIRS. NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE MONTH.

/88 SYSTEM

672

/88 SYSTEM

774

/88 SYSTEM

720

/88 SYSTEM

774

/88 SYSTEM

720

/88 SYSTEM

774

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

ALAMITO CO: SPRINGVILLE 1 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR UNIT OUTAGES WERE ENCOUNTERED DURING
 THE MONTHS OF FEBRUARY THROUGH JULY.

8/88 SYSTEM 774

9/88 SYSTEM 720

10/88 SYSTEM 774

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE UNIT WAS OFF-LINE 5 DAYS IN AUGUST DUE TO A
 SLAG BRIDGE IN THE ASH BIN AND 4 DAYS IN OCTOBER DUE TO BOILER TUBE LEAKS.
 NO MAJOR FGD-RELATED PROBLEMS WERE REPORTED.

11/88 SYSTEM 720

12/88 SYSTEM 774

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR OUTAGES DUE TO EITHER THE UNIT OR FGD
 SYSTEM WERE ENCOUNTERED DURING THE MONTHS OF NOVEMBER AND DECEMBER.

SECTION 13
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	APPLIED ENERGY SERVICE
PLANT NAME	BEAVER VALLEY
UNIT NUMBER	2-5
CITY	MONACA
STATE	PENNSYLVANIA
REGULATORY CLASSIFICATION	****
PARTICULATE EMISSION LIMITATION - NG/J	49. (0.113 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	322. (0.750 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	***** (***** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	113
GROSS UNIT GENERATING CAPACITY - MW	126
NET UNIT GENERATING CAPACITY W/FGD - MW	113
NET UNIT GENERATING CAPACITY WO/FGD - MW	119
EQUIVALENT SCRUBBED CAPACITY - MW	126
*** UNIT DATA - BOILER AND STACK	
BOILER SUPPLIER	BABCOCK AND WILCOX / CE
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	45. (146 FT)
STACK SHELL	****
STACK TOP DIAMETER - M	***** (***** FT)
*** PARTICLE CONTROL	
** ESP	
NUMBER	4
TYPE	COLD SIDE
SUPPLIER	ENVIRONMENTAL ELEMENTS
*** FGD SYSTEM	
** GENERAL DATA	
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT
SO2 REMOVAL MODE	WET SCRUBBING
PROCESS TYPE	LIME
SYSTEM SUPPLIER	FMC
A-E FIRM	BECHTEL
DEVELOPMENT LEVEL	FULL SCALE
NEW/RETROFIT	RETROFIT
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.00
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	95.00
ENERGY CONSUMPTION - %	4.8
CURRENT STATUS	1
COMMERCIAL START-UP	8/1980
INITIAL START-UP	8/1980
CONTRACT AWARDED	0/ 78
** DESIGN AND OPERATING PARAMETERS	
DESIGN COAL SULFUR CONTENT - %	2.25
DESIGN CHLORIDE CONTENT - %	*****
** ABSORBER	
NUMBER	4
GENERIC TYPE	IMPINGEMENT TOWER
SPECIFIC TYPE	FIXED BAFFLE
TRADE NAME/COMMON TYPE	DISC CONTACTOR
SUPPLIER	FMC
LIQUID RECIRCULATION RATE - LITER/S	69. (1100 GPM)
L/G RATIO - L/CU.M	0.9 (6.7 GAL/1000 ACF)
INLET GAS FLOW - CU. M/S	77.86 (165000 ACFM)
INLET GAS TEMPERATURE - C	204.4 (400 F)
** MIST ELIMINATOR	
MANUFACTURER	MUNTERS

ILITY FGD SURVEY: JANUARY - DECEMBER 1988

PLIED ENERGY SERVICE: BEAVER VALLEY 2-5 (CONT.)

* REHEATER
 GENERIC TYPE N/A
 PERCENT GAS BYPASSED - AVG 0.0
 OUTLET FLUE GAS FLOW RATE - CU. M/S 28.31 (60000 ACFM)

SOLIDS CONCENTRATING/DEWATERING
 DEVICE THICKENER
 NUMBER 1

SOLIDS CONCENTRATING/DEWATERING
 DEVICE VACUUM FILTER
 NUMBER 2

SLUDGE

TREATMENT
 METHOD STABILIZATION

DISPOSAL
 NATURE FINAL
 TYPE LANDFILL

WATER BALANCE
 WATER LOOP TYPE CLOSED

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

100 MODULE AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
37	SYSTEM				744			
37	SYSTEM				672			
37	SYSTEM				744			
37	SYSTEM				720			
37	SYSTEM				744			
37	SYSTEM				720			
37	SYSTEM				744			
37	SYSTEM				744			
37	SYSTEM				720			
37	SYSTEM				744			
37	SYSTEM				720			
37	SYSTEM				744			

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS OCCURRED IN THE YEAR, 1987.

8	SYSTEM	774
8	SYSTEM	672
8	SYSTEM	774
8	SYSTEM	720
8	SYSTEM	774

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

IED ENERGY SERVICE: BEAVER VALLEY 2-5 (CONT.)

-----PERFORMANCE DATA-----									
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER BOILER HOURS HOURS	FGD CAP. HOURS FACTOR
6/88	SYSTEM							720	
7/88	SYSTEM							774	
8/88	SYSTEM							774	
9/88	SYSTEM							720	
10/88	SYSTEM							774	
11/88	SYSTEM							720	
12/88	SYSTEM							774	

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE JANUARY-DECEMBER 1988 PERIOD.

SECTION 13
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	APPLIED ENERGY SERVICE	
PLANT NAME	DEEPWATER	
UNIT NUMBER	1	
CITY	PASADENA	
STATE	TEXAS	
REGULATORY CLASSIFICATION	B	
ARTICULATE EMISSION LIMITATION - NG/J	*****	(***** LB/MMBTU)
SO ₂ EMISSION LIMITATION - NG/J	*****	(***** LB/MMBTU)
NO _x EMISSION LIMITATION - NG/J	*****	(***** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	129	
GROSS UNIT GENERATING CAPACITY - MW	165	
NET UNIT GENERATING CAPACITY W/FGD - MW	129	
NET UNIT GENERATING CAPACITY WO/FGD - MW	134	
EQUIVALENT SCRUBBED CAPACITY - MW	165	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	FOSTER WHEELER	
BOILER TYPE	PULVERIZED COKE	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	299.18	(634000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	182.2	(360 F)
STACK HEIGHT - M	145.	(475 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	4.5	(14.6 FT)
** FUEL DATA		
FUEL TYPE	COKE	
FUEL GRADE	PETROLEUM COKE	
AVERAGE HEAT CONTENT - J/G	30238.	(13000 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		12000 - 135000
AVERAGE ASH CONTENT - %	0.50	
RANGE ASH CONTENT - %	****	
AVERAGE MOISTURE CONTENT - %	8.75	
RANGE MOISTURE CONTENT - %	8-15	
AVERAGE SULFUR CONTENT - %	4.00	
RANGE SULFUR CONTENT - %	4-8	
AVERAGE CHLORIDE CONTENT - %	*****	
RANGE CHLORIDE CONTENT - %	****	
** PARTICLE CONTROL		
** ESP		
NUMBER	1	
NUMBER OF SPARES	0	
TYPE	COLD SIDE	
SUPPLIER	BABCOCK & WILCOX	
INLET FLUE GAS CAPACITY - CU.M/S	299.2	(634000 ACFM)
INLET FLUE GAS TEMPERATURE - C	182.2	(360 F)
PRESSURE DROP - KPA	0.5	(2. IN-H ₂ O)
PARTICLE REMOVAL EFFICIENCY - %	97.0	
** PARTICLE SCRUBBER		
NUMBER	2	
NUMBER OF SPARES	1	
INITIAL START-UP DATE	86/1903	
GENERIC TYPE	VENTURI TOWER	
SPECIFIC TYPE	FIXED THROAT	
TRADE NAME/COMMON NAME	N/A	
SUPPLIER	BABCOCK & WILCOX	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	AISI 1110	
LINER GENERIC MATERIAL	RUBBER	
LIQUID RECIRCULATION RATE - LITER/S	3906.0	(62000 GPM)
L/G RATIO - LITER/CU.M	1.7	(12.7 GAL/1000ACF)
PRESSURE DROP - KPA	0.4	(1.5 IN-H ₂ O)
INLET GAS FLOW RATE - CU.M/S	228.9	(485000 ACFM)
INLET GAS TEMPERATURE - C	54.4	(130 F)
SO ₂ REMOVAL EFFICIENCY - %	90.0	

APPLIED ENERGY SERVICE: DEEPWATER 1 (CONT.)

*** FGD SYSTEM

** GENERAL DATA

SALEABLE PRODUCT/THROWAWAY PRODUCT	SALEABLE PRODUCT
SO2 REMOVAL MODE	WET SCRUBBING
PROCESS TYPE	LIMESTONE
SYSTEM SUPPLIER	BABCOCK & WILCOX
DEVELOPMENT LEVEL	FULL SCALE
NEW/RETROFIT	NEW
ENERGY CONSUMPTION - %	3.0
CURRENT STATUS	1
COMMERCIAL START-UP	6/1986
INITIAL START-UP	3/1986
CONTRACT AWARDED	3/1984

** DESIGN AND OPERATING PARAMETERS

DESIGN COAL SULFUR CONTENT - %	4.00	
DESIGN COAL HEAT CONTENT - J/G	30238.0	(13000 BTU/LB)
DESIGN COAL ASH CONTENT - %	0.50	
DESIGN MOISTURE CONTENT - %	8.00	
DESIGN CHLORIDE CONTENT - %	*****	

** ABSORBER

NUMBER	2	
NUMBER OF SPARES	1	
GENERIC TYPE	SPPAY TOWER	
SUPPLIER	BABCOCK & WILCOX	
SHELL GENERIC MATERIAL	C/S	
LINER GENERIC MATERIAL	RUBBER	
GAS CONTACTING DEVICE TYPE	SPRAY	
LIQUID RECIRCULATION RATE - LITER/S	4032.	(64000 GPM)
L/G RATIO - L/CU.M	2.9	(21.7 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	0.0	(0.0 IN-H2O)
INLET GAS FLOW - CU. M/S	228.87	(485000 ACFM)

** REHEATER

GENERIC TYPE	IN-LINE
SPECIFIC TYPE	STEAM

** SOLIDS CONCENTRATING/DEWATERING

DEVICE	THICKENER
FEED STREAM SOURCE	ABSORBER BLEED

** SOLIDS CONCENTRATING/DEWATERING

DEVICE	CENTRIFUGE
FEED STREAM SOURCE	THICKENER UNDERFLOW

*** SALEABLE BYPRODUCTS

NATURE	GYPSUM
FULL LOAD QUANTITY - M T/H	18.14 (20.00 TPH)
DISPOSITION	MARKETED
NATURE OF END PRODUCT	CASO4 (WALL BOARD MATERIAL)

*** SLUDGE

** TREATMENT

METHOD	FORCED OXIDATION
DEVICE	OXIDATION TOWERS

** DISPOSAL

NATURE	FINAL
TYPE	NONE
LOCATION	OFF-SITE

ILITY FGD SURVEY: JANUARY - DECEMBER 1988

PLIED ENERGY SERVICE: DEEPWATER 1 (CONT.)

* WATER BALANCE
WATER LOOP TYPE

CLOSED

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

/86	SYSTEM	774
/86	SYSTEM	720
/86	SYSTEM	774
/86	SYSTEM	720

** PROBLEMS/SOLUTIONS/COMMENTS

INITIAL OPERATIONS AT DEEPWATER 1 STARTED ON MARCH 12, 1986 THE UNIT WAS DECLARED COMMERCIAL ON JUNE 26, 1986.

/86	SYSTEM	774
/86	SYSTEM	774
/86	SYSTEM	720
/86	SYSTEM	774
/86	SYSTEM	720
/86	SYSTEM	774

** PROBLEMS/SOLUTIONS/COMMENTS

VANDAIUM IN THE COKE BURNED PROMOTES THE FORMATION OF SO3 FROM SO2 BY ACTING AS A CATALYST. MUCH OF THE SO3 PASSES THROUGH THE FGD SYSTEM UNCOLLECTED. A WET ESP IS REQUIRED DOWN-STREAM OF THE LIMESTONE SO2 SCRUBBER FOR ITS REMOVAL. PLASTIC COATED ELECTRICALLY CHARGED PLATES SPRAYED WITH A FILM OF WATER ATTRACT AND COLLECT THE SO3 VIA GASEOUS ABSORPTION. THE RESULTANT COLLECTED H2SO4 ACID FROM THE WET ESP IS THEN USED TO NEUTRALIZE ANY UNREACTED LIMESTONE IN THE SCRUBBER SLUDGE WHICH IS LATER FORCIBLY OXIDIZED TO PRODUCE A SALEABLE GYPSUM BY-PRODUCT. APPROXIMATELY 450 TONS/DAY OF THIS GYPSUM IS PRODUCED FOR A MAJOR WALLBOARD COMPANY. THE WALLBOARD COMPANY CURRENTLY USES 75% UTILITY PRODUCED GYPSUM IN THEIR FINAL WALLBOARD PRODUCT.

NO MAJOR FGD-RELATED PROBLEMS WERE REPORTED FOR THE YEAR 1986. FIRST YEAR FGD SYSTEM AVAILABILITY WAS REPORTED TO BE GREATER THAN 92%.

1/87	SYSTEM	744
2/87	SYSTEM	672
3/87	SYSTEM	744
4/87	SYSTEM	720
5/87	SYSTEM	744
6/87	SYSTEM	720
7/87	SYSTEM	744
8/87	SYSTEM	744
9/87	SYSTEM	720
10/87	SYSTEM	744

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

APPLIED ENERGY SERVICE: DEEPWATER 1 (CONT.)

-----PERFORMANCE DATA-----										
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PER PART.	BOILER HOURS	FGD HOURS	CAP. FACTOR
11/87	SYSTEM							720		
12/87	SYSTEM							744		
** PROBLEMS/SOLUTIONS/COMMENTS										
AES REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS OR OUTAGES WERE ENCOUNTERED DURING THE YEAR. THE PLANT WAS SHUTDOWN IN 1987 DURING THE MONTHS OF APRIL AND OCTOBER FOR SCHEDULED BOILER/FGD MAINTENANCE.										
1/88	SYSTEM							774		
2/88	SYSTEM							672		
3/88	SYSTEM							774		
4/88	SYSTEM							720		
5/88	SYSTEM							774		
6/88	SYSTEM							720		
7/88	SYSTEM							774		
8/88	SYSTEM							774		
9/88	SYSTEM							720		
10/88	SYSTEM							774		
11/88	SYSTEM							720		
12/88	SYSTEM							774		
** PROBLEMS/SOLUTIONS/COMMENTS										
THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED OUTAGES WERE ENCOUNTERED DURING THE YEAR. THE UNIT WAS OFF-LINE IN OCTOBER FOR APPROXIMATELY THREE WEEKS FOR A SCHEDULED MAINTENANCE OUTAGE.										

SECTION 13
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	ARIZONA ELECTRIC POWER	
PLANT NAME	APACHE	
UNIT NUMBER	2	
CITY	COCHISE	
STATE	ARIZONA	
REGULATORY CLASSIFICATION	C	
PARTICULATE EMISSION LIMITATION - NG/J	43.	(0.100 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	344.	(0.800 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	301.	(0.700 LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	530	
GROSS UNIT GENERATING CAPACITY - MW	195	
NET UNIT GENERATING CAPACITY W/FGD - MW	172	
NET UNIT GENERATING CAPACITY WO/FGD - MW	180	
EQUIVALENT SCRUBBED CAPACITY - MW	98	

** UNIT DATA - BOILER AND STACK

BOILER SUPPLIER	RILEY STOKER	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	520.98	(1104000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	376.7	(710 F)
STACK HEIGHT - M	122.	(400 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	4.9	(16.2 FT)

** FUEL DATA

FUEL TYPE	COAL	
FUEL GRADE	SUBBITUMINOUS	
AVERAGE HEAT CONTENT - J/G	23260.	(10000 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		9500-10800
AVERAGE ASH CONTENT - %	15.00	
RANGE ASH CONTENT - %	15-20	
AVERAGE MOISTURE CONTENT - %	13.00	
RANGE MOISTURE CONTENT - %	9.0-15.0	
AVERAGE SULFUR CONTENT - %	0.70	
RANGE SULFUR CONTENT - %	0.4-0.6	
AVERAGE CHLORIDE CONTENT - %	0.01	
RANGE CHLORIDE CONTENT - %	0.00-0.03	

*** PARTICLE CONTROL

** MECHANICAL COLLECTOR

NUMBER	0
TYPE	NONE

** ESP

NUMBER	1
NUMBER OF SPARES	0
TYPE	HOT SIDE
SUPPLIER	AIR CORRECTION DIVISION, UOP
INLET FLUE GAS CAPACITY - CU.M/S	521.0 (1104000 ACFM)
INLET FLUE GAS TEMPERATURE - C	376.7 (710 F)
PRESSURE DROP - KPA	0.1 (1. IN-H2O)
PARTICLE REMOVAL EFFICIENCY - %	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

ILITY FGD SURVEY: JANUARY - DECEMBER 1988

IZONA ELECTRIC POWER: APACHE 2 (CONT.)

* GENERAL DATA		
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT	
SO2 REMOVAL MODE	WET SCRUBBING	
PROCESS TYPE	LIMESTONE	
PROCESS ADDITIVES	NONE	
SYSTEM SUPPLIER	RESEARCH-COTTRELL	
A-E FIRM	BURNS & MCDONNELL	
DEVELOPMENT LEVEL	FULL SCALE	
NEW/RETROFIT	NEW	
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.60	
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	85.00	
ENERGY CONSUMPTION - %	4.1	
CURRENT STATUS	1	
COMMERCIAL START-UP	1/1979	
INITIAL START-UP	8/1978	
CONTRACT AWARDED	7/1974	
* DESIGN AND OPERATING PARAMETERS		
DESIGN COAL SULFUR CONTENT - %	0.70	
DESIGN COAL HEAT CONTENT - J/G	23260.0	(10000 BTU/LB)
DESIGN COAL ASH CONTENT - %	17.00	
DESIGN MOISTURE CONTENT - %	18.00	
DESIGN CHLORIDE CONTENT - %	0.00	
SPACE REQUIREMENTS - SQ M	4046.7	(43560 SQ FT)
OPER. & MAINT. REQUIREMENT - MANHR/DAY	72.0	
* QUENCHER/PRESATURATOR		
NUMBER	2	
TYPE	CYCLONIC SPRAY QUENCHER	
SUPPLIER	RESEARCH-COTTRELL	
INLET GAS FLOW - CU. M/S	188.76	(400000 ACFM)
INLET GAS TEMPERATURE - C	132.2	(270 F)
PRESSURE DROP - KPA	0.2	(1.0 IN-H2O)
LIQUID RECIRCULATION RATE - LITERS/S	567.	(9000 GPM)
L/G RATIO - L/CU. M	2.7	(20.0 GAL/1000 ACFM)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	
CONSTRUCTION MATERIAL SPECIFIC TYPE	AISI 1110	
* ABSORBER		
NUMBER	2	
NUMBER OF SPARES	1	
GENERIC TYPE	COMBINATION TOWER	
SPECIFIC TYPE	SPRAY/PACKED	
TRADE NAME/COMMON TYPE	N/A	
SUPPLIER	RESEARCH-COTTRELL	
DIMENSIONS - FT	30.0 DIA X 110.0	
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	
LINER MATERIAL TRADE NAME/COMMON TYPE	FLAKELINE 103	
GAS CONTACTING DEVICE TYPE	SPRAY ZONE & VERTICAL CROSS CHANNEL FIXED GRID P	
NUMBER OF CONTACTING ZONES	2	
LIQUID RECIRCULATION RATE - LITER/S	567.	(9000 GPM)
L/G RATIO - L/CU.M	5.3	(40.0 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	0.6	(2.5 IN-H2O)
SUPERFICIAL GAS VELOCITY - M/SEC	3.0	(10.0 FT/S)
INLET GAS FLOW - CU. M/S	94.38	(200000 ACFM)
INLET GAS TEMPERATURE - C	68.3	(155 F)
SO2 REMOVAL EFFICIENCY - %	97.0	
PARTICLE REMOVAL EFFICIENCY - %	99.6	
* MIST ELIMINATOR		
PRE-MIST ELIMINATOR/MIST ELIMINATOR	PRIMARY COLLECTOR	
NUMBER PER SYSTEM	2	
NUMBER OF SPARES PER SYSTEM	1	
NUMBER PER MODULE	1	
GENERIC TYPE	IMPINGEMENT	
SPECIFIC TYPE	BAFFLE	

ARIZONA ELECTRIC POWER: APACHE 2 (CONT.)

TRADE NAME/COMMON TYPE	CLOSED VANE	
MANUFACTURER	MUNTERS	
CONFIGURATION	HORIZONTAL	
NUMBER OF STAGES	2	
NUMBER OF PASSES PER STAGE	3	
FREEBOARD DISTANCE - M	0.61	(2.0 FT)
DISTANCE BETWEEN STAGES - CM	30.48	(12.0 IN)
DISTANCE BETWEEN VANES - CM	10.2	(4.00 IN)
VANE ANGLES - DEGREES	45	
PRESSURE DROP - KPA	0.2	(1.0 IN-H2O)
SUPERFICIAL GAS VELOCITY - M/S	3.0	(10.0 FT/S)
CONSTRUCTION MATERIAL GENERIC TYPE	ORGANIC	
CONSTRUCTION MATERIAL SPECIFIC TYPE	POLYVINYL CHLORIDE	
WASH WATER SOURCE	FRESH	
WASH FREQUENCY	INTERMITTENT	'LOWER STAGE!; ONCE EVERY HOUR 'UPP
WASH RATE - L/S	12.6	(200 GAL/MIN)
** REHEATER		
NUMBER	0	
GENERIC TYPE	NONE	
SPECIFIC TYPE	N/A	
TRADE NAME/COMMON TYPE	N/A	
PERCENT GAS BYPASSED - AVG	50.0	
TEMPERATURE INCREASE - C	43.3	(78 F)
INLET FLUE GAS TEMPERATURE - C	46.1	(115 F)
OUTLET FLUE GAS TEMPERATURE - C	89.4	(193 F)
CONSTRUCTION MATERIAL GENERIC TYPE	NONE	
CONSTRUCTION MATERIAL SPECIFIC TYPE	N/A	
** FANS		
NUMBER	2	
NUMBER OF SPARES	0	
DESIGN	CENTRIFUGAL	
SUPPLIER	WESTINGHOUSE	
FUNCTION	UNIT	
APPLICATION	FORCED DRAFT	
SERVICE	DRY	
FLUE GAS FLOW RATE - CU.M/S	188.76	(400000 ACFM)
FLUE GAS TEMPERATURE - C	132.2	(270 F)
PRESSURE DROP - KPA	6.2	(20.5 IN-H2O)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	
** DAMPERS		
NUMBER	2	
FUNCTION	SHUT-OFF	
GENERIC TYPE	LOUVER	
SPECIFIC TYPE	PARALLEL BLADE MULTILOUVER	
MODULATION	OPEN/CLOSED	
SEAL AIR FLOW - CU. M/S	0.24	(500 ACFM)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR	
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	
MODULATION	OPEN/CLOSED	
SEAL AIR FLOW - CU. M/S	0.24	(500 ACFM)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR	
LINER GENERIC MATERIAL TYPE	HIGH ALLOY	
LINER SPECIFIC MATERIAL TYPE	NICKEL BASE/CHROMIUM-IRON-COPPER-MOLYBDENUM	
** DAMPERS		
NUMBER	2	
FUNCTION	SHUT-OFF	
GENERIC TYPE	LOUVER	
SPECIFIC TYPE	PARALLEL BLADE MULTILOUVER	

TILITY FGD SURVEY: JANUARY - DECEMBER 1988

RIZONA ELECTRIC POWER: APACHE 2 (CONT.)

MODULATION	OPEN/CLOSED
SEAL AIR FLOW - CU. M/S	0.24 (500 ACFM)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR
LINER GENERIC MATERIAL TYPE	HIGH ALLOY
LINER SPECIFIC MATERIAL TYPE	NICKEL BASE/CHROMIUM-IRON-COPPER-MOLYBDENUM
** DUCTWORK	
LOCATION	ABSORBER INLET
CONFIGURATION	RECTANGULAR
DIMENSIONS	12.0 X 14.0
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	ABSORBER OUTLET
CONFIGURATION	RECTANGULAR
DIMENSIONS	12.0 X 14.0
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
SHELL SPECIFIC MATERIAL TYPE	AISI 1110
LINER GENERIC MATERIAL TYPE	ORGANIC
LINER SPECIFIC MATERIAL TYPE	FLUOROELASTOMER
** REAGENT PREPARATION EQUIPMENT	
FUNCTION	WET BALL MILL
DEVICE	COMPARTMENTED
DEVICE TYPE	NR
MANUFACTURER	KENNEDY VAN SAUN
NUMBER	1
NUMBER OF SPARES	0
FULL LOAD DRY FEED CAPACITY - M.TONS/HR	4.5 (5 TPH)
PRODUCT QUALITY - % SOLIDS	45.0
** TANKS	
SERVICE	NUMBER
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ABSORBER FEED	1
REAGENT FEED	1
MILL SLURRY SUMP	1
WASTE SLURRY SUMP	1
** PUMPS	
SERVICE	NUMBER
-----	-----
ABSORBER	3
QUENCHER	4
MILL SLURRY RECYCLE	2
ADDITIVE FEED	2
WASTE SLURRY TRANSFER	1
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	NONE
** SALEABLE BYPRODUCTS	
NATURE	NONE
DISPOSITION	N/A
** SLUDGE	
MOISTURE CONTENT - % TOTAL FREE WATER	70.0
% CASO ₄ - DRY	80.0
** TREATMENT	
METHOD	BLEED
DEVICE	N/A
PROPRIETARY PROCESS	N/A

ARIZONA ELECTRIC POWER: APACHE 2 (CONT.)

** DISPOSAL		
NATURE	FINAL	
TYPE	POND	
LOCATION	OFF-SITE	
SITE TRANSPORTATION METHOD	PIPELINE	
SITE TREATMENT	NONE	
SITE DIMENSIONS	25 TO 30 ACRES BY 18 FT DEEP	
SITE CAPACITY - CU.M	611500	(500.0 ACRE-FT)
SITE SERVICE LIFE - YRS	30	
** PROCESS CONTROL AND INSTRUMENTATION		
PROCESS STREAM	QUENCHER RECYCLE LINE	
CHEMICAL PARAMETERS	PH	
PHYSICAL VARIABLES	PERCENT SOLIDS	
CONTROL LEVELS	5.0 PH	
PROCESS CONTROL MANNER	MANUAL	
PROCESS CHEMISTRY MODE	FEEDBACK	
** WATER BALANCE		
WATER LOOP TYPE	OPEN	
MAKEUP WATER ADDITION - LITERS/S	115.9	(1840 GPM)
SOURCE OF MAKEUP WATER	WELL WATER	
** CHEMICALS AND CONSUMPTION		
FUNCTION	ABSORBENT	
NAME	LIMESTONE	
PRINCIPAL CONSTITUENT	>93% CaCO ₃	
SOURCE/SUPPLIER	PAUL LIME	
UTILIZATION - %	99.0	
POINT OF ADDITION	BALL MILL	
** FGD SPARE CAPACITY INDICES		
ABSORBER - %	100.0	
MIST ELIMINATOR - %	0.0	
FAN - %	0.0	
BALL MILL - %	0.0	
EFFLUENT HOLD TANK - %	0.0	
RECIRCULATION PUMP - %	50.0	
** FGD SPARE COMPONENT INDICES		
ABSORBER	1.0	
MIST ELIMINATOR	0.0	
FAN	0.0	
BALL MILL	0.0	
EFFLUENT HOLD TANK	0.0	
RECIRCULATION PUMP	1.0	

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

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

8/78 SYSTEM

744

** PROBLEMS/SOLUTIONS/COMMENTS

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

9/78 SYSTEM

720

** PROBLEMS/SOLUTIONS/COMMENTS

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

10/78 SYSTEM

744 303

59.5

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

ARIZONA ELECTRIC POWER: APACHE 2 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS SHUTDOWN IN EARLY OCTOBER TO MAKE ADDITIONAL BOILER MODIFICATIONS. NO PROBLEMS WERE REPORTED FOR THE FGD SYSTEM. COMPLIANCE TESTING IS SCHEDULED FOR EARLY NOVEMBER. THE UTILITY HAS DECIDED THAT IN APPROXIMATELY A YEAR THE SCRUBBER INLET DUCTWORK WILL BE CHANGED FROM CARBON STEEL TO STAINLESS STEEL.

1/78	A	24.8	16.8				
	B	43.7	29.6				
	SYSTEM	68.5	46.4	720	488	334	82.8

** PROBLEMS/SOLUTIONS/COMMENTS

THE SO2 STACK MONITORS HAVE NEVER BEEN OPERABLE. THE MONITORS HAVE BEEN SENT BACK TO THE FACTORY AND ARE NOT EXPECTED BACK ON SITE UNTIL LATE DECEMBER.

THE LIMESTONE CRUSHER HAS BEEN UNABLE TO OPERATE AT DESIGN CAPACITY.

A COMPLIANCE TEST WAS COMPLETED BUT THE RESULTS ARE NOT YET AVAILABLE. THE ACCEPTANCE IS SCHEDULED FOR THE BEGINNING OF 1979.

2/78	SYSTEM	0.0	0.0	744	512	0	
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** PROBLEMS/SOLUTIONS/COMMENTS

RESULTS OF THE RECENT COMPLIANCE TEST INDICATED THAT SO2 EMISSIONS WERE BETWEEN 1.2 LB/MM BTU, THE FEDERAL APPLICABLE STANDARD; AND 0.8 LB/MM BTU, THE STATE STANDARD, WITHOUT THE FGD SYSTEM. THE UTILITY IS CURRENTLY BURNING LOW SULFUR COAL (0.6% S). IT IS BELIEVED THAT THE STATE STANDARD COULD BE MET WITHOUT FGD SYSTEM OPERATION WHEN THE FURNACE IS "FINE TUNED".

A 30 HOUR OUTAGE OCCURRED DUE TO A RUPTURE IN THE REAGENT FEED LINE.

1/79	SYSTEM	0.0	0.0	744	662	0	
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** PROBLEMS/SOLUTIONS/COMMENTS

SHUTDOWN/DEBUGGING OPERATION CONTINUED THROUGH JANUARY.

COMMERCIAL OPERATIONS BEGAN ON JANUARY 15.

2/79	SYSTEM	0.0	0.0	672	504	0	
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** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS NOT IN SERVICE DURING DECEMBER, JANUARY, OR FEBRUARY DUE TO VARIOUS SHUTDOWN/DEBUGGING PROBLEMS ESPECIALLY IN MAINTAINING RECYCLE PUMP OPERATION.

3/79	SYSTEM	0.0	0.0	744	372	0	
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** PROBLEMS/SOLUTIONS/COMMENTS

A BOILER EXPLOSION AT THE BURNER FACE CAUSED THE UNIT TO BE DOWN FROM THE LAST WEEK IN FEBRUARY THROUGH THE MIDDLE OF MARCH.

4/79	SYSTEM			720	720		
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UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

ARIZONA ELECTRIC POWER: APACHE 2 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

COMPLIANCE TESTS WERE RUN ON THIS UNIT LAST NOVEMBER AND THE UNIT WAS DECLARED COMMERCIAL IN FEBRUARY. THE FGD SYSTEM OPERATES ONLY ABOUT 50 % OF THE BOILER HOURS BECAUSE THE UNIT OPERATES AT SUCH A LOW RATING 50% OF THE TIME THAT THE FGD SYSTEM IS NOT NEEDED.

5/79 SYSTEM 744
 6/79 SYSTEM 720

** PROBLEMS/SOLUTIONS/COMMENTS

IN GENERAL THE FGD SYSTEM AND BOILER OPERATED WELL THROUGH MAY AND JUNE.

THE FRP REAGENT FEED PIPING HAS BEEN A CONTINUAL PROBLEM AREA. THE FRP HAS BEEN RUPTURING PARTICULARLY AT PIPING CONNECTIONS. THE UTILITY IS IN THE PROCESS OF REPLACING THE FRP PIPING WITH CARBON STEEL PIPING.

THE BALL MILL APPEARS TO HAVE BEEN UNDERDESIGNED. THE MILL PRODUCES 4 TONS/HOUR OF GROUND LIMESTONE AT BEST ALTHOUGH IT WAS RATED AT 5 TON/HOU CAPACITY.

7/79 SYSTEM 744
 8/79 SYSTEM 744

** PROBLEMS/SOLUTIONS/COMMENTS

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

9/79 SYSTEM 720

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE THIRD QUARTER OF 1979 THE BOILER AND FGD SYSTEM ONLY OPERATED ABOUT 25% OF THE TIME BECAUSE OF CONTINUING PROBLEMS WITH THE REAGENT FEED LINE. THE FRP SECTION FROM THE GRINDER TO THE SCRUBBERS FAILED. THE LINE WAS REPAIRED AT THE END OF SEPTEMBER.

ON NOVEMBER 3 THE UNIT WILL BE SHUT DOWN FOR A FOUR TO SIX WEEK SCHEDULED OUTAGE.

10/79 SYSTEM 0.0 0.0 0.0 744 0

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY IS IN THE PROCESS OF REPLACING THE REAGENT HANDLING SYSTEM; THEREFORE, THE FGD SYSTEM DID NOT OPERATE DURING OCTOBER.

11/79 SYSTEM 100.0 100.0 100.0 6.3 720 41 41 2.9

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS OUT OF SERVICE FOR MOST OF NOVEMBER FOR AN ANNUAL INSPECTION.

12/79 SYSTEM 100.0 0.0 0.0 0.0 744 130 0 5.7

TILITY FGD SURVEY: JANUARY - DECEMBER 1988

RIZONA ELECTRIC POWER: APACHE 2 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

THE EXTENSIVE PROBLEMS ENCOUNTERED EARLIER WITH THE REAGENT HANDLING SYSTEM HAVE BEEN RESOLVED. THE SYSTEM REPLACEMENT WAS COMPLETED IN DECEMBER.

DURING DECEMBER THE BOILER OPERATED 130 HOURS FOR WHICH THE SCRUBBER WAS AVAILABLE 100% OF THE TIME.

THE BOILER ENCOUNTERED DAMPER PROBLEMS THAT ACCOUNTED FOR MOST OF THE DECEMBER DOWN TIME.

1/80	SYSTEM	91.0	58.3	88.8	57.3	744	731	426	56.1
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** PROBLEMS/SOLUTIONS/COMMENTS

DURING JANUARY SOME OUTAGE TIME WAS DUE TO A PUMP MALFUNCTION.

OUTAGE TIME WAS ALSO CAUSED BY A BROKEN FEED BELT TO THE LIMESTONE BALL MILL.

2/80	SYSTEM	92.8	96.7	92.8	92.8	696	668	646	87.4
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** PROBLEMS/SOLUTIONS/COMMENTS

DURING FEBRUARY OUTAGE TIME RESULTED FROM AN ESP FAILURE.

FORCED OUTAGE TIME WAS ALSO CAUSED BY A PUMP MALFUNCTION.

3/80	SYSTEM	99.1	99.1	99.0	99.1	744	744	738	74.1
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** PROBLEMS/SOLUTIONS/COMMENTS

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

OUTAGE TIME RESULTED FROM STICKING VALVES AND LIMESTONE FEED-BELT PROBLEMS.

4/80	SYSTEM	67.2	65.2	65.2	61.4	720	678	442	
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** PROBLEMS/SOLUTIONS/COMMENTS

DURING APRIL THE FGD SYSTEM WAS FORCED DOWN DUE TO PUMP FAILURES AND A RUPTURE IN THE SLURRY RECIRCULATION LINE.

5/80	SYSTEM	90.5	90.5	90.5	90.5	744	744	673	
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** PROBLEMS/SOLUTIONS/COMMENTS

DURING MAY THE UNIT WAS FORCED OFF LINE WHEN THE LIMESTONE CRUSHER MALFUNCTIONED.

THE UNIT WAS ALSO FORCED OUT DUE TO PUMP AND VALVE FAILURES.

6/80	SYSTEM					720			
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** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE DATA FOR THE MONTH OF JUNE HAS BEEN MISPLACED.

7/80	202	100.0	0.0		0.0				
	203	85.0	85.7	85.7	85.0				
	SYSTEM	100.0	85.7	85.7	85.0	744	738	633	77.8

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

ARIZONA ELECTRIC POWER: APACHE 2 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

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

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

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

8/80	202	0.0	0.0		0.0				
	203	96.8	66.0	95.2	63.3				
	SYSTEM	96.8	66.0	95.2	63.3	744	714	471	61.0

** PROBLEMS/SOLUTIONS/COMMENTS

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

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

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

9/80	SYSTEM					720			
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** PROBLEMS/SOLUTIONS/COMMENTS

NO INFORMATION WAS AVAILABLE FOR SEPTEMBER 1980.

10/80	202	0.0	0.0		0.0				
	203	92.6	87.7	98.6	82.4				
	SYSTEM	92.7	87.7	98.6	82.4	744	699	613	62.4

** PROBLEMS/SOLUTIONS/COMMENTS

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

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

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

11/80	202	20.0	22.4	40.0	6.7				
	203	0.0	0.0		0.0				
	SYSTEM	20.0	22.4	40.0	6.7	720	214	48	25.1

** PROBLEMS/SOLUTIONS/COMMENTS

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

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

12/80	202	100.0	100.0	100.0	99.9				
	203	0.0	0.0		0.0				
	SYSTEM	100.0	100.0	100.0	99.9	744	743	743	87.2

** PROBLEMS/SOLUTIONS/COMMENTS

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

1/81	202	100.0	62.9	100.0	62.9				
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TILITY FGD SURVEY: JANUARY - DECEMBER 1988

RIZONA ELECTRIC POWER: APACHE 2 (CONT.)

-----PERFORMANCE DATA-----										
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	203	0.0	0.0		0.0					
	SYSTEM	100.0	62.9	100.0	62.9		744	744	468	86.6

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE 202 WAS NOT OPERATED DURING THE LAST 276 HOURS OF THE MONTH AS A RESULT OF THE LOW SULFUR CONTENT OF THE COAL BEING FIRED.

MODULE 203 WAS NOT AVAILABLE FOR OPERATION DURING JANUARY.

2/81	202	100.0	10.7	100.0	10.7					
	203	0.0	0.0		0.0					
	SYSTEM	100.0	10.7	100.0	10.7		672	672	72	77.4

** PROBLEMS/SOLUTIONS/COMMENTS

DURING FEBRUARY THE OPERATION OF THE FGD SYSTEM WAS REDUCED DUE TO THE LOW SULFUR CONTENT OF THE COAL.

REPAIRS WERE MADE ON TOWER 203 DURING FEBRUARY.

3/81	202	0.0	0.0		0.0					
	203	100.0	53.7	100.0	43.7					
	SYSTEM	100.0	53.6	100.0	43.7		744	605	325	70.2

** PROBLEMS/SOLUTIONS/COMMENTS

DURING MARCH MODULE 202 WAS NOT AVAILABLE DUE TO EROSION PROBLEMS.

THE SYSTEM WAS BY-PASSED DURING PART OF THE MONTH BECAUSE THE UNIT WAS FIRING LOW SULFUR COAL.

4/81	202	0.0	0.0		0.0					
	203	100.0	100.0	100.0	100.0					
	SYSTEM	100.0	100.0	100.0	100.0		720	720	720	98.2

** PROBLEMS/SOLUTIONS/COMMENTS

DURING APRIL MODULE 202 WAS NOT AVAILABLE FOR OPERATION DUE TO ERROSION OF THE BOWL AREA OF THE MODULE. THIS HAS BEEN A CONTINUAL PROBLEM AND THE UTILITY IS PRESENTLY CONDUCTING STUDIES TO ALLEVIATE THE PROBLEM.

5/81	202	100.0	0.0		0.0					
	203	100.0	100.0	100.0	100.0					
	SYSTEM	100.0	100.0	100.0	100.0		744	744	744	87.4

** PROBLEMS/SOLUTIONS/COMMENTS

DURING MAY THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED.

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

6/81	202	100.0	0.0		0.0					
	203	100.0	100.0	100.0	100.0					
	SYSTEM	100.0	100.0	100.0	100.0		720	716	720	91.9

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR PROBLEMS WERE EXPERIENCED DURING THE MONTH OF JUNE.

7/81	202	100.0	45.2	100.0	45.2					
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UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

ARIZONA ELECTRIC POWER: APACHE 2 (CONT.)

-----PERFORMANCE DATA-----											
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART. HOURS	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	203	46.2	46.2	100.0	46.2						
	203	100.0	91.4	100.0	91.4			744	744	680	91.0
	SYSTEM										

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE 203 WAS TAKEN OUT OF SERVICE ON JULY 15 FOR PREVENTIVE MAINTENANCE AND REPAIRS, AT WHICH TIME MODULE 202 WAS PUT INTO SERVICE.

8/81	202	100.0	39.9	100.0	35.5						
	203	0.0	0.0		0.0						
	SYSTEM	100.0	39.9	100.0	35.5			744	661	264	75.2

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE 202 WAS REMOVED FROM SERVICE ON AUGUST 8 AS A RESULT OF PROBLEMS ENCOUNTERED WITH THE ELECTROSTATIC PRECIPITATOR. THE MODULE WAS PLACED BACK IN SERVICE ON AUGUST 21.

9/81	202	100.0	99.3	100.0	99.0						
	203	0.0	0.0		0.0						
	SYSTEM	100.0	99.3	100.0	99.0			720	718	713	85.4

** PROBLEMS/SOLUTIONS/COMMENTS

THE ONLY PROBLEMS ENCOUNTERED DURING THE MONTH WERE BOILER RELATED.

10/81	202	100.0	100.0	100.0	41.5						
	203	0.0	0.0		0.0						
	SYSTEM	100.0	100.0	100.0	41.5			744	303	309	29.2

** PROBLEMS/SOLUTIONS/COMMENTS

UNIT 2 WAS DOWN FROM OCTOBER 3 UNTIL OCTOBER 20 FOR ANNUAL MAINTENANCE AND REPAIRS.

11/81	202	65.4	63.6	64.8	63.6						
	203	0.0	0.0		0.0						
	SYSTEM	65.4	63.6	64.8	63.6			720	720	458	74.2

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE 202 WAS TAKEN OUT OF SERVICE TWICE DURING NOVEMBER BECAUSE OF LOW SLURRY DENSITY.

ON NOVEMBER 22 THE SYSTEM WAS TAKEN OUT OF SERVICE FOR THE REMAINDER OF THE MONTH FOR REPAIRS ON THE DAMPER SEALS.

ADDITIONAL OUTAGE TIME DURING THE MONTH WAS DUE TO BOILER-RELATED PROBLEMS

12/81	SYSTEM							744			
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** PROBLEMS/SOLUTIONS/COMMENTS

THE ORIGINAL COPY OF THE DECEMBER UPDATE INFORMATION WAS LOST IN THE MAIL.

1/82	202	80.5	90.5	80.5	80.5						
	203		0.0		0.0						
	SYSTEM	80.5	90.5	80.5	80.5			744	662	599	70.9

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JANUARY MODULE 202 WAS DOWN APPROXIMATELY 145 DUE TO RESTRICTIONS IN A FEED LINE.

TILITY FGD SURVEY: JANUARY - DECEMBER 1988

RIZONA ELECTRIC POWER: APACHE 2 (CONT.)

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

2/82	202		0.0		0.0				
	203	98.6	96.2	99.0	96.2				
	SYSTEM	98.6	96.2	99.0	96.2	672	672	646	81.3

** PROBLEMS/SOLUTIONS/COMMENTS

DURING FEBRUARY MODULE 202 WAS DOWN FOR REPAIRS AND MAINTENANCE.

MODULE 203 WAS OUT OF SERVICE FOR APPROXIMATELY SIX HOURS DUE TO A QUENCHER PUMP FAILURE.

3/82	202		0.0		0.0				
	203	100.0	99.0	100.0	87.3				
	SYSTEM	100.0	99.0	100.0	87.3	744	656	649	50.0

** PROBLEMS/SOLUTIONS/COMMENTS

DURING MARCH MODULE 203 WAS OUT OF SERVICE PART OF THE TIME DUE TO A UNIT 2 WATER WALL RUPTURE.

4/82	202	100.0	0.0		0.0				
	203	87.2	87.2	87.2	87.2				
	SYSTEM	87.2	87.2	87.2	87.2	720	720	627	70.1

** PROBLEMS/SOLUTIONS/COMMENTS

DURING APRIL OUTAGE TIME FOR MODULE 203 WAS DUE TO PUMP PROBLEMS.

5/82	202	3.9	5.3	100.0	3.9				
	203	0.0	0.0		0.0				
	SYSTEM	3.9	5.3	100.0	3.9	744	541	29	48.6

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE 203 WAS UNAVAILABLE DURING MAY DUE TO SOME MAJOR REPAIRS AND RECONSTRUCTION.

6/82	202	100.0	97.0	100.0	97.0				
	203	100.0	0.0		0.0				
	SYSTEM	100.0	97.0	100.0	97.0	720	720	698	82.3

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING JUNE.

7/82	202	100.0	99.9	100.0	99.9				
	203	100.0	0.0		0.0				
	SYSTEM	100.0	99.9	100.0	99.9	744	744	743	85.1

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED BY THE UTILITY DURING JULY.

8/82	202	100.0	98.4	100.0	87.3				
	203	100.0	0.0		0.0				
	SYSTEM	100.0	98.4	100.0	87.3	744	660	650	79.3

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

ARIZONA ELECTRIC POWER: APACHE 2 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING AUGUST.

9/82	202	100.0	87.7	100.0	87.7				
	203	100.0	0.0		0.0				
	SYSTEM	100.0	87.7	100.0	87.7	720	720	631	73.2

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING SEPTEMBER.

10/82	202	100.0	100.0	100.0	2.9				
	203	100.0	0.0		0.0				
	SYSTEM	100.0	100.0	100.0	2.9	744	22	22	2.0

** PROBLEMS/SOLUTIONS/COMMENTS

ON OCTOBER 1 THE UNIT WAS DOWN FOR ANNUAL MAINTENANCE AND REPAIR OUTAGES.

11/82	202	100.0	0.0		0.0				
	203	19.4	31.1	94.4	9.4				
	SYSTEM	19.4	31.1	94.4	9.4	720	217	68	15.1

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS PUT ON LINE NOVEMBER 21 AFTER THE COMPLETION OF ANNUAL MAINTENANCE AND REPAIR OUTAGE.

MODULE 203 WAS PLACED BACK IN SERVICE ON NOVEMBER 24.

12/82	202	100.0	0.0		0.0				
	203	90.2	68.8	87.6	68.8				
	SYSTEM	90.2	68.8	87.6	68.8	744	744	512	65.1

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING DECEMBER.

1/83	202	100.0	0.0		0.0				
	203	100.0	68.7	100.0	64.2				
	SYSTEM	100.0	68.7	100.0	64.2	744	696	478	57.2

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING JANUARY.

2/83	202	100.0	0.0		0.0				
	203	99.9	61.8	99.8	61.8				
	SYSTEM	99.9	61.8	99.8	61.8	672	672	415	62.4

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD-RELATED PROBLEMS WERE REPORTED BY THE UTILITY DURING FEBRUARY.

3/83	202	100.0	0.0		0.0				
	203	98.8	56.1	95.1	44.4				
	SYSTEM	98.8	56.1	95.1	28.7	744	311	174	25.2

ILITY FGD SURVEY: JANUARY - DECEMBER 1988

IZONA ELECTRIC POWER: APACHE 2 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS OFF LINE FROM MARCH 1 TO MARCH 17 DUE TO LOW DEMAND.

/83	202	100.0	0.0		0.0				
	203	99.2	54.4	98.5	54.4				
	SYSTEM	99.2	54.4	98.5	54.4	720	720	392	54.1

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING APRIL.

/83	202	100.0	0.0		0.0				
	203	99.7	42.3	99.4	42.3				
	SYSTEM	99.7	42.3	99.4	42.3	744	744	315	50.3

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING MAY.

/83	202	100.0	0.0		0.0				
	203	100.0	26.9	100.0	8.5				
	SYSTEM	100.0	26.9	100.0	8.5	720	229	62	13.7

** PROBLEMS/SOLUTIONS/COMMENTS

UNIT 2 WAS TAKEN OFF LINE ON JUNE 10 AS A RESULT OF LOW DEMAND.

/83	202	90.3	2.4	100.0	1.4				
	203	100.0	49.2	100.0	29.4				
	SYSTEM	100.0	51.5	100.0	30.8	744	445	229	35.9

/83	202	100.0	0.0		0.0				
	203	100.0	75.6	100.0	13.6				
	SYSTEM	100.0	75.6	100.0	13.6	744	134	101	12.3

/83	202	100.0	7.9	100.0	7.9				
	203	99.9	42.2	99.7	42.0				
	SYSTEM	100.0	50.1	100.0	49.9	720	718	360	59.1

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED FOR THE PERIOD OF JULY THROUGH SEPTEMBER, 1983.

/83	202	100.0	0.0		0.0				
	203	100.0	0.0		0.0				
	SYSTEM	100.0	0.0		0.0	744	47	0	1.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT UNIT 2 WAS DOWN THE ENTIRE MONTH OF OCTOBER EXCEPT FOR OCTOBER 1 TO OCTOBER 3. ANNUAL MAINTENANCE AND REPAIR BEGAN ON OCTOBER 15.

/83	202	100.0			0.0				
	203	100.0			0.0				
	SYSTEM	100.0			0.0	720	0	0	0.0

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

ARIZONA ELECTRIC POWER: APACHE 2 (CONT.)

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

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART. HOURS	PER BOILER HOURS	FGD HOURS	CAP. FACTOR
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** PROBLEMS/SOLUTIONS/COMMENTS

UNIT 2 WAS DOWN THE ENTIRE MONTH OF NOVEMBER FOR ANNUAL MAINTENANCE AND REPAIR.

12/83	202	100.0			0.0					
	203	100.0			0.0					
	SYSTEM	100.0			0.0		744	0	0	0.0

** PROBLEMS/SOLUTIONS/COMMENTS

ANNUAL MAINTENANCE AND REPAIRS WERE COMPLETED ON DECEMBER 14. THE UNIT WAS DOWN FOR THE REMAINDER OF THE MONTH DUE TO LOW POWER DEMAND.

1/84	202	100.0			0.0					
	203	100.0			0.0					
	SYSTEM	100.0			0.0		744	0	0	0.0

** PROBLEMS/SOLUTIONS/COMMENTS

2/84	202	100.0			0.0					
	203	100.0			0.0					
	SYSTEM	100.0			0.0		696	0	0	0.0

** PROBLEMS/SOLUTIONS/COMMENTS

UNIT 2 WAS OFF LINE DURING JANUARY AND FEBRUARY DUE TO LOW POWER DEMAND.

3/84	202	100.0	0.0		0.0					
	203	99.3	27.1	89.5	5.8					
	SYSTEM	100.0	27.1	89.5	5.8		744	158	43	8.3
4/84	202	100.0	40.9	100.0	33.3					
	203	35.5	43.6	100.0	35.5					
	SYSTEM	100.0	84.5	100.0	68.8		720	587	496	40.4
5/84	202	100.0	39.9	100.0	39.9					
	203	98.8	60.1	98.0	60.1					
	SYSTEM	100.0	100.0	100.0	100.0		744	744	744	73.0
6/84	202	99.6	6.5	100.0	5.0					
	203	98.8	98.1	100.0	74.6					
	SYSTEM	100.0	100.0	100.0	79.6		720	548	573	46.5

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE PERIOD OF MARCH THROUGH JUNE 1984.

7/84	202	88.2	87.3	87.6	79.9					
	203	0.0	0.0		0.0					
	SYSTEM	44.1	43.6	87.6	40.0		744	682	297	60.2

** PROBLEMS/SOLUTIONS/COMMENTS

MAINTENANCE WAS COMPLETED ON MODULE 202 AND IT WAS PLACED BACK INTO SERVICE ON JULY 4, 1984.

MODULE 203 WAS OUT OF SERVICE DURING THE ENTIRE MONTH OF JULY.

8/84	SYSTEM						744			
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UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

ARIZONA ELECTRIC POWER: APACHE 2 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

INFORMATION WAS UNAVAILABLE FOR AUGUST 1984.

7/84	202	100.0	100.0	100.0	100.0				
	203	0.0	0.0		0.0				
	SYSTEM	100.0	100.0	100.0	100.0	720	720	720	80.4
8/84	202	100.0	100.0	100.0	100.0				
	203	0.0	0.0	0.0	0.0				
	SYSTEM	100.0	100.0	100.0	100.0	744	744	744	74.5
9/84	202	100.0	100.0	100.0	100.0				
	203	0.0	0.0		0.0				
	SYSTEM	100.0	100.0	100.0	100.0	720	720	720	87.0

** PROBLEMS/SOLUTIONS/COMMENTS

TOWER 203 WAS OUT OF SERVICE FOR THE MONTHS OF SEPTEMBER, OCTOBER AND NOVEMBER FOR GENERAL CLEANING AND REPAIRS.

2/84	202	13.1	79.6	80.2	13.1				
	203	0.0	0.0	0.0	0.0				
	SYSTEM	13.1	79.6	80.2	13.1	744	123	97	12.7

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT ON DECEMBER 5, 1984, UNIT 2 WAS SHUT DOWN FOR ANNUAL MAINTENANCE AND REPAIRS. MAJOR REPAIRS ON UNIT 2 SCRUBBER TOWERS WERE ALSO BEGUN. ON DECEMBER 13, 1984, UNIT 2 WAS STARTED UP AND RAN FOR APPROXIMATELY 24 HOURS TO EMPTY THE COAL BURNERS. NO SCRUBBER TOWERS WERE AVAILABLE FOR SERVICE DURING THIS TIME.

1/85	202	0.0			0.0				
	203	0.0			0.0				
	SYSTEM	0.0			0.0	744	0	0	0.0

** PROBLEMS/SOLUTIONS/COMMENTS

APACHE 2 WAS OUT OF SERVICE DURING THE MONTH FOR ANNUAL MAINTENANCE AND REPAIR. THE ABSORBERS UNDERWENT MAJOR REPAIRS AND WERE UNAVAILABLE FOR SERVICE.

2/85	202	83.6	72.1	79.9	11.5				
	203	0.0	0.0	0.0	0.0				
	SYSTEM	83.6	72.1	79.9	11.5	672	108	77	7.2

** PROBLEMS/SOLUTIONS/COMMENTS

THE ANNUAL OUTAGE CONTINUED UNTIL 2/12/85. ON 2/16/86 THE BOILER WAS TAKEN OUT OF SERVICE FOR BOILER REPAIRS. MODULE 203 WAS DOWN FOR MAJOR REPAIRS.

3/85	202	100.0	97.9	100.0	89.0				
	203	0.0	0.0	0.0	0.0				
	SYSTEM	100.0	97.9	100.0	89.0	744	676	662	76.1
4/85	202	100.0	99.2	100.0	98.2				
	203	0.0	0.0	0.0	0.0				
	SYSTEM	100.0	99.2	100.0	98.2	720	713	707	69.2
5/85	202	100.0	100.0	100.0	100.0				

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

ARIZONA ELECTRIC POWER: APACHE 2 (CONT.)

-----PERFORMANCE DATA-----										
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART. HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	203	0.0	0.0	0.0	0.0					
	SYSTEM	100.0	100.0	100.0	100.0		744	744	744	54.3
6/85	202	48.8	48.8	98.6	48.8					
	203	59.8	59.8	95.3	59.8					
	SYSTEM	100.0	100.0	100.0	100.0		720	720	720	69.9

** PROBLEMS/SOLUTIONS/COMMENTS

THE MAJOR REPAIR WORK BEGUN IN FEBRUARY CONTINUED THROUGH MAY AND INTO THE EARLY PART OF JUNE.

MODULE 202 WAS OUT OF SERVICE FOR REPAIRS FROM 6/16/85 THROUGH 6/30/85.

7/85	202	0.0	0.0	0.0	0.0					
	203	98.7	76.3	76.2	76.2					
	SYSTEM	98.7	76.3	76.2	76.2		744	743	567	74.4

** PROBLEMS/SOLUTIONS/COMMENTS

THE MAJOR REPAIR WORK THAT BEGAN ON MODULE 202 IN JUNE CONTINUED THROUGH JULY.

8/85	202	100.0	65.0	97.6	65.0					
	203	100.0	48.1	96.0	48.1					
	SYSTEM	100.0	100.0	100.0	100.0		744	744	744	82.5
9/85	202	100.0	0.0		0.0					
	203	100.0	100.0	100.0	79.4					
	SYSTEM	100.0	100.0	100.0	79.4		720	572	572	60.1

** PROBLEMS/SOLUTIONS/COMMENTS

ALTHOUGH THE FGD SYSTEM WAS NOT OPERATED AT FULL LOAD THROUGH THE AUGUST AND SEPTEMBER PERIOD NO FGD SYSTEM PROBLEMS WERE REPORTED BY THE UTILITY.

10/85	202	100.0			0.0					
	203	100.0			0.0					
	SYSTEM	100.0			0.0		744	0	0	0.0

** PROBLEMS/SOLUTIONS/COMMENTS

APACHE 2 WAS DOWN FOR THE MONTH OF OCTOBER FOR ANNUAL MAINTENANCE AND REPAIR.

11/85	202	100.0	0.0	0.0	0.0					
	203	100.0	95.3	100.0	74.4					
	SYSTEM	100.0	95.3	100.0	74.4		720	562	536	64.6
12/85	202	100.0	27.9	98.6	27.7					
	203	100.0	75.2	99.5	74.7					
	SYSTEM	100.0	100.0	100.0	100.0		744	740	744	77.5

** PROBLEMS/SOLUTIONS/COMMENTS

NO FGD SYSTEM PROBLEMS WERE REPORTED BY THE UTILITY DURING THE MONTHS OF NOVEMBER AND DECEMBER.

1/86	202	100.0			0.0					
	203	100.0			0.0					
	SYSTEM	100.0			0.0		744	0	0	0.0
2/86	202	14.9			0.0					

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

ARIZONA ELECTRIC POWER: APACHE 2 (CONT.)

-----PERFORMANCE DATA-----										
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	203	14.9			0.0					
	SYSTEM	29.8			0.0		672	0	0	0.0
** PROBLEMS/SOLUTIONS/COMMENTS										
BECAUSE OF LOW CONSUMER DEMAND, APACHE 2 WAS OUT OF SERVICE FOR THE MONTHS OF JANUARY AND FEBRUARY.										
3/86	202	99.2	97.8	98.2	45.2					
	203	11.6	0.0		0.0					
	SYSTEM	100.0	97.8	98.2	45.2		744	344	337	27.8
** PROBLEMS/SOLUTIONS/COMMENTS										
TOWER 203 WAS UNAVAILABLE FOR SERVICE DURING THE MONTH SO THAT QUENCHER LINES, TOWER PACKING AND NOZZLES COULD BE CLEANED.										
4/86	202	99.9	100.0	100.0	99.9					
	203	0.0	0.0		0.0					
	SYSTEM	99.9	100.0	100.0	99.9		720	720	719	57.2
** PROBLEMS/SOLUTIONS/COMMENTS										
TOWER 203 WAS UNAVAILABLE FOR THE MONTH OF APRIL FOR CLEANING OF ALL QUENCHER LINES, AND PREPARATION OF THE TOWER FOR STRUCTURAL REPAIRS AND ABSORBER FLOOR RELINING.										
5/86	202	77.4	77.3	99.5	77.3					
	203	20.7	20.4	96.2	20.4					
	SYSTEM	98.1	97.7	100.0	97.7		744	744	727	66.1
** PROBLEMS/SOLUTIONS/COMMENTS										
TOWER 203 WAS DOWN FOR MOST OF THE MONTH OF MAY FOR STRUCTURAL REPAIR OF THE TOWER FLOOR.										
5/86	202	38.9	0.0		0.0					
	203	100.0	91.5	100.0	91.5					
	SYSTEM	100.0	91.5	100.0	91.5		720	720	658	65.1
** PROBLEMS/SOLUTIONS/COMMENTS										
TOWER 202 WAS UNAVAILABLE FOR SERVICE 6/1/86 THROUGH 6/19/86 WHILE GENERAL CLEANING, WASHING, AND FLOOR INSPECTION OPERATIONS WERE PERFORMED.										
7/86	202	100.0	0.0		0.0					
	203	100.0	94.5	100.0	94.5					
	SYSTEM	100.0	94.5	100.0	94.5		744	744	703	52.9
** PROBLEMS/SOLUTIONS/COMMENTS										
NO FGD SYSTEM-RELATED PROBLEMS WERE REPORTED FOR THE MONTHS OF JULY OR AUGUST.										
9/86	202	99.8	76.6	99.6	64.1					
	203	100.0	0.0		0.0					
	SYSTEM	100.0	76.6	99.6	64.1		744	623	477	51.6
9/86	202	100.0			0.0					
	203	100.0			0.0					
	SYSTEM	100.0			0.0		720	0	0	0.0

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

ARIZONA ELECTRIC POWER: APACHE 2 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

APACHE 2 WAS OFF-LINE THROUGH SEPTEMBER AS A RESULT OF LOW CONSUMER DEMAND.

10/86	202	61.3		0.0					
	203	61.3		0.0					
	SYSTEM	100.0		0.0	744	0	0	0	0.0

** PROBLEMS/SOLUTIONS/COMMENTS

BOTH TOWERS 202 AND 203 WERE UNAVAILABLE FOR SERVICE 10/16/86 THROUGH 10/28/86 SO THAT THE OUTLET DUCT TO THE STACK COULD BE RELINED.

11/86	202	100.0		0.0					
	203	100.0		0.0					
	SYSTEM	100.0		0.0	720	0	0	0	0.0

** PROBLEMS/SOLUTIONS/COMMENTS

BECAUSE OF LOW CONSUMER DEMAND, APACHE 2 WAS OUT OF SERVICE THROUGH THE MONTH OF NOVEMBER.

12/86	SYSTEM				744				
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** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY ANNOUNCED THAT UNIT 2 WAS SHUTDOWN IN DECEMBER AND PUT ON COLD STANDBY. THE UNIT IS EXPECTED TO REMAIN OFF-LINE ALL OF 1987.

1/87	SYSTEM				744				
2/87	SYSTEM				672				
3/87	SYSTEM				744				
4/87	SYSTEM				720				
5/87	SYSTEM				744				
6/87	SYSTEM				720				
7/87	SYSTEM				744				
8/87	SYSTEM				744				
9/87	SYSTEM				720				
10/87	SYSTEM				744				
11/87	SYSTEM				720				
12/87	SYSTEM				744				

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE UNIT REMAINED ON COLD STANDBY ALL OF 1987. THE UNIT IS NOT EXPECTED TO OPERATE UNTIL 1990. THIS IS LARGELY DUE TO THE CURRENT LACK OF POWER DEMAND AND THE LOW COST OF NATURAL GAS.

1/88	SYSTEM				774				
2/88	SYSTEM				672				

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

ARIZONA ELECTRIC POWER: APACHE 2 (CONT.)

-----PERFORMANCE DATA-----										
RIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PER PART.	BOILER HOURS	FGD HOURS	CAP. FACTOR
/88	SYSTEM							774		
/88	SYSTEM							720		
/88	SYSTEM							774		
/88	SYSTEM							720		
/88	SYSTEM							774		
/88	SYSTEM							774		
/88	SYSTEM							720		
/88	SYSTEM							774		
/88	SYSTEM							720		
/88	SYSTEM							774		

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE UNIT REMAINED ON COLD STANDBY ALL OF 1988.
THE UNIT IS SCHEDULED TO REMAIN ON STANDBY UNTIL THE UNIT CAN BE CONVERTED
AND OPERATED AS A GAS-FIRED UNIT. THE CONVERSION IS PLANNED TO TAKE PLACE
BETWEEN OCTOBER OF 1989 AND JANUARY 1990.

SECTION 13
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	ARIZONA ELECTRIC POWER	
PLANT NAME	APACHE	
UNIT NUMBER	3	
CITY	COCHISE	
STATE	ARIZONA	
REGULATORY CLASSIFICATION	C	
ARTICULATE EMISSION LIMITATION - NG/J	43.	(0.100 LB/MMBTU)
SO ₂ EMISSION LIMITATION - NG/J	344.	(0.800 LB/MMBTU)
SO _x EMISSION LIMITATION - NG/J	301.	(0.700 LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	530	
GROSS UNIT GENERATING CAPACITY - MW	195	
NET UNIT GENERATING CAPACITY W/FGD - MW	172	
NET UNIT GENERATING CAPACITY WO/FGD - MW	180	
EQUIVALENT SCRUBBED CAPACITY - MW	98	

** UNIT DATA - BOILER AND STACK

BOILER SUPPLIER	RILEY STOKER	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	520.98	(1104000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	376.7	(710 F)
STACK HEIGHT - M	122.	(400 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	4.9	(16.2 FT)

** FUEL DATA

FUEL TYPE	COAL	
FUEL GRADE	SUBBITUMINOUS	
AVERAGE HEAT CONTENT - J/G	23260.	(10000 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		9500-10800
AVERAGE ASH CONTENT - %	15.00	
RANGE ASH CONTENT - %	15-20	
AVERAGE MOISTURE CONTENT - %	13.00	
RANGE MOISTURE CONTENT - %	9.0-15.0	
AVERAGE SULFUR CONTENT - %	0.70	
RANGE SULFUR CONTENT - %	0.4-0.6	
AVERAGE CHLORIDE CONTENT - %	0.01	
RANGE CHLORIDE CONTENT - %	0.00-0.03	

** PARTICLE CONTROL

** MECHANICAL COLLECTOR

NUMBER	0
TYPE	NONE

** ESP

NUMBER	1
NUMBER OF SPARES	0
TYPE	HOT SIDE
SUPPLIER	AIR CORRECTION DIVISION, UOP
INLET FLUE GAS CAPACITY - CU.M/S	521.0 (1104000 ACFM)
INLET FLUE GAS TEMPERATURE - C	376.7 (710 F)
PRESSURE DROP - KPA	0.1 (1. IN-H ₂ O)
PARTICLE REMOVAL EFFICIENCY - %	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

ARIZONA ELECTRIC POWER: APACHE 3 (CONT.)

** GENERAL DATA	
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT
SO2 REMOVAL MODE	WET SCRUBBING
PROCESS TYPE	LIMESTONE
PROCESS ADDITIVES	NONE
SYSTEM SUPPLIER	RESEARCH-COTTRELL
A-E FIRM	BURNS & MCDONNELL
DEVELOPMENT LEVEL	FULL SCALE
NEW/RETROFIT	NEW
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.60
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	85.00
ENERGY CONSUMPTION - %	4.1
CURRENT STATUS	1
COMMERCIAL START-UP	6/1979
INITIAL START-UP	6/1979
CONTRACT AWARDED	8/1974
** DESIGN AND OPERATING PARAMETERS	
DESIGN COAL SULFUR CONTENT - %	0.70
DESIGN COAL HEAT CONTENT - J/G	23260.0 (10000 BTU/LB)
DESIGN COAL ASH CONTENT - %	17.00
DESIGN MOISTURE CONTENT - %	18.00
DESIGN CHLORIDE CONTENT - %	0.00
SPACE REQUIREMENTS - SQ M	4046.7 (43560 SQ FT)
OPER. & MAINT. REQUIREMENT - MANHR/DAY	72.0
** QUENCHER/PRESATURATOR	
NUMBER	2
TYPE	CYCLONIC SPRAY QUENCHER
SUPPLIER	RESEARCH-COTTRELL
INLET GAS FLOW - CU. M/S	188.76 (400000 ACFM)
INLET GAS TEMPERATURE - C	132.2 (270 F)
PRESSURE DROP - KPA	0.2 (1.0 IN-H2O)
LIQUID RECIRCULATION RATE - LITERS/S	567. (9000 GPM)
L/G RATIO - L/CU. M	2.7 (20.0 GAL/1000 ACFM)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL
CONSTRUCTION MATERIAL SPECIFIC TYPE	AISI 1110
** ABSORBER	
NUMBER	2
NUMBER OF SPARES	1
GENERIC TYPE	COMBINATION TOWER
SPECIFIC TYPE	SPRAY/PACKED
TRADE NAME/COMMON TYPE	N/A
SUPPLIER	RESEARCH-COTTRELL
DIMENSIONS - FT	30.0 DIA X 110.0
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
LINER MATERIAL TRADE NAME/COMMON TYPE	FLAKELINE 103
GAS CONTACTING DEVICE TYPE	SPRAY ZONE & VERTICAL CROSS CHANNEL FIXED GRID P
NUMBER OF CONTACTING ZONES	2
LIQUID RECIRCULATION RATE - LITER/S	567. (9000 GPM)
L/G RATIO - L/CU.M	5.3 (40.0 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	0.6 (2.5 IN-H2O)
SUPERFICIAL GAS VELOCITY - M/SEC	3.0 (10.0 FT/S)
INLET GAS FLOW - CU. M/S	94.38 (200000 ACFM)
INLET GAS TEMPERATURE - C	68.3 (155 F)
SO2 REMOVAL EFFICIENCY - %	97.0
PARTICLE REMOVAL EFFICIENCY - %	99.6
** MIST ELIMINATOR	
PRE-MIST ELIMINATOR/MIST ELIMINATOR	PRIMARY COLLECTOR
NUMBER PER SYSTEM	2
NUMBER OF SPARES PER SYSTEM	1
NUMBER PER MODULE	1
GENERIC TYPE	IMPINGEMENT
SPECIFIC TYPE	BAFFLE

ILITY FGD SURVEY: JANUARY - DECEMBER 1988

IZONA ELECTRIC POWER: APACHE 3 (CONT.)

TRADE NAME/COMMON TYPE	CLOSED VANE	
MANUFACTURER	MUNTERS	
CONFIGURATION	HORIZONTAL	
NUMBER OF STAGES	2	
NUMBER OF PASSES PER STAGE	3	
FREEBOARD DISTANCE - M	0.61	(2.0 FT)
DISTANCE BETWEEN STAGES - CM	30.48	(12.0 IN)
DISTANCE BETWEEN VANES - CM	10.2	(4.00 IN)
VANE ANGLES - DEGREES	45	
PRESSURE DROP - KPA	0.2	(1.0 IN-H ₂ O)
SUPERFICIAL GAS VELOCITY - M/S	3.0	(10.0 FT/S)
CONSTRUCTION MATERIAL GENERIC TYPE	ORGANIC	
CONSTRUCTION MATERIAL SPECIFIC TYPE	POLYVINYL CHLORIDE	
WASH WATER SOURCE	FRESH	
WASH FREQUENCY	INTERMITTENT	'LOWER STAGE!; ONCE EVERY HOUR 'UPP
WASH RATE - L/S	12.6	(200 GAL/MIN)
* REHEATER		
NUMBER	0	
GENERIC TYPE	NONE	
SPECIFIC TYPE	N/A	
TRADE NAME/COMMON TYPE	N/A	
PERCENT GAS BYPASSED - AVG	50.0	
TEMPERATURE INCREASE - C	43.3	(78 F)
INLET FLUE GAS TEMPERATURE - C	46.1	(115 F)
OUTLET FLUE GAS TEMPERATURE - C	89.4	(193 F)
CONSTRUCTION MATERIAL GENERIC TYPE	NONE	
CONSTRUCTION MATERIAL SPECIFIC TYPE	N/A	
* FANS		
NUMBER	2	
NUMBER OF SPARES	0	
DESIGN	CENTRIFUGAL	
SUPPLIER	WESTINGHOUSE	
FUNCTION	UNIT	
APPLICATION	FORCED DRAFT	
SERVICE	DRY	
FLUE GAS FLOW RATE - CU.M/S	188.76	(400000 ACFM)
FLUE GAS TEMPERATURE - C	132.2	(270 F)
PRESSURE DROP - KPA	6.2	(20.5 IN-H ₂ O)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	
* DAMPERS		
NUMBER	2	
FUNCTION	SHUT-OFF	
GENERIC TYPE	LOUVER	
SPECIFIC TYPE	PARALLEL BLADE MULTILOUVER	
MODULATION	OPEN/CLOSED	
SEAL AIR FLOW - CU. M/S	0.24	(500 ACFM)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR	
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	
MODULATION	OPEN/CLOSED	
SEAL AIR FLOW - CU. M/S	0.24	(500 ACFM)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR	
LINER GENERIC MATERIAL TYPE	HIGH ALLOY	
LINER SPECIFIC MATERIAL TYPE	NICKEL BASE/CHROMIUM-IRON-COPPER-MOLYBDENUM	
** DAMPERS		
NUMBER	2	
FUNCTION	SHUT-OFF	
GENERIC TYPE	LOUVER	
SPECIFIC TYPE	PARALLEL BLADE MULTILOUVER	

ARIZONA ELECTRIC POWER: APACHE 3 (CONT.)

MODULATION	OPEN/CLOSED
SEAL AIR FLOW - CU. M/S	0.24 (500 ACFM)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR
LINER GENERIC MATERIAL TYPE	HIGH ALLOY
LINER SPECIFIC MATERIAL TYPE	NICKEL BASE/CHROMIUM-IRON-COPPER-MOLYBDENUM
** DUCTWORK	
LOCATION	ABSORBER INLET
CONFIGURATION	RECTANGULAR
DIMENSIONS	12.0 X 14.0
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	ABSORBER OUTLET
CONFIGURATION	RECTANGULAR
DIMENSIONS	12.0 X 14.0
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
SHELL SPECIFIC MATERIAL TYPE	AISI 1110
LINER GENERIC MATERIAL TYPE	ORGANIC
LINER SPECIFIC MATERIAL TYPE	FLUOROELASTOMER
** REAGENT PREPARATION EQUIPMENT	
FUNCTION	WET BALL MILL
DEVICE	COMPARTMENTED
DEVICE TYPE	NR
MANUFACTURER	KENNEDY VAN SAUN
NUMBER	1
NUMBER OF SPARES	0
FULL LOAD DRY FEED CAPACITY - M.TONS/HR	4.5 (5 TPH)
PRODUCT QUALITY - % SOLIDS	45.0
** TANKS	
SERVICE	NUMBER
-----	-----
ABSORBER FEED	1
REAGENT FEED	1
MILL SLURRY SUMP	1
WASTE SLURRY SUMP	1
** PUMPS	
SERVICE	NUMBER
-----	-----
ABSORBER	3
QUENCHER	4
MILL SLURRY RECYCLE	2
ADDITIVE FEED	2
WASTE SLURRY TRANSFER	1
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	NONE
*** SALEABLE BYPRODUCTS	
NATURE	NONE
DISPOSITION	N/A
*** SLUDGE	
MOISTURE CONTENT - % TOTAL FREE WATER	70.0
% CASO ₄ - DRY	80.0
** TREATMENT	
METHOD	BLEED
DEVICE	N/A
PROPRIETARY PROCESS	N/A

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

ARIZONA ELECTRIC POWER: APACHE 3 (CONT.)

** DISPOSAL	
NATURE	FINAL
TYPE	POND
LOCATION	OFF-SITE
SITE TRANSPORTATION METHOD	PIPELINE
SITE TREATMENT	NONE
SITE DIMENSIONS	25 TO 30 ACRES BY 18 FT DEEP
SITE CAPACITY - CU.M	611500 (500.0 ACRE-FT)
SITE SERVICE LIFE - YRS	30

** PROCESS CONTROL AND INSTRUMENTATION	
PROCESS STREAM	QUENCHER RECYCLE LINE
CHEMICAL PARAMETERS	PH
PHYSICAL VARIABLES	PERCENT SOLIDS
CONTROL LEVELS	5.0 PH
PROCESS CONTROL MANNER	MANUAL
PROCESS CHEMISTRY MODE	FEEDBACK

** WATER BALANCE	
WATER LOOP TYPE	OPEN
MAKEUP WATER ADDITION - LITERS/S	115.9 (1840 GPM)
SOURCE OF MAKEUP WATER	WELL WATER

** CHEMICALS AND CONSUMPTION	
FUNCTION	ABSORBENT
NAME	LIMESTONE
PRINCIPAL CONSTITUENT	>93% CaCO ₃
SOURCE/SUPPLIER	PAUL LIME
UTILIZATION - %	99.0
POINT OF ADDITION	BALL MILL

** FGD SPARE CAPACITY INDICES	
ABSORBER - %	100.0
MIST ELIMINATOR - %	0.0
FAN - %	0.0
BALL MILL - %	0.0
EFFLUENT HOLD TANK - %	0.0
RECIRCULATION PUMP - %	50.0

** FGD SPARE COMPONENT INDICES	
ABSORBER	1.0
MIST ELIMINATOR	0.0
FAN	0.0
BALL MILL	0.0
EFFLUENT HOLD TANK	0.0
RECIRCULATION PUMP	1.0

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

6/79	SYSTEM				50.00	99.50	720	
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** PROBLEMS/SOLUTIONS/COMMENTS

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

7/79	SYSTEM						744	
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8/79	SYSTEM						744	
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ARIZONA ELECTRIC POWER: APACHE 3 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

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

9/79 SYSTEM

720

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE THIRD QUARTER OF 1979 THE BOILER AND FGD SYSTEM ONLY OPERATED ABOUT 25% OF THE TIME BECAUSE OF CONTINUING PROBLEMS WITH THE REAGENT FEED LINE. THE FRP SECTION FROM THE GRINDER TO THE SCRUBBERS FAILED. THE LINE WAS REPAIRED AT THE END OF SEPTEMBER.

COMMERCIAL OPERATIONS AT APACHE 3 BEGAN ON SEPTEMBER 1.

10/79 SYSTEM 0.0 0.0 0.0 744 0

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY IS IN THE PROCESS OF REPLACING THE REAGENT HANDLING SYSTEM; THEREFORE, THE FGD SYSTEM DID NOT OPERATE DURING OCTOBER.

11/79 302 89.4 39.8 39.4 39.4
 303 89.4 50.5 50.0 50.0
 SYSTEM 100.0 90.3 89.4 89.4 720 713 644 92.7

12/79 SYSTEM 99.5 99.5 99.5 99.5 744 744 741 95.4

** PROBLEMS/SOLUTIONS/COMMENTS

THE REAGENT HANDLING SYSTEM REPLACEMENT WAS COMPLETED IN DECEMBER.

THE OUTAGE TIME DURING DECEMBER WAS CAUSED BY A FAULTY BOILER FLUE DAMPER.

1/80 SYSTEM 91.7 91.7 91.7 91.7 744 744 682 89.7

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JANUARY SOME OUTAGE TIME WAS DUE TO A PUMP MALFUNCTION.

OUTAGE TIME WAS ALSO CAUSED BY A BROKEN FEED BELT TO THE LIMESTONE BALL MILL.

2/80 SYSTEM 95.6 74.1 96.0 71.4 696 671 497 83.5

** PROBLEMS/SOLUTIONS/COMMENTS

DURING FEBRUARY OUTAGE TIME RESULTED FROM AN ESP FAILURE.

FORCED OUTAGE TIME WAS ALSO CAUSED BY A PUMP MALFUNCTION.

3/80 SYSTEM 90.9 90.9 90.9 90.9 744 744 677 91.1

** PROBLEMS/SOLUTIONS/COMMENTS

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

OUTAGE TIME RESULTED FROM STICKING VALVES AND LIMESTONE FEED-BELT PROBLEMS.

ILITY FGD SURVEY: JANUARY - DECEMBER 1988

IZONA ELECTRIC POWER: APACHE 3 (CONT.)

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

'80 SYSTEM 99.0 96.9 96.9 30.6 720 227 220

** PROBLEMS/SOLUTIONS/COMMENTS

DURING APRIL THE FGD SYSTEM WAS FORCED DOWN DUE TO PUMP FAILURES AND A RUPTURE IN THE SLURRY RECIRCULATION LINE.

'80 SYSTEM 0.0 0.0 0.0 0.0 744 39 0

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER AND FGD SYSTEM WERE DOWN FOR A SCHEDULED OVERHAUL. THE LINERS IN THE ABSORBER QUENCHER HAD TO BE REPAIRED. THE BOILER RETURNED TO SERVICE BEFORE REPAIR WORK FOR THE FGD SYSTEM WAS COMPLETE. THE FGD SYSTEM WAS UNAVAILABLE IN MAY BECAUSE OF THIS OVERHAUL.

'80 SYSTEM 720

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE DATA FOR THE MONTH OF JUNE HAS BEEN MISPLACED.

'80 302 29.0 30.0 90.0 29.0
 303 0.0 0.0 0.0 0.0
 SYSTEM 29.0 30.0 90.0 29.0 744 721 216 49.3

** PROBLEMS/SOLUTIONS/COMMENTS

BOTH MODULES WERE UNAVAILABLE BECAUSE OF REPLACEMENT OF THE ABSORBER LINER. MODULE 302 WAS OUT OF SERVICE FOR 22 DAYS, WHILE MODULE 303 WAS OUT OF SERVICE DURING ALL OF JULY.

A PACKING PUMP FAILURE CAUSED THE FGD SYSTEM TO GO DOWN.

'80 302 98.5 47.8 96.3 38.4
 303 98.5 19.3 91.3 15.5
 SYSTEM 98.5 67.1 94.8 54.0 744 599 402 41.5

** PROBLEMS/SOLUTIONS/COMMENTS

TOWER 302 WAS UNAVAILABLE DURING PART OF AUGUST BECAUSE OF A QUENCHER PUMP FAILURE.

DUE TO A SAMPLING LINE FAILURE IN AUGUST, TOWER 303 WAS SHUT DOWN FOR PART OF THE MONTH.

THE REDUCED RATE OF FGD OPERATION IN AUGUST WAS A RESULT OF BOILER UNIT PROBLEMS AND REDUCED LOAD CAPACITY.

'80 SYSTEM 720

** PROBLEMS/SOLUTIONS/COMMENTS

NO INFORMATION WAS AVAILABLE FOR SEPTEMBER 1980.

'80 302 76.2 87.7 97.1 68.1
 303 0.0 0.0 0.0 0.0
 SYSTEM 76.2 87.7 97.1 68.1 744 567 507 52.5

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

ARIZONA ELECTRIC POWER: APACHE 3 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER WAS OPERATED AT A REDUCED LOAD FOR 60 HOURS
 AND WAS TAKEN OFF LINE FOR SIX DAYS DURING OCTOBER.

UNAVAILABLE FGD SYSTEM TIME WAS DUE TO A QUENCHER PUMP FAILURE AND PH
 INSTABILITY.

11/80	302	78.4	78.1	95.4	77.8				
	303	100.0	17.8	100.0	17.8				
	SYSTEM	100.0	96.0	100.0	95.6	744	717	688	99.6

** PROBLEMS/SOLUTIONS/COMMENTS

DURING NOVEMBER THE FGD SYSTEM WAS FORCED OUT OF SERVICE DUE TO FAILURE
 OF THE QUENCHER PUMPS, SAMPLE LINE AND TRANSFORMER.

THE BOILER UNIT TRIPPED CAUSING APPROXIMATELY FIVE HOURS OF OUTAGE TIME
 DURING THE MONTH.

12/80	302	0.0	0.0		0.0				
	303	100.0	98.6	100.0	96.6				
	SYSTEM	100.0	98.6	100.0	96.6	744	729	719	86.2

** PROBLEMS/SOLUTIONS/COMMENTS

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

1/81	302	0.0	0.0		0.0				
	303	100.0	52.9	100.0	46.1				
	SYSTEM	100.0	52.9	100.0	46.1	744	649	343	80.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER WAS OUT OF SERVICE APPROXIMATELY 123 HOURS DURING JANUARY.

MODULE 303 WAS TAKEN OUT OF SERVICE FOR APPROXIMATELY 272 HOURS DUE TO THE
 LOW SULFUR CONTENT OF THE COAL. MODULE 302 WAS NOT AVAILABLE FOR OPERATIO
 DURING JANUARY.

2/81	302	0.0	0.0		0.0				
	303	100.0	27.4	100.0	27.4				
	SYSTEM	100.0	27.4	100.0	27.4	672	672	184	95.6

** PROBLEMS/SOLUTIONS/COMMENTS

DURING FEBRUARY THE OPERATION OF THE FGD SYSTEM WAS REDUCED DUE TO THE LOW
 SULFUR CONTENT OF THE COAL.

REPAIRS WERE MADE ON TOWER 302 DURING THE MONTH.

3/81	302	78.5	23.7	52.5	23.7				
	303	0.0	0.0		0.0				
	SYSTEM	78.5	23.7	52.5	23.7	744	744	177	87.5

** PROBLEMS/SOLUTIONS/COMMENTS

DURING MARCH LOW OPERABILITY OF MODULE 302 WAS DUE TO THE FIRING OF LOW
 SULFUR COAL.

MODULE 303 WAS UNAVAILABLE DUE TO A MALFUNCTION OF THE LIMESTONE GRINDING
 CIRCUIT.

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

ARIZONA ELECTRIC POWER: APACHE 3 (CONT.)

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

4/81	302	100.0	75.3	100.0	35.8				
	303	0.0	0.0		0.0				
	SYSTEM	100.0	75.3	100.0	35.8	720	342	258	44.5

** PROBLEMS/SOLUTIONS/COMMENTS

DURING APRIL THE BOILER WAS UNAVAILABLE DUE TO A 2 WEEK SCHEDULED MAINTENANCE OUTAGE.

MODULE 303 WAS NOT AVAILABLE FOR OPERATION DUE TO EROSION PROBLEMS DISCOVERED IN THE MODULE BOWL AREA. THIS HAS BEEN A CONTINUAL PROBLEM AND THE UTILITY IS PRESENTLY CONDUCTING STUDIES TO ALLEVIATE THE PROBLEM.

5/81	302	100.0	87.1	100.0	87.1				
	303	100.0	0.0		0.0				
	SYSTEM	100.0	87.1	100.0	87.1	744	648	648	90.0

** PROBLEMS/SOLUTIONS/COMMENTS

DURING MAY THE BOILER WAS TAKEN OUT OF SERVICE APPROXIMATELY 96 HOURS DUE TO MAINTENANCE.

5/81	302	100.0	86.7	100.0	86.7				
	303	100.0	0.0		0.0				
	SYSTEM	100.0	86.7	100.0	86.7	720	720	624	87.1

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JUNE MODULE 303 WAS OUT OF SERVICE DUE TO REPAIRS ON THE ESP.

7/81	302	45.2	11.9	100.0	10.8				
	303	100.0	57.3	100.0	51.6				
	SYSTEM	100.0	69.2	100.0	69.2	744	670	464	77.6

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE 302 WAS REMOVED FROM SERVICE ON JULY 1 AS A RESULT OF PROBLEMS WITH THE ELECTROSTATIC PRECIPITATOR. MODULE 303 WAS PLACED IN SERVICE ON JULY 17 SO THAT PREVENTIVE MAINTENANCE COULD BE PERFORMED ON MODULE 302

8/81	302	0.0	0.0		0.0				
	303	100.0	100.0	100.0	100.0				
	SYSTEM	100.0	100.0	100.0	100.0	744	744	744	89.1

9/81	302	0.0	0.0		0.0				
	303	62.4	62.5	62.4	62.4				
	SYSTEM	62.4	62.5	62.4	62.4	720	718	449	80.8

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE 303 WAS OFF LINE FOR APPROXIMATELY ELEVEN DAYS DURING SEPTEMBER AS A RESULT OF A MALFUNCTION THAT CAUSED THE INLET AND OUTLET DAMPERS TO CLOSE.

10/81	302	0.0	0.0		0.0				
	303	96.2	98.2	96.2	96.2				
	SYSTEM	96.2	98.2	96.2	96.2	744	729	716	78.6

** PROBLEMS/SOLUTIONS/COMMENTS

DURING OCTOBER TOWER 303 WAS OUT OF SERVICE FOR THREE HOURS TO CHANGE THE QUENCHER PUMPS.

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

ARIZONA ELECTRIC POWER: APACHE 3 (CONT.)

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

ADDITIONAL FGD SYSTEM OUTAGE TIME RESULTED FROM UNIT TRIPS.

11/81	302	0.0	0.0		88.1				
	303	100.0	100.0	88.1	88.1				
	SYSTEM	100.0	100.0	88.1	88.1	720	634	634	63.6

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE 303 WAS OUT OF SERVICE FROM NOVEMBER 3 THROUGH NOVEMBER 11 DUE TO ESP PROBLEMS.

12/81	SYSTEM					744			
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** PROBLEMS/SOLUTIONS/COMMENTS

THE ORIGINAL COPY OF THE DECEMBER UPDATE INFORMATION WAS LOST IN THE MAIL.

1/82	302	95.1	84.0	93.7	73.2				
	303		0.0		0.0				
	SYSTEM	95.1	84.0	93.7	73.2	744	648	544	62.2

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JANUARY MODULE 302 WAS OUT OF SERVICE PART OF THE TIME DUE TO A LEAK IN THE COLLECTION BOWL BELOW THE ABSORBER PACKING.

2/82	302	95.5	93.9	95.5	93.6				
	303		0.0		0.0				
	SYSTEM	95.5	93.9	95.5	93.6	672	670	635	84.4

** PROBLEMS/SOLUTIONS/COMMENTS

DURING FEBRUARY APPROXIMATELY 25 HOURS OF OUTAGE TIME WAS REQUIRED FOR MAINTENANCE ON THE COLLECTION BOWL.

3/82	302	21.9	24.6	20.6	20.3				
	303	0.0	0.0		0.0				
	SYSTEM	21.9	24.6	20.6	20.3	744	615	151	47.2

** PROBLEMS/SOLUTIONS/COMMENTS

ON MARCH 6, BOTH MODULES WERE TAKEN OUT OF SERVICE FOR MAJOR REPAIR AND RECONSTRUCTION. THIS RESULTED IN SUSPENSION OF SCRUBBING OPERATIONS FOR THE REMAINDER OF THE MONTH.

4/82	302	0.0	0.0		0.0				
	303	0.0	0.0		0.0				
	SYSTEM	0.0	0.0		0.0	720	53	0	3.8

** PROBLEMS/SOLUTIONS/COMMENTS

ON APRIL 1 AND APRIL 2, BOTH MODULES WERE OUT OF SERVICE FOR MAJOR REPAIR AND RECONSTRUCTION.

AS OF APRIL 3, THE UNIT WAS DOWN FOR ANNUAL MAINTENANCE AND REPAIR.

5/82	302	0.0	0.0		0.0				
	303	0.0	0.0		0.0				
	SYSTEM	0.0	0.0		0.0	744	510	0	49.6

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

ARIZONA ELECTRIC POWER: APACHE 3 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS OUT OF SERVICE FOR THE MONTH OF MAY FOR MAJOR REPAIR AND RECONSTRUCTION.

5/82	302		0.0		0.0				
	303	52.4	49.2	45.0	38.9				
	SYSTEM	52.4	49.2	45.0	38.9	720	569	280	66.9

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE 303 WAS PLACED BACK IN SERVICE ON JUNE 11 AFTER COMPLETION OF MAJOR REPAIRS AND RECONSTRUCTION.

MODULE 303 WAS TAKEN OFF-LINE FOR APPROXIMATELY THREE DAYS DUE TO HIGH OPACITY AND A QUENCHER PUMP MALFUNCTION.

ESP REPAIRS SHUT THE SYSTEM DOWN FOR APPROXIMATELY THREE DAYS.

6/82	302	59.0	56.6	100.0	56.1				
	303	40.9	41.3	100.0	40.9				
	SYSTEM	99.9	97.9	100.0	97.0	744	738	722	87.8

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE 303 WAS TAKEN OUT OF SERVICE ON JULY 13 TO REPAIR A LEAK IN THE PACKING RETURN LINE TO THE ABSORBER FEED TANK.

MODULE 302 WAS PLACED IN SERVICE ON JULY 13 AFTER COMPLETION OF MAJOR REPAIRS AND RECONSTRUCTION.

MODULE 302 WAS OUT OF SERVICE APPROXIMATELY 11 HOURS ON JULY 21 FOR TESTING PURPOSES.

MODULE 302 WAS OUT OF SERVICE 11 HOURS ON JULY 26 DUE TO A TRIP OF UNIT 3.

7/82	302	96.8	95.3	96.4	87.6				
	303	100.0	0.0		0.0				
	SYSTEM	96.8	95.3	96.4	87.6	744	685	652	85.9

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING AUGUST.

8/82	302	100.0	85.3	100.0	72.8				
	303	100.0	0.0		0.0				
	SYSTEM	100.0	85.3	100.0	72.8	720	615	524	60.8

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING SEPTEMBER.

9/82	302	100.0	91.0	100.0	90.9				
	303	100.0	0.0		0.0				
	SYSTEM	100.0	91.0	100.0	90.9	744	743	676	74.6

** PROBLEMS/SOLUTIONS/COMMENTS

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

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

ARIZONA ELECTRIC POWER: APACHE 3 (CONT.)

-----PERFORMANCE DATA-----										
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART. HOURS	PER BOILER HOURS	FGD HOURS	CAP. FACTOR
11/82	302	98.4	65.4	97.1	53.8					
	303	100.0	0.0		0.0					
	SYSTEM	98.4	65.4	97.1	53.8		720	592	387	55.3
** PROBLEMS/SOLUTIONS/COMMENTS										
THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING NOVEMBER.										
12/82	302	100.0	69.2	100.0	61.6					
	303	100.0	0.0		0.0					
	SYSTEM	100.0	69.2	100.0	61.6		744	662	458	46.2
** PROBLEMS/SOLUTIONS/COMMENTS										
NO MAJOR FGD-RELATED PROBLEMS WERE REPORTED BY THE UTILITY DURING DECEMBER.										
1/83	302	8.1	5.8	100.0	4.8					
	303	78.6	34.8	68.1	28.5					
	SYSTEM	86.7	40.6	100.0	33.2		744	609	247	40.2
** PROBLEMS/SOLUTIONS/COMMENTS										
MODULE 302 WAS TAKEN OUT OF SERVICE ON JANUARY 3 DUE TO AN INDUCED DRAFT FAN MALFUNCTION.										
MODULE 303 WAS PLACED BACK IN SERVICE ON JANUARY 6.										
2/83	302	100.0	0.0		0.0					
	303	100.0	74.3	100.0	20.7					
	SYSTEM	100.0	74.3	100.0	20.7		672	187	139	17.5
** PROBLEMS/SOLUTIONS/COMMENTS										
THE UNIT WAS TAKEN OFF LINE FEBRUARY 8 DUE TO LOW DEMAND.										
3/83	302	100.0	17.6	100.0	10.7					
	303	100.0	50.9	100.0	31.0					
	SYSTEM	100.0	68.5	100.0	41.8		744	454	311	43.4
** PROBLEMS/SOLUTIONS/COMMENTS										
THE UNIT WAS OFF LINE FROM MARCH 18 TO MARCH 28 DUE TO LOW DEMAND.										
4/83	302				0.0					
	303				0.0					
	SYSTEM				0.0		720	0	0	0.0
** PROBLEMS/SOLUTIONS/COMMENTS										
UNIT 3 WAS DOWN DURING THE MONTH OF APRIL FOR ANNUAL MAINTENANCE AND REPAIR.										
5/83	302				0.0					
	303				0.0					
	SYSTEM				0.0		744	0	0	0.0
** PROBLEMS/SOLUTIONS/COMMENTS										
UNIT 3 WAS DOWN DURING MAY FOR ANNUAL MAINTENANCE AND REPAIR.										
6/83	302	91.7	42.2	81.5	36.6					

UTILITY FGD SURVEY: JANUARY - DECEMBER 1982

ARIZONA ELECTRIC POWER: APACHE 3 (CONT.)

-----PERFORMANCE DATA-----										
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART. HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	303	100.0	0.0		0.0					
	SYSTEM	91.7	42.2	81.5	36.6		720	624	263	50.8

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING JUNE.

7/83	302	99.4	56.0	97.7	25.3					
	303	100.0	0.0		0.0					
	SYSTEM	99.4	56.0	97.7	25.3		744	336	188	28.7
3/83	302	97.6	56.4	95.4	48.5					
	303	100.0	0.0		0.0					
	SYSTEM	97.6	56.4	95.4	48.5		744	641	361	56.8

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING JULY AND AUGUST.

9/83	302	100.0	0.0		0.0					
	303	100.0	0.0		0.0					
	SYSTEM	100.0	0.0		0.0		720	7	0	0.1

** PROBLEMS/SOLUTIONS/COMMENTS

BOTH MODULES WERE OUT OF SERVICE DURING SEPTEMBER DUE TO THE UNIT OPERATING AT REDUCED LOAD.

10/83	302	100.0	0.0		0.0					
	303	98.5	38.8	95.9	35.2					
	SYSTEM	100.0	38.8	95.9	35.2		744	675	262	40.8
1/83	302	100.0	0.0		0.0					
	303	96.7	44.4	91.9	38.0					
	SYSTEM	100.0	44.4	91.9	38.0		720	616	274	41.0
2/83	302	100.0	0.0		0.0					
	303	99.8	21.6	98.9	18.0					
	SYSTEM	100.0	21.6	98.9	18.0		744	618	134	29.2

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD-RELATED PROBLEMS WERE REPORTED DURING THE FOURTH QUARTER OF 1983.

1/84	302	100.0	0.0		0.0					
	303	100.0	29.1	100.0	26.9					
	SYSTEM	100.0	29.1	100.0	26.9		744	690	201	35.7
2/84	302	100.0	0.0		0.0					
	303	99.9	46.0	99.7	46.0					
	SYSTEM	100.0	46.0	99.7	46.0		696	696	320	50.0
3/84	302	100.0	0.5	100.0	0.5					
	303	100.0	51.4	100.0	45.5					
	SYSTEM	100.0	51.9	100.0	45.9		744	659	342	45.6
4/84	302	100.0	0.0		0.0					
	303	100.0	91.6	100.0	18.1					
	SYSTEM	100.0	91.6	100.0	18.1		720	143	131	10.7
5/84	302	100.0	69.3	100.0	44.1					

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

ARIZONA ELECTRIC POWER: APACHE 3 (CONT.)

-----PERFORMANCE DATA-----										
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	303	77.4	27.7	100.0	17.6					
	SYSTEM	100.0	97.0	100.0	61.7		744	473	459	44.4
** PROBLEMS/SOLUTIONS/COMMENTS										
THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE PERIOD OF JANUARY THROUGH MAY 1984.										
6/84	302	77.6	78.1	78.2	77.6					
	303	0.0	0.0	0.0	0.0					
	SYSTEM	77.6	78.1	78.2	77.6		720	716	559	68.6
** PROBLEMS/SOLUTIONS/COMMENTS										
ON JUNE 24, MODULE 302 WAS TAKEN OUT OF SERVICE FOR PACKING REPAIRS AND REMAINED OUT OF SERVICE FOR THE REST OF THE MONTH.										
7/84	302	0.0	0.0		0.0					
	303	88.0	87.9	88.0	87.9					
	SYSTEM	44.0	44.0	88.0	44.0		744	744	327	82.0
** PROBLEMS/SOLUTIONS/COMMENTS										
MAINTENANCE WAS COMPLETED ON MODULE 303 AND IT WAS PLACED BACK INTO SERVICE ON JULY 4, 1984.										
MODULE 302 WAS UNAVAILABLE FOR SERVICE DURING THE MONTH DUE TO ABSORBER PACKING REPAIRS.										
8/84	SYSTEM						744			
** PROBLEMS/SOLUTIONS/COMMENTS										
INFORMATION WAS UNAVAILABLE FOR AUGUST 1984.										
9/84	302	100.0	99.8	100.0	99.8					
	303	0.0	0.0		0.0					
	SYSTEM	100.0	99.8	100.0	99.8		720	720	719	77.7
10/84	302	100.0	100.0	100.0	51.3					
	303	0.0	0.0	0.0	0.0					
	SYSTEM	100.0	100.0	100.0	51.3		744	382	382	38.3
** PROBLEMS/SOLUTIONS/COMMENTS										
TOWER 303 WAS OUT OF SERVICE DURING THE MONTHS OF SEPTEMBER AND OCTOBER FOR PATCHING, RELINING, COATING AND GENERAL CLEANING.										
11/84	302	100.0			0.0					
	303	0.0			0.0					
	SYSTEM	100.0			0.0		720	0	0	0.0
** PROBLEMS/SOLUTIONS/COMMENTS										
THE UTILITY REPORTED THAT UNIT 3 WAS OFF LINE FOR THE MONTH OF NOVEMBER AS A RESULT OF LOW CONSUMER DEMAND. TOWER 303 WAS UNAVAILABLE FOR SERVICE DURING THE MONTH DUE TO EXTENSIVE REPAIRS.										
12/84	302	89.4	95.9	97.1	88.5					
	303	0.0	0.0	0.0	0.0					
	SYSTEM	89.4	95.9	97.1	88.5		744	687	659	63.2

ILITY FGD SURVEY: JANUARY - DECEMBER 1988

IZONA ELECTRIC POWER: APACHE 3 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT TOWER 303 WAS UNAVAILABLE FOR THE MONTH OF
 DECEMBER FOR RELINING, COATING, AND GENERAL REPAIRS.

/85	302	100.0	100.0	100.0	100.0				
	303	0.0	0.0	0.0	0.0				
	SYSTEM	100.0	100.0	100.0	100.0	744	744	744	75.3

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE 303 WAS OUT OF SERVICE DURING JANUARY FOR ABSORBER RELINING,
 COATING AND GENERAL REPAIRS.

/85	302	99.6	98.6	99.6	97.8				
	303	0.0	0.0	0.0	0.0				
	SYSTEM	99.6	98.6	99.6	97.8	672	666	657	69.2

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE 303 WAS OUT OF SERVICE THROUGH THE MONTH FOR MAJOR REPAIRS.

/85	302	100.0	97.5	100.0	10.6				
	303	0.0	0.0		0.0				
	SYSTEM	100.0	97.5	100.0	10.6	744	81	79	5.1

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS TAKEN OFF LINE ON 3/4/85 FOR ANNUAL MAINTENANCE AND REPAIR.
 MODULE 303 MAJOR REPAIRS CONTINUED THROUGH THE MONTH.

/85	302	100.0	94.5	100.0	33.1				
	303	0.0	0.0	0.0	0.0				
	SYSTEM	100.0	94.5	100.0	33.1	720	253	239	13.3

** PROBLEMS/SOLUTIONS/COMMENTS

THE MODULE 303 MAJOR REPAIRS INITIATED IN JANUARY 1985 CONTINUED
 THROUGH APRIL.

/85	302	87.1	71.4	100.0	71.4				
	303	100.0	31.9	100.0	31.9				
	SYSTEM	100.0	100.0	100.0	100.0	744	744	744	50.4

/85	302	99.6	30.7	98.7	30.7				
	303	98.4	98.4	98.4	98.4				
	SYSTEM	100.0	100.0	100.0	100.0	720	720	720	71.1

/85	302	98.5	66.4	97.7	66.3				
	303	98.6	67.1	93.6	67.1				
	SYSTEM	100.0	100.0	100.0	100.0	744	744	744	75.5

** PROBLEMS/SOLUTIONS/COMMENTS

NO FGD SYSTEM PROBLEMS WERE REPORTED BY THE UTILITY FOR THE MONTHS OF
 MAY THROUGH JULY 1985.

/85	302	40.3	9.1	76.3	9.1				
	303	100.0	98.5	100.0	98.5				
	SYSTEM	100.0	100.0	100.0	100.0	744	744	744	81.2

/85	302	0.0	0.0	0.0	0.0				
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UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

ARIZONA ELECTRIC POWER: APACHE 3 (CONT.)

-----PERFORMANCE DATA-----										
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
10/85	303	100.0	98.7	100.0	57.1					
	SYSTEM	100.0	98.7	100.0	57.1		720	417	411	39.1
	302	0.0	0.0	0.0	0.0					
11/85	303	91.9	92.6	92.6	91.9					
	SYSTEM	91.9	92.6	92.6	91.9		744	739	684	76.7
	302	0.0	0.0	0.0	0.0					
12/85	303	99.8	83.6	84.2	48.4					
	SYSTEM	99.8	83.6	84.2	48.4		720	417	349	45.6
	302	0.0	0.0		0.0					
1/86	303	100.0	51.7	100.0	1.0					
	SYSTEM	100.0	51.7	100.0	1.0		744	15	8	0.6

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE 302 WAS TAKEN OUT OF SERVICE ON 8/13/85 FOR MAJOR REPAIRS AND WAS UNAVAILABLE FOR SERVICE FOR THE REMAINDER OF THE MONTH. THE MODULE REMAINED OUT OF SERVICE THROUGH DECEMBER 1985.

1/86	302	20.8	14.7	94.8	14.7					
	303	100.0	86.0	99.5	86.0					
	SYSTEM	100.0	100.0	100.0	100.0		744	744	744	72.7

** PROBLEMS/SOLUTIONS/COMMENTS

TOWER 302 WAS OUT OF SERVICE FOR MAINTENANCE FROM 1/1/86 THROUGH 1/25/86.

2/86	302	100.0	100.0	100.0	100.0					
	303	100.0	0.0	0.0	0.0					
	SYSTEM	100.0	100.0	100.0	100.0		672	672	672	77.6
3/86	302	80.6	100.0	100.0	68.5					
	303	80.6	0.0	0.0	0.0					
	SYSTEM	100.0	100.0	100.0	68.5		744	510	510	46.5
4/86	302	0.0			0.0					
	303	0.0			0.0					
	SYSTEM	0.0			0.0		720	0	0	0.0

** PROBLEMS/SOLUTIONS/COMMENTS

TOWERS 302 AND 303 WERE TAKEN OUT OF SERVICE ON 3/25/86 FOR MAINTENANCE DURING THE SCHEDULED UNIT SHUTDOWN WHICH CONTINUED THROUGH APRIL.

5/86	302	0.0			0.0					
	303	4.3			0.0					
	SYSTEM	4.3			0.0		744	0	0	0.0

** PROBLEMS/SOLUTIONS/COMMENTS

APACHE 3 WAS NOT OPERATED IN MAY BECAUSE OF LOW CONSUMER DEMAND.

6/86	302	100.0	6.0	100.0	4.2					
	303	99.8	72.6	99.6	51.2					
	SYSTEM	100.0	78.6	100.0	55.5		720	508	399	27.9

** PROBLEMS/SOLUTIONS/COMMENTS

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

7/86	302	100.0	44.0	100.0	26.2					
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UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

ARIZONA ELECTRIC POWER: APACHE 3 (CONT.)

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

303	72.3	55.8	98.0	33.2				
SYSTEM	100.0	99.8	100.0	59.3	744	443	442	27.7

** PROBLEMS/SOLUTIONS/COMMENTS

TOWER 303 WAS UNAVAILABLE FOR SERVICE FROM 7/22/86 THROUGH THE END OF THE MONTH FOR REPAIRS AND CLEANING.

8/86	302	100.0	98.4	100.0	20.5			
	303	53.0	0.0		0.0			
	SYSTEM	100.0	98.4	100.0	20.5	744	155	152 11.2

** PROBLEMS/SOLUTIONS/COMMENTS

TOWER 303 REMAINED OUT OF SERVICE UNTIL 8/15/86 AS CLEANING, INSPECTION, AND REPAIR OF TOWER PACKING AND NOZZLES CONTINUED FROM LAST MONTH.

9/86	302	67.8	100.0	100.0	62.8			
	303	78.6	1.1	100.0	0.7			
	SYSTEM	100.0	100.0	100.0	63.4	720	452	457 30.7

** PROBLEMS/SOLUTIONS/COMMENTS

TOWER 302 WAS OUT OF SERVICE FOR CLEANING AND INSPECTION OF TOWER PACKING AND NOZZLES FROM 9/21/86 THROUGH THE END OF OCTOBER. TOWER 303 WAS OUT OF SERVICE FOR TOWER PACKING, WASHING, AND INSPECTION FROM 9/24/86 THROUGH THE END OF OCTOBER.

0/86	302	0.0			0.0			
	303	0.0			0.0			
	SYSTEM	0.0			0.0	744	0	0 0.0

1/86	302	100.0	0.0		0.0			
	303	100.0	95.9	99.8	56.1			
	SYSTEM	100.0	95.9	99.8	56.1	720	421	404 20.8

2/86	SYSTEM					774		
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** PROBLEMS/SOLUTIONS/COMMENTS

NO INFORMATION WAS REPORTED BY THE UTILITY FOR THE MONTH OF DECEMBER.

1/87	SYSTEM					744		
2/87	SYSTEM					672		
3/87	SYSTEM					744		
4/87	SYSTEM					720		
5/87	SYSTEM					744		
6/87	SYSTEM					720		
7/87	SYSTEM					744		
8/87	SYSTEM					744		
9/87	SYSTEM					720		

ARIZONA ELECTRIC POWER: APACHE 3 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE MUNTERS PACKING IN THE ABSORBER TOWERS ON BOTH UNITS 2 AND 3 WERE REPLACED WITH A MATERIAL CALLED POLY-PAC. THE REPLACEMENT WAS CONDUCTED OVER A PERIOD OF 3 YEARS. THE TOWERS ARE ALSO BEING RELINED WITH A MATERIAL CALLED TROWEL-ON 325EXL AS THE ORIGINAL FLAKELINE 103 MATERIAL FAILS. THE MATERIAL IS BEING USED FROM THE BASE OF THE TOWER UP TO AND PAST THE BOWL ARM.

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED OUTAGES WERE ENCOUNTERED DURING THE FIRST 3 QUARTERS OF 1987.

10/87	SYSTEM	744
11/87	SYSTEM	720
12/87	SYSTEM	744

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE THIRD QUARTER OF 1987, THE UTILITY BEGAN USING COMPLIANCE COAL BYPASSING THE FGD SYSTEM. THE UNIT IS EXPECTED TO OPERATE IN THIS MANNER ALL OF 1988.

1/88	SYSTEM	774
2/88	SYSTEM	672
3/88	SYSTEM	774
4/88	SYSTEM	720
5/88	SYSTEM	774
6/88	SYSTEM	720
7/88	SYSTEM	774
8/88	SYSTEM	774
9/88	SYSTEM	720
10/88	SYSTEM	774
11/88	SYSTEM	720
12/88	SYSTEM	774

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE UNIT CONTINUED TO BURN COMPLIANCE COAL ALL OF 1988. THE COLORADO SUBBITUMINOUS COAL HAS A SULFUR CONTENT OF 0.3 PERCENT, A HEATING VALUE OF 12,500 BTU, AND AN ASH CONTENT OF 15 TO 17 PERCENT. NO PROBLEMS WERE REPORTED CONCERNING THE UNIT DURING 1988. HOWEVER, THE UTILITY REPORTED EXPERIENCING OPACITY PROBLEMS DUE TO THE ASH CHARACTERISTICS OF THE COAL. THE UTILITY IS CURRENTLY TESTING VARIOUS CHEMICAL ADDITIVES TO IMPROVE PARTICULATE COLLECTION OF THEIR ESP.

SECTION 13
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	ARIZONA PUBLIC SERVICE	
PLANT NAME	CHOLLA	
UNIT NUMBER	1	
CITY	JOSEPH CITY	
STATE	ARIZONA	
REGULATORY CLASSIFICATION	C	
PARTICULATE EMISSION LIMITATION - NG/J	84.	(0.196 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	430.	(1.000 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	344.	(0 800 LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	615	
GROSS UNIT GENERATING CAPACITY - MW	126	
NET UNIT GENERATING CAPACITY W/FGD - MW	115	
NET UNIT GENERATING CAPACITY WO/FGD - MW	119	
EQUIVALENT SCRUBBED CAPACITY - MW	126	
** 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	226.51	(480000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	135.6	(276 F)
STACK HEIGHT - M	76.	(250 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	3.7	(12.0 FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	BITUMINOUS	
AVERAGE HEAT CONTENT - J/G	23609.	(10150 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		9650-10600
AVERAGE ASH CONTENT - %	13.50	
RANGE ASH CONTENT - %	9.7-22.5	
AVERAGE MOISTURE CONTENT - %	15.00	
RANGE MOISTURE CONTENT - %	****	
AVERAGE SULFUR CONTENT - %	0.50	
RANGE SULFUR CONTENT - %	0.4-1.0	
AVERAGE CHLORIDE CONTENT - %	0.02	
RANGE CHLORIDE CONTENT - %	0.01-0.04	
*** PARTICLE CONTROL		
** MECHANICAL COLLECTOR		
NUMBER	1	
NUMBER OF SPARES	0	
TYPE	CYCLONE	
SUPPLIER	RESEARCH-COTTRELL	
INLET FLUE GAS CAPACITY - CU.M/S	276.5	(480000 ACFM)
INLET FLUE GAS TEMPERATURE - C	135.6	(276 F)
PARTICLE REMOVAL EFFICIENCY -%	75.0	
** ESP		
NUMBER	0	
TYPE	NONE	
** PARTICLE SCRUBBER		
NUMBER	2	
INITIAL START-UP DATE	10/1973	
GENERIC TYPE	VENTURI TOWER	
SPECIFIC TYPE	VARIABLE-THROAT/BOTTOM-ENTRY LIQUID DISTRIBUTION	
TRADE NAME/COMMON NAME	FLOODED DISC SCRUBBER	
SUPPLIER	RESEARCH-COTTRELL	
DIMENSIONS - FT	6.0 DIA X 45.0	
SHELL GENERIC MATERIAL	STAINLESS STEEL	
SHELL SPECIFIC MATERIAL	AUSTENITIC	
LINER GENERIC MATERIAL	ORGANIC	
LINER SPECIFIC MATERIAL	MAT-REINFORCED EPOXY	
GAS CONTACTING DEVICE TYPE	NONE	
NUMBER OF CONTACTING ZONES	1	
LIQUID RECIRCULATION RATE - LITER/S	336.4	(5340 GPM)

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

ARIZONA PUBLIC SERVICE: CHOLLA 1 (CONT.)

L/G RATIO - LITER/CU.M	2.9	(22.0 GAL/1000ACF)
PH CONTROL ADDITIVE	ABSORBER SLURRY	TRAIN A ONLY!
PRESSURE DROP - KPA	3.7	(15.0 IN-H2O)
INLET GAS FLOW RATE - CU.M/S	113.3	(240000 ACFM)
INLET GAS TEMPERATURE - C	136.7	(278 F)
PARTICLE REMOVAL EFFICIENCY - %	99.2	

* FGD SYSTEM

** GENERAL DATA

SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT
SO2 REMOVAL MODE	WET SCRUBBING
PROCESS TYPE	LIMESTONE
PROCESS ADDITIVES	NONE
SYSTEM SUPPLIER	RESEARCH-COTTRELL
A-E FIRM	EBASCO
DEVELOPMENT LEVEL	FULL SCALE
NEW/RETROFIT	RETROFIT
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	55.00
ENERGY CONSUMPTION - %	3.2
CURRENT STATUS	1
COMMERCIAL START-UP	12/1973
INITIAL START-UP	10/1973
CONTRACT AWARDED	7/1971

** DESIGN AND OPERATING PARAMETERS

DESIGN COAL SULFUR CONTENT - %	0.60
DESIGN CHLORIDE CONTENT - %	*****
OPER. & MAINT. REQUIREMENT - MANHR/DAY	40.0

** QUENCHER/PRESATURATOR

NUMBER	0
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** ABSORBER

NUMBER	1
GENERIC TYPE	COMBINATION TOWER
SPECIFIC TYPE	SPRAY/PACKED
TRADE NAME/COMMON TYPE	N/A
SUPPLIER	RESEARCH-COTTRELL
DIMENSIONS - FT	22.0 DIA X 70.0
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	VERTICAL CROSS CHANNEL FIXED GRID PACKING
NUMBER OF CONTACTING ZONES	1
DISTANCE BETWEEN GAS CONTACTING ZONES - CM	61.0 (24.0IN)
LIQUID RECIRCULATION RATE - LITER/S	586. (9300 GPM)
L/G RATIO - L/CU.M	6.0 (45.0 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	0.1 (0.5 IN-H2O)
SUPERFICIAL GAS VELOCITY - M/SEC	2.1 (6.9 FT/S)
INLET GAS FLOW - CU. M/S	96.74 (205000 ACFM)
INLET GAS TEMPERATURE - C	50.0 (122 F)
SO2 REMOVAL EFFICIENCY - %	92.0
PARTICLE REMOVAL EFFICIENCY - %	99.7

** ABSORBER

NUMBER	1
GENERIC TYPE	SPRAY TOWER
SPECIFIC TYPE	OPEN COUNTERCURRENT SPRAY
TRADE NAME/COMMON TYPE	N/A
SUPPLIER	RESEARCH-COTTRELL
DIMENSIONS - FT	22.0 DIA X 70.0
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

ARIZONA PUBLIC SERVICE: CHOLLA 1 (CONT.)

GAS CONTACTING DEVICE TYPE	NONE
NUMBER OF CONTACTING ZONES	1
LIQUID RECIRCULATION RATE - LITER/S	586. (9300 GPM)
L/G RATIO - L/CU.M	6.0 (45.0 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	0.1 (0.5 IN-H2O)
SUPERFICIAL GAS VELOCITY - M/SEC	2.1 (6.9 FT/S)
INLET GAS FLOW - CU. M/S	96.74 (205000 ACFM)
INLET GAS TEMPERATURE - C	50.0 (122 F)
SO2 REMOVAL EFFICIENCY - %	25.0
** MIST ELIMINATOR	PRIMARY COLLECTOR
PRE-MIST ELIMINATOR/MIST ELIMINATOR	2
NUMBER PER SYSTEM	1
NUMBER PER MODULE	CYCLONIC
GENERIC TYPE	CYCLONIC SEPARATOR
SPECIFIC TYPE	CYCLONIC TOWER
TRADE NAME/COMMON TYPE	VERTICAL
CONFIGURATION	1
NUMBER OF STAGES	STAINLESS STEEL
CONSTRUCTION MATERIAL GENERIC TYPE	AUSTENITIC
CONSTRUCTION MATERIAL SPECIFIC TYPE	NONE
WASH WATER SOURCE	N/A
WASH FREQUENCY	
** REHEATER	2
NUMBER	1
NUMBER PER MODULE	IN-LINE
GENERIC TYPE	STEAM
SPECIFIC TYPE	BARE TUBE
TRADE NAME/COMMON TYPE	SEPARATE VESSEL AFTER ABSORBER
LOCATION	0.0
PERCENT GAS BYPASSED - AVG	22.2 (40 F)
TEMPERATURE INCREASE - C	115.62 (245000 ACFM)
INLET FLUE GAS FLOW RATE - CU. M/S	48.9 (120 F)
INLET FLUE GAS TEMPERATURE - C	71.1 (160 F)
OUTLET FLUE GAS TEMPERATURE - C	3
NUMBER OF BUNDLES PER BANK	STAINLESS STEEL
CONSTRUCTION MATERIAL GENERIC TYPE	AUSTENITIC
CONSTRUCTION MATERIAL SPECIFIC TYPE	
** FANS	2
NUMBER	0
NUMBER OF SPARES	CENTRIFUGAL
DESIGN	WESTINGHOUSE
SUPPLIER	UNIT
FUNCTION	FORCED DRAFT
APPLICATION	DRY
SERVICE	113.26 (240000 ACFM)
FLUE GAS FLOW RATE - CU.M/S	135.6 (276 F)
FLUE GAS TEMPERATURE - C	CARBON STEEL
CONSTRUCTION MATERIAL GENERIC TYPE	
** FANS	2
NUMBER	0
NUMBER OF SPARES	CENTRIFUGAL
DESIGN	WESTINGHOUSE
SUPPLIER	BOOSTER
FUNCTION	FORCED DRAFT
APPLICATION	DRY
SERVICE	113.26 (240000 ACFM)
FLUE GAS FLOW RATE - CU.M/S	135.6 (276 F)
FLUE GAS TEMPERATURE - C	CARBON STEEL
CONSTRUCTION MATERIAL GENERIC TYPE	
** DAMPERS	2
NUMBER	SHUT-OFF
FUNCTION	GUILLOTINE
GENERIC TYPE	NR
SPECIFIC TYPE	STAINLESS STEEL
CONSTRUCTION MATERIAL GENERIC TYPE	AUSTENITIC
CONSTRUCTION MATERIAL SPECIFIC TYPE	

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

ARIZONA PUBLIC SERVICE: CHOLLA 1 (CONT.)

LINER GENERIC MATERIAL TYPE	NONE
LINER SPECIFIC MATERIAL TYPE	N/A
* DAMPERS	
NUMBER	2
FUNCTION	SHUT-OFF
GENERIC TYPE	GUILLOTINE
SPECIFIC TYPE	NR
CONSTRUCTION MATERIAL GENERIC TYPE	STAINLESS STEEL
CONSTRUCTION MATERIAL SPECIFIC TYPE	AUSTENITIC
LINER GENERIC MATERIAL TYPE	NONE
LINER SPECIFIC MATERIAL TYPE	N/A
* DAMPERS	
NUMBER	2
FUNCTION	SHUT-OFF
GENERIC TYPE	GUILLOTINE
SPECIFIC TYPE	NR
CONSTRUCTION MATERIAL GENERIC TYPE	STAINLESS STEEL
CONSTRUCTION MATERIAL SPECIFIC TYPE	AUSTENITIC
LINER GENERIC MATERIAL TYPE	NONE
LINER SPECIFIC MATERIAL TYPE	N/A
* DAMPERS	
NUMBER	2
FUNCTION	CONTROL
GENERIC TYPE	LOUVER
SPECIFIC TYPE	NR
CONSTRUCTION MATERIAL GENERIC TYPE	STAINLESS STEEL
CONSTRUCTION MATERIAL SPECIFIC TYPE	AUSTENITIC
LINER GENERIC MATERIAL TYPE	NONE
LINER SPECIFIC MATERIAL TYPE	N/A
** DAMPERS	
NUMBER	2
FUNCTION	CONTROL
GENERIC TYPE	LOUVER
SPECIFIC TYPE	NR
CONSTRUCTION MATERIAL GENERIC TYPE	STAINLESS STEEL
CONSTRUCTION MATERIAL SPECIFIC TYPE	AUSTENITIC
LINER GENERIC MATERIAL TYPE	NONE
LINER SPECIFIC MATERIAL TYPE	N/A
** 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
** DUCTWORK	
LOCATION	SCRUBBER OUTLET TO REHEATER
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
SHELL SPECIFIC MATERIAL TYPE	AISI 1110
LINER GENERIC MATERIAL TYPE	ORGANIC
LINER SPECIFIC MATERIAL TYPE	MICA FLAKE-FILLED POLYESTER
** DUCTWORK	
LOCATION	BYPASS
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	NONE
DEVICE	N/A
DEVICE TYPE	N/A
NUMBER	0

ARIZONA PUBLIC SERVICE: CHOLLA 1 (CONT.)

** TANKS	
SERVICE	NUMBER
-----	-----
SCRUBBER RECYCLE	1
WASTE SLURRY BLEED	2
ABSORBER RECYCLE	1
REAGENT PREP PRODUCT	2
** PUMPS	
SERVICE	NUMBER
-----	-----
SCRUBBER RECIRCULATION	3
ABSORBER RECIRCULATION	2
MIST ELIMINATOR WASH	****
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	NONE
*** SALEABLE BYPRODUCTS	
NATURE	NONE
DISPOSITION	N/A
*** SLUDGE	
MOISTURE CONTENT - % TOTAL FREE WATER	87.0
** 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	70-100 ACRES X 6 FT DEEP
SITE CAPACITY - CU.M	623730 (510.0 ACRE-FT)
** PROCESS CONTROL AND INSTRUMENTATION	
PROCESS STREAM	SCRUBBER AND ABSORBER HOLD TANK
CHEMICAL PARAMETERS	PH
CONTROL LEVELS	PH 5.2 IN SCRUBBER HOLD TANK, 6.5 IN ABSORBER HO
PROCESS CONTROL MANNER	MANUAL
** WATER BALANCE	
WATER LOOP TYPE	OPEN
MAKEUP WATER ADDITION - LITERS/S	7.6 (120 GPM)
** CHEMICALS AND CONSUMPTION	
FUNCTION	ABSORBENT
NAME	LIMESTONE
SOURCE/SUPPLIER	SUPERIOR CO.
POINT OF ADDITION	ABSORBER RECYCLE TANK
** FGD SPARE CAPACITY INDICES	
ABSORBER - %	0.0
** FGD SPARE COMPONENT INDICES	
ABSORBER	0.0

ILITY FGD SURVEY: JANUARY - DECEMBER 1988

IZONA PUBLIC SERVICE: CHOLLA 1 (CONT.)

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

1/73 SYSTEM

744

** PROBLEMS/SOLUTIONS/COMMENTS

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

THE DATA COLLECTED INCLUDED THE FOLLOWING:

FLOODED DISC SCRUBBER SO2 REMOVAL EFFICIENCY (MODULE A): 92%

SPRAY TOWER SCRUBBER SO2 REMOVAL EFFICIENCY (MODULE B): 25%

UNIT OVERALL SO2 REMOVAL EFFICIENCY: 58.5%

MIST CARRYOVER FROM MODULES A AND B: 0%

SOLIDS CARRYOVER FROM MODULE A: 0.005 GR/SCF

AIR LEAKAGE INTO SYSTEM DOWNSTREAM OF SCRUBBERS: 18,400 ACFM

CHLORIDE ION CONCENTRATION IN FLOODED DISC SCRUBBER RECIRCULATION:
1600 PPM

CHLORIDE ION CONCENTRATION IN SPRAY TOWER RECIRCULATION: 575 PPM

CHLORIDE ION CONCENTRATION IN SCRUBBER MAKEUP WATER (COOLING TOWER
BLOWDOWN): 933 PPM

CHLORIDE LEVELS ARE SUFFICIENT TO CAUSE PITTING CORROSION IN LOCALIZED
AREAS WHEN TEMPERATURES ARE GREATER THAN 140F AND PH IS LESS THAN
3.0.

1/73 SYSTEM

720

2/73 SYSTEM

744

** PROBLEMS/SOLUTIONS/COMMENTS

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

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

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

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

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

SOLIDS SETTLED OUT IN STANDBY PUMPS, AND EXCESSIVE FAN VIBRATIONS OCCURRED
BECAUSE OF ACCUMULATION OF SCALE BUILDUP WHEN THE UNIT WAS IDLE. TO
SOLVE THESE PROBLEMS THE PACKING GLAND POSITION WAS REVERSED (INSTALLED
UPSIDE DOWN). THE FAN WAS SANDBLASTED. THE PIPING WAS MODIFIED TO
ELIMINATE STAGNANT POCKETS, AND PUMPS WERE FLUSHED IMMEDIATELY AFTER
REMOVAL FROM SERVICE.

THE UTILITY EXPERIENCED SOLIDS BUILDUP IN THE FDS STUFFING GLAND BOX AND
ON TOP OF THE SPRAY DOME.

1/74 A
B
SYSTEM

97.0
90.0
93.5

744

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

ARIZONA PUBLIC SERVICE: CHOLLA 1 (CONT.)

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

2/74 A 100.0
 B 94.0
 SYSTEM 97.0 672

3/74 A 100.0
 B 66.0
 SYSTEM 83.0 744

4/74 A 66.0
 B 57.0
 SYSTEM 61.5 720

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM PERFORMED SATISFACTORILY FROM DECEMBER 15, 1973 TO APRIL 15, 1974. ALTHOUGH SEVERAL UPSETS CAUSED SHUTDOWN OF ONE OR BOTH MODULES FOR SHORT PERIODS SYSTEM AVAILABILITY AVERAGED 92.6% DURING THAT PERIOD.

THE SCRUBBER MODULES WERE SHUTDOWN FOR SHORT PERIODS IN APRIL TO REPLACE CORRODED COR-TEN STEEL EXPANSION JOINTS ON THE REHEATER BUNDLES. MODULE A WAS DOWN APRIL 17 THROUGH 27. MODULE B WAS DOWN APRIL 15 THROUGH 28.

5/74 A 98.0
 B 99.0
 SYSTEM 98.5 744 744

6/74 A 100.0
 B 100.0
 SYSTEM 100.0 720

7/74 A 97.5 97.0 97.5
 B 98.5 92.0 98.5
 SYSTEM 98.0 94.5 98.0 744 744 729

8/74 A 94.5 97.0 94.5
 B 100.0 100.0 100.0
 SYSTEM 97.3 98.5 97.3 744 744 724

** PROBLEMS/SOLUTIONS/COMMENTS

EACH MODULE WAS OUT OF SERVICE ONE DAY OVER THE MONTH FOR THE INSTALLATION OF BAFFLE PLATES IN THE INLET DUCT OF EACH REHEATER. THE BAFFLE INSTALLATIONS WERE PARTLY SUCCESSFUL IN STOPPING REHEATER VIBRATION PROBLEMS.

9/74 A 95.0
 B 99.0
 SYSTEM 97.0 720

10/74 A 83.0
 B 68.0
 SYSTEM 75.5 744

** PROBLEMS/SOLUTIONS/COMMENTS

THE SYSTEM WAS SHUT DOWN IN LATE OCTOBER FOR AN ANNUAL BOILER AND FGD SYSTEM OVERHAUL.

DURING THE OUTAGE SEVERAL INSTANCES OF PITTING CORROSION WERE DISCOVERED IN THE 316L SS FLOODED DISCS SCRUBBER WALLS.

REHEATER TUBE LEAKS WERE DISCOVERED IN THE B-SIDE REHEATER DURING THE OUTAGE.

-----PERFORMANCE DATA-----
 R100 MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION % REMOVAL PER BOILER FGD CAP.
 SO2 PART. HOURS HOURS HOURS HOURS FACTOR

174	A		100.0					
	B		98.0					
	SYSTEM		99.0			720		
174	A		100.0					
	B		100.0					
	SYSTEM		100.0			744		
175	A	97.7	97.7	97.7				
	B	98.7	98.7	98.7				
	SYSTEM	98.2	98.2	98.2		744	744	730

** PROBLEMS/SOLUTIONS/COMMENTS

OPERATION OF THE SYSTEM THROUGHOUT 1975 AND 1976 WAS ACCOMPANIED BY A NUMBER OF MINOR PROBLEM AREAS INCLUDING: SIGNIFICANT CORROSION ATTACK IN THE VESSEL WALLS OF THE VENTURI FLOODED-DISC PARTICULATE SCRUBBER MODULE; ACI CORROSION IN THE B-SIDE REHEATER HOUSING; SCALE BUILDUP IN THE PIPE OUTLET AT THE SLUDGE/FLYASH EVAPORATION POND; PLUGGING IN THE SCRUBBER TOWER PACKING AND MIST ELIMINATOR; EROSION IN THE PUMPS; CORROSION IN THE BOILER EXHAUST ELBOW OF THE DUCTWORK LEADING FROM THE SCRUBBERS TO THE STACK.

DURING JANUARY THE BYPASS SYSTEM EXPERIENCED CONTROL PROBLEMS. NO SOLUTION HAS YET BEEN FOUND.

A LEAK IN THE B-SIDE ABSORBER TOWER WAS WELDED IN JANUARY.

SOME LEAKS WERE DISCOVERED OVER THE MOUTH ON THE A-SIDE VENTURI THROATS. THE LEAKS WERE ATTRIBUTED TO NORMAL WEAR.

LEAKS WERE DISCOVERED IN THE B-SIDE REHEATER DUCTS IN JANUARY.

175	A	95.5	95.5	95.5				
	B	91.4	91.4	91.4				
	SYSTEM	93.5	93.5	93.5		672	672	628

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT PROBLEMS WITH VESSEL LEAKS CONTINUED THROUGH FEBRUARY.

SOME OUTAGE TIME WAS REQUIRED FOR RECYCLE PUMP REPAIRS OVER THE MONTH.

THE UTILITY DISCOVERED SOME ADDITIONAL EROSION/CORROSION PROBLEMS IN THE FGD SYSTEM IN FEBRUARY.

175	SYSTEM					744		
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** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT BUILDUP OF SEDIMENT HAS OCCURRED SEVERAL TIMES SINCE STARTUP IN DEAD SPACES, IN PIPE LINES, AND VALVES OF IDLE PUMPS AS WELL AS IN PROCESS LINES DURING PERIODS OF REDUCED OPERATING RATE.

SOME PIPE LINERS HAVE EXPERIENCED EROSION SINCE STARTUP. THE EROSION WAS DUE IN SOME CASES TO UNSATISFACTORY LINER MATERIALS AND IN OTHER CASES TO HIGH VELOCITIES THROUGH PIPES AND FITTINGS. PIPING MODIFICATIONS HELPED TO REDUCE THE EROSION PROBLEM. CRACKING OF THE RUBBER LINING IN SOME PIPES WAS DUE TO DEFECTS IN FABRICATION.

SOME FLOODED DISC SCRUBBER PACKING PLUGGING HAS OCCURRED. IT APPEARS THAT THIS IS A RESULT OF THE GRADE OF COAL BURNED. THE "WETTED FILM CONTACTOR" PACKING LIFE HAS BEEN REDUCED.

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

ARIZONA PUBLIC SERVICE: CHOLLA 1 (CONT.)

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

4/75	A		88.5	88.5	82.4						
	B		65.2	65.2	60.7						
	SYSTEM		76.9	76.9	71.6		720	670	515		
** PROBLEMS/SOLUTIONS/COMMENTS											
THE UTILITY REPORTED THAT THERE ARE STILL PROBLEMS WITH THE BYPASS SYSTEM CONTROLS.											
SOME DOWN TIME WAS REQUIRED TO REPAIR VALVES AND PIPING AND TO UNPLUG SECTIONS OF THE A MODULE TOWER PACKING (MUNTERS).											
THE REHEATER SECTION WAS AGAIN PATCHED WITH CEILCOTE DURING APRIL.											
5/75	A		47.5	47.5	47.5						
	B		39.9	39.9	39.9						
	SYSTEM		43.7	43.7	43.7		744	744	325		
** PROBLEMS/SOLUTIONS/COMMENTS											
BOTH MODULES WERE OUT OF SERVICE FOR MOST OF THE MONTH SO THAT SCHEDULED REPAIRS AND CLEANING COULD BE UNDERTAKEN.											
6/75	A	100.0	100.0	100.0	100.0						
	B	100.0	100.0	100.0	100.0						
	SYSTEM	100.0	100.0	100.0	100.0		720	720	720		
** PROBLEMS/SOLUTIONS/COMMENTS											
A SUBSTANTIAL AMOUNT OF PLUGGING WAS OBSERVED IN THE MODULE A ABSORBER TOWER PACKING.											
PLUGGING OCCURRED IN MIST ELIMINATORS.											
NO MAJOR PROBLEMS WERE ENCOUNTERED DURING THE PERIOD.											
7/75	A		97.5	97.5	97.5						
	B		98.5	98.5	98.5						
	SYSTEM		98.0	98.0	98.0		744	744	729		
** PROBLEMS/SOLUTIONS/COMMENTS											
MODULES WERE SHUT DOWN TO CLEAN FLOW RESTRICTIONS IN FLOODED-DISC RECIRCULATION LINES.											
8/75	A		94.5	94.5	94.5						
	B	100.0	100.0	100.0	100.0						
	SYSTEM		97.3	97.3	97.3		744	744	724		
** PROBLEMS/SOLUTIONS/COMMENTS											
THE A-SIDE WAS SHUT DOWN FOR INSPECTION.											
9/75	A		64.5	97.6	64.5						
	B		93.0	97.4	93.0						
	SYSTEM		78.8	97.5	78.8		720	720	567		
** PROBLEMS/SOLUTIONS/COMMENTS											
MINOR OUTAGE RESULTED FROM PLUGGED FLOODED DISC SCRUBBER RECIRCULATION LINES.											
10/75	A		78.0	84.0	56.4						

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

ARIZONA PUBLIC SERVICE: CHOLLA 1 (CONT.)

-----PERFORMANCE DATA-----										
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	B	24.6	54.8	17.8						
	SYSTEM	51.3	69.4	37.1			744	538	276	
** PROBLEMS/SOLUTIONS/COMMENTS										
OUTAGES RESULTED FROM SCHEDULED EQUIPMENT OVERHAULS AND RECOATING OF VESSELS.										
1/75	A	100.0	100.0	100.0						
	B	71.4	80.0	71.4						
	SYSTEM	85.7	90.0	85.7			720	720	617	
** PROBLEMS/SOLUTIONS/COMMENTS										
NO MAJOR OUTAGES OR PROBLEMS OCCURRED DURING THE REPORT PERIOD.										
1/75	A	100.0	100.0	100.0						
	B	100.0	100.0	100.0						
	SYSTEM	100.0	100.0	100.0			744	744	744	
** PROBLEMS/SOLUTIONS/COMMENTS										
MINOR PROBLEMS ENCOUNTERED REQUIRED RECYCLE PUMP REBUILDING.										
THE B-SIDE REHEATER COIL MALFUNCTIONED BUT NO OUTAGE TIME WAS REQUIRED.										
1/76	A	96.0	98.9	96.0						
	B	87.9	98.6	89.9						
	SYSTEM	92.0	98.8	92.0			744	744	684	
** PROBLEMS/SOLUTIONS/COMMENTS										
MINOR VALVE PLUGGING OCCURRED.										
MINOR RECIRCULATION LINE PLUGGING OCCURRED.										
MODULE B OPERATING HOURS WERE LOWER BECAUSE OF REDUCED SYSTEM REQUIREMENT										
2/76	SYSTEM						696			
3/76	SYSTEM						744			
** PROBLEMS/SOLUTIONS/COMMENTS										
INFORMATION WAS UNAVAILABLE FOR THE MONTHS OF FEBRUARY AND MARCH.										
4/76	A		99.0							
	B		97.4							
	SYSTEM		98.2				720			
** PROBLEMS/SOLUTIONS/COMMENTS										
THE FGD SYSTEM IS CURRENTLY EXPERIENCEING COATING FAILURES IN THE ELBOW OF THE SCRUBBER EXHAUST DUCT LEADING TO THE STACK.										
THE UTILITY PERFORMED SOME MINOR REPAIRS TO THE HOUSING OF THE B-SIDE REHEATER.										
5/76	A		76.4							
	B		99.6							
	SYSTEM		88.0				744			

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

ARIZONA PUBLIC SERVICE: CHOLLA 1 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

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

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

PLUGGING OCCURRED IN THE FLOODED DISC SCRUBBER PACKING.

PLUGGING OCCURRED IN THE MIST ELIMINATORS.

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

6/76	A		64.1					
	B		39.4					
	SYSTEM		51.8			720		

** PROBLEMS/SOLUTIONS/COMMENTS

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

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

7/76	A		100.0					
	B		97.5					
	SYSTEM		98.8			744		

8/76	A		100.0					
	B		100.0					
	SYSTEM		100.0			744		

** PROBLEMS/SOLUTIONS/COMMENTS

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

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

9/76	A	100.0	100.0	100.0	100.0			
	B		93.9	100.0	93.9			
	SYSTEM		97.0	100.0	97.0	720	720	698

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER WAS IN SERVICE THE ENTIRE MONTH. NO SIGNIFICANT SCRUBBER PROBLEMS WERE REPORTED.

10/76	A		99.5	56.0	55.8			
	B		66.4	56.0	37.2			
	SYSTEM		83.0	56.0	46.5	744	417	346

11/76	A		94.8	95.8	94.8			
	B		77.2	97.6	77.2			
	SYSTEM		86.1	96.7	86.1	720	720	619

ILITY FGD SURVEY: JANUARY - DECEMBER 1988

IZONA PUBLIC SERVICE: CHOLLA 1 (CONT.)

-----PERFORMANCE DATA-----
R100 MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION % REMOVAL PER BOILER FGD CAP.
SO2 PART. HOURS HOURS HOURS FACTOR

** PROBLEMS/SOLUTIONS/COMMENTS

TWO MINOR FORCED SCRUBBER OUTAGES OCCURRED DURING THE PERIOD.

A REHEATER STEAM LEAK CAUSED A MINOR FORCED OUTAGE.

AN INLET GAS DAMPER ADJUSTMENT PROBLEM IN BOTH THE A-SIDE AND B-SIDE
SCRUBBING TRAINS CAUSED A MINOR OUTAGE.

/76	A	99.8	99.7	99.8			
	B	67.0	100.0	67.0			
	SYSTEM	99.9	99.0	83.4	744	744	620

** PROBLEMS/SOLUTIONS/COMMENTS

ONE OUTAGE WAS REPORTED. THE OUTAGE WAS THE RESULT OF AN ADDITIONAL AD-
JUSTMENT TO THE A-SIDE GAS INLET DAMPER.

/77	A	71.6	72.3	71.6			
	B	91.9	93.4	91.9			
	SYSTEM	81.8	82.9	81.8	744	744	608

** PROBLEMS/SOLUTIONS/COMMENTS

THE PERFORMANCE INDEX VALUES CONTAINED IN THESE TABLES ARE BASED UPON THE
MODULE ACTUAL SERVICE TIME FOR THE PERIOD VERSUS THE NUMBER OF HOURS THE
MODULES ARE CALLED UPON TO OPERATE FOR THE SAME PERIOD. THE MODULES OPER-
ATE ON A DEMAND-ONLY BASIS. FLUE GAS IS BYPASSED AROUND THE MODULES WHEN
THEY ARE NOT REQUIRED FOR SERVICE.

THE MUNTERS PACKING IN THE A-SIDE TOWER WAS REPLACED IN JANUARY.

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MINOR CORROSION OCCURRED IN THE SYSTEM.

MINOR PLUGGING OF SCRUBBER INTERNALS OCCURRED. THE TOWERS WERE CLEANED.

SOME PROBLEMS OCCURRED WITH THE LIQUID PIPING.

AVERAGE SO2 INLET AND OUTLET CONCENTRATIONS DURING JANUARY WERE 350 PPM
AND 175 PPM RESPECTIVELY.

/77	A	96.5	98.8	96.5			
	B	88.0	99.6	88.0			
	SYSTEM	92.2	99.2	92.2	672	672	620

** PROBLEMS/SOLUTIONS/COMMENTS

THERE WERE MECHANICAL DIFFICULTIES WITH THE BY-PASS DAMPERS.

AVERAGE SO2 INLET AND OUTLET VALUES DURING FEBRUARY WERE 350 PPM AND 175
PPM RESPECTIVELY.

/77	A	71.6	72.3	71.6			
	B	91.9	93.4	91.9			
	SYSTEM	81.8	82.9	81.8	744	744	608

** PROBLEMS/SOLUTIONS/COMMENTS

THE A-SIDE TOWER PACKING WAS REPLACED DURING MARCH.

BOTH MODULES WERE OUT OF SERVICE FOR CLEANING OF AREAS OF PLUGGING
IN THE SCRUBBER INTERNALS DURING THE MONTH.

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

ARIZONA PUBLIC SERVICE: CHOLLA 1 (CONT.)

-----PERFORMANCE DATA-----										
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
4/77	A		99.6	100.0	88.2					
	B		98.6	100.0	87.3					
	SYSTEM		99.1	100.0	87.8		720	638	632	
** PROBLEMS/SOLUTIONS/COMMENTS										
THE UTILITY REPORTED NO MAJOR PROBLEMS OCCURRED DURING APRIL.										
5/77	A		100.0	87.0	86.7					
	B		100.0	87.0	86.7					
	SYSTEM		100.0	87.0	86.7		744	645	645	
** PROBLEMS/SOLUTIONS/COMMENTS										
OUTAGE TIME FOR THE BOILER AND FGD SYSTEM WAS A RESULT OF THE SCHEDULED MID-YEAR SCRUBBER CLEANOUT.										
DURING MAY RESEARCH-COTTRELL PERSONNEL CONDUCTED FORCED OXIDATION TESTS B BLOWING AIR INTO THE FLOODED DISC SCRUBBER AND CONVERTING ALL CASO3 TO CASO4 YIELDING SUPERIOR SLUDGE DEWATERING HANDLING AND SCALE-FREE OPERATION.										
6/77	A	100.0	100.0	100.0	100.0					
	B	100.0	100.0	100.0	100.0					
	SYSTEM	100.0	100.0	100.0	100.0		720	720	720	
** PROBLEMS/SOLUTIONS/COMMENTS										
THE UTILITY REPORTED NO MAJOR PROBLEMS FOR THE MONTH OF JUNE.										
7/77	A			97.0						
	B			99.0						
	SYSTEM			98.0			744	744		
** PROBLEMS/SOLUTIONS/COMMENTS										
A MINOR LEAK OCCURRED IN THE LIMESTONE SLURRY TANK.										
A MINOR LEAK OCCURRED IN THE B-SIDE RETURN LINE FROM THE FLOODED DISC SCRUBBER TO THE SCRUBBER TANK.										
RESEARCH-COTTRELL PERSONNEL ARE STILL ON THE PLANT SITE CONTINUING FORCED OXIDATION STUDIES.										
8/77	A		97.2	97.2	97.2					
	B		98.6	98.6	98.6					
	SYSTEM		97.9	97.9	97.9		744	744	729	
** PROBLEMS/SOLUTIONS/COMMENTS										
DOWN TIME WAS REQUIRED TO REPAIR LEAKS IN THE SLURRY DISPOSAL TANK AND TH FLOODED DISC SCRUBBER RETURN LINE BETWEEN THE TOWER AND THE SCRUBBER RECYCLE TANK.										
9/77	A	100.0	99.7	100.0	99.7					
	B	100.0	99.7	100.0	99.7					
	SYSTEM	100.0	99.7	100.0	99.7		720	720	718	
** PROBLEMS/SOLUTIONS/COMMENTS										
ONLY ROUTINE MAINTENANCE WAS REQUIRED FOR THE SCRUBBING SYSTEM DURING SEPTEMBER.										

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

ARIZONA PUBLIC SERVICE: CHOLLA 1 (CONT.)

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

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

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED NO MAJOR PROBLEMS FOR OCTOBER.

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

** PROBLEMS/SOLUTIONS/COMMENTS

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

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

12/77	SYSTEM	0.0			0.0	744		0
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** PROBLEMS/SOLUTIONS/COMMENTS

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

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

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

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

1/78	A		97.0	97.0	17.6			
	B		90.9	96.9	16.5			
	SYSTEM		94.0	97.0	17.1	744	135	127

** PROBLEMS/SOLUTIONS/COMMENTS

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

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

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

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

ARIZONA PUBLIC SERVICE: CHOLLA 1 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

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

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

** PROBLEMS/SOLUTIONS/COMMENTS

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

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

** PROBLEMS/SOLUTIONS/COMMENTS

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

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

** PROBLEMS/SOLUTIONS/COMMENTS

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

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

** PROBLEMS/SOLUTIONS/COMMENTS

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

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

** PROBLEMS/SOLUTIONS/COMMENTS

ONLY ROUTINE MAINTENANCE WAS REQUIRED ON THE SCRUBBER FOR JULY.

8/78	A	100.0	100.0	100.0	100.0			
	B		95.1	95.1	95.1			
	SYSTEM		97.6	97.6	97.6	744	744	726

** PROBLEMS/SOLUTIONS/COMMENTS

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

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

ILITY FGD SURVEY: JANUARY - DECEMBER 1988

IZONA PUBLIC SERVICE: CHOLLA 1 (CONT.)

-----PERFORMANCE DATA-----
 R100 MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION % REMOVAL PER BOILER FGD CAP.
 SO2 PART. HOURS HOURS HOURS FACTOR

** PROBLEMS/SOLUTIONS/COMMENTS

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

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

** PROBLEMS/SOLUTIONS/COMMENTS

ONLY ROUTINE MAINTENANCE WAS REQUIRED ON THE SCRUBBER IN OCTOBER.

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

** PROBLEMS/SOLUTIONS/COMMENTS

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

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

** PROBLEMS/SOLUTIONS/COMMENTS

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

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

** PROBLEMS/SOLUTIONS/COMMENTS

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

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

** PROBLEMS/SOLUTIONS/COMMENTS

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

/79	A	100.0	100.0	100.0	100.0			
	B	100.0	100.0	100.0	100.0			
	SYSTEM	100.0	100.0	100.0	100.0	720	720	720

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED NO PROBLEMS FOR THE MONTH OF APRIL.

/79	A		99.1	99.4	99.1			
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UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

ARIZONA PUBLIC SERVICE: CHOLLA 1 (CONT.)

-----PERFORMANCE DATA-----										
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	B SYSTEM		44.1 71.6	44.1 71.8	44.1 71.6		744	744	533	
** PROBLEMS/SOLUTIONS/COMMENTS										
CORRODED DUCTWORK ON MODULE B FROM THE TOWER TO THE STACK WAS REPLACED DURING MAY.										
REPAIRS WERE MADE TO THE MODULE B SCRUBBER LINING.										
6/79	A B SYSTEM	100.0	78.2 100.0 89.1	78.0 100.0 89.0	78.2 100.0 89.1		720	720	642	
** PROBLEMS/SOLUTIONS/COMMENTS										
THE MODULE A ABSORBER TOWER MUNTERS PACKING WAS REPLACED DURING JUNE.										
EMERGENCY MAINTENANCE WAS PERFORMED JUNE 23 ON THE MODULE A COMMON DIS-CHARGE HEADER.										
7/79	SYSTEM						744			
** PROBLEMS/SOLUTIONS/COMMENTS										
NO INFORMATION WAS AVAILA3LE FOR THE MONTH OF JULY.										
8/79	A B SYSTEM		95.7 95.7 95.7	95.6 95.7 95.7	95.7 95.7 95.7		744	744	712	
** PROBLEMS/SOLUTIONS/COMMENTS										
DURING AUGUST GENERAL MAINTENANCE WAS PERFORMED ON THE FLOODED DISC SCRUBBER.										
9/79	SYSTEM						720			
** PROBLEMS/SOLUTIONS/COMMENTS										
INFORMATION WAS NOT AVAILABLE FOR THE MONTH OF SEPTEMBER.										
10/79	A B SYSTEM		97.8 94.3 96.1	100.0 98.0 99.0	45.0 43.3 44.2		744	342	328	
** PROBLEMS/SOLUTIONS/COMMENTS										
DURING OCTOBER ROUTINE MAINTENANCE WAS PERFORMED ON THE FGD SYSTEM.										
11/79	A B SYSTEM		77.0 98.5 87.8		77.0 98.5 87.8		720	720	632	
12/79	A B SYSTEM		94.0 86.7 90.4		94.0 86.7 90.4		744	744	672	
1/80	A B SYSTEM		95.5 99.1 97.3		95.5 99.1 97.3		744	744	724	91.7
2/80	A	100.0	100.0	100.0	100.0					

ILITY FGD SURVEY: JANUARY - DECEMBER 1988

IZONA PUBLIC SERVICE: CHOLLA 1 (CONT.)

-----PERFORMANCE DATA-----											
RIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	B		99.4		99.4						
	SYSTEM		99.7		99.7			696	696	694	92.1
/80	A		99.1		99.1						
	B		93.1		93.1						
	SYSTEM		96.1		96.1			744	744	715	88.6
** PROBLEMS/SOLUTIONS/COMMENTS											
NO FORCED OUTAGES WERE REPORTED BY THE UTILITY FOR THE FIVE MONTH PERIOD OF NOVEMBER 1979 THROUGH MARCH 1980. SOME SCHEDULED OUTAGE TIME WAS REQUIRED FOR REPAIR OF THE REHEATER DUCTWORK.											
/80	A	100.0	100.0	100.0	100.0						
	B	100.0	100.0	100.0	100.0						
	SYSTEM	100.0	100.0	100.0	100.0			720	720	720	82.8
** PROBLEMS/SOLUTIONS/COMMENTS											
NO FGD-RELATED PROBLEMS WERE REPORTED FOR THE MONTH OF APRIL.											
/80	A	100.0	100.0	100.0	100.0						
	B	99.2	99.2	99.2	99.2						
	SYSTEM	99.6	99.6	99.6	99.6			744	744	741	87.6
** PROBLEMS/SOLUTIONS/COMMENTS											
THE B-MODULE OUTAGE TIME IN MAY WAS CAUSED BY PROBLEMS WITH THE BOOSTER FAN.											
/80	A	100.0	80.7	100.0	68.7						
	B	99.3	87.7	99.1	74.6						
	SYSTEM	99.7	84.2	99.6	71.7			720	613	516	67.5
** PROBLEMS/SOLUTIONS/COMMENTS											
DURING JUNE SCHEDULED MAINTENANCE WAS PERFORMED ON THE BOILER. THE SCHEDULED OUTAGE TIME WAS NECESSARY TO ACID WASH THE CONDENSERS.											
THE ONLY FGD-RELATED OUTAGE OCCURRED WHEN A BLOCK VALVE MALFUNCTIONED. THE B-MODULE WAS OUT OF SERVICE FOR FIVE HOURS.											
/80	A	100.0	100.0	100.0	100.0						
	B	100.0	98.6	100.0	98.6						
	SYSTEM	100.0	99.3	100.0	99.3			744	744	739	95.8
** PROBLEMS/SOLUTIONS/COMMENTS											
THE FGD SYSTEM WAS AVAILABLE 100% OF THE TIME IN JULY. MODULE B WAS NOT UTILIZED FOR PART OF THE MONTH DUE TO LOW BOILER LOAD.											
/80	SYSTEM							744			
/80	SYSTEM							720			
** PROBLEMS/SOLUTIONS/COMMENTS											
DATA FOR THE AUGUST AND SEPTEMBER MONTHS WERE NOT AVAILABLE DUE TO PERSONNEL CHANGES.											
/80	SYSTEM							744			
/80	SYSTEM							720			
/80	SYSTEM							744			

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

ARIZONA PUBLIC SERVICE: CHOLLA 1 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

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

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

1/81	SYSTEM	744
2/81	SYSTEM	672
3/81	SYSTEM	744
4/81	SYSTEM	720
5/81	SYSTEM	744
6/81	SYSTEM	720
7/81	SYSTEM	744
8/81	SYSTEM	744
9/81	SYSTEM	720
10/81	SYSTEM	744
11/81	SYSTEM	720
12/81	SYSTEM	744
1/82	SYSTEM	744
2/82	SYSTEM	672
3/82	SYSTEM	744
4/82	SYSTEM	720
5/82	SYSTEM	744
6/82	SYSTEM	720
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	744

ILITY FGD SURVEY: JANUARY - DECEMBER 1988

IZONA PUBLIC SERVICE: CHOLLA 1 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

INFORMATION WAS UNAVAILABLE FOR THE PERIOD OF JANUARY 1981 TO MARCH 1983.

/83	SYSTEM	720
/83	SYSTEM	744
/83	SYSTEM	720

** PROBLEMS/SOLUTIONS/COMMENTS

INFORMATION WAS UNAVAILABLE FOR THE PERIOD OF JANUARY 1981 TO JUNE 1983.

/83	SYSTEM	744
/83	SYSTEM	744
/83	SYSTEM	720

** PROBLEMS/SOLUTIONS/COMMENTS

INFORMATION WAS UNAVAILABLE FOR THE THIRD QUARTER OF 1983.

/83	SYSTEM	744
/83	SYSTEM	720
/83	SYSTEM	744

** PROBLEMS/SOLUTIONS/COMMENTS

INFORMATION WAS UNAVAILABLE FOR THE FOURTH QUARTER OF 1983.

/84	SYSTEM	744
/84	SYSTEM	696
/84	SYSTEM	744
/84	SYSTEM	720
/84	SYSTEM	744
/84	SYSTEM	720
/84	SYSTEM	744
/84	SYSTEM	744
/84	SYSTEM	720

** PROBLEMS/SOLUTIONS/COMMENTS

INFORMATION WAS NOT AVAILABLE FOR THE FIRST THREE QUARTERS OF 1984.

/84	SYSTEM	744
/84	SYSTEM	720
/84	SYSTEM	744

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

ARIZONA PUBLIC SERVICE: CHOLLA 1 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE FOURTH QUARTER OF 1984. THE NEXT UNIT OUTAGE IS SCHEDULED FOR FEBRUARY AND WILL LAST APPROXIMATELY 3 WEEKS.

1/85	SYSTEM	744
2/85	SYSTEM	672
3/85	SYSTEM	744
4/85	SYSTEM	720
5/85	SYSTEM	744
6/85	SYSTEM	720
7/85	SYSTEM	744
8/85	SYSTEM	744
9/85	SYSTEM	720
10/85	SYSTEM	744
11/85	SYSTEM	720
12/85	SYSTEM	744

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE FGD SYSTEM OPERATED IN 1985 WITHOUT ANY SCHEDULED OR FORCED OUTAGES. FGD-RELATED PROBLEMS ENCOUNTERED DURING THE YEAR INCLUDED EROSION TO BOOSTER FAN ROTORS AND CORROSION TO THE INLINE REHEAT TUBE BUNDLES.

1/86	SYSTEM	774
2/86	SYSTEM	672

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT BEGAN OPERATING WITHOUT REHEAT DURING THE MONTH OF FEBRUARY. IT WAS DECIDED TO TRY WET STACK OPERATION DUE TO THE CONTINUED CORROSION-RELATED PROBLEMS WITH THE IN-LINE STEAM REHEAT SYSTEM.

3/86	SYSTEM	774
4/86	SYSTEM	720
5/86	SYSTEM	774

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS DOWN DURING THE MONTH OF MAY FOR A MAJOR TURBINE/BOILER OUTAGE. DURING THIS OUTAGE, THE UTILITY REPLACED THE SCRUBBER OUTLET DUCTWORK BETWEEN THE REHEATER AND STACK WITH HASTELLOY C-22 AT A COST OF \$55,000. PRIOR TO THIS, THE UTILITY WAS RELINING ONCE A YEAR AND REPLACING THE CARBON STEEL METAL DUCTWORK COMPLETELY EVERY THIRD YEAR.

6/86	SYSTEM	720
7/86	SYSTEM	774

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

IZONA PUBLIC SERVICE: CHOLLA 1 (CONT.)

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

86	SYSTEM									774
86	SYSTEM									720
86	SYSTEM									774
86	SYSTEM									720
86	SYSTEM									774

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT CAME BACK ON-LINE IN JUNE AND OPERATED UNTIL AUGUST AT WHICH TIME THE UNIT WAS PLACED ON COLD STANDBY. THE UNIT WAS CAPPED WITH NITROGEN AND IS NOT EXPECTED TO OPERATE UNTIL 1991. THIS WAS LARGELY DUE TO LACK IN POWER DEMAND AND THE RECENT START-UP OF 3000 MW OF NUCLEAR CAPACITY.

37	SYSTEM									744
37	SYSTEM									672
37	SYSTEM									744
37	SYSTEM									720
37	SYSTEM									744
37	SYSTEM									720
37	SYSTEM									744
37	SYSTEM									744
37	SYSTEM									720
37	SYSTEM									744
37	SYSTEM									720
37	SYSTEM									744

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS OCCURRED IN THE YEAR, 1987.

38	SYSTEM									774
38	SYSTEM									672
38	SYSTEM									774
38	SYSTEM									720
38	SYSTEM									774
38	SYSTEM									720
38	SYSTEM									774
38	SYSTEM									774
38	SYSTEM									720

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

ARIZONA PUBLIC SERVICE: CHOLLA 1 (CONT.)

-----PERFORMANCE DATA-----											
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PER PART.	BOILER HOURS	FGD HOURS	CAP. HOURS	FACTOR
10/88	SYSTEM							774			
11/88	SYSTEM							720			
12/88	SYSTEM							774			

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE JANUARY-DECEMBER 1988 PERIOD.

SECTION 13
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	ARIZONA PUBLIC SERVICE	
PLANT NAME	CHOCOLA	
UNIT NUMBER	2	
CITY	JOSEPH CITY	
STATE	ARIZONA	
REGULATORY CLASSIFICATION	C	
ARTICULATE EMISSION LIMITATION - NG/J	72.	(0.167 LB/MMBTU)
SO ₂ EMISSION LIMITATION - NG/J	430.	(1.000 LB/MMBTU)
CO EMISSION LIMITATION - NG/J	344.	(0.800 LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	615	
GROSS UNIT GENERATING CAPACITY - MW	250	
NET UNIT GENERATING CAPACITY W/FGD - MW	235	
NET UNIT GENERATING CAPACITY WO/FGD - MW	245	
EQUIVALENT SCRUBBED CAPACITY - MW	250	
** 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	519.09	(1100000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	142.2	(288 F)
STACK HEIGHT - M	168.	(550 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	4.5	(14.7 FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	BITUMINOUS	
AVERAGE HEAT CONTENT - J/G	23609.	(10150 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		9650-10600
AVERAGE ASH CONTENT - %	13.50	
RANGE ASH CONTENT - %	9.7-22.5	
AVERAGE MOISTURE CONTENT - %	15.00	
RANGE MOISTURE CONTENT - %	****	
AVERAGE SULFUR CONTENT - %	0.50	
RANGE SULFUR CONTENT - %	0.4-1.0	
AVERAGE CHLORIDE CONTENT - %	0.02	
RANGE CHLORIDE CONTENT - %	0.01-0.04	
** PARTICLE CONTROL		
** MECHANICAL COLLECTOR		
NUMBER	2	
NUMBER OF SPARES	0	
TYPE	CYCLONE	
SUPPLIER	RESEARCH-COTTRELL	
INLET FLUE GAS CAPACITY - CU.M/S	259.5	(550000 ACFM)
INLET FLUE GAS TEMPERATURE - C	137.8	(280 F)
PARTICLE REMOVAL EFFICIENCY -%	70.0	
** ESP		
NUMBER	0	
TYPE	NONE	
** PARTICLE SCRUBBER		
NUMBER	4	
NUMBER OF SPARES	1	
GENERIC TYPE	VENTURI TOWER	
SPECIFIC TYPE	VARIABLE-THROAT/BOTTOM-ENTRY LIQUID DISTRIBUTION	
TRADE NAME/COMMON NAME	FLOODED DISC SCRUBBER	
SUPPLIER	RESEARCH-COTTRELL	
DIMENSIONS - FT	6.0 DIA X 45.0	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	AISI 1110	
LINER GENERIC MATERIAL	ORGANIC	
LINER SPECIFIC MATERIAL	MAT-REINFORCED EPOXY	
GAS CONTACTING DEVICE TYPE	NONE	
NUMBER OF CONTACTING ZONES	1	
LIQUID RECIRCULATION RATE - LITER/S	617.4	(9800 GPM)

ARIZONA PUBLIC SERVICE: CHOLLA 2 (CONT.)

L/G RATIO - LITER/CU.M	3.3	(25.0 GAL/1000ACF)
PH CONTROL ADDITIVE	ABSORBER SLURRY	
PRESSURE DROP - KPA	5.7	(23.0 IN-H2O)
INLET GAS FLOW RATE - CU.M/S	185.0	(392000 ACFM)
INLET GAS TEMPERATURE - C	137.8	(280 F)
PARTICLE REMOVAL EFFICIENCY - %	99.0	

*** FGD SYSTEM

** GENERAL DATA

SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT
SO2 REMOVAL MODE	WET SCRUBBING
PROCESS TYPE	LIMESTONE
PROCESS ADDITIVES	NONE
SYSTEM SUPPLIER	RESEARCH-COTTRELL
A-E FIRM	EBASCO
DEVELOPMENT LEVEL	FULL SCALE
NEW/RETROFIT	NEW
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.70
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	75.00
ENERGY CONSUMPTION - %	4.0
CURRENT STATUS	1
COMMERCIAL START-UP	6/1978
INITIAL START-UP	4/1978
CONTRACT AWARDED	12/1974

** DESIGN AND OPERATING PARAMETERS

DESIGN COAL SULFUR CONTENT - %	0.60
DESIGN CHLORIDE CONTENT - %	*****
OPER. & MAINT. REQUIREMENT - MANHR/DAY	40.0

** QUENCHER/PRESATURATOR

NUMBER	0
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** ABSORBER

NUMBER	4
NUMBER OF SPARES	1
GENERIC TYPE	COMBINATION TOWER
SPECIFIC TYPE	SPRAY/PACKED
TRADE NAME/COMMON TYPE	N/A
SUPPLIER	RESEARCH-COTTRELL
DIMENSIONS - FT	22.0 DIA X 70.0
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	MAT-REINFORCED EPOXY; GLASS FLAKE-FILLED POLYEST
LINER MATERIAL TRADE NAME/COMMON TYPE	COROLINE 505AR; FLAKELINE 103
GAS CONTACTING DEVICE TYPE	VERTICAL CROSS CHANNEL FIXED GRID PACKING
NUMBER OF CONTACTING ZONES	2
LIQUID RECIRCULATION RATE - LITER/S	1210.
L/G RATIO - L/CU.M	6.5
SUPERFICIAL GAS VELOCITY - M/SEC	3.0
INLET GAS FLOW - CU. M/S	184.98
INLET GAS TEMPERATURE - C	50.0
SO2 REMOVAL EFFICIENCY - %	98.0
PARTICLE REMOVAL EFFICIENCY - %	99.0

** MIST ELIMINATOR

PRE-MIST ELIMINATOR/MIST ELIMINATOR	PRIMARY COLLECTOR
NUMBER PER SYSTEM	4
NUMBER OF SPARES PER SYSTEM	1
NUMBER PER MODULE	1
GENERIC TYPE	CYCLONIC
SPECIFIC TYPE	CYCLONIC SEPARATOR
TRADE NAME/COMMON TYPE	CYCLONIC TOWER
CONFIGURATION	VERTICAL
NUMBER OF STAGES	1
CONSTRUCTION MATERIAL GENERIC TYPE	STAINLESS STEEL
CONSTRUCTION MATERIAL SPECIFIC TYPE	AUSTENITIC
WASH WATER SOURCE	NONE

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

ARIZONA PUBLIC SERVICE: CHOLLA 2 (CONT.)

WASH FREQUENCY	N/A
** REHEATER	
NUMBER	4
NUMBER OF SPARES	1
NUMBER PER MODULE	1
GENERIC TYPE	IN-LINE
SPECIFIC TYPE	STEAM
TRADE NAME/COMMON TYPE	BARE TUBE
LOCATION	TOP OF THE ABSORBER
PERCENT GAS BYPASSED - AVG	0.0
TEMPERATURE INCREASE - C	22.2 (40 F)
INLET FLUE GAS TEMPERATURE - C	49.4 (121 F)
OUTLET FLUE GAS TEMPERATURE - C	71.1 (160 F)
NUMBER OF HEAT EXCHANGER BANKS	3
CONSTRUCTION MATERIAL GENERIC TYPE	HIGH ALLOY
CONSTRUCTION MATERIAL SPECIFIC TYPE	NICKEL BASE/CHROMIUM-IRON-MOLYBDENUM
** FANS	
NUMBER	2
DESIGN	CENTRIFUGAL
FUNCTION	UNIT
APPLICATION	FORCED DRAFT
SERVICE	DRY
FLUE GAS TEMPERATURE - C	137.8 (280 F)
CONSTRUCTION MATERIAL GENERIC TYPE	NR
** FANS	
NUMBER	2
DESIGN	CENTRIFUGAL
FUNCTION	BOOSTER
APPLICATION	INDUCED DRAFT
SERVICE	DRY
FLUE GAS TEMPERATURE - C	71.1 (160 F)
CONSTRUCTION MATERIAL GENERIC TYPE	ORGANIC; CARBON STEEL HOUSING!; STAINLESS STEEL
** DAMPERS	
NUMBER	4
FUNCTION	SHUT-OFF
GENERIC TYPE	GUILLOTINE
SPECIFIC TYPE	NR
MANUFACTURER	MOSSER
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL
LINER GENERIC MATERIAL TYPE	STAINLESS STEEL
LINER SPECIFIC MATERIAL TYPE	AUSTENITIC
** DAMPERS	
NUMBER	4
FUNCTION	CONTROL
GENERIC TYPE	LOUVER
SPECIFIC TYPE	NR
MANUFACTURER	MOSSER
CONSTRUCTION MATERIAL GENERIC TYPE	STAINLESS STEEL
CONSTRUCTION MATERIAL SPECIFIC TYPE	AUSTENITIC
LINER GENERIC MATERIAL TYPE	NONE
LINER SPECIFIC MATERIAL TYPE	N/A
** DAMPERS	
NUMBER	2
FUNCTION	CONTROL
GENERIC TYPE	LOUVER
MANUFACTURER	MOSSER
** DAMPERS	
NUMBER	4
FUNCTION	CONTROL
GENERIC TYPE	LOUVER
MANUFACTURER	MOSSER

ARIZONA PUBLIC SERVICE: CHOLLA 2 (CONT.)

** DAMPERS	
NUMBER	4
FUNCTION	SHUT-OFF
GENERIC TYPE	LOUVER
MANUFACTURER	MOSSER
** DUCTWORK	
LOCATION	INLET
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
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
SHELL SPECIFIC MATERIAL TYPE	AISI 1110
LINER GENERIC MATERIAL TYPE	ORGANIC; ORGANIC
LINER SPECIFIC MATERIAL TYPE	GLASS FLAKE-FILLED POLYESTER; INERT FLAKE-FILLED
** DUCTWORK	
LOCATION	BYPASS
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	COMPARTMENTED
DEVICE TYPE	NR
MANUFACTURER	KENNEDY VAN SAUN
NUMBER	2
FULL LOAD DRY FEED CAPACITY - M.TONS/HR	6.4 (7 TPH)
PRODUCT QUALITY - % SOLIDS	25.0
** TANKS	
SERVICE	NUMBER
-----	-----
ABSORBER FEED	2
REAGENT FEED	****
MILL SLURRY SUMP	****
SCRUBBER RECYCLE	4
SLUDGE STORAGE	****
** PUMPS	
SERVICE	NUMBER
-----	-----
SCRUBBER RECIRCULATION	12
ABSORBER RECIRCULATION	8
MILL SLURRY SUMP	****
REAGENT FEED	****
MIST ELIMINATOR WASH	****
*** SALEABLE BYPRODUCTS	
NATURE	NONE
DISPOSITION	N/A
*** SLUDGE	
MOISTURE CONTENT - % TOTAL FREE WATER	35.0
** TREATMENT	
METHOD	BLEED
DEVICE	NR
PROPRIETARY PROCESS	NONE
INLET QUALITY - %	15.0

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

ARIZONA PUBLIC SERVICE: CHOLLA 2 (CONT.)

** DISPOSAL		
NATURE	FINAL	
TYPE	POND	
LOCATION	ON-SITE	
SITE TRANSPORTATION METHOD	PIPELINE	
SITE TREATMENT	NONE	
** PROCESS CONTROL AND INSTRUMENTATION		
PROCESS STREAM	SCRUBBER AND ABSORBER HOLD TANK	
CHEMICAL PARAMETERS	PH	
CONTROL LEVELS	PH 4.8-5.2 IN SCRUBBER HOLD TANK; 5.9-6.2 IN ABS	
** WATER BALANCE		
WATER LOOP TYPE	OPEN	
MAKEUP WATER ADDITION - LITERS/S	7.6	(120 GPM)
** CHEMICALS AND CONSUMPTION		
FUNCTION	ABSORBENT	
NAME	LIMESTONE	
POINT OF ADDITION	BALL MILL	
** FGD SPARE CAPACITY INDICES		
SCRUBBER - %	33.3	
ABSORBER - %	33.3	
** FGD SPARE COMPONENT INDICES		
SCRUBBER	1.0	
ABSORBER	1.0	

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

4/78	SYSTEM						720		
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5/78	SYSTEM						744		
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** PROBLEMS/SOLUTIONS/COMMENTS

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

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

6/78	SYSTEM						720		
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7/78	SYSTEM						744		
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** PROBLEMS/SOLUTIONS/COMMENTS

SHAKEDOWN/DEBUGGING OPERATIONS ARE CONTINUING.

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

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

8/78	SYSTEM						744		
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9/78	SYSTEM						720		
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ARIZONA PUBLIC SERVICE: CHOLLA 2 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

THE SLURRY RECYCLE SYSTEM COMPONENTS ARE STILL EXPERIENCING RESONANT VIBRATIONS.

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

SHAKEDOWN/DEBUGGING OPERATIONS ARE CONTINUING.

10/78	SYSTEM	744
11/78	SYSTEM	720

** PROBLEMS/SOLUTIONS/COMMENTS

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

12/78	SYSTEM	744
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** PROBLEMS/SOLUTIONS/COMMENTS

DECEMBER-JANUARY INFORMATION IS UNAVAILABLE AT THIS TIME FOR CHOLLA 2. THE UTILITY REPORTED THAT IT WOULD SOON BE KEEPING PERFORMANCE RECORDS.

1/79	SYSTEM	744
2/79	SYSTEM	672
3/79	SYSTEM	744
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
4/80	SYSTEM	720
5/80	SYSTEM	744
6/80	SYSTEM	720

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

ARIZONA PUBLIC SERVICE: CHOLLA 2 (CONT.)

-----PERFORMANCE DATA-----											
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
7/80	SYSTEM								744		
8/80	SYSTEM								744		
9/80	SYSTEM								720		
10/80	SYSTEM								744		
11/80	SYSTEM								720		
12/80	SYSTEM								744		
1/81	SYSTEM								744		
2/81	SYSTEM								672		
3/81	SYSTEM								744		
4/81	SYSTEM								720		
5/81	SYSTEM								744		
6/81	SYSTEM								720		
7/81	SYSTEM								744		
8/81	SYSTEM								744		
9/81	SYSTEM								720		
10/81	SYSTEM								744		
11/81	SYSTEM								720		
12/81	SYSTEM								744		
1/82	SYSTEM								744		
2/82	SYSTEM								672		
3/82	SYSTEM								744		
4/82	SYSTEM								720		
5/82	SYSTEM								720		
6/82	SYSTEM								720		
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		

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

ARIZONA PUBLIC SERVICE: CHOLLA 2 (CONT.)

-----PERFORMANCE DATA-----										
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PER PART.	BOILER HOURS	FGD HOURS	CAP. FACTOR
3/83	SYSTEM								744	
** PROBLEMS/SOLUTIONS/COMMENTS										
INFORMATION WAS UNAVAILABLE FOR THE PERIOD OF JANUARY 1979 TO MARCH 1983.										
4/83	SYSTEM								720	
5/83	SYSTEM								744	
6/83	SYSTEM								720	
** PROBLEMS/SOLUTIONS/COMMENTS										
INFORMATION WAS UNAVAILABLE FOR THE PERIOD OF JANUARY 1979 TO JUNE 1983.										
7/83	SYSTEM								744	
8/83	SYSTEM								744	
9/83	SYSTEM								720	
** PROBLEMS/SOLUTIONS/COMMENTS										
INFORMATION WAS UNAVAILABLE FOR THE THIRD QUARTER OF 1983.										
10/83	SYSTEM								744	
11/83	SYSTEM								720	
12/83	SYSTEM								744	
** PROBLEMS/SOLUTIONS/COMMENTS										
INFORMATION WAS UNAVAILABLE FOR 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 NOT AVAILABLE FOR THE FIRST THREE QUARTERS OF 1984.										
10/84	SYSTEM								744	
11/84	SYSTEM								720	
12/84	SYSTEM								744	

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

ARIZONA PUBLIC SERVICE: CHOLLA 2 (CONT.)

-----PERFORMANCE DATA-----
 R100 MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION % REMOVAL PER BOILER FGD CAP.
 SO2 PART. HOURS HOURS HOURS FACTOR

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE FOURTH QUARTER OF 1984. THE NEXT UNIT OUTAGE IS SCHEDULED FOR APRIL AND WILL LAST APPROXIMATELY 4 WEEKS.

1/85	SYSTEM	744
2/85	SYSTEM	672
3/85	SYSTEM	744
4/85	SYSTEM	720
5/85	SYSTEM	744
6/85	SYSTEM	720
7/85	SYSTEM	744
8/85	SYSTEM	744
9/85	SYSTEM	720
10/85	SYSTEM	744
11/85	SYSTEM	720
12/85	SYSTEM	744

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO FGD-RELATED FORCED OUTAGES WERE ENCOUNTERED DURING THE YEAR 1985. THE FGD SYSTEM AVAILABILITY FOR THE YEAR WAS APPROXIMATELY 99 %.

1/86	SYSTEM	774
2/86	SYSTEM	672
3/86	SYSTEM	774
4/86	SYSTEM	720
5/86	SYSTEM	774
6/86	SYSTEM	720
7/86	SYSTEM	774
8/86	SYSTEM	774
9/86	SYSTEM	720
10/86	SYSTEM	774
11/86	SYSTEM	720
12/86	SYSTEM	774

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

ARIZONA PUBLIC SERVICE: CHOLLA 2 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED OUTAGES WERE ENCOUNTERED DURING 1986. THE UNIT HAD A SCHEDULED MINOR BOILER/FGD OUTAGE IN SEPTEMBER WHICH LASTED APPROXIMATELY 4 WEEKS. CURRENTLY, THE USUALLY BASE LOADED UNIT IS OPERATING AS A PEAK UNIT AND WILL REMAIN AS SUCH UNTIL APPROXIMATELY 1991.

1/87	SYSTEM	744
2/87	SYSTEM	672
3/87	SYSTEM	744
4/87	SYSTEM	720
5/87	SYSTEM	744
6/87	SYSTEM	720
7/87	SYSTEM	744
8/87	SYSTEM	744
9/87	SYSTEM	720
10/87	SYSTEM	744
11/87	SYSTEM	720
12/87	SYSTEM	744

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS OCCURRED IN THE YEAR, 1987.

1/88	SYSTEM	774
2/88	SYSTEM	672
3/88	SYSTEM	774
4/88	SYSTEM	720
5/88	SYSTEM	774
6/88	SYSTEM	720
7/88	SYSTEM	774
8/88	SYSTEM	774
9/88	SYSTEM	720
10/88	SYSTEM	774
11/88	SYSTEM	720
12/88	SYSTEM	774

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE JANUARY-DECEMBER 1988 PERIOD.

SECTION 13
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	ARIZONA PUBLIC SERVICE	
PLANT NAME	CHOLLA	
UNIT NUMBER	4	
CITY	JOSEPH CITY	
STATE	ARIZONA	
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	965	
GROSS UNIT GENERATING CAPACITY - MW	380	
NET UNIT GENERATING CAPACITY W/FGD - MW	350	
NET UNIT GENERATING CAPACITY WO/FGD - MW	352	
EQUIVALENT SCRUBBED CAPACITY - MW	137	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	COMBUSTION ENGINEERING	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	*****	(***** ACFM)
BOILER FLUE GAS TEMPERATURE - C	*****	(**** F)
STACK HEIGHT - M	*****	(**** FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	*****	(**** FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	BITUMINOUS	
AVERAGE HEAT CONTENT - J/G	23609.	(10150 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		****
AVERAGE ASH CONTENT - %	13.50	
RANGE ASH CONTENT - %	****	
AVERAGE MOISTURE CONTENT - %	15.00	
RANGE MOISTURE CONTENT - %	****	
AVERAGE SULFUR CONTENT - %	0.50	
RANGE SULFUR CONTENT - %	0.4-1.0	
AVERAGE CHLORIDE CONTENT - %	0.02	
RANGE CHLORIDE CONTENT - %	0.01-0.04	
*** 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	NONE	
*** FGD SYSTEM		
** GENERAL DATA		
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT	
SO2 REMOVAL MODE	WET SCRUBBING	
PROCESS TYPE	LIMESTONE	
SYSTEM SUPPLIER	RESEARCH-COTTRELL	
A-E FIRM	EBASCO	
DEVELOPMENT LEVEL	FULL SCALE	
NEW/RETROFIT	NEW	
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	95.00	
ENERGY CONSUMPTION - %	0.5	
CURRENT STATUS	1	
COMMERCIAL START-UP	6/1981	

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

ARIZONA PUBLIC SERVICE: CHOLLA 4 (CONT.)

INITIAL START-UP	3/1981
CONTRACT AWARDED	10/1977
** DESIGN AND OPERATING PARAMETERS	
DESIGN COAL SULFUR CONTENT - %	0.60
DESIGN CHLORIDE CONTENT - %	*****
** QUENCHER/PRESATURATOR	
CONSTRUCTION MATERIAL GENERIC TYPE	NR
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR
** ABSORBER	
NUMBER	1
GENERIC TYPE	COMBINATION TOWER
SPECIFIC TYPE	SPRAY/PACKED
TRADE NAME/COMMON TYPE	N/A
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
SO2 REMOVAL EFFICIENCY - %	95.0
** MIST ELIMINATOR	
PRE-MIST ELIMINATOR/MIST ELIMINATOR	PRIMARY COLLECTOR
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	BYPASS
SPECIFIC TYPE	NR
TRADE NAME/COMMON TYPE	NR
PERCENT GAS BYPASSED - AVG	64.0
CONSTRUCTION MATERIAL GENERIC TYPE	NR
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR
** FANS	
DESIGN	CENTRIFUGAL
FUNCTION	NR
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

ARIZONA PUBLIC SERVICE: CHOLLA 4 (CONT.)

** TANKS	NUMBER
SERVICE	-----
NR	****
** PUMPS	NUMBER
SERVICE	-----
NR	****
** SOLIDS CONCENTRATING/DEWATERING	NA
DEVICE	
*** SALEABLE BYPRODUCTS	NONE
NATURE	N/A
DISPOSITION	
*** SLUDGE	
** TREATMENT	BLEED
METHOD	NA
DEVICE	NA
PROPRIETARY PROCESS	
** DISPOSAL	FINAL
NATURE	POND
TYPE	ON-SITE
LOCATION	NONE
SITE TREATMENT	
** FGD SPARE CAPACITY INDICES	
ABSORBER - %	0.0
** FGD SPARE COMPONENT INDICES	
ABSORBER	0.0

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

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

744

** PROBLEMS/SOLUTIONS/COMMENTS

IN MARCH 1981 THE FGD SYSTEM COMMENCED OPERATIONS. THE SYSTEM OPERATED FOR APPROXIMATELY ONE WEEK BEFORE BEING TAKEN OFF LINE FOR A BEARING INSPECTION.

4/81 SYSTEM

720

5/81 SYSTEM

744

6/81 SYSTEM

720

7/81 SYSTEM

744

8/81 SYSTEM

744

9/81 SYSTEM

720

10/81 SYSTEM

744

11/81 SYSTEM

720

TILITY FGD SURVEY: JANUARY - DECEMBER 1988

RIZONA PUBLIC SERVICE: CHOLLA 4 (CONT.)

-----PERFORMANCE DATA-----											
ERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
2/81	SYSTEM								744		
1/82	SYSTEM								744		
2/82	SYSTEM								672		
3/82	SYSTEM								744		
4/82	SYSTEM								720		
5/82	SYSTEM								720		
5/82	SYSTEM								720		
7/82	SYSTEM								744		
3/82	SYSTEM								744		
9/82	SYSTEM								720		
3/82	SYSTEM								744		
1/82	SYSTEM								720		
2/82	SYSTEM								744		
1/83	SYSTEM								744		
2/83	SYSTEM								672		
3/83	SYSTEM								744		
** PROBLEMS/SOLUTIONS/COMMENTS											
INFORMATION WAS UNAVAILABLE FOR THE PERIOD OF APRIL 1981 TO MARCH 1983.											
4/83	SYSTEM								720		
5/83	SYSTEM								744		
6/83	SYSTEM								720		
** PROBLEMS/SOLUTIONS/COMMENTS											
INFORMATION WAS UNAVAILABLE FOR THE PERIOD OF APRIL 1981 TO JUNE 1983.											
7/83	SYSTEM								744		
8/83	SYSTEM								744		
9/83	SYSTEM								720		
** PROBLEMS/SOLUTIONS/COMMENTS											
INFORMATION WAS UNAVAILABLE FOR THE THIRD QUARTER OF 1983.											
0/83	SYSTEM								744		
1/83	SYSTEM								720		
2/83	SYSTEM								744		

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

ARIZONA PUBLIC SERVICE: CHOLLA 4 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

INFORMATION WAS UNAVAILABLE FOR 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 NOT AVAILABLE FOR THE FIRST THREE QUARTERS OF 1984.

10/84	SYSTEM	744
11/84	SYSTEM	720
12/84	SYSTEM	744

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE FOURTH QUARTER OF 1984.

1/85	SYSTEM	744
2/85	SYSTEM	672
3/85	SYSTEM	744
4/85	SYSTEM	720
5/85	SYSTEM	744
6/85	SYSTEM	720
7/85	SYSTEM	744
8/85	SYSTEM	744
9/85	SYSTEM	720
10/85	SYSTEM	744
11/85	SYSTEM	720
12/85	SYSTEM	744

ILITY FGD SURVEY: JANUARY - DECEMBER 1988

ZONA PUBLIC SERVICE: CHOLLA 4 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THERE WERE 4 MAJOR OUTAGES DURING 1985 DUE TO TOWER PLUGGING CAUSED BY SCALE BUILDUP. LACK OF PROCESS CONTROL AND INADEQUATE CLEANING WERE BLAMED. FGD SYSTEM AVAILABILITY FOR THE YEAR WAS APPROXIMATELY 87 %.

36 SYSTEM 774

36 SYSTEM 672

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR BOILER OR FGD-RELATED OUTAGES WERE REPORTED FOR THE MONTHS OF JANUARY OR FEBRUARY 1986.

36 SYSTEM 774

36 SYSTEM 720

36 SYSTEM 774

** PROBLEMS/SOLUTIONS/COMMENTS

BEGINNING IN MARCH AND LASTING UNTIL THE END OF MAY, THE BOILER AND FGD SYSTEM WERE DOWN COLLECTIVELY FOR APPROXIMATELY 10 WEEKS FOR SCHEDULED MAINTENANCE. FGD REPAIRS INCLUDED THE RELINING OF THE ABSORBER VESSELS. THE CEILCOTE 505AR WAS REPLACED WITH TROWELON 325SL. THE CEILCOTE HAD DISBONDED AND HAD NUMEROUS PENETRATIONS.

36 SYSTEM 720

36 SYSTEM 774

36 SYSTEM 774

36 SYSTEM 720

36 SYSTEM 774

36 SYSTEM 720

36 SYSTEM 774

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT OPERATED THE LAST HALF OF THE YEAR WITHOUT ANY OTHER MAJOR OUTAGE PERIODS. THIS PLANT IS CURRENTLY STILL BASE LOADED. THE NEW ABSORBER VESSEL LINING MATERIAL IS REPORTED TO BE WORKING SATISFACTORILY.

87 SYSTEM 744

87 SYSTEM 672

87 SYSTEM 744

87 SYSTEM 720

87 SYSTEM 744

87 SYSTEM 720

87 SYSTEM 744

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

ARIZONA PUBLIC SERVICE: CHOLLA 4 (CONT.)

-----PERFORMANCE DATA-----									
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER BOILER HOURS	FGD HOURS	CAP. FACTOR
8/87	SYSTEM						744		
9/87	SYSTEM						720		
10/87	SYSTEM						744		
11/87	SYSTEM						720		
12/87	SYSTEM						744		
** PROBLEMS/SOLUTIONS/COMMENTS									
THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS OCCURRED IN THE YEAR, 1987.									
1/88	SYSTEM						774		
2/88	SYSTEM						672		
3/88	SYSTEM						774		
4/88	SYSTEM						720		
5/88	SYSTEM						774		
6/88	SYSTEM						720		
7/88	SYSTEM						774		
8/88	SYSTEM						774		
9/88	SYSTEM						720		
10/88	SYSTEM						774		
11/88	SYSTEM						720		
12/88	SYSTEM						774		
** PROBLEMS/SOLUTIONS/COMMENTS									
THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE JANUARY-DECEMBER 1988 PERIOD.									

SECTION 13

DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	ARIZONA PUBLIC SERVICE	
PLANT NAME	FOUR CORNERS	
UNIT NUMBER	1	
CITY	FRUITLAND	
STATE	NEW MEXICO	
REGULATORY CLASSIFICATION	C	
PARTICULATE EMISSION LIMITATION - NG/J	21.	(0.050 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	365.	(0.850 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	301.	(0.700 LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	2085	
GROSS UNIT GENERATING CAPACITY - MW	186	
NET UNIT GENERATING CAPACITY W/FGD - MW	170	
NET UNIT GENERATING CAPACITY WO/FGD - MW	175	
EQUIVALENT SCRUBBED CAPACITY - MW	186	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	RILEY STOKER	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	384.13	(814000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	171.1	(340 F)
STACK HEIGHT - M	76.	(250 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	5.3	(17.5 FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	SUBBITUMINOUS	
AVERAGE HEAT CONTENT - J/G	20004.	(8600 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		8500-9100
AVERAGE ASH CONTENT - %	22.00	
RANGE ASH CONTENT - %	19-25	
AVERAGE MOISTURE CONTENT - %	10.80	
RANGE MOISTURE CONTENT - %	8.5-13.4	
AVERAGE SULFUR CONTENT - %	0.75	
RANGE SULFUR CONTENT - %	.5-1.3	
AVERAGE CHLORIDE CONTENT - %	0.03	
RANGE CHLORIDE CONTENT - %	.01-.06	
*** PARTICLE CONTROL		
** MECHANICAL COLLECTOR		
NUMBER	0	
TYPE	NONE	
** ESP		
NUMBER	0	
TYPE	NONE	
*** FGD SYSTEM		
** GENERAL DATA		
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT	
SO2 REMOVAL MODE	WET SCRUBBING	
PROCESS TYPE	LIME/ALKALINE FLYASH	
PROCESS ADDITIVES	NONE	
SYSTEM SUPPLIER	GE ENVIRONMENTAL SERVICES	
A-E FIRM	IN-HOUSE	
DEVELOPMENT LEVEL	FULL SCALE	
NEW/RETROFIT	RETROFIT	
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.50	
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	50.00	
ENERGY CONSUMPTION - %	2.7	
CURRENT STATUS	1	
COMMERCIAL START-UP	11/1979	
INITIAL START-UP	11/1979	
CONTRACT AWARDED	0/1978	

ILITY FGD SURVEY: JANUARY - DECEMBER 1988

WONA PUBLIC SERVICE: FOUR CORNERS 1 (CONT.)

* DESIGN AND OPERATING PARAMETERS		
DESIGN COAL SULFER CONTENT - %	0.80	
DESIGN COAL HEAT CONTENT - J/G	19771.0	(8500 BTU/LB)
DESIGN COAL ASH CONTENT - %	25.00	
DESIGN MOISTURE CONTENT - %	13.40	
DESIGN CHLORIDE CONTENT - %	0.06	
SPACE REQUIREMENTS - SQ M	520.2	(5600 SQ FT)
OPER. & MAINT. REQUIREMENT - MANHR/DAY	200.0	
* QUENCHER/PRESATURATOR		
CONSTRUCTION MATERIAL GENERIC TYPE	NR	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR	
* ABSORBER		
NUMBER	2	
NUMBER OF SPARES	0	
GENERIC TYPE	VENTURI TOWER	
SPECIFIC TYPE	VARIABLE-THROAT/TOP-ENTRY PLUMB BOB	
TRADE NAME/COMMON TYPE	N/A	
DIMENSIONS - FT	25 DIA	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	AISI 1110	
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A	
LINER GENERIC MATERIAL	ORGANIC	
LINER SPECIFIC MATERIAL	GLASS FLAKE-FILLED POLYESTER	
LINER MATERIAL TRADE NAME/COMMON TYPE	FLAKELINE 103	
GAS CONTACTING DEVICE TYPE	VENTURI THROAT TANGENTIAL NOZZLES AT TOP & AT S	
NUMBER OF CONTACTING ZONES	1	
LIQUID RECIRCULATION RATE - LITER/S	630.	(10000 GPM)
L/G RATIO - L/CU.M	3.2	(24.0 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	2.5	(10.0 IN-H2O)
INLET GAS FLOW - CU. M/S	192.06	(407000 ACFM)
INLET GAS TEMPERATURE - C	171.1	(340 F)
SO2 REMOVAL EFFICIENCY - %	67.5	
PARTICLE REMOVAL EFFICIENCY - %	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	
CONFIGURATION	HORIZONTAL	
NUMBER OF STAGES	1	
NUMBER OF PASSES PER STAGE	6	
CONSTRUCTION MATERIAL GENERIC TYPE	ORGANIC	
CONSTRUCTION MATERIAL SPECIFIC TYPE	FIBER-REINFORCED POLYESTER	
WASH WATER SOURCE	FRESH FROM LAKE!	
WASH FREQUENCY	ONCE PER SHIFT	
* REHEATER		
NUMBER	0	
GENERIC TYPE	NONE	
SPECIFIC TYPE	N/A	
TRADE NAME/COMMON TYPE	N/A	
CONSTRUCTION MATERIAL GENERIC TYPE	N/A	
CONSTRUCTION MATERIAL SPECIFIC TYPE	N/A	
* FANS		
NUMBER	2	
NUMBER OF SPARES	0	
DESIGN	CENTRIFUGAL	
SUPPLIER	AMERICAN STANDARD	
FUNCTION	UNIT	
APPLICATION	INDUCED DRAFT	
SERVICE	WET	
FLUE GAS FLOW RATE - CU.M/S	259.54	(550000 ACFM)
FLUE GAS TEMPERATURE - C	51.7	(125 F)

ARIZONA PUBLIC SERVICE: FOUR CORNERS 1 (CONT.)

CONSTRUCTION MATERIAL GENERIC TYPE	HIGH ALLOY
** DAMPERS	
NUMBER	2
FUNCTION	CONTROL
GENERIC TYPE	LOUVER
SPECIFIC TYPE	PARALLEL BLADE MULTILOUVER
MANUFACTURER	AMERICAN STANDARD
SERVICE CONDITIONS	120-130 F
CONSTRUCTION MATERIAL GENERIC TYPE	STAINLESS STEEL
CONSTRUCTION MATERIAL SPECIFIC TYPE	AUSTENITIC
LINER GENERIC MATERIAL TYPE	NONE
LINER SPECIFIC MATERIAL TYPE	N/A
** DAMPERS	
NUMBER	1
FUNCTION	SHUT-OFF
GENERIC TYPE	GUILLOTINE
SPECIFIC TYPE	NR
MANUFACTURER	NR
SERVICE CONDITIONS	NR
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	CIRCULAR
DIMENSIONS	14 DIA X 90 FT
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
SHELL SPECIFIC MATERIAL TYPE	ASTM A-283
LINER GENERIC MATERIAL TYPE	NONE
LINER SPECIFIC MATERIAL TYPE	N/A
** DUCTWORK	
LOCATION	OUTLET 'ME TO STACK!
CONFIGURATION	RECTANGULAR
DIMENSIONS	12 X 12 X 50 FT
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
SHELL SPECIFIC MATERIAL TYPE	ASTM A-283
LINER GENERIC MATERIAL TYPE	STAINLESS STEEL
LINER SPECIFIC MATERIAL TYPE	AUSTENITIC
** REAGENT PREPARATION EQUIPMENT	
FUNCTION	SLAKER
DEVICE	NR
DEVICE TYPE	NR
MANUFACTURER	JOY
NUMBER	1
NUMBER OF SPARES	0
FULL LOAD DRY FEED CAPACITY - M.TONS/HR	13.6 (15 TPH)
PRODUCT QUALITY - % SOLIDS	30.0
** REAGENT PREPARATION EQUIPMENT	
FUNCTION	WET BALL MILL
DEVICE	NR
DEVICE TYPE	NR
MANUFACTURER	KENNEDY VAN SAUN
NUMBER	1
NUMBER OF SPARES	0
** TANKS	
SERVICE	NUMBER
-----	-----
BLEED STREAM	1
RECYCLE	2
MAKEUP WATER	1
RETURN TRANSFER	1
LIME SLURRY	4

LITY FGD SURVEY: JANUARY - DECEMBER 1988

ZONA PUBLIC SERVICE: FOUR CORNERS 1 (CONT.)

PUMPS	
SERVICE	NUMBER
-----	-----
RECYCLE	2
RECYCLE 'STANDBY!	4
BLEED STREAM TANK	****
THICKENER UNDERFLOW	4
LIME SLURRY TRANSFER	2
RETURN WATER	2
SERVICE WATER	****
ME WATER	****
SOLIDS CONCENTRATING/DEWATERING	
DEVICE	THICKENER
NUMBER	1
NUMBER OF SPARES	0
CONFIGURATION	CIRCULAR
DIMENSIONS - FT	100
CAPACITY	1000000
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
SHELL SPECIFIC MATERIAL TYPE	AISI 1110
LINER GENERIC MATERIAL TYPE	ORGANIC
LINER SPECIFIC MATERIAL TYPE	GLASS FLAKE-FILLED POLYESTER
FEED STREAM SOURCE	ABSORBER BLEED
OUTLET STREAM CHARACTERISTICS	40.0%
SALEABLE BYPRODUCTS	
NATURE	NONE
DISPOSITION	N/A
SLUDGE	
FULL LOAD SLUDGE QUANTITY - M.TONS/HR (DRY)	25.4 (28.0 TPH)
MOISTURE CONTENT - % TOTAL FREE WATER	60.0
% CASO3 - DRY	18.0
% CASO4 - DRY	5.0
% CAOH2 - DRY	1.0
% CACO3 - DRY	1.0
% ASH - DRY	75.0
% OTHER COMPOUNDS - DRY	1.0
TREATMENT	
METHOD	DEWATERED
DEVICE	NR
PROPRIETARY PROCESS	NR
DISPOSAL	
NATURE	FINAL
TYPE	POND
LOCATION	ON-SITE
SITE TRANSPORTATION METHOD	PIPELINE
SITE TREATMENT	NONE
SITE DIMENSIONS	70 ACRES/55 FT
SITE CAPACITY - CU.M	4708550 (3850.0 ACRE-FT)
SITE SERVICE LIFE - YRS	10
PROCESS CONTROL AND INSTRUMENTATION	
PROCESS STREAM	SLURRY STREAM
CHEMICAL PARAMETERS	PH
PHYSICAL VARIABLES	% SOLIDS, FLOW, TEMPERATURE
CONTROL LEVELS	PH 6.2-7.2, 12% SOLIDS
MONITOR TYPE	PH- APS FLOW THROUGH; DENSITY- TEXAS NUCLEAR
MONITOR LOCATION	RECYCLE LOOP ON TANGENTIAL NOZZLE HEADER
PROCESS CONTROL MANNER	AUTOMATIC
PROCESS CHEMISTRY MODE	FEEDBACK

ARIZONA PUBLIC SERVICE: FOUR CORNERS 1 (CONT.)

** WATER BALANCE
 WATER LOOP TYPE OPEN
 EVAPORATION WATER LOSS - LITER/S 6.3 (100 GPM)
 SOURCE OF MAKEUP WATER LAKE WATER

** CHEMICALS AND CONSUMPTION
 FUNCTION ABSORBENT
 NAME LIME
 PRINCIPAL CONSTITUENT CAO
 SOURCE/SUPPLIER CAN AM, PAUL LIME CO.
 CONSUMPTION 20 TPD
 UTILIZATION - % 83.0
 POINT OF ADDITION SLAKER, ABSORBER BOTTOM

** FGD SPARE CAPACITY INDICES
 ABSORBER - % 0.0

** FGD SPARE COMPONENT INDICES
 ABSORBER 0.0

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

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

INITIAL OPERATIONS STARTED IN NOVEMBER 1979.

1/80	SYSTEM						744			
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2/80	SYSTEM						696			
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3/80	SYSTEM						744			
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** PROBLEMS/SOLUTIONS/COMMENTS

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

4/80	SYSTEM						720			
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5/80	SYSTEM						744			
------	--------	--	--	--	--	--	-----	--	--	--

6/80	SYSTEM						720			
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** PROBLEMS/SOLUTIONS/COMMENTS

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

7/80	SYSTEM						744			
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8/80	SYSTEM						744			
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9/80	SYSTEM						720			
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10/80	SYSTEM						744			
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11/80	SYSTEM						720			
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12/80	SYSTEM						744			
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1/81	SYSTEM						744			
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2/81	SYSTEM						672			
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ILITY FGD SURVEY: JANUARY - DECEMBER 1988

20NA PUBLIC SERVICE: FOUR CORNERS 1 (CONT.)

-----PERFORMANCE DATA-----										
100	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART. HOURS	PER BOILER HOURS	FGD HOURS	CAP. FACTOR
91	SYSTEM							744		
81	SYSTEM							720		
81	SYSTEM							744		
81	SYSTEM							720		
81	SYSTEM							744		
81	SYSTEM							744		
81	SYSTEM							720		
81	SYSTEM							744		
81	SYSTEM							720		
81	SYSTEM							744		
82	SYSTEM							744		
82	SYSTEM							672		
'82	SYSTEM							744		
'82	SYSTEM							720		
'82	SYSTEM							744		
'82	SYSTEM							720		
'82	SYSTEM							744		
'82	SYSTEM							744		
/82	SYSTEM							720		
/82	SYSTEM							744		
/82	SYSTEM							720		
/82	SYSTEM							744		
/83	SYSTEM							744		
/83	SYSTEM							672		
/83	SYSTEM							744		

** PROBLEMS/SOLUTIONS/COMMENTS

INFORMATION WAS UNAVAILABLE FOR THE PERIOD OF JULY 1980 THROUGH MARCH 1983

/83	SYSTEM							720		
5/83	SYSTEM							744		
5/83	SYSTEM							720		

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

ARIZONA PUBLIC SERVICE: FOUR CORNERS 1 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

INFORMATION WAS UNAVAILABLE FOR THE PERIOD OF JULY 1980 THROUGH JUNE 1983.

7/83	SYSTEM	744
8/83	SYSTEM	744
9/83	SYSTEM	720

** PROBLEMS/SOLUTIONS/COMMENTS

INFORMATION WAS UNAVAILABLE FOR THE THIRD QUARTER OF 1983.

10/83	SYSTEM	744
11/83	SYSTEM	720
12/83	SYSTEM	744

** PROBLEMS/SOLUTIONS/COMMENTS

INFORMATION WAS UNAVAILABLE FOR 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 NOT AVAILABLE FOR THE FIRST THREE QUARTERS OF 1984.

10/84	SYSTEM	744
11/84	SYSTEM	720
12/84	SYSTEM	744

** PROBLEMS/SOLUTIONS/COMMENTS

INFORMATION WAS NOT AVAILABLE FOR THE FOURTH QUARTER OF 1984.

1/85	SYSTEM	744
2/85	SYSTEM	672
3/85	SYSTEM	744
4/85	SYSTEM	720

LITY FGD SURVEY: JANUARY - DECEMBER 1988
 ZONA PUBLIC SERVICE: FOUR CORNERS 1 (CONT.)

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

85	SYSTEM	744
85	SYSTEM	720
85	SYSTEM	744
85	SYSTEM	744
85	SYSTEM	720
85	SYSTEM	744
85	SYSTEM	720
85	SYSTEM	744

** PROBLEMS/SOLUTIONS/COMMENTS

INFORMATION WAS UNAVAILABLE FOR THE MONTHS OF JANUARY THROUGH DECEMBER 1985.

'86	SYSTEM	774
'86	SYSTEM	672
'86	SYSTEM	774
'86	SYSTEM	720
'86	SYSTEM	774
'86	SYSTEM	720
'86	SYSTEM	774
'86	SYSTEM	774
'86	SYSTEM	720
'86	SYSTEM	774
'86	SYSTEM	720
'86	SYSTEM	774

** PROBLEMS/SOLUTIONS/COMMENTS

DURING A 6 WEEK SCHEDULED UNIT OUTAGE IN 1986, LINER REPAIRS AND REWORK OF THE WET FGD BOOSTER FANS WERE CONDUCTED. NO OTHER MAJOR SCHEDULED OR UNSCHEDULED OUTAGES WERE REPORTED FOR 1986 BY THE UTILITY.

'87	SYSTEM	744
'87	SYSTEM	672
'87	SYSTEM	744
'87	SYSTEM	720
'87	SYSTEM	744
'87	SYSTEM	720
'87	SYSTEM	744

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

ARIZONA PUBLIC SERVICE: FOUR CORNERS 1 (CONT.)

-----PERFORMANCE DATA-----										
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
8/87	SYSTEM								744	
9/87	SYSTEM								720	
10/87	SYSTEM								744	
11/87	SYSTEM								720	
12/87	SYSTEM								744	

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED OUTAGES WERE ENCOUNTERED DURING 1987. THE UNIT WAS REPORTED TO HAVE BEEN OFF-LINE OCTOBER 16 THROUGH NOVEMBER 6 FOR SCHEDULED BOILER/TURBINE MAINTENANCE. DURING THE OUTAGE, THE UTILITY PERFORMED ROUTINE MAINTENANCE ON THE FGD SYSTEM.

1/88	SYSTEM								774	
2/88	SYSTEM								672	
3/88	SYSTEM								774	
4/88	SYSTEM								720	
5/88	SYSTEM								774	
6/88	SYSTEM								720	
7/88	SYSTEM								774	
8/88	SYSTEM								774	
9/88	SYSTEM								720	
10/88	SYSTEM								774	
11/88	SYSTEM								720	
12/88	SYSTEM								774	

** PROBLEMS/SOLUTIONS/COMMENTS

INFORMATION WAS UNAVAILABLE FOR THE YEAR 1988.

SECTION 13

DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	ARIZONA PUBLIC SERVICE
PLANT NAME	FOUR CORNERS
UNIT NUMBER	2
CITY	FRUITLAND
STATE	NEW MEXICO
REGULATORY CLASSIFICATION	C
PARTICULATE EMISSION LIMITATION - NG/J	21. (0.050 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	365. (0.850 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	301. (0.700 LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	2085
GROSS UNIT GENERATING CAPACITY - MW	186
NET UNIT GENERATING CAPACITY W/FGD - MW	170
NET UNIT GENERATING CAPACITY WO/FGD - MW	175
EQUIVALENT SCRUBBED CAPACITY - MW	186
** UNIT DATA - BOILER AND STACK	
BOILER SUPPLIER	RILEY STOKER
BOILER TYPE	PULVERIZED COAL
BOILER SERVICE LOAD	BASE
DESIGN BOILER FLUE GAS FLOW - CU.M/S	384.13 (814000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	171.1 (340 F)
STACK HEIGHT - M	76. (250 FT)
STACK SHELL	CONCRETE
STACK TOP DIAMETER - M	5.3 (17.5 FT)
** FUEL DATA	
FUEL TYPE	COAL
FUEL GRADE	SUBBITUMINOUS
AVERAGE HEAT CONTENT - J/G	20004. (8600 BTU/LB)
RANGE HEAT CONTENT - BTU/LB	8500-9100
AVERAGE ASH CONTENT - %	22.00
RANGE ASH CONTENT - %	19-25
AVERAGE MOISTURE CONTENT - %	10.80
RANGE MOISTURE CONTENT - %	8.5-13.4
AVERAGE SULFUR CONTENT - %	0.75
RANGE SULFUR CONTENT - %	.5-1.3
AVERAGE CHLORIDE CONTENT - %	0.03
RANGE CHLORIDE CONTENT - %	.01-.06
*** PARTICLE CONTROL	
** MECHANICAL COLLECTOR	
NUMBER	0
TYPE	NONE
** ESP	
NUMBER	0
TYPE	NONE
*** FGD SYSTEM	
** GENERAL DATA	
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT
SO2 REMOVAL MODE	WET SCRUBBING
PROCESS TYPE	LIME/ALKALINE FLYASH
PROCESS ADDITIVES	NONE
SYSTEM SUPPLIER	GE ENVIRONMENTAL SERVICES
A-E FIRM	IN-HOUSE
DEVELOPMENT LEVEL	FULL SCALE
NEW/RETROFIT	RETROFIT
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.50
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	50.00
ENERGY CONSUMPTION - %	2.7
CURRENT STATUS	1
COMMERCIAL START-UP	11/1979
INITIAL START-UP	11/1979
CONTRACT AWARDED	0/1978

ILITY FGD SURVEY: JANUARY - DECEMBER 1988
 IZONA PUBLIC SERVICE: FOUR CORNERS 2 (CONT.)

* DESIGN AND OPERATING PARAMETERS		
DESIGN COAL SULFUR CONTENT - %	0.80	
DESIGN COAL HEAT CONTENT - J/G	19771.0	(8500 BTU/LB)
DESIGN COAL ASH CONTENT - %	25.00	
DESIGN MOISTURE CONTENT - %	13.40	
DESIGN CHLORIDE CONTENT - %	0.06	
SPACE REQUIREMENTS - SQ M	520.2	(5600 SQ FT)
OPER. & MAINT. REQUIREMENT - MANHR/DAY	200.0	
* QUENCHER/PRESATURATOR		
CONSTRUCTION MATERIAL GENERIC TYPE	NR	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR	
* ABSORBER		
NUMBER	2	
NUMBER OF SPARES	0	
GENERIC TYPE	VENTURI TOWER	
SPECIFIC TYPE	VARIABLE-THROAT/TOP-ENTRY PLUMB BOB	
TRADE NAME/COMMON TYPE	N/A	
DIMENSIONS - FT	25 DIA	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	AISI 1110	
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A	
LINER GENERIC MATERIAL	ORGANIC	
LINER SPECIFIC MATERIAL	GLASS FLAKE-FILLED POLYESTER	
LINER MATERIAL TRADE NAME/COMMON TYPE	FLAKELINE 103	
GAS CONTACTING DEVICE TYPE	VENTURI THROAT TANGENTIAL NOZZLES AT TOP & AT S	
NUMBER OF CONTACTING ZONES	1	
LIQUID RECIRCULATION RATE - LITER/S	630.	(10000 GPM)
L/G RATIO - L/CU.M	3.2	(24.0 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	2.5	(10.0 IN-H2O)
INLET GAS FLOW - CU. M/S	192.06	(407000 ACFM)
INLET GAS TEMPERATURE - C	171.1	(340 F)
SO2 REMOVAL EFFICIENCY - %	67.5	
PARTICLE REMOVAL EFFICIENCY - %	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	
CONFIGURATION	HORIZONTAL	
NUMBER OF STAGES	1	
NUMBER OF PASSES PER STAGE	6	
CONSTRUCTION MATERIAL GENERIC TYPE	ORGANIC	
CONSTRUCTION MATERIAL SPECIFIC TYPE	FIBER-REINFORCED POLYESTER	
WASH WATER SOURCE	FRESH FROM LAKE!	
WASH FREQUENCY	ONCE PER SHIFT	
* REHEATER		
NUMBER	0	
GENERIC TYPE	NONE	
SPECIFIC TYPE	N/A	
TRADE NAME/COMMON TYPE	N/A	
CONSTRUCTION MATERIAL GENERIC TYPE	N/A	
CONSTRUCTION MATERIAL SPECIFIC TYPE	N/A	
* FANS		
NUMBER	2	
NUMBER OF SPARES	0	
DESIGN	CENTRIFUGAL	
SUPPLIER	AMERICAN STANDARD	
FUNCTION	UNIT	
APPLICATION	INDUCED DRAFT	
SERVICE	WET	
FLUE GAS FLOW RATE - CU.M/S	259.54	(550000 ACFM)
FLUE GAS TEMPERATURE - C	51.7	(125 F)

ARIZONA PUBLIC SERVICE: FOUR CORNERS 2 (CONT.)

CONSTRUCTION MATERIAL GENERIC TYPE	HIGH ALLOY
** DAMPERS	
NUMBER	2
FUNCTION	CONTROL
GENERIC TYPE	LOUVER
SPECIFIC TYPE	PARALLEL BLADE MULTILOUVER
MANUFACTURER	AMERICAN STANDARD
SERVICE CONDITIONS	120-130 F
CONSTRUCTION MATERIAL GENERIC TYPE	STAINLESS STEEL
CONSTRUCTION MATERIAL SPECIFIC TYPE	AUSTENITIC
LINER GENERIC MATERIAL TYPE	NONE
LINER SPECIFIC MATERIAL TYPE	N/A
** DAMPERS	
NUMBER	1
FUNCTION	SHUT-OFF
GENERIC TYPE	GUILLOTINE
SPECIFIC TYPE	NR
MANUFACTURER	NR
SERVICE CONDITIONS	NR
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	CIRCULAR
DIMENSIONS	14 DIA X 90 FT
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
SHELL SPECIFIC MATERIAL TYPE	ASTM A-283
LINER GENERIC MATERIAL TYPE	NONE
LINER SPECIFIC MATERIAL TYPE	N/A
** DUCTWORK	
LOCATION	OUTLET 'ME TO STACK!
CONFIGURATION	RECTANGULAR
DIMENSIONS	12 X 12 X 50 FT
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
SHELL SPECIFIC MATERIAL TYPE	ASTM A-283
LINER GENERIC MATERIAL TYPE	STAINLESS STEEL
LINER SPECIFIC MATERIAL TYPE	AUSTENITIC
** REAGENT PREPARATION EQUIPMENT	
FUNCTION	SLAKER
DEVICE	NR
DEVICE TYPE	NR
MANUFACTURER	JOY
NUMBER	1
NUMBER OF SPARES	0
FULL LOAD DRY FEED CAPACITY - M.TONS/HR	13.6 (15 TPH)
PRODUCT QUALITY - % SOLIDS	30.0
** REAGENT PREPARATION EQUIPMENT	
FUNCTION	WET BALL MILL
DEVICE	NR
DEVICE TYPE	NR
MANUFACTURER	KENNEDY VAN SAUN
NUMBER	1
NUMBER OF SPARES	0
** TANKS	
SERVICE	NUMBER
-----	-----
BLEED STREAM	1
RECYCLE	2
MAKEUP WATER	1
RETURN TRANSFER	1
LIME SLURRY	4

ILITY FGD SURVEY: JANUARY - DECEMBER 1988
 IZONA PUBLIC SERVICE: FOUR CORNERS 2 (CONT.)

** PUMPS	
SERVICE	NUMBER
-----	-----
RECYCLE	2
RECYCLE "STANDBY"	4
BLEED STREAM TANK	****
THICKENER UNDERFLOW	4
LINE SLURRY TRANSFER	2
RETURN WATER	2
SERVICE WATER	****
ME WATER	****
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	THICKENER
NUMBER	1
NUMBER OF SPARES	0
CONFIGURATION	CIRCULAR
DIMENSIONS - FT	100
CAPACITY	1000000
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
SHELL SPECIFIC MATERIAL TYPE	AISI 1110
LINER GENERIC MATERIAL TYPE	ORGANIC
LINER SPECIFIC MATERIAL TYPE	GLASS FLAKE-FILLED POLYESTER
FEED STREAM SOURCE	ABSORBER BLEED
OUTLET STREAM CHARACTERISTICS	40.0%
** SALEABLE BYPRODUCTS	
NATURE	NONE
DISPOSITION	N/A
** SLUDGE	
FULL LOAD SLUDGE QUANTITY - M.TONS/HR (DRY)	25.4 (28.0 TPH)
MOISTURE CONTENT - % TOTAL FREE WATER	60.0
% CASO3 - DRY	18.0
% CASO4 - DRY	5.0
% CAOH2 - DRY	1.0
% CACO3 - DRY	1.0
% ASH - DRY	75.0
% OTHER COMPOUNDS - DRY	1.0
** TREATMENT	
METHOD	DEWATERED
DEVICE	NR
PROPRIETARY PROCESS	NR
** DISPOSAL	
NATURE	FINAL
TYPE	POND
LOCATION	ON-SITE
SITE TRANSPORTATION METHOD	PIPELINE
SITE TREATMENT	NONE
SITE DIMENSIONS	70 ACRES/55 FT
SITE CAPACITY - CU.M	4708550 (3850.0 ACRE-FT)
SITE SERVICE LIFE - YRS	10
** PROCESS CONTROL AND INSTRUMENTATION	
PROCESS STREAM	SLURRY STREAM
CHEMICAL PARAMETERS	PH
PHYSICAL VARIABLES	% SOLIDS, FLOW, TEMPERATURE
CONTROL LEVELS	PH 6.2-7.2, 12% SOLIDS
MONITOR TYPE	PH- APS FLOW THROUGH; DENSITY- TEXAS NUCLEAR
MONITOR LOCATION	RECYCLE LOOP ON TANGENTIAL NOZZLE HEADER
PROCESS CONTROL MANNER	AUTOMATIC
PROCESS CHEMISTRY MODE	FEEDBACK

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

ARIZONA PUBLIC SERVICE: FOUR CORNERS 2 (CONT.)

** WATER BALANCE	
WATER LOOP TYPE	OPEN
EVAPORATION WATER LOSS - LITER/S	6.3 (100 GPM)
SOURCE OF MAKEUP WATER	LAKE WATER
** CHEMICALS AND CONSUMPTION	
FUNCTION	ABSORBENT
NAME	LIME
PRINCIPAL CONSTITUENT	CAO
SOURCE/SUPPLIER	CAN AM, PAUL LIME CO.
CONSUMPTION	20 TPD
UTILIZATION - %	83.0
POINT OF ADDITION	SLAKER, ABSORBER BOTTOM
** FGD SPARE CAPACITY INDICES	
ABSORBER - %	0.0
** FGD SPARE COMPONENT INDICES	
ABSORBER	0.0

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

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

11/79	SYSTEM						720		
12/79	SYSTEM						744		

** PROBLEMS/SOLUTIONS/COMMENTS

INITIAL OPERATIONS STARTED IN NOVEMBER 1979.

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

** PROBLEMS/SOLUTIONS/COMMENTS

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

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

** PROBLEMS/SOLUTIONS/COMMENTS

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

7/80	SYSTEM						744		
8/80	SYSTEM						744		
9/80	SYSTEM						720		
10/80	SYSTEM						744		
11/80	SYSTEM						720		
12/80	SYSTEM						744		
1/81	SYSTEM						744		
2/81	SYSTEM						672		

LITY FGD SURVEY: JANUARY - DECEMBER 1988

ZONA PUBLIC SERVICE: FOUR CORNERS 2 (CONT.)

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

81	SYSTEM	744
81	SYSTEM	720
81	SYSTEM	744
'81	SYSTEM	720
'81	SYSTEM	744
'81	SYSTEM	744
'81	SYSTEM	720
'81	SYSTEM	744
'81	SYSTEM	720
'81	SYSTEM	744
/82	SYSTEM	744
/82	SYSTEM	672
/82	SYSTEM	744
/82	SYSTEM	720
/82	SYSTEM	744
/82	SYSTEM	720
/82	SYSTEM	744
/82	SYSTEM	744
/82	SYSTEM	720
/82	SYSTEM	744
/82	SYSTEM	720
/82	SYSTEM	744
1/83	SYSTEM	744
2/83	SYSTEM	672
3/83	SYSTEM	744

★★ PROBLEMS/SOLUTIONS/COMMENTS

INFORMATION WAS UNAVAILABLE FOR THE PERIOD OF JULY 1980 THROUGH MARCH 1983

4/83	SYSTEM	720
5/83	SYSTEM	744
5/83	SYSTEM	720

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

ARIZONA PUBLIC SERVICE: FOUR CORNERS 2 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

INFORMATION WAS UNAVAILABLE FOR THE PERIOD OF JULY 1980 THROUGH JUNE 1983.

7/83	SYSTEM	744
8/83	SYSTEM	744
9/83	SYSTEM	720

** PROBLEMS/SOLUTIONS/COMMENTS

INFORMATION WAS UNAVAILABLE FOR THE THIRD QUARTER OF 1983.

10/83	SYSTEM	744
11/83	SYSTEM	720
12/83	SYSTEM	744

** PROBLEMS/SOLUTIONS/COMMENTS

INFORMATION WAS UNAVAILABLE FOR 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 NOT AVAILABLE FOR THE FIRST THREE QUARTERS OF 1984.

10/84	SYSTEM	744
11/84	SYSTEM	720
12/84	SYSTEM	744

** PROBLEMS/SOLUTIONS/COMMENTS

INFORMATION WAS NOT AVAILABLE FOR THE FOURTH QUARTER OF 1984.

1/85	SYSTEM	744
2/85	SYSTEM	672
3/85	SYSTEM	744
4/85	SYSTEM	720

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

ZONA PUBLIC SERVICE: FOUR CORNERS 2 (CONT.)

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

85	SYSTEM	744
85	SYSTEM	720
85	SYSTEM	744
85	SYSTEM	744
85	SYSTEM	720
85	SYSTEM	744
85	SYSTEM	720
85	SYSTEM	744

** PROBLEMS/SOLUTIONS/COMMENTS

INFORMATION WAS UNAVAILABLE FOR THE MONTHS OF JANUARY THROUGH DECEMBER 1985.

86	SYSTEM	774
86	SYSTEM	672
86	SYSTEM	774
86	SYSTEM	720
86	SYSTEM	774
86	SYSTEM	720
86	SYSTEM	774
86	SYSTEM	774
86	SYSTEM	720
86	SYSTEM	774
86	SYSTEM	720
86	SYSTEM	774

** PROBLEMS/SOLUTIONS/COMMENTS

DURING A 2-3 WEEK SCHEDULED UNIT OUTAGE IN 1986, LINER REPAIRS AND REWORK OF THE WET FGD BOOSTER FANS WERE CONDUCTED. NO OTHER MAJOR SCHEDULED OR UNSCHEDULED OUTAGES WERE REPORTED FOR 1986 BY THE UTILITY.

/87	SYSTEM	744
/87	SYSTEM	672
/87	SYSTEM	744
/87	SYSTEM	720
/87	SYSTEM	744
/87	SYSTEM	720
/87	SYSTEM	744

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

ARIZONA PUBLIC SERVICE: FOUR CORNERS 2 (CONT.)

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

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

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED OUTAGES WERE ENCOUNTERED DURING 1987. THE UNIT WAS REPORTED TO HAVE BEEN OFF-LINE APPROXIMATELY 3 WEEKS IN NOVEMBER FOR SCHEDULED BOILER/TURBINE MAINTENANCE. DURING THIS OUTAGE, THE UTILITY PERFORMED ROUTINE MAINTENANCE ON THE FGD SYSTEM.

1/88	SYSTEM						774
2/88	SYSTEM						672
3/88	SYSTEM						774
4/88	SYSTEM						720
5/88	SYSTEM						774
6/88	SYSTEM						720
7/88	SYSTEM						774
8/88	SYSTEM						774
9/88	SYSTEM						720
10/88	SYSTEM						774
11/88	SYSTEM						720
12/88	SYSTEM						774

** PROBLEMS/SOLUTIONS/COMMENTS

INFORMATION WAS UNAVAILABLE FOR THE YEAR 1988.

SECTION 13
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	ARIZONA PUBLIC SERVICE	
PLANT NAME	FOUR CORNERS	
UNIT NUMBER	3	
CITY	FRUITLAND	
STATE	NEW MEXICO	
REGULATORY CLASSIFICATION	C	
PARTICULATE EMISSION LIMITATION - NG/J	21.	(0.050 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	365.	(0.850 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	301.	(0.700 LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	2085	
GROSS UNIT GENERATING CAPACITY - MW	244	
NET UNIT GENERATING CAPACITY W/FGD - MW	220	
NET UNIT GENERATING CAPACITY WO/FGD - MW	231	
EQUIVALENT SCRUBBED CAPACITY - MW	244	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	RILEY STOKER	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	486.06	(1030000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	171.1	(340 F)
STACK HEIGHT - M	76.	(250 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	*****	(***** FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	SUBBITUMINOUS	
AVERAGE HEAT CONTENT - J/G	20004.	(8600 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		8500-9100
AVERAGE ASH CONTENT - %	22.00	
RANGE ASH CONTENT - %	19-25	
AVERAGE MOISTURE CONTENT - %	10.80	
RANGE MOISTURE CONTENT - %	8.5-13.4	
AVERAGE SULFUR CONTENT - %	0.75	
RANGE SULFUR CONTENT - %	.5-1.3	
AVERAGE CHLORIDE CONTENT - %	0.03	
RANGE CHLORIDE CONTENT - %	.01-.06	
*** PARTICLE CONTROL		
** MECHANICAL COLLECTOR		
NUMBER	0	
TYPE	NONE	
** ESP		
NUMBER	0	
TYPE	NONE	
*** FGD SYSTEM		
** GENERAL DATA		
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT	
SO2 REMOVAL MODE	WET SCRUBBING	
PROCESS TYPE	LIME/ALKALINE FLYASH	
PROCESS ADDITIVES	NONE	
SYSTEM SUPPLIER	GE ENVIRONMENTAL SERVICES	
A-E FIRM	IN-HOUSE	
DEVELOPMENT LEVEL	FULL SCALE	
NEW/RETROFIT	RETROFIT	
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.50	
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	50.00	
ENERGY CONSUMPTION - %	4.5	
CURRENT STATUS	1	
COMMERCIAL START-UP	11/1979	
INITIAL START-UP	11/1979	
CONTRACT AWARDED	0/1978	

ILITY FGD SURVEY: JANUARY - DECEMBER 1988

WONA PUBLIC SERVICE: FOUR CORNERS 3 (CONT.)

* DESIGN AND OPERATING PARAMETERS			
DESIGN COAL SULFUR CONTENT - %	0.80		
DESIGN COAL HEAT CONTENT - J/G	19771.0	(8500 BTU/LB)	
DESIGN COAL ASH CONTENT - %	25.00		
DESIGN MOISTURE CONTENT - %	13.40		
DESIGN CHLORIDE CONTENT - %	0.06		
SPACE REQUIREMENTS - SQ M	520.2	(5600 SQ FT)	
OPER. & MAINT. REQUIREMENT - MANHR/DAY	200.0		
* QUENCHER/PRESATURATOR			
CONSTRUCTION MATERIAL GENERIC TYPE	NR		
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR		
* ABSORBER			
NUMBER	2		
NUMBER OF SPARES	0		
GENERIC TYPE	VENTURI TOWER		
SPECIFIC TYPE	VARIABLE-THROAT/TOP-ENTRY PLUMB BOB		
TRADE NAME/COMMON TYPE	N/A		
DIMENSIONS - FT	25 DIA		
SHELL GENERIC MATERIAL	CARBON STEEL		
SHELL SPECIFIC MATERIAL	AISI 1110		
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A		
LINER GENERIC MATERIAL	ORGANIC		
LINER SPECIFIC MATERIAL	GLASS FLAKE-FILLED POLYESTER		
LINER MATERIAL TRADE NAME/COMMON TYPE	FLAKELINE 103		
GAS CONTACTING DEVICE TYPE	VENTURI THROAT TANGENTIAL NOZZLES AT TOP & AT S		
NUMBER OF CONTACTING ZONES	1		
L/G RATIO - L/CU.M	3.2	(24.0 GAL/1000 ACF)	
GAS-SIDE PRESSURE DROP - KPA	2.5	(10.0 IN-H2O)	
INLET GAS TEMPERATURE - C	171.1	(340 F)	
SO2 REMOVAL EFFICIENCY - %	67.5		
PARTICLE REMOVAL EFFICIENCY - %	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		
CONFIGURATION	HORIZONTAL		
NUMBER OF STAGES	1		
NUMBER OF PASSES PER STAGE	6		
CONSTRUCTION MATERIAL GENERIC TYPE	ORGANIC		
CONSTRUCTION MATERIAL SPECIFIC TYPE	FIBER-REINFORCED POLYESTER		
WASH WATER SOURCE	FRESH FROM LAKE!		
WASH FREQUENCY	ONCE PER SHIFT		
* REHEATER			
NUMBER	0		
GENERIC TYPE	NONE		
SPECIFIC TYPE	N/A		
TRADE NAME/COMMON TYPE	N/A		
CONSTRUCTION MATERIAL GENERIC TYPE	N/A		
CONSTRUCTION MATERIAL SPECIFIC TYPE	N/A		
* FANS			
NUMBER	2		
NUMBER OF SPARES	0		
DESIGN	CENTRIFUGAL		
SUPPLIER	AMERICAN STANDARD		
FUNCTION	NR		
APPLICATION	INDUCED DRAFT		
SERVICE	WET		
FLUE GAS TEMPERATURE - C	51.7	(125 F)	
CONSTRUCTION MATERIAL GENERIC TYPE	HIGH ALLOY		

ARIZONA PUBLIC SERVICE: FOUR CORNERS 3 (CONT.)

** DAMPERS	
NUMBER	2
FUNCTION	CONTROL
GENERIC TYPE	LOUVER
SPECIFIC TYPE	PARALLEL BLADE MULTILOUVER
MANUFACTURER	AMERICAN STANDARD
SERVICE CONDITIONS	120-130 F
CONSTRUCTION MATERIAL GENERIC TYPE	STAINLESS STEEL
CONSTRUCTION MATERIAL SPECIFIC TYPE	AUSTENITIC
LINER GENERIC MATERIAL TYPE	NONE
LINER SPECIFIC MATERIAL TYPE	N/A

** DAMPERS	
NUMBER	1
FUNCTION	SHUT-OFF
GENERIC TYPE	GUILLOTINE
SPECIFIC TYPE	NR
MANUFACTURER	NR
SERVICE CONDITIONS	NR
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	CIRCULAR
DIMENSIONS	NR
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
SHELL SPECIFIC MATERIAL TYPE	ASTM A-283
LINER GENERIC MATERIAL TYPE	NONE
LINER SPECIFIC MATERIAL TYPE	N/A

** DUCTWORK	
LOCATION	OUTLET 'ME TO STACK!
CONFIGURATION	RECTANGULAR
DIMENSIONS	NR
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
SHELL SPECIFIC MATERIAL TYPE	ASTM A-283
LINER GENERIC MATERIAL TYPE	STAINLESS STEEL
LINER SPECIFIC MATERIAL TYPE	AUSTENITIC

** REAGENT PREPARATION EQUIPMENT	
FUNCTION	SLAKER
DEVICE	NR
DEVICE TYPE	NR
MANUFACTURER	JOY
NUMBER	1
NUMBER OF SPARES	0
FULL LOAD DRY FEED CAPACITY - M.TONS/HR	13.6 (15 TPH)
PRODUCT QUALITY - % SOLIDS	30.0

** REAGENT PREPARATION EQUIPMENT	
FUNCTION	WET BALL MILL
DEVICE	NR
DEVICE TYPE	NR
MANUFACTURER	KENNEDY VAN SAUN
NUMBER	1
NUMBER OF SPARES	0

** TANKS	
SERVICE	NUMBER
-----	-----
BLEED STREAM	1
RECYCLE	2
MAKEUP WATER	1
RETURN TRANSFER	1
LIME SLURRY	4

LITY FGD SURVEY: JANUARY - DECEMBER 1988

ZONA PUBLIC SERVICE: FOUR CORNERS 3 (CONT.)

PUMPS	
SERVICE	NUMBER
-----	-----
RECYCLE	2
RECYCLE `STANDBY!	4
BLEED STREAM TANK	****
THICKENER UNDERFLOW	4
LIME SLURRY TRANSFER	2
RETURN WATER	2
SERVICE WATER	****
ME WATER	****
SOLIDS CONCENTRATING/DEWATERING	
DEVICE	THICKENER
NUMBER	1
NUMBER OF SPARES	0
CONFIGURATION	CIRCULAR
DIMENSIONS - FT	100
CAPACITY	1000000
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
SHELL SPECIFIC MATERIAL TYPE	AISI 1110
LINER GENERIC MATERIAL TYPE	ORGANIC
LINER SPECIFIC MATERIAL TYPE	GLASS FLAKE-FILLED POLYESTER
FEED STREAM SOURCE	ABSORBER BLEED
OUTLET STREAM CHARACTERISTICS	40.0%
* SALEABLE BYPRODUCTS	
NATURE	NONE
DISPOSITION	N/A
* SLUDGE	
FULL LOAD SLUDGE QUANTITY - M.TONS/HR (DRY)	25.4 (28.0 TPH)
MOISTURE CONTENT - % TOTAL FREE WATER	60.0
% CASO3 - DRY	18.0
% CASO4 - DRY	5.0
% CAOH2 - DRY	1.0
% CACO3 - DRY	1.0
% ASH - DRY	75.0
% OTHER COMPOUNDS - DRY	1.0
* TREATMENT	
METHOD	DEWATERED
DEVICE	NR
PROPRIETARY PROCESS	NR
* DISPOSAL	
NATURE	FINAL
TYPE	POND
LOCATION	ON-SITE
SITE TRANSPORTATION METHOD	PIPELINE
SITE TREATMENT	NONE
SITE DIMENSIONS	70 ACRES/55 FT
SITE CAPACITY - CU.M	4708550 (3850.0 ACRE-FT)
SITE SERVICE LIFE - YRS	10
* PROCESS CONTROL AND INSTRUMENTATION	
PROCESS STREAM	SLURRY STREAM
CHEMICAL PARAMETERS	PH
PHYSICAL VARIABLES	% SOLIDS, FLOW, TEMPERATURE
CONTROL LEVELS	PH 6.2-7.2, 12% SOLIDS
MONITOR TYPE	PH- APS FLOW THROUGH; DENSITY- TEXAS NUCLEAR
MONITOR LOCATION	RECYCLE LOOP ON TANGENTIAL NOZZLE HEADER
PROCESS CONTROL MANNER	AUTOMATIC
PROCESS CHEMISTRY MODE	FEEDBACK

ARIZONA PUBLIC SERVICE: FOUR CORNERS 3 (CONT.)

** WATER BALANCE	
WATER LOOP TYPE	OPEN
EVAPORATION WATER LOSS - LITER/S	6.3 (100 GPM)
SOURCE OF MAKEUP WATER	LAKE WATER
** CHEMICALS AND CONSUMPTION	
FUNCTION	ABSORBENT
NAME	LIME
PRINCIPAL CONSTITUENT	CAO
SOURCE/SUPPLIER	CAN AM, PAUL LIME CO.
CONSUMPTION	20 TPD
UTILIZATION - %	83.0
POINT OF ADDITION	SLAKER, ABSORBER BOTTOM
** FGD SPARE CAPACITY INDICES	
ABSORBER - %	0.0
** FGD SPARE COMPONENT INDICES	
ABSORBER	0.0

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

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

** PROBLEMS/SOLUTIONS/COMMENTS

INITIAL OPERATIONS STARTED IN NOVEMBER 1979.

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

** PROBLEMS/SOLUTIONS/COMMENTS

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

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

** PROBLEMS/SOLUTIONS/COMMENTS

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

7/80	SYSTEM						744		
8/80	SYSTEM						744		
9/80	SYSTEM						720		
10/80	SYSTEM						744		
11/80	SYSTEM						720		
12/80	SYSTEM						744		
1/81	SYSTEM						744		
2/81	SYSTEM						672		

ILITY FGD SURVEY: JANUARY - DECEMBER 1988

WAZONA PUBLIC SERVICE: FOUR CORNERS 3 (CONT.)

-----PERFORMANCE DATA-----										
100	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
'81	SYSTEM									744
'81	SYSTEM									720
'81	SYSTEM									744
'81	SYSTEM									720
'81	SYSTEM									744
'81	SYSTEM									744
'81	SYSTEM									720
'81	SYSTEM									744
'81	SYSTEM									720
'81	SYSTEM									744
'82	SYSTEM									744
'82	SYSTEM									672
'82	SYSTEM									744
'82	SYSTEM									720
'82	SYSTEM									744
'82	SYSTEM									720
'82	SYSTEM									744
'82	SYSTEM									744
'82	SYSTEM									720
'82	SYSTEM									744
'82	SYSTEM									720
'82	SYSTEM									744
'83	SYSTEM									744
'83	SYSTEM									672
'83	SYSTEM									744

** PROBLEMS/SOLUTIONS/COMMENTS

INFORMATION WAS UNAVAILABLE FOR THE PERIOD OF JULY 1980 THROUGH MARCH 1983

'83	SYSTEM									720
'83	SYSTEM									744
'83	SYSTEM									720

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

ARIZONA PUBLIC SERVICE: FOUR CORNERS 3 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

INFORMATION WAS UNAVAILABLE FOR THE PERIOD OF JULY 1980 THROUGH JUNE 1983.

7/83	SYSTEM	744
8/83	SYSTEM	744
9/83	SYSTEM	720

** PROBLEMS/SOLUTIONS/COMMENTS

INFORMATION WAS UNAVAILABLE FOR THE THIRD QUARTER OF 1983.

10/83	SYSTEM	744
11/83	SYSTEM	720
12/83	SYSTEM	744

** PROBLEMS/SOLUTIONS/COMMENTS

INFORMATION WAS UNAVAILABLE FOR 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 NOT AVAILABLE FOR THE FIRST THREE QUARTERS OF 1984.

10/84	SYSTEM	744
11/84	SYSTEM	720
12/84	SYSTEM	744

** PROBLEMS/SOLUTIONS/COMMENTS

INFORMATION WAS NOT AVAILABLE FOR THE FOURTH QUARTER OF 1984.

1/85	SYSTEM	744
2/85	SYSTEM	672
3/85	SYSTEM	744
4/85	SYSTEM	720

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988
 IZOMA PUBLIC SERVICE: FOUR CORNERS 3 (CONT.)

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

/85	SYSTEM						744		
/85	SYSTEM						720		
/85	SYSTEM						744		
/85	SYSTEM						744		
/85	SYSTEM						720		
/85	SYSTEM						744		
/85	SYSTEM						720		
/85	SYSTEM						744		

** PROBLEMS/SOLUTIONS/COMMENTS

INFORMATION WAS UNAVAILABLE FOR THE MONTHS OF JANUARY THROUGH DECEMBER 1985.

/86	SYSTEM						774		
/86	SYSTEM						672		
/86	SYSTEM						774		
/86	SYSTEM						720		
/86	SYSTEM						774		
/86	SYSTEM						720		
/86	SYSTEM						774		
/86	SYSTEM						774		
/86	SYSTEM						720		
/86	SYSTEM						774		
/86	SYSTEM						720		
/86	SYSTEM						774		

** PROBLEMS/SOLUTIONS/COMMENTS

DURING A 2-3 WEEK SCHEDULED UNIT OUTAGE IN 1986, LINER REPAIRS AND REWORK OF THE WET FGD BOOSTER FANS WERE CONDUCTED. NO OTHER MAJOR SCHEDULED OR UNSCHEDULED OUTAGES WERE REPORTED FOR 1986 BY THE UTILITY.

/87	SYSTEM						744		
/87	SYSTEM						672		
/87	SYSTEM						744		
/87	SYSTEM						720		
/87	SYSTEM						744		
/87	SYSTEM						720		
/87	SYSTEM						744		

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

ARIZONA PUBLIC SERVICE: FOUR CORNERS 3 (CONT.)

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

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

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED OUTAGES WERE ENCOUNTERED DURING 1987. THE UNIT WAS REPORTED TO HAVE BEEN OFF-LINE MARCH 29 THROUGH MAY 1 FOR SCHEDULED BOILER/TURBINE MAINTENANCE. DURING THIS OUTAGE, THE UTILITY PERFORMED ROUTINE MAINTENANCE ON THE FGD SYSTEM.

1/88	SYSTEM						774
2/88	SYSTEM						672
3/88	SYSTEM						774
4/88	SYSTEM						720
5/88	SYSTEM						774
6/88	SYSTEM						720
7/88	SYSTEM						774
8/88	SYSTEM						774
9/88	SYSTEM						720
10/88	SYSTEM						774
11/88	SYSTEM						720
12/88	SYSTEM						774

** PROBLEMS/SOLUTIONS/COMMENTS

INFORMATION WAS UNAVAILABLE FOR THE YEAR 1988.

SECTION 13
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	ARIZONA PUBLIC SERVICE
PLANT NAME	FOUR CORNERS
UNIT NUMBER	4
CITY	FARMINGTON
STATE	NEW MEXICO
REGULATORY CLASSIFICATION	A
PARTICULATE EMISSION LIMITATION - NG/J	215. (0.500 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	258. (0.600 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	301. (0.700 LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	2089
GROSS UNIT GENERATING CAPACITY - MW	786
NET UNIT GENERATING CAPACITY W/FGD - MW	739
NET UNIT GENERATING CAPACITY WO/FGD - MW	758
EQUIVALENT SCRUBBED CAPACITY - MW	668
*** 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	20120. (8650 BTU/LB)
RANGE HEAT CONTENT - BTU/LB	8300-9000
AVERAGE ASH CONTENT - %	22.00
RANGE ASH CONTENT - %	****
AVERAGE MOISTURE CONTENT - %	*****
RANGE MOISTURE CONTENT - %	****
AVERAGE SULFUR CONTENT - %	0.75
RANGE SULFUR CONTENT - %	0.6-1.0
AVERAGE CHLORIDE CONTENT - %	0.10
RANGE CHLORIDE CONTENT - %	****
*** PARTICLE CONTROL	
** FABRIC FILTER	
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
*** FGD SYSTEM	
** GENERAL DATA	
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT
SO2 REMOVAL MODE	WET SCRUBBING
PROCESS TYPE	LIME
SYSTEM SUPPLIER	BABCOCK & WILCOX
A-E FIRM	EBASCO
DEVELOPMENT LEVEL	FULL SCALE
NEW/RETROFIT	RETROFIT
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	80.00
ENERGY CONSUMPTION - %	2.4
CURRENT STATUS	1
COMMERCIAL START-UP	1/1985
INITIAL START-UP	10/1984

ILITY FGD SURVEY: JANUARY - DECEMBER 1988

WONA PUBLIC SERVICE: FOUR CORNERS 4 (CONT.)

CONTRACT AWARDED	0/1978
* DESIGN AND OPERATING PARAMETERS	
DESIGN COAL SULFUR CONTENT - %	0.80
DESIGN CHLORIDE CONTENT - %	*****
* QUENCHER/PRESATURATOR	
CONSTRUCTION MATERIAL GENERIC TYPE	NR
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR
* ABSORBER	
NUMBER	10
GENERIC TYPE	SPRAY TOWER
SPECIFIC TYPE	OPEN COUNTERCURRENT SPRAY
TRADE NAME/COMMON TYPE	NR
SHELL GENERIC MATERIAL	STAINLESS STEEL
SHELL SPECIFIC MATERIAL	AUSTENITIC
SHELL MATERIAL TRADE NAME/COMMON TYPE	TYPE 317LM
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	306.73 (650000 ACFM)
SO2 REMOVAL EFFICIENCY - %	67.5
* 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	BYPASS
SPECIFIC TYPE	N/A
TRADE NAME/COMMON TYPE	N/A
PERCENT GAS BYPASSED - AVG	15.0
CONSTRUCTION MATERIAL GENERIC TYPE	NR
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR
* FANS	
DESIGN	NR
FUNCTION	NR
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	SLAKER
DEVICE	DETENTION
DEVICE TYPE	N/A

ARIZONA PUBLIC SERVICE: FOUR CORNERS 4 (CONT.)

** TANKS	
SERVICE	NUMBER
-----	-----
NR	****
** PUMPS	
SERVICE	NUMBER
-----	-----
NR	****
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	NA
*** SALEABLE BYPRODUCTS	
NATURE	NONE
DISPOSITION	N/A
*** SLUDGE	
** TREATMENT	
METHOD	FIXATION
DEVICE	NA
PROPRIETARY PROCESS	CONVERSION SYSTEMS 'POZ-O-TEC'
** DISPOSAL	
NATURE	FINAL
TYPE	LANDFILL
SITE TREATMENT	NR

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

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

10/84	SYSTEM						744		
11/84	SYSTEM						720		
12/84	SYSTEM						744		

** PROBLEMS/SOLUTIONS/COMMENTS

INFORMATION WAS NOT AVAILABLE FOR THE FOURTH QUARTER OF 1984.

1/85	SYSTEM						744		
2/85	SYSTEM						672		
3/85	SYSTEM						744		
4/85	SYSTEM						720		
5/85	SYSTEM						744		
6/85	SYSTEM						720		
7/85	SYSTEM						744		
8/85	SYSTEM						744		
9/85	SYSTEM						720		
10/85	SYSTEM						744		
11/85	SYSTEM						720		

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988
 IZONA PUBLIC SERVICE: FOUR CORNERS 4 (CONT.)

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

/85 SYSTEM 744

** PROBLEMS/SOLUTIONS/COMMENTS

INFORMATION WAS UNAVAILABLE FOR THE MONTHS OF JANUARY THROUGH DECEMBER 1985.

/86 SYSTEM 774

/86 SYSTEM 672

/86 SYSTEM 774

/86 SYSTEM 720

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE BOILER OUTAGE MINOR PATCH WORK WAS CONDUCTED ON THE SCRUBBER OUTLET DUCTWORK.

DUE TO AN EXPLOSION AT A SIMILIARLY DESIGNED BOILER AT ANOTHER UTILITY, APS HAD TO SHUTDOWN TWO OF THEIR BOILERS FOR EMERGENCY REPAIRS TO THE HOT REHEAT PIPING. FOUR CORNERS 4 AND 5 BOTH HAD TO BE SHUT DOWN FOR REPAIRS. UNIT 4 WAS TAKEN OFF-LINE IN MARCH AND REMAINED OFF-LINE UNTIL APRIL.

/86 SYSTEM 774

/86 SYSTEM 720

/86 SYSTEM 774

/86 SYSTEM 774

/86 SYSTEM 720

/86 SYSTEM 774

/86 SYSTEM 720

/86 SYSTEM 774

** PROBLEMS/SOLUTIONS/COMMENTS

AFTER STARTUP IN APRIL, NO MAJOR UNIT OR FGD OUTAGES WERE ENCOUNTERED DURING THE REMAINDER OF 1986. FGD ANNUAL SYSTEM AVAILABILITY AND RELIABILITY WERE REPORTED TO BE 99.24 AND 99.03%, RESPECTIVELY.

/87 SYSTEM 744

/87 SYSTEM 672

/87 SYSTEM 744

/87 SYSTEM 720

/87 SYSTEM 744

/87 SYSTEM 720

/87 SYSTEM 744

/87 SYSTEM 744

/87 SYSTEM 720

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

ARIZONA PUBLIC SERVICE: FOUR CORNERS 4 (CONT.)

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

10/87	SYSTEM						744
11/87	SYSTEM						720
12/87	SYSTEM						744

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED OUTAGES WERE ENCOUNTERED DURING 1987. THE UNIT WAS REPORTED TO HAVE BEEN OFF-LINE JANUARY 31 THROUGH FEBRUARY 26 FOR SCHEDULED BOILER/TURBINE MAINTENANCE. DURING THIS OUTAGE, THE UTILITY PERFORMED ROUTINE MAINTENANCE ON THE FGD SYSTEM.

1/88	SYSTEM						774
2/88	SYSTEM						672
3/88	SYSTEM						774
4/88	SYSTEM						720
5/88	SYSTEM						774
6/88	SYSTEM						720
7/88	SYSTEM						774
8/88	SYSTEM						774
9/88	SYSTEM						720
10/88	SYSTEM						774
11/88	SYSTEM						720
12/88	SYSTEM						774

** PROBLEMS/SOLUTIONS/COMMENTS

INFORMATION WAS UNAVAILABLE FOR THE YEAR 1988.

SECTION 13

DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	ARIZONA PUBLIC SERVICE
PLANT NAME	FOUR CORNERS
UNIT NUMBER	5
CITY	FARMINGTON
STATE	NEW MEXICO
REGULATORY CLASSIFICATION	A
PARTICULATE EMISSION LIMITATION - NG/J	215. (0.500 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	258. (0.600 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	301. (0.700 LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	2089
GROSS UNIT GENERATING CAPACITY - MW	786
NET UNIT GENERATING CAPACITY W/FGD - MW	739
NET UNIT GENERATING CAPACITY WO/FGD - MW	758
EQUIVALENT SCRUBBED CAPACITY - MW	668
** 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	20120. (8650 BTU/LB)
RANGE HEAT CONTENT - BTU/LB	8300-9000
AVERAGE ASH CONTENT - %	22.00
RANGE ASH CONTENT - %	*****
AVERAGE MOISTURE CONTENT - %	*****
RANGE MOISTURE CONTENT - %	*****
AVERAGE SULFUR CONTENT - %	0.75
RANGE SULFUR CONTENT - %	0.6-1.0
AVERAGE CHLORIDE CONTENT - %	0.10
RANGE CHLORIDE CONTENT - %	*****
*** PARTICLE CONTROL	
** FABRIC FILTER	
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	BABCOCK & WILCOX
A-E FIRM	EBASCO
DEVELOPMENT LEVEL	FULL SCALE
NEW/RETROFIT	RETROFIT
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	80.00
ENERGY CONSUMPTION - %	2.4
CURRENT STATUS	1
COMMERCIAL START-UP	1/1985

ILITY FGD SURVEY: JANUARY - DECEMBER 1988

IZONA PUBLIC SERVICE: FOUR CORNERS 5 (CONT.)

INITIAL START-UP	10/1984	
CONTRACT AWARDED	0/1978	
* DESIGN AND OPERATING PARAMETERS		
DESIGN COAL SULFUR CONTENT - %	0.80	
DESIGN CHLORIDE CONTENT - %	*****	
* QUENCHER/PRESATURATOR		
CONSTRUCTION MATERIAL GENERIC TYPE	NR	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR	
* ABSORBER		
NUMBER	10	
GENERIC TYPE	SPRAY TOWER	
SPECIFIC TYPE	OPEN COUNTERCURRENT SPRAY	
TRADE NAME/COMMON TYPE	NR	
SHELL GENERIC MATERIAL	STAINLESS STEEL	
SHELL SPECIFIC MATERIAL	AUSTENITIC	
SHELL MATERIAL TRADE NAME/COMMON TYPE	TYPE 317LM	
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	306.73	(650000 ACFM)
SO2 REMOVAL EFFICIENCY - %	90.0	
* 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	BYPASS	
SPECIFIC TYPE	N/A	
TRADE NAME/COMMON TYPE	N/A	
PERCENT GAS BYPASSED - AVG	15.0	
CONSTRUCTION MATERIAL GENERIC TYPE	NR	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR	
* FANS		
DESIGN	NR	
FUNCTION	NR	
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	SLAKER	
DEVICE	DETENTION	
DEVICE TYPE	N/A	

ARIZONA PUBLIC SERVICE: FOUR CORNERS 5 (CONT.)

** TANKS SERVICE ----- NR	NUMBER ----- ****
** PUMPS SERVICE ----- NR	NUMBER ----- ****
** SOLIDS CONCENTRATING/DEWATERING DEVICE	NA
*** SALEABLE BYPRODUCTS NATURE DISPOSITION	NONE N/A
*** SLUDGE	
** TREATMENT METHOD DEVICE PROPRIETARY PROCESS	FIXATION NA CONVERSION SYSTEMS 'POZ-O-TEC'
** DISPOSAL NATURE TYPE SITE TREATMENT	FINAL LANDFILL NR

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

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

10/84	SYSTEM						744		
11/84	SYSTEM						720		
12/84	SYSTEM						744		

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE FGD SYSTEM OPERATED WELL DURING THE FOURTH QUARTER OF 1984 WITH THE EXCEPTION OF MINOR INCIDENTS OF PLUGGING OR NEED TO SWAP OUT ATOMIZERS.

1/85	SYSTEM						744		
2/85	SYSTEM						672		
3/85	SYSTEM						744		
4/85	SYSTEM						720		
5/85	SYSTEM						744		
6/85	SYSTEM						720		
7/85	SYSTEM						744		
8/85	SYSTEM						744		
9/85	SYSTEM						720		
10/85	SYSTEM						744		

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988
 ZONA PUBLIC SERVICE: FOUR CORNERS 5 (CONT.)

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

35	SYSTEM							720			
35	SYSTEM							744			
36	SYSTEM							774			
36	SYSTEM							672			
36	SYSTEM							774			
36	SYSTEM							720			
36	SYSTEM							774			
36	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

DUE TO AN EXPLOSION AT A SIMILARLY DESIGNED BOILER AT ANOTHER UTILITY, APS HAD TO SHUTDOWN TWO OF THEIR BOILERS FOR EMERGENCY REPAIRS TO THE HOT DURING THE BOILER OUTAGE MINOR PATCH WORK WAS CONDUCTED ON THE SCRUBBER OUTLET DUCTWORK. REHEAT PIPING. FOUR CORNERS 4 AND 5 BOTH HAD TO BE SHUTDOWN FOR REPAIRS. UNIT 5 WAS TAKEN OFF-LINE IN MARCH AND REMAINED OFF-LINE UNTIL JUNE. UNIT 5 WAS DOWN LONGER THAN UNIT 4 BECAUSE THE UTILITY DECIDED TO REPLACE ALL NINE COAL PULVERIZERS IN ADDITION TO THE BOILER REPAIR WORK.

36	SYSTEM							774			
36	SYSTEM							774			
36	SYSTEM							720			
86	SYSTEM							774			
86	SYSTEM							720			
86	SYSTEM							774			

** PROBLEMS/SOLUTIONS/COMMENTS

AFTER STARTUP IN JUNE, NO MAJOR UNIT OR FGD OUTAGES WERE ENCOUNTERED DURING THE REMAINDER OF 1986. FGD ANNUAL SYSTEM AVAILABILITY AND RELIABILITY WERE REPORTED TO BE 97.60 AND 97.55 %, RESPECTIVELY.

87	SYSTEM							744			
87	SYSTEM							672			
87	SYSTEM							744			
87	SYSTEM							720			
87	SYSTEM							744			
97	SYSTEM							720			
87	SYSTEM							744			
87	SYSTEM							744			
87	SYSTEM							720			

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

ARIZONA PUBLIC SERVICE: FOUR CORNERS 5 (CONT.)

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

10/87	SYSTEM							744		
11/87	SYSTEM							720		
12/87	SYSTEM							744		

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED OUTAGES WERE ENCOUNTERED DURING 1987. THE UNIT WAS REPORTED TO HAVE BEEN OFF-LINE MARCH 1 THROUGH MARCH 21 FOR SCHEDULED BOILER/TURBINE MAINTENANCE. DURING THIS OUTAGE, THE UTILITY PERFORMED ROUTINE MAINTENANCE ON THE FGD SYSTEM.

1/88	SYSTEM							774		
2/88	SYSTEM							672		
3/88	SYSTEM							774		
4/88	SYSTEM							720		
5/88	SYSTEM							774		
6/88	SYSTEM							720		
7/88	SYSTEM							774		
8/88	SYSTEM							774		
9/88	SYSTEM							720		
10/88	SYSTEM							774		
11/88	SYSTEM							720		
12/88	SYSTEM							774		

** PROBLEMS/SOLUTIONS/COMMENTS

INFORMATION WAS UNAVAILABLE FOR THE YEAR 1988.

SECTION 13

DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	ASSOCIATED ELECTRIC
PLANT NAME	THOMAS HILL
UNIT NUMBER	3
CITY	MOBERLY
STATE	MISSOURI
REGULATORY CLASSIFICATION	B
PARTICULATE EMISSION LIMITATION - NG/J	***** (***** LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	516. (1.200 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	***** (***** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	1150
GROSS UNIT GENERATING CAPACITY - MW	670
NET UNIT GENERATING CAPACITY W/FGD - MW	628
NET UNIT GENERATING CAPACITY WO/FGD - MW	643
EQUIVALENT SCRUBBED CAPACITY - MW	615
** 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	198. (650 FT)
STACK SHELL	CONCRETE
STACK TOP DIAMETER - M	***** (***** FT)
** FUEL DATA	
FUEL TYPE	COAL
FUEL GRADE	BITUMINOUS
AVERAGE HEAT CONTENT - J/G	24423. (10500 BTU/LB)
RANGE HEAT CONTENT - BTU/LB	9600-9800
AVERAGE ASH CONTENT - %	11.20
RANGE ASH CONTENT - %	****
AVERAGE MOISTURE CONTENT - %	14.00
RANGE MOISTURE CONTENT - %	****
AVERAGE SULFUR CONTENT - %	4.80
RANGE SULFUR CONTENT - %	3.8-4.5
AVERAGE CHLORIDE CONTENT - %	*****
RANGE CHLORIDE CONTENT - %	****
*** PARTICLE CONTROL	
** ESP	
NUMBER	2
NUMBER OF SPARES	0
TYPE	COLD SIDE
SUPPLIER	PEABODY INTERNATIONAL
INLET FLUE GAS CAPACITY - CU.M/S	1349.6 (2860000 ACFM)
INLET FLUE GAS TEMPERATURE - C	148.9 (300 F)
PARTICLE REMOVAL EFFICIENCY - %	99.7
** 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
*** FGD SYSTEM	
** GENERAL DATA	
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT
SO2 REMOVAL MODE	WET SCRUBBING
PROCESS TYPE	LIMESTONE
PROCESS ADDITIVES	MAGNESIUM OXIDE
SYSTEM SUPPLIER	M.W. KELLOGG

ILITY FGD SURVEY: JANUARY - DECEMBER 1988

SOCIATED ELECTRIC: THOMAS HILL 3 (CONT.)

A-E FIRM	BURNS & MCDONNELL
DEVELOPMENT LEVEL	FULL SCALE
NEW/RETROFIT	NEW
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.00
UNIT DESIGN SO ₂ REMOVAL EFFICIENCY - %	91.50
ENERGY CONSUMPTION - %	2.2
CURRENT STATUS	1
COMMERCIAL START-UP	12/1982
INITIAL START-UP	10/1982
CONTRACT AWARDED	2/1978
DESIGN AND OPERATING PARAMETERS	
DESIGN COAL SULFUR CONTENT - %	4.80
DESIGN CHLORIDE CONTENT - %	*****
SPACE REQUIREMENTS - SQ M	1858.0 (20000 SQ FT)
QUENCHER/PRESATURATOR	
CONSTRUCTION MATERIAL GENERIC TYPE	NR
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR
ABSORBER	
NUMBER	4
NUMBER OF SPARES	1
GENERIC TYPE	SPRAY TOWER
SPECIFIC TYPE	OPEN CROSSCURRENT SPRAY
TRADE NAME/COMMON TYPE	HORIZONTAL SPRAY CHAMBER
SUPPLIER	PULLMAN KELLOGG
DIMENSIONS - FT	26.0 X 18.0 X 80.0
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 H ₂ O ABSORPTION!
GAS CONTACTING DEVICE TYPE	NONE
NUMBER OF CONTACTING ZONES	4
LIQUID RECIRCULATION RATE - LITER/S	2646. (42000 GPM)
L/G RATIO - L/CU.M	2.3 (17.4 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	0.4 (1.5 IN-H ₂ O)
SUPERFICIAL GAS VELOCITY - M/SEC	6.7 (22.0 FT/S)
INLET GAS FLOW - CU. M/S	1142.00 (2420000 ACFM)
INLET GAS TEMPERATURE - C	137.8 (280 F)
SO ₂ REMOVAL EFFICIENCY - %	92.0
MIST ELIMINATOR	
PRE-MIST ELIMINATOR/MIST ELIMINATOR	PRIMARY COLLECTOR
NUMBER PER SYSTEM	4
GENERIC TYPE	IMPINGEMENT
SPECIFIC TYPE	BAFFLE
TRADE NAME/COMMON TYPE	CLOSED VANE
CONFIGURATION	VERTICAL
CONSTRUCTION MATERIAL GENERIC TYPE	NR
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR
WASH FREQUENCY	INTERMITTENT
REHEATER	
GENERIC TYPE	BYPASS
SPECIFIC TYPE	COLD SIDE
TRADE NAME/COMMON TYPE	N/A
CONSTRUCTION MATERIAL GENERIC TYPE	NR
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR
FANS	
NUMBER	2
NUMBER OF SPARES	0
DESIGN	AXIAL
SUPPLIER	TLT-BABCOCK
FUNCTION	UNIT
APPLICATION	FORCED DRAFT
SERVICE	DRY
FLUE GAS FLOW RATE - CU.M/S	1349.63 (2860000 ACFM)

ASSOCIATED ELECTRIC: THOMAS HILL 3 (CONT.)

FLUE GAS TEMPERATURE - C	148.9	(300 F)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	
** FANS		
NUMBER	2	
NUMBER OF SPARES	0	
DESIGN	AXIAL	
SUPPLIER	WESTINGHOUSE	
FUNCTION	UNIT	
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	KENNEDY VAN SAUN	
NUMBER	2	
NUMBER OF SPARES	0	
FULL LOAD DRY FEED CAPACITY - M.TONS/HR	74.4	(82 TPH)
** REAGENT PREPARATION EQUIPMENT		
FUNCTION	SLAKER	
DEVICE	NR	
DEVICE TYPE	NR	
MANUFACTURER	NR	
** TANKS		
SERVICE	NUMBER	
-----	-----	
LIMESTONE-SLURRY STORAGE	2	
MIST ELIMINATOR WASH	****	
FLOCCULANT	****	
THICKENER OVERFLOW	****	
ABSORBER RECYCLE	****	
FORCED OXIDATION	2	
MILL-PRODUCT	2	
** PUMPS		
SERVICE	NUMBER	
-----	-----	
ABSORBER RECIRCULATION	16	
WASH WATER	****	
FLOCCULANT FEED	****	
THICKENER UNDERFLOW	****	
THICKENER OVERFLOW	****	
LIMESTONE SLURRY TRANSFER	4	
MILL-PRODUCT	4	
** SOLIDS CONCENTRATING/DEWATERING		
DEVICE	CENTRIFUGE	
NUMBER	7	

LITY FGD SURVEY: JANUARY - DECEMBER 1988

OCIATED ELECTRIC: THOMAS HILL 3 (CONT.)

SOLIDS CONCENTRATING/DEWATERING	THICKENER
DEVICE	1
NUMBER	180.0 DIA
DIMENSIONS - FT	30% SOLIDS
OUTLET STREAM CHARACTERISTICS	
SALEABLE BYPRODUCTS	NONE
NATURE	N/A
DISPOSITION	
SLUDGE	
TREATMENT	FORCED OXIDATION
METHOD	N/A
DEVICE	N/A
PROPRIETARY PROCESS	
DISPOSAL	FINAL
NATURE	LANDFILL
TYPE	TRUCK
SITE TRANSPORTATION METHOD	NR
SITE TREATMENT	
PROCESS CONTROL AND INSTRUMENTATION	
MONITOR TYPE	KVB
WATER BALANCE	
WATER LOOP TYPE	CLOSED
MAKEUP WATER ADDITION - LITERS/S	48.6 (772 GPM)
CHEMICALS AND CONSUMPTION	
FUNCTION	ABSORBENT
NAME	DOLOMITIC LIME
PRINCIPAL CONSTITUENT	60% CAO, 40% MGO
POINT OF ADDITION	SLAKER
FGD SPARE CAPACITY INDICES	
ABSORBER - %	33.3
FGD SPARE COMPONENT INDICES	
ABSORBER	1.0

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

/82 SYSTEM

744

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT INITIAL START-UP OF THE FGD SYSTEM OCCURRED
DURING OCTOBER, 1982.

/82 SYSTEM

720

/82 SYSTEM

744

/83 SYSTEM

744

/83 SYSTEM

672

/83 SYSTEM

744

ASSOCIATED ELECTRIC: THOMAS HILL 3 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED PROBLEMS WITH A CENTRIFUGE IN THE SLUDGE DEWATERING PROCESS SECTION. THE INABILITY TO REDUCE THE SLUDGE SOLIDS CONTENT HAS FORCED THE UTILITY TO OPERATE BELOW THE FULL LOAD DEMAND.

4/83	SYSTEM					720			
5/83	SYSTEM					744			
6/83	SYSTEM					720			

** PROBLEMS/SOLUTIONS/COMMENTS

INFORMATION WAS UNAVAILABLE FOR THE PERIOD OF APRIL THROUGH JUNE 1983.

7/83	3A1	35.6	35.2		32.5				
	3A2	63.8	61.5		56.9				
	3B1	13.8	14.9		13.8				
	3B2	80.8	79.9		73.9				
	SYSTEM	64.7	63.8	63.8	59.0	744	688	439	80.6
8/83	3A1	36.7	36.8		36.7				
	3A2	51.3	51.4		51.3				
	3B1	59.3	59.4		59.3				
	3B2	50.0	50.1		50.0				
	SYSTEM	65.7	65.9	65.9	65.7	744	742	489	93.5
9/83	3A1	23.9	24.0		23.9				
	3A2	60.1	60.4		60.1				
	3B1	40.0	39.5		39.3				
	3B2	72.6	68.9		68.5				
	SYSTEM	65.5	64.2	64.2	63.9	720	717	460	91.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY ENCOUNTERED MAJOR PROBLEMS IN ATTEMPTING TO OPERATE THE DEWATERING PLANT AT REQUIRED CAPACITY FOR FULL FLUE GAS SCRUBBING. THESE PROBLEMS CENTERED AROUND THE CENTRIFUGE AND OXIDATION SYSTEM.

THE UTILITY EXPERIENCED CENTRIFUGE FAILURE WHILE DEWATERING UNDERFLOW TO THE REQUIRED SOLIDS CONCENTRATION. IN ATTEMPTS TO DUPLICATE CONDITIONS PRESENTED AT A TEST CENTRIFUGE, IT WAS DISCOVERED THAT OXIDIZED SLUDGE BELOW THE DESIGN SOLIDS CONCENTRATION TRIPS THE MACHINE ON TORQUE AND UNOXIDIZED SLUDGE BELOW THE DESIGN SOLIDS CONCENTRATION TRIPS THE MACHINE ON VIBRATION. THE UTILITY IS CONTINUING TO ADDRESS THE PROBLEM.

THE OXIDATION SYSTEM IS NOT UP TO REQUIRED CAPACITY. DURING THIS PERIOD WORK ON 2 OF 3 COMPRESSORS HAS BROUGHT UP THEIR CAPACITY, BUT PLUGGING OF THE SPARGER RINGS AND BUILD UP OF SOLIDS IN THE OXIDATION TANK CONTINUE TO ADVERSELY EFFECT THE OXIDATION CAPABILITIES. DESIGN FAILURE OF THE MIXING PADDLES HAS ALSO OCCURRED AND A TEMPORARY FIX WAS MADE. VENTING OF SOLIDS AT FULL OXIDATION RATES WITH SLURRY FLOW NEAR CAPACITY HAS ALSO BECOME A PROBLEM. VARIOUS DESIGN CHANGES ARE PROJECTED FOR THE SYSTEM DURING THE UNIT 3 FALL OUTAGE IN OCTOBER.

THE CONTINUOUS EMISSIONS MONITOR SAMPLE LINE REPLACEMENT IS NEARING COMPLETION AND SHOULD BE READY FOR TESTING IN MID-OCTOBER.

DURING THIS REPORTING PERIOD, TESTS WERE RUN ON ONE ISOLATED SCRUBBER MODULE RUNNING AT DESIGN FLOW TO DETERMINE OPERATING EFFICIENCY. RESULTS OF THESE TESTS SHOWED SOX REMOVAL RATES WITHIN DESIGN BUT ONLY WHEN LIME-STONE WAS ADDED AT A LEVEL OF OVER TWICE THE THEORETICAL STOICHIOMETRY.

LITY FGD SURVEY: JANUARY - DECEMBER 1988

OCIATED ELECTRIC: THOMAS HILL 3 (CONT.)

-----PERFORMANCE DATA-----									
100	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER BOILER HOURS	FGD HOURS	CAP. HOURS FACTOR
83	3A1	22.3	39.8		21.6				
	3A2	25.9	47.5		25.9				
	3B1	53.9	97.8		53.2				
	3B2	13.4	24.6		13.4				
	SYSTEM	38.5	69.9	69.9	38.0		744	405	283 45.3

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS OFF-LINE FROM OCTOBER 17 THROUGH THE END OF THE MONTH. PROBLEMS WITH THE DEWATERING PLANT DURING THE THIRD QUARTER WERE STILL PRESENT INTO THE FOURTH QUARTER.

CARRYOVER OF SOLIDS THROUGH THE MIST ELIMINATORS CONTINUED TO BE A PROBLEM DURING OCTOBER. SLUDGE WAS BUILDING UP IN THE DUCTS AND ON THE BOTTOM OF THE STACK.

VELOCITY TESTS CONDUCTED DURING THE MONTH INDICATED ABOVE DESIGN VELOCITIES THROUGH THE MODULES. OPERATIONAL PARAMETERS WERE SET TO REDUCE VELOCITY.

DURING THE OCTOBER OUTAGE, WATER NOZZLES AND DRAINS WERE INSTALLED IN THE BREECHING DOWNSTREAM OF THE MIST ELIMINATORS AND IN THE STACK TO REDUCE SOLIDS BUILD UP.

STACK LINER DAMAGE WAS DISCOVERED TO BE THE RESULT OF CARRYOVER FROM THE FGD SYSTEM DURING THIS PERIOD. THE EXTENT OF DAMAGE IS BEING EVALUATED.

/83	3A1	61.7	85.7		58.4				
	3A2	48.5	66.6		45.4				
	3B1	44.8	61.8		42.2				
	3B2	47.8	65.3		44.5				
	SYSTEM	67.6	93.1	93.1	63.5		720	491	457 56.3

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT OUTAGE CONTINUED THROUGH NOVEMBER 10, 1983.

FGD SYSTEM OUTAGE TIME DURING NOVEMBER WAS DUE PRIMARILY TO MIST ELIMINATOR CLEANING.

/83	3A1	14.3	11.1		11.1				
	3A2	95.7	85.8		85.4				
	3B1	91.9	75.0		74.6				
	3B2	84.4	67.6		67.3				
	SYSTEM	95.4	79.8	79.8	79.5		744	741	591 81.4

** PROBLEMS/SOLUTIONS/COMMENTS

FGD SYSTEM OUTAGE TIME DURING DECEMBER WAS DUE IN PART TO MIST ELIMINATOR CLEANING.

SEVERE COLD WEATHER CONTRIBUTED TO FGD SYSTEM DOWN TIME DURING DECEMBER.

CENTRIFUGE FAILURE TO DEWATER THE SLUDGE UNDERFLOW AT THE REQUIRED SOLIDS CONCENTRATION IS STILL A PROBLEM. NEGOTIATIONS ARE UNDERWAY WITH THE CENTRIFUGE MANUFACTURER TO PLAN PERFORMANCE GUARANTEE TESTS.

MODIFICATIONS TO THE FORCED OXIDATION SYSTEM WERE MADE DURING THE FOURTH QUARTER AND HAVE IMPROVED THE ABILITY OF THE SYSTEM TO OXIDIZE SCRUBBER SLUDGE. A NUMBER OF DESIGN AND OPERATIONAL PROBLEMS ARE CONTINUOUSLY BEING ADDRESSED.

1/84	3A1	99.9	57.0		47.4				
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UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

ASSOCIATED ELECTRIC: THOMAS HILL 3 (CONT.)

-----PERFORMANCE DATA-----										
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	3A2	97.2	73.9		61.5					
	3B1	77.4	37.6		31.3					
	3B2	74.2	21.2		17.7					
	SYSTEM	100.0	63.3	63.3	52.6		744	619	392	53.8

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE EXTREME COLD WEATHER ADVERSELY EFFECTED BOTH BOILER AND SCRUBBER OPERATIONS.

2/84	3A1	95.1	48.0		25.5					
	3A2	66.5	53.5		28.4					
	3B1	67.7	60.6		32.2					
	3B2	65.0	62.3		33.1					
	SYSTEM	98.1	74.8	88.4	39.7		696	370	276	35.3

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE UNIT WAS OFF LINE FOR 13 DAYS DURING FEBRUARY.

3/84	3A1	73.5	68.1		65.7					
	3A2	69.2	67.8		65.4					
	3B1	81.0	50.5		48.7					
	3B2	53.4	50.3		48.6					
	SYSTEM	92.3	78.9	78.9	76.2		744	718	567	76.5

4/84	3A1	23.9	64.7		23.3					
	3A2	16.8	36.9		13.3					
	3B1	29.2	77.7		28.0					
	3B2	23.4	65.0		23.4					
	SYSTEM	31.1	81.4	81.4	29.4		720	260	212	28.1

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE UNIT WAS OFF LINE 19 DAYS DURING APRIL.

THE ABSORBER AND DEWATERING FACILITIES UNDERWENT REPAIRS DURING THE MONTH.

THE UTILITY IS CONTINUING TO HAVE PROBLEMS IN THEIR ATTEMPT TO OPERATE THE DEWATERING PLANT AT REQUIRED CAPACITY FOR FULL FLUE GAS SCRUBBING. THESE PROBLEMS ARE PRIMARILY DUE TO CENTRIFUGE FAILURE AND OXIDATION SYSTEM PROBLEMS.

DURING MARCH OF THIS PERIOD, M.W. KELLOGG, THE SYSTEM SUPPLIER, CONDUCTED EXTENSIVE TESTING ON THE FGD SYSTEM. THIS TESTING WAS AN ATTEMPT TO GET THE SYSTEM OPERATING AT DESIGN SO2 REMOVAL EFFICIENCIES. AT THE END OF THE QUARTER, TESTING WAS NOT COMPLETE, BUT IT WAS FOUND THAT OVER FEEDING LIMESTONE BY 2 TO 3 TIMES WOULD RAISE THE SYSTEM PH TO LEVELS THAT WOULD GIVE REMOVAL EFFICIENCIES ABOVE 90%. OPERATION AT THIS LEVEL OF UNREACTED LIMESTONE IN THE WASTE SLURRY ONLY ADDS TO DEWATERING PROBLEMS. THROUGH THE MIDDLE OF APRIL, M.W. KELLOGG CONTINUED ITS TESTING AND WILL ASSIST THE UTILITY IN A SOLUTION TO ITS PROBLEMS WITH REACTOR CHEMISTRY.

5/84	3A1	0.0			0.0					
	3A2	0.0			0.0					
	3B1	0.0			0.0					
	3B2	0.0			0.0					
	SYSTEM	0.0			0.0		744	0	0	0.0

ILITY FGD SURVEY: JANUARY - DECEMBER 1988

SOCIATED ELECTRIC: THOMAS HILL 3 (CONT.)

-----PERFORMANCE DATA-----
R100 MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION % REMOVAL PER BOILER FGD CAP.
SO2 PART. HOURS HOURS HOURS HOURS FACTOR

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE UNIT WAS OFF LINE ALL MONTH FOR A SCHEDULED OUTAGE.

THE MODULES WERE UNAVAILABLE DUE TO REPAIR WORK IN THE ABSORBER AND DEWATERING FACILITIES.

/84	3A1	40.0	88.0	36.9				
	3A2	40.0	88.8	37.3				
	3B1	26.3	49.5	20.8				
	3B2	20.3	42.3	17.8				
	SYSTEM	42.2	89.5	37.6	720	302	271	33.2

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE UNIT WAS OFF LINE UNTIL JUNE 19 FOR A SCHEDULED OUTAGE.

THE ABSORBER AND DEWATERING FACILITIES WERE BEING REPAIRED DURING JUNE.

/84	3A1	66.3	67.1	66.3				
	3A2	73.4	74.3	73.4				
	3B1	70.4	71.2	70.4				
	3B2	67.2	68.1	67.2				
	SYSTEM	92.4	93.6	92.4	744	735	688	89.6

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY IS CONTINUING TO EXPERIENCE PROBLEMS IN THEIR ATTEMPT TO OPERATE THE DEWATERING PLANT AT REQUIRED CAPACITY FOR FULL FLUE GAS SCRUBBING. THOSE PROBLEMS ARE PRIMARILY DUE TO CENTRIFUGE FAILURE AND OXIDATION SYSTEM PROBLEMS.

WITH THE COMPLETION OF TESTS IN APRIL THE FGD SYSTEM SUPPLIER, M.W. KELLOGG, HAS RECOMMENDED AND WILL MAKE THE FOLLOWING MODIFICATIONS IN ATTEMPTS TO BRING THE SYSTEM UP TO DESIGN PERFORMANCE

- (1) REPLACEMENT OF REACTOR BAFFLER.
- (2) REPLACEMENT OF ALL NOZZLES WITH BETE DESIGN.
- (3) MODIFICATION OF THE RECYCLE PUMPS FOR HIGHER FLOW RATES.
- (4) INSTALL A ROUGHING DEMISTER.

THE DESCRIBED WORK IS SCHEDULED TO BEGIN AUGUST 6TH.

9/84	3A1	83.4	82.4	79.3				
	3A2	67.4	61.1	58.8				
	3B1	11.0	6.6	6.3				
	3B2	82.2	83.0	79.9				
	SYSTEM	81.3	77.7	74.8	744	716	556	86.3

** PROBLEMS/SOLUTIONS/COMMENTS

FGD SYSTEM OUTAGE TIME DURING AUGUST WAS DUE IN PART TO MODULE CLEANING.

MODULE 3B1 UNDERWENT MAJOR DESIGN MODIFICATIONS DURING AUGUST.

THE UNIT WAS DOWN DURING PART OF AUGUST DUE TO BOILER LEAKS.

FGD SYSTEM OUTAGE TIME DURING AUGUST WAS DUE IN PART TO MODULE CLEANING.

MODULE 3B1 UNDERWENT MAJOR DESIGN MODIFICATIONS DURING AUGUST.

THE UNIT WAS DOWN DURING PART OF AUGUST DUE TO BOILER TUBE LEAKS.

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

ASSOCIATED ELECTRIC: THOMAS HILL 3 (CONT.)

-----PERFORMANCE DATA-----									
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER BOILER HOURS	BOILER HOURS	FGD CAP. HOURS FACTOR
9/84	3A1	45.3	45.5		45.3				
	3A2	71.2	71.4		71.2				
	3B1	52.5	52.7		52.5				
	3B2	27.6	27.7		27.6				
	SYSTEM	65.5	65.8		65.5		720	717	472 84.5

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT IT WILL BE CONDUCTING THE FOLLOWING MAJOR REPAIRS DURING THE FOURTH QUARTER OF 1984 IN EFFORTS TO INCREASE THE SYSTEMS SO2 REMOVAL EFFICIENCY AND LIMESTONE UTILIZATION:

- (1) INSTALLING TWO BAFFLES IN EACH REACTOR TO ESTABLISH A PH PROFILE ACROSS THREE SEPARATE COMPARTMENTS.
- (2) INSTALLING NEW DOWNCOMERS BETWEEN THE ABSORBERS AND REACTORS TO HELP RETAIN THE HIGH PH SCRUBBER LIQUOR IN THE FIRST COMPARTMENT.
- (3) REPLACING THE EXISTING SPRAY NOZZLES WITH NEW LOWER PRESSURE DROP NOZZLES TO INCREASE THE SYSTEM'S L/G.
- (4) INSTALLING NEW BULK ENTRAINMENT MIST ELIMINATORS TO REDUCE THE LIQUID LOADING AND FLATTEN THE FLOW DISTRIBUTION TO THE EXISTING MIST ELIMINATORS.

THE UTILITY ALSO REPORTED EXPERIENCING THE FOLLOWING PROBLEMS:

- (1) FAILURE OF CENTRIFUGES TO DEWATER SLUDGE AT MORE THAN 50% DESIGN. UTILITY IS CURRENTLY TESTING A NEW MODIFIED CENTRIFUGE.
- (2) OXIDATION TANK SPARGER RING PLUGGING, BLOWER INLET PLUGGING AND TANK PRESSURIZATION. UTILITY IS PRESENTLY ADDRESSING THIS PROBLEM ALSO.

10/84	3A1	44.7	48.6		43.6				
	3A2	26.8	29.9		26.8				
	3B1	39.4	43.9		39.4				
	3B2	41.3	46.0		41.3				
	SYSTEM	50.7	56.1		50.3		744	668	375 76.8

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE FGD SYSTEM WAS DOWN MOST OF THE MONTH OF OCTOBER DUE TO DEMISTER PLUGGING. THE UNIT WAS ALSO DOWN APPROXIMATELY 3 DAYS DUE TO TUBE LEAKS.

11/84	3A1	58.3	62.6		58.3				
	3A2	76.5	76.2		70.9				
	3B2	58.0	62.3		58.0				
	3B1	69.5	69.7		64.8				
	SYSTEM	87.4	90.3		84.0		720	660	605 83.1

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE MONTH OF NOVEMBER WITH THE EXCEPTION OF HAVING TO CLEAN ABSORBER MIST ELIMINATORS AND REPAIR A SEAL WATER LEAK.

12/84	3A1	63.7	57.7		52.5				
	3A2	65.5	61.9		56.3				
	3B1	67.9	33.1		30.1				
	3B2	82.6	78.7		71.6				
	SYSTEM	93.2	77.1		70.1		744	676	522 76.6

** PROBLEMS/SOLUTIONS/COMMENTS

THE PLANNED WORK REFERENCED TO DURING THE MONTH OF SEPTEMBER IS NOW COMPLETE THE SYSTEM SUPPLIER IS CURRENTLY INSPECTING THE SYSTEM TO DETERMINE THE EFFECT OF THESE MODIFICATIONS. ALL FOUR MODULES WERE ALSO

LITY FGD SURVEY: JANUARY - DECEMBER 1988

OCIATED ELECTRIC: THOMAS HILL 3 (CONT.)

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

CLEANED DURING THE MONTH OF DECEMBER.

85	3A1	77.0	70.3	70.3	66.7				
	3A2	77.1	74.9	74.9	71.1				
	3B1	64.3	60.5	60.5	57.4				
	3B2	65.1	58.9	58.9	55.9				
	SYSTEM	94.5	88.2	88.2	83.7	744	706	623	80.1
85	3A1	63.2	58.1	58.1	58.1				
	3A2	41.3	21.0	21.0	21.0				
	3B1	63.9	60.8	60.8	60.8				
	3B2	55.0	42.9	42.9	42.9				
	SYSTEM	74.5	60.9	60.9	60.9	672	672	409	78.5

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS DOWN FOR PART OF JANUARY AND FEBRUARY TO PERMIT MIST
 ELIMINATOR AND DUCTWORK CLEANING.

85	3A1	19.9	57.6	57.6	14.9				
	3A2	19.9	62.1	62.1	16.1				
	3B1	19.9	53.5	53.5	13.8				
	3B2	18.7	59.3	59.3	15.3				
	SYSTEM	26.1	77.5	77.5	20.0	744	192	149	16.9

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY IS INVESTIGATING THE USE OF DIBASIC ACID AND OTHER
 PROCESS/SYSTEM MODIFICATIONS TO IMPROVE SO2 REMOVAL EFFICIENCY AND SYSTEM
 RELIABILITY. BY PASS DAMPER OPERATION HAS BEEN IMPROVED SO THAT A SHUTOFF
 CAN NOW BE INVOKED. CENTRIFUGE MODIFICATIONS HAVE IMPROVED CAPACITY
 PROBLEMS. HOWEVER, OXIDATION SYSTEM AND THICKENER PROBLEMS CONTINUE TO BE
 A CONCERN WHEN FULL SCRUBBING CONDITIONS ARE ATTEMPTED UNDER FULL/HIGH
 BOILER LOADS.

85	3A1	0.9	39.6	39.6	0.9				
	3A2	0.9	39.6	39.6	0.9				
	3B1	0.9	39.6	39.6	0.9				
	3B2	0.2	9.1	9.1	0.2				
	SYSTEM	0.0	42.7	42.7	0.0	720	16	7	1.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS OFFLINE FOR A SCHEDULED OUTAGE FOR ALL BUT 16.4 HOURS OF THE
 MONTH. NO SPECIFIC FGD SYSTEM PROBLEMS WERE DESCRIBED BY THE UTILITY.

85	3A1	56.5	64.4	64.4	56.5				
	3A2	78.1	89.2	89.2	78.1				
	3B1	47.9	54.7	54.7	47.9				
	3B2	72.4	82.6	82.6	72.4				
	SYSTEM	85.0	97.0	97.0	85.0	744	652	632	62.1

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS REPORTEDLY PERFORMING UNDER COMPLIANCE CONDITIONS FOR ALL
 BUT 12.3 HOURS DURING THE ENTIRE MONTH. FULL LOAD COMPLIANCE OPERATION
 WAS ACHIEVED, HOWEVER, NOT ON A FULL TIME BASIS. A CONTRACTOR WAS
 EMPLOYED TO ASSIST IN DETERMINING OPTIMUM OPERATIONAL PARAMETERS AND
 ADDITIVE CHEMICALS.

85	3A1	64.4	74.9	74.9	64.4				
	3A2	69.6	81.0	81.0	69.6				
	3B1	62.2	72.3	72.3	62.2				

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

ASSOCIATED ELECTRIC: THOMAS HILL 3 (CONT.)

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

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	3B2	77.3	89.9	89.9	77.3					
	SYSTEM	91.1	100.0	100.0	91.1		720	619	656	64.7

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT OPERATED WITHIN THE 1.2 LB/MM BTU SO2 LIMITATION FOR ALL BUT 10.6 HOURS DURING THE MONTH. TOTAL SYSTEM DEPENDABILITY WAS VERY HIGH BECAUSE OF 4-MODULE OPERATION DURING THE MONTH (ONLY 3 ARE REQUIRED FOR FULL LOAD SERVICE).

7/85	3A1	50.5	67.1	67.1	50.5					
	3A2	71.8	95.4	95.4	71.8					
	3B1	62.3	82.9	82.9	62.3					
	3B2	70.8	94.1	94.1	70.8					
	SYSTEM	85.1	100.0	100.0	85.1		744	560	633	52.2

** PROBLEMS/SOLUTIONS/COMMENTS

MUCH OF THE SYSTEM UNAVAILABLE TIME DURING THE MONTH WAS ATTRIBUTED TO THE NECESSARY MIST ELIMINATOR CLEANING.

8/85	3A1	75.1	85.7	85.7	75.1					
	3A2	78.2	89.2	89.2	78.2					
	3B1	72.0	82.1	82.1	72.0					
	3B2	81.0	92.4	92.4	81.0					
	SYSTEM	100.0	100.0	100.0	100.0		744	652	744	60.1

** PROBLEMS/SOLUTIONS/COMMENTS

MIST ELIMINATOR CLEANING CONTINUED TO BE A MAJOR CAUSE OF MODULE UNAVAILABILITY DURING THE MONTHS OF JUNE THROUGH AUGUST.

THE FGD SYSTEM OPERATED WITH FOUR MODULES IN SERVICE DURING THE PERIOD. THE UNIT MAINTAINED SO2 COMPLIANCE FOR ALL BUT 28.9 HOURS DURING AUGUST.

9/85	3A1	94.0	94.5	98.2	88.0					
	3A2	97.1	97.2	99.8	90.5					
	3B1	92.6	90.6	98.5	84.3					
	3B2	93.9	94.0	97.5	87.5					
	SYSTEM	100.0	100.0	100.0	100.0		720	670	720	76.8

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT MAINTAINED SO2 COMPLIANCE FOR ALL BUT 10 HOURS THROUGH SEPTEMBER. 4-MODULE FGD SYSTEM OPERATION CONTINUED THROUGH THE MONTH.

10/85	3A1	94.4	93.6	96.8	91.9					
	3A2	91.2	93.7	99.3	92.0					
	3B1	91.7	88.0	96.8	86.4					
	3B2	94.4	93.8	96.8	92.1					
	SYSTEM	100.0	100.0	100.0	100.0		744	731	744	86.5

11/85	3A1	95.5	83.2	100.0	81.8					
	3A2	96.1	88.3	98.8	86.8					
	3B1	92.3	82.9	96.5	81.6					
	3B2	95.8	82.7	100.0	81.3					
	SYSTEM	100.0	100.0	100.0	100.0		720	708	720	68.3

12/85	3A1	97.4	85.2	100.0	77.5					
	3A2	96.0	72.0	99.3	65.5					
	3B1	98.7	86.4	100.0	78.6					
	3B2	98.0	45.7	99.6	41.5					
	SYSTEM	100.0	96.4	100.0	87.7		744	677	653	42.5

LITY FGD SURVEY: JANUARY - DECEMBER 1988

OCIATED ELECTRIC: THOMAS HILL 3 (CONT.)

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

86	3A1	94.6	88.3	94.5	74.0				
	3A2	94.2	74.9	93.9	62.8				
	3B1	95.4	88.1	95.0	73.8				
	3B2	96.0	91.6	95.1	76.8				
	SYSTEM	100.0	100.0	100.0	95.8	744	624	713	59.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT REMAINED IN COMPLIANCE AT 1.2 LB SO2/MM BTU FOR ALL BUT 13.5 HOURS IN JANUARY.

ABSORBER AND MIST ELIMINATOR CLEANING WAS PERFORMED PERIODICALLY THROUGHOUT THE MONTH.

86	3A1	77.8	72.9	94.1	49.5				
	3A2	71.9	81.1	98.3	55.1				
	3B1	73.6	79.0	98.3	53.6				
	3B2	79.3	79.2	96.5	53.8				
	SYSTEM	100.0	100.0	100.0	70.7	672	456	475	42.0

** PROBLEMS/SOLUTIONS/COMMENTS

THOMAS HILL 3 OPERATED WITHIN THE 1.2 LB/MM BTU SO2 STANDARD FOR ALL BUT 25.4 HOURS DURING FEBRUARY.

ABSORBER LINER FAILURES WERE REPAIRED DURING THE MONTH.

THE UTILITY REPORTED THAT MIST ELIMINATOR AND NOZZLE CLEANING WAS PERFORMED.

DURING FEBRUARY ABSORBER INTERNALS AND FLOORS WERE CLEANED.

THOMAS HILL 3 OPERATED WITHIN THE 1.2 LB/MM BTU SO2 STANDARD FOR ALL BUT 25.4 HOURS DURING FEBRUARY.

/86	3A1	98.5	96.1	98.5	96.1				
	3A2	98.5	94.3	99.6	94.3				
	3B1	98.4	91.7	98.2	91.7				
	3B2	96.2	85.0	98.4	85.0				
	SYSTEM	100.0	100.0	100.0	100.0	744	744	744	76.5

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY EXPERIENCED RECYCLE PUMP PROBLEMS IN MARCH. MAINTENANCE WAS PERFORMED AND THE PUMPS WERE PLACED BACK IN SERVICE.

MIST ELIMINATOR PLUGGING PROBLEMS WERE REPORTED DURING THE PERIOD. PERIODIC CLEANING WAS PERFORMED.

UNIT 3 OPERATED WITHIN THE 1.2 LB/MM BTU SO2 STANDARD FOR ALL BUT 6.25 HOURS DURING MARCH.

SOME ABSORBOR CLEANING WAS REPORTED DURING MARCH.

/86	3A1	49.2	90.8	100.0	40.3				
	3A2	50.0	69.3	100.0	30.8				
	3B1	49.2	83.5	100.0	37.1				
	3B2	49.1	89.1	100.0	39.6				
	SYSTEM	65.8	100.0	100.0	49.3	720	320	355	29.8

UTILITY FGD SURVEY: JANUARY - DECEMBER 1985

ASSOCIATED ELECTRIC: THOMAS HILL 3 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

THOMAS HILL 3 OPERATED WITHIN THE 1.2 LB/MM BTU SO2 STANDARD FOR ALL BUT 6.3 HOURS DURING APRIL.

THE ANNUAL SPRING OUTAGE BEGAN ON 4/16/86.

SOME DOWNTIME DURING THE MONTH WAS ATTRIBUTED TO A BOILER TUBE LEAK.

DURING APRIL THE UTILITY REPORTED THAT MIST ELIMINATOR CLEANING WAS REQUIRED SEVERAL TIMES.

GENERAL ABSORBER CLEANING AND MAINTENANCE WAS PERFORMED.

5/86	3A1	40.9	87.0	98.3	23.2				
	3A2	40.0	73.3	100.0	19.6				
	3B1	40.1	75.5	98.0	20.1				
	3B2	39.6	73.9	98.9	19.7				
	SYSTEM	53.5	100.0	100.0	27.5	744	198	205	16.7

** PROBLEMS/SOLUTIONS/COMMENTS

THOMAS HILL 3 OPERATED WITHIN THE 1.2 LB/MM BTU SO2 STANDARD FOR ALL BUT 9.8 HOURS DURING MAY.

THE UTILITY REPORTED THAT RECYCLE PUMP PROBLEMS WERE ENCOUNTERED DURING THE MONTH ON MODULE 3B2.

THE SCHEDULED SPRING OUTAGE CONTINUE THROUGH 5/19/86.

6/86	3A1	100.0	91.7	100.0	88.6				
	3A2	98.4	92.7	99.4	89.6				
	3B1	100.0	88.9	100.0	86.0				
	3B2	100.0	87.9	100.0	85.0				
	SYSTEM	100.0	100.0	100.0	100.0	720	696	720	74.7

** PROBLEMS/SOLUTIONS/COMMENTS

THOMAS HILL 3 OPERATED WITHIN THE 1.2 LB/MM BTU SO2 STANDARD FOR ALL BUT 8.8 HOURS DURING JUNE.

DAMPER PROBLEMS CAUSED BY A COMPUTER MALFUNCTION WERE REPORTED FOR THE 3A2 MODULE IN JUNE.

PERIODIC ABSORBER CLEANING WAS PERFORMED DURING THE MONTH.

7/86	3A1	96.7	76.3	100.0	54.1				
	3A2	98.5	96.3	100.0	68.2				
	3B1	97.3	87.4	100.0	61.9				
	3B2	98.5	95.4	100.0	67.6				
	SYSTEM	100.0	100.0	100.0	84.0	744	527	625	55.3

** PROBLEMS/SOLUTIONS/COMMENTS

CLEANING AND WELDING REPAIR ON A LEAK OCCURRED ON MODULE 3B1. GENERAL CLEANING AND MAINTENANCE WORK WAS PERFORMED ON THE OTHER MODULES.

THE UTILITY REPORTED THAT RECYCLE PUMP SPRAY NOZZLES WERE CLEANED IN JULY.

AN INSPECTION OF THE OUTLET DUCKWORK WAS PERFORMED.

THOMAS HILL 3 OPERATED WITHIN THE 1.2 LB/MM BTU SO2 STANDARD FOR ALL BUT

LITY FGD SURVEY: JANUARY - DECEMBER 1988

OCIATED ELECTRIC: THOMAS HILL 3 (CONT.)

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

THOMAS HILL 3 OPERATED WITHIN THE 1.2 LB/MM BTU SO2 STANDARD FOR ALL BUT 22.8 HOURS DURING JULY.

MIST ELIMINATOR CLEANING WAS PERFORMED ON MODULE 3B2.

86	3A1	94.9	80.0	97.4	69.7				
	3A2	96.8	86.7	98.2	75.6				
	3B1	98.5	87.7	98.5	76.4				
	3B2	96.7	85.9	98.4	74.8				
	SYSTEM	100.0	100.0	100.0	98.8	744	648	735	64.4

** PROBLEMS/SOLUTIONS/COMMENTS

THOMAS HILL 3 OPERATED WITHIN THE 1.2 LB/MM BTU SO2 STANDARD FOR ALL BUT 31 HOURS DURING AUGUST.

SOME MIST ELIMINATOR PLUGGING WAS REPORTED. MIST ELIMINATOR CLEANING WORK WAS PERFORMED DURING TIMES WHEN INDIVIDUAL ABSORBERS WERE NOT REQUIRED FOR SCRUBBING SERVICE.

SLURRY SPRAY NOZZLE CLEANING WORK WAS REQUIRED DURING AUGUST.

A COMPUTER FUSE BLOW OUT CAUSED A 3A1/3A2 SCRUBBER TRIP BRIEFLY IN AUGUST.

GENERAL ABSORBER CLEANING/MAINTENANCE WORK WAS PERFORMED DURING THE MONTH.

'86	3A1	99.5	87.1	100.0	79.8				
	3A2	98.4	93.8	100.0	86.0				
	3B1	98.7	96.1	100.0	88.1				
	3B2	97.7	93.7	99.5	85.8				
	SYSTEM	100.0	100.0	100.0	100.0	720	660	720	74.0

** PROBLEMS/SOLUTIONS/COMMENTS

ABSORBER CLEANING/MAINTENANCE WAS REQUIRED IN SEPTEMBER. NO FGD SYSTEM DOWNTIME WAS ATTRIBUTED TO SCRUBBER PROBLEMS.

THE UTILITY PERFORMED MIST ELIMINATOR CLEANING WORK PERIODICALLY THROUGHOUT THE MONTH.

THOMAS HILL 3 OPERATED WITHIN THE 1.2 LB/MM BTU SO2 STANDARD FOR ALL BUT 17.3 HOURS DURING SEPTEMBER.

/86	3A1	79.4	78.6	98.5	76.0				
	3A2	93.8	94.3	99.2	91.2				
	3B1	89.8	88.6	99.6	85.8				
	3B2	79.3	79.4	99.7	76.8				
	SYSTEM	100.0	100.0	100.0	100.0	744	720	744	79.6

** PROBLEMS/SOLUTIONS/COMMENTS

PRESATURATOR LINER PATCHING WAS PERFORMED ON THE ABSORBER MODULE THROUGHOUT THE PERIOD.

THOMAS HILL 3 OPERATED WITHIN THE 1.2 LB/MM BTU SO2 STANDARD FOR ALL BUT 18 HOURS DURING OCTOBER.

RECYCLE PUMP MAINTENANCE WAS PERFORMED ON MODULE 3B1 IN OCTOBER.

MODULE 3A1 MIST ELIMINATOR CLEANING WAS REPORTED DURING THE MONTH.

THE UTILITY REPORTED THAT SLURRY SPRAY NOZZLE CLEANING WAS REQUIRED DURING THE MONTH.

ASSOCIATED ELECTRIC: THOMAS HILL 3 (CONT.)

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

 ABSORBER CLEANING WAS PERFORMED PERIODICALLY THROUGHOUT THE MONTH.

11/86	3A1	97.8	96.2	99.8	89.5				
	3A2	78.4	70.4	100.0	65.5				
	3B1	79.2	75.0	100.0	69.8				
	3B2	96.4	96.2	99.7	89.5				
	SYSTEM	100.0	100.0	100.0	100.0	720	670	720	83.6

** PROBLEMS/SOLUTIONS/COMMENTS

MIST ELIMINATOR CLEANING WAS PERFORMED PERIODICALLY THROUGHOUT THE PERIOD.

PRESATURATION PATCHING BEGUN LAST MONTH CONTINUED THROUGH NOVEMBER.

GENERAL ABSORBER CLEANING WAS PERFORMED DURING THE MONTH. SOME CONTRACTOR REBUILDING WORK WAS COMPLETED ON MODULE 3A2.

THOMAS HILL 3 OPERATED WITHIN THE 1.2 LB/MM BTU SO2 STANDARD FOR ALL BUT 26 HOURS DURING NOVEMBER.

INSTRUMENTATION PROBLEMS WERE REPORTED FOR NOVEMBER AND A COMPUTER FAILURE TRIPPED THE FGD SYSTEM OFF BRIEFLY.

12/86	3A1	99.6	96.8	100.0	96.4				
	3A2	99.1	94.9	100.0	94.6				
	3B1	98.9	95.2	100.0	94.8				
	3B2	97.8	95.0	100.0	94.6				
	SYSTEM	100.0	100.0	100.0	100.0	744	741	744	87.8

** PROBLEMS/SOLUTIONS/COMMENTS

MIST ELIMINATOR CLEANING WAS REQUIRED ON SEVERAL OCCASSIONS DURING THE MONTH.

PERIODIC CLEANING OF ABSORBER INTERNALS WAS REPORTED DURING DECEMBER.

RECYCLE PUMP HEADER REPAIRS WERE MADE DURING THE PERIOD INVOLVING SEVERAL PUMPS. SOME PLUGGING PROBLEMS WERE ENCOUNTERED LATER.

A COMPUTER CONTROLLER FAILURE TRIPPED THE RECYCLE PUMPS OFF FOR A SHORT TIME. A RELATED DAMPER CONTROLLER PROBLEM ALSO OCCURRED.

THOMAS HILL 3 OPERATED WITHIN THE 1.2 LB/MM BTU SO2 STANDARD FOR ALL BUT 14 HOURS DURING DECEMBER.

1/87	3A1	99.7	92.9	100.0	90.8				
	3A2	98.6	87.9	100.0	85.9				
	3B1	99.9	95.7	100.0	93.6				
	3B2	98.9	88.4	99.8	86.4				
	SYSTEM	100.0	100.0	100.0	100.0	744	728	744	73.9

** PROBLEMS/SOLUTIONS/COMMENTS

GENERAL ABSORBER CLEANING/MAINTENANCE WORK WAS PERFORMED DURING THE MONTH.

MODULE 3B2 WAS OUT OF SERVICE FOR DUCT WORK INSPECTION IN JANUARY.

SOME DOWNTIME DURING THE MONTH WAS ATTRIBUTED TO A BOILER TUBE LEAK.

THE UTILITY PERFORMED MIST ELIMINATOR WORK PERIODICALLY THROUGHOUT THE MONTH.

THE UTILITY REPORTED THAT RECYCLE SPRAY NOZZLES WERE REPLACED ON MODULES

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

ASSOCIATED ELECTRIC: THOMAS HILL 3 (CONT.)

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

3A2 AND 3B2 DURING JANUARY.

THE UTILITY REPORTED THAT MAINTENANCE WORK WAS PERFORMED ON PUMPS AND HOSES DURING JANUARY.

THOMAS HILL 3 OPERATED WITHIN THE 1.2 LB/MM BTU SO2 STANDARD FOR ALL BUT 6.5 HOURS DURING JANUARY.

/87	3A1	99.0	88.8	100.0	84.9				
	3A2	99.7	94.4	100.0	90.2				
	3B1	100.0	87.3	100.0	83.4				
	3B2	99.3	85.5	100.0	81.7				
	SYSTEM	100.0	100.0	100.0	100.0	672	642	672	69.1

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT MAINTENANCE WORK WAS PERFORMED ON RECYCLE PUMPS THROUGHOUT FEBRUARY.

GENERAL MAINTENANCE/CLEANING OF MODULES WAS REPORTED THROUGHOUT THE MONTH OF FEBRUARY.

THOMAS HILL 3 OPERATED WITHIN THE 1.2 LB/MM BTU SO2 STANDARD FOR ALL BUT 7.75 HOURS DURING FEBRUARY.

MIST ELIMINATOR CLEANING AND MAINTENANCE WAS PERFORMED THROUGHOUT THE MONTH.

/87	3A1	100.0	84.4	100.0	81.7				
	3A2	100.0	95.6	100.0	92.5				
	3B1	99.7	75.6	100.0	73.1				
	3B2	100.0	89.7	100.0	86.8				
	SYSTEM	100.0	100.0	100.0	100.0	744	720	744	67.2

** PROBLEMS/SOLUTIONS/COMMENTS

FGD SYSTEM OUTAGE TIME DURING DECEMBER WAS DUE IN PART TO MIST ELIMINATOR CLEANING.

THOMAS HILL 3 OPERATED WITHIN THE 1.2 LB/MM BTU SO2 STANDARD FOR ALL BUT 13.25 HOURS DURING MARCH.

MODULE 3B1 WAS UNAVAILABLE FOR 2 HOURS IN MARCH DUE TO RECYCLE PUMP MAINTENANCE.

FGD SYSTEM OUTAGE TIME DURING MARCH WAS DUE IN PART TO MODULE CLEANING.

/87	3A1	60.3	93.9	100.0	56.3				
	3A2	60.2	91.3	100.0	54.8				
	3B1	60.3	87.0	100.0	52.2				
	3B2	60.0	93.7	100.0	56.2				
	SYSTEM	80.3	100.0	100.0	73.1	720	432	527	45.0

** PROBLEMS/SOLUTIONS/COMMENTS

THOMAS HILL 3 OPERATED WITHIN THE 1.2 LB/MM BTU SO2 STANDARD DURING APRIL.

FGD SYSTEM OUTAGE TIME DURING APRIL WAS DUE IN PART TO MIST ELIMINATOR CLEANING.

ABSORBER CLEANING/MAINTENANCE WAS PERFORMED PERIODICALLY DURING APRIL.

THE ANNUAL OUTAGE BEGAN ON APRIL 19, 1987.

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

ASSOCIATED ELECTRIC: THOMAS HILL 3 (CONT.)

-----PERFORMANCE DATA-----										
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
5/87	3A1	0.0			0.0					
	3A2	0.0			0.0					
	3B1	0.0			0.0					
	3B2	0.0			0.0					
	SYSTEM	0.0			0.0		744	0	0	0.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE SCHEDULED SPRING OUTAGE CONTINUED THROUGHOUT ALL OF MAY.

6/87	3A1	90.8	96.8	98.4	84.0					
	3A2	95.6	95.2	99.9	82.6					
	3B1	72.8	73.1	93.3	63.4					
	3B2	95.7	96.8	99.9	84.1					
	SYSTEM	100.0	100.0	100.0	100.0		720	625	720	70.8

** PROBLEMS/SOLUTIONS/COMMENTS

THOMAS HILL 3 OPERATED WITHIN THE 1.2 LB/MM BTU SO2 STANDARD FOR ALL BUT 25.0 HOURS DURING JUNE.

ABSORBER CLEANING AND MAINTENANCE WERE PERFORMED THROUGHOUT THE MONTH.

THE SCHEDULED SPRING OUTAGE CONTINUED THROUGH JUNE 2.

CONSTRUCTION WORK WAS PERFORMED ON MODULE 3B1 DURING JUNE.

RECYCLE PUMP HEADER REPAIRS WERE PERFORMED ON MODULE 3B1 DURING JUNE.

SOME DOWNTIME DURING THE MONTH WAS ATTRIBUTED TO A BOILER TUBE LEAK.

FGD SYSTEM OUTAGE TIME DURING JUNE WAS DUE IN PART TO MIST ELIMINATOR CLEANING.

7/87	3A1	99.6	95.1	100.0	94.9					
	3A2	100.0	94.6	100.0	94.4					
	3B1	99.9	87.6	100.0	87.5					
	3B2	100.0	90.7	100.0	90.5					
	SYSTEM	100.0	100.0	100.0	100.0		744	743	744	78.5

** PROBLEMS/SOLUTIONS/COMMENTS

FGD OUTAGE TIME DURING JULY WAS DUE IN PART TO MIST ELIMINATOR CLEANING.

THOMAS HILL 3 OPERATED WITHIN THE 1.2 LB/MM BTU SO2 STANDARD FOR ALL BUT 12.0 HOURS DURING JULY.

RECYCLE PUMP REPAIRS WERE PERFORMED ON MODULE 3B1 DURING JULY.

ABSORBER CLEANING AND MAINTENANCE WERE PERFORMED THROUGHOUT THE MONTH.

8/87	3A1	99.5	95.6	100.0	95.4					
	3A2	96.1	88.1	98.8	88.0					
	3B1	96.8	84.3	100.0	84.2					
	3B2	100.0	92.1	100.0	92.0					
	SYSTEM	100.0	100.0	100.0	100.0		744	743	744	71.6

** PROBLEMS/SOLUTIONS/COMMENTS

MAINTENANCE WAS REQUIRED ON RECYCLE AND INLET SPRAY NOZZLES DURING AUGUST.

A BOILER TRIP OCCURRED DURING THE MONTH ACCOUNTING FOR PART OF THE DOWNTIME FOR MODULE 3A1 AND 3B1.

ILITY FGD SURVEY: JANUARY - DECEMBER 1988

SOCIATED ELECTRIC: THOMAS HILL 3 (CONT.)

-----PERFORMANCE DATA-----
R100 MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION % REMOVAL PER BOILER FGD CAP.
SO2 PART. HOURS HOURS HOURS FACTOR

ABSORBER CLEANING AND MAINTENANCE WERE PERFORMED THROUGHOUT THE MONTH.

A SPOOL PIECE WAS INSTALLED IN MODULE 3A1.

RECYCLE PUMP MAINTENANCE WAS PERFORMED ON MODULE 3A1 DURING AUGUST.

FGD OUTAGE TIME DURING AUGUST WAS DUE IN PART TO MIST ELIMINATOR CLEANING AND MAINTENANCE. MODULE A1 MIST ELIMINATOR PANELS WERE WASHED. PANELS WERE REPLACED IN MODULES A2 AND B1. WASH HEADERS WERE REPAIRED IN MODULE B1.

THOMAS HILL 3 OPERATED WITHIN THE 1.2 LB/MM BTU SO2 STANDARD FOR ALL BUT 25.0 HOURS DURING AUGUST.

THE UTILITY REPORTED THAT A DOOR LEAK WAS REPAIRED ON MODULE 3A2.

/87	3A1	99.0	91.2	99.8	91.2				
	3A2	100.0	95.7	100.0	95.7				
	3B1	99.2	91.2	100.0	91.2				
	3B2	98.1	90.0	100.0	90.0				
	SYSTEM	100.0	100.0	100.0	100.0	720	720	720	73.6

** PROBLEMS/SOLUTIONS/COMMENTS

THOMAS HILL 3 OPERATED WITHIN THE 1.2 LB/MM BTU SO2 STANDARD FOR ALL BUT 11 HOURS DURING SEPTEMBER.

THE UTILITY REPORTED THAT A LEAK ON A WELD SEAM WAS REPAIRED ON MODULE 3A1.

FGD OUTAGE TIME DURING SEPTEMBER WAS DUE IN PART TO MIST ELIMINATOR CLEANING.

RECYCLE PUMP MAINTENANCE WAS PERFORMED DURING SEPTEMBER. HOSE LEAKS WERE REPAIRED ON MODULES 3A1 AND 3B2. MAINTENANCE WAS ALSO PERFORMED ON 3B1 AND 3B2 PUMP HEADERS.

9/87	3A1	99.3	83.0	100.0	79.4				
	3A2	99.9	91.9	100.0	87.8				
	3B1	99.7	86.1	99.8	82.4				
	3B2	98.8	90.8	100.0	86.8				
	SYSTEM	100.0	100.0	100.0	100.0	744	712	744	62.4

** PROBLEMS/SOLUTIONS/COMMENTS

THOMAS HILL 3 OPERATED WITHIN THE 1.2 LB/MM BTU SO2 STANDARD FOR ALL BUT 17 HOURS DURING OCTOBER.

ABSORBER CLEANING AND MAINTENANCE WERE PERFORMED THROUGHOUT THE MONTH.

SOME DOWNTIME DURING THE MONTH WAS ATTRIBUTED TO A BOILER TUBE LEAK.

RECYCLE PUMP MAINTENANCE WAS PERFORMED DURING OCTOBER.

MODULE 3B1 WAS OUT OF SERVICE FOR 30 MINUTES TO INSTALL A TEST NOZZLE.

10/87	3A1	33.3	85.0	100.0	17.8				
	3A2	56.7	97.1	100.0	20.3				
	3B1	56.7	95.5	100.0	20.0				
	3B2	56.7	96.3	100.0	20.1				
	SYSTEM	67.8	100.0	100.0	26.1	720	151	188	16.6

ASSOCIATED ELECTRIC: THOMAS HILL 3 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

THOMAS HILL 3 OPERATED WITHIN THE 1.2 LB/MM BTU SO2 STANDARD FOR ALL BUT 6.0 HOURS DURING NOVEMBER.

THE UTILITY REPORTED NO MAJOR FGD-RELATED PROBLEMS FOR NOVEMBER. THOMAS HILL 3 WAS PUT ON STANDBY 11/8/87. MODULE 3A1 WAS UNAVAILABLE DUE TO OUTAGE REPAIRS BEGINNING 11/11/87. THE REMAINING MODULES WERE ON PLACED OUTAGE ON 11/18/87. MODULES REMAINED ON OUTAGE THROUGHOUT THE MONTH.

12/87	3A1	52.7			0.0				
	3A2	43.0			0.0				
	3B1	41.9			0.0				
	3B2	43.0			0.0				
	SYSTEM	60.2			0.0	744	0	0	0.0

** PROBLEMS/SOLUTIONS/COMMENTS

THOMAS HILL 3 WAS PLACED ON STANDBY OR OFF LINE FOR OUTAGE REPAIRS DURING ALL OF DECEMBER.

1/88	3A1	99.2	97.4	99.0	82.1				
	3A2	99.2	97.2	99.0	81.9				
	3B1	99.0	97.8	98.8	82.5				
	3B2	98.6	91.7	98.4	77.3				
	SYSTEM	100.0	100.0	100.0	100.0	744	627	744	68.9

** PROBLEMS/SOLUTIONS/COMMENTS

THOMAS HILL 3 OPERATED WITHIN THE 1.2 LB/MM BTU SO2 STANDARD FOR ALL BUT 32 HOURS DURING JANUARY.

2/88	3A1	100.0	89.4	100.0	88.8				
	3A2	100.0	94.5	100.0	93.9				
	3B1	100.0	86.0	100.0	85.4				
	3B2	100.0	94.6	100.0	94.0				
	SYSTEM	100.0	100.0	100.0	100.0	696	691	696	93.6

** PROBLEMS/SOLUTIONS/COMMENTS

THOMAS HILL 3 OPERATED WITHIN THE 1.2 LB/MM BTU SO2 STANDARD FOR ALL BUT 6.0 HOURS DURING FEBRUARY.

3/88	3A1	100.0	88.8	100.0	84.7				
	3A2	95.5	63.9	100.0	61.0				
	3B1	100.0	55.9	100.0	53.3				
	3B2	100.0	93.1	100.0	88.8				
	SYSTEM	100.0	100.0	100.0	95.9	744	710	714	87.6

** PROBLEMS/SOLUTIONS/COMMENTS

THOMAS HILL 3 OPERATED WITHIN THE 1.2 LB/MM BTU SO2 STANDARD FOR ALL BUT 13 HOURS DURING MARCH.

4/88	3A1	91.6	83.5	100.0	76.7				
	3A2	96.7	72.0	100.0	66.1				
	3B1	86.3	71.0	100.0	65.2				
	3B2	96.7	77.6	100.0	71.3				
	SYSTEM	100.0	100.0	100.0	93.1	720	661	670	83.0

ILITY FGD SURVEY: JANUARY - DECEMBER 1988

SOCIATED ELECTRIC: THOMAS HILL 3 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

THOMAS HILL 3 OPERATED WITHIN THE 1.2 LB/MM BTU SO2 STANDARD FOR ALL BUT
 6 HOURS DURING APRIL.

/88	3A1	90.3	85.6	100.0	64.5				
	3A2	87.1	72.0	100.0	54.2				
	3B1	90.3	63.8	100.0	48.1				
	3B2	90.1	76.5	100.0	57.6				
	SYSTEM	100.0	99.3	100.0	74.8	744	560	556	68.0

** PROBLEMS/SOLUTIONS/COMMENTS

THOMAS HILL 3 OPERATED WITHIN THE 1.2 LB/MM BTU SO2 STANDARD FOR ALL BUT
 16 HOURS DURING MAY.

/88	3A1	65.2	78.0	100.0	43.0				
	3A2	50.4	43.7	100.0	24.1				
	3B1	65.2	84.4	100.0	46.5				
	3B2	66.7	78.3	100.0	43.1				
	SYSTEM	82.5	94.8	100.0	52.2	720	397	376	44.8

** PROBLEMS/SOLUTIONS/COMMENTS

THOMAS HILL 3 OPERATED WITHIN THE 1.2 LB/MM BTU SO2 STANDARD FOR ALL BUT
 14 HOURS DURING JUNE.

/88	3A1	100.0	88.5	100.0	87.0				
	3A2	100.0	68.5	100.0	67.4				
	3B1	100.0	60.8	100.0	59.7				
	3B2	100.0	81.6	100.0	80.1				
	SYSTEM	100.0	99.8	100.0	98.1	744	731	730	86.4

** PROBLEMS/SOLUTIONS/COMMENTS

THOMAS HILL 3 OPERATED WITHIN THE 1.2 LB/MM BTU SO2 STANDARD FOR ALL BUT
 4 HOURS DURING JULY.

/88	3A1	99.5	82.2	100.0	77.5				
	3A2	96.2	69.5	98.5	65.6				
	3B1	99.5	81.0	100.0	76.4				
	3B2	99.5	85.2	100.0	80.3				
	SYSTEM	100.0	100.0	100.0	100.0	744	702	744	83.9

** PROBLEMS/SOLUTIONS/COMMENTS

THOMAS HILL 3 OPERATED WITHIN THE 1.2 LB/MM BTU SO2 STANDARD FOR ALL BUT
 6 HOURS DURING AUGUST.

/88	3A1	57.2	96.0	100.0	49.1				
	3A2	53.3	71.0	100.0	36.3				
	3B1	57.2	63.9	100.0	32.7				
	3B2	57.2	72.8	100.0	37.3				
	SYSTEM	75.0	100.0	100.0	51.8	720	369	373	41.7

** PROBLEMS/SOLUTIONS/COMMENTS

THOMAS HILL 3 OPERATED WITHIN THE 1.2 LB/MM BTU SO2 STANDARD FOR ALL BUT
 5 HOURS DURING SEPTEMBER. THE UNIT WAS SHUTDOWN ON SEPTEMBER 18 AND
 REMAINED OFF-LINE THE REST OF THE MONTH FOR A SCHEDULED BOILER/TURBINE
 MAINTENANCE OUTAGE.

/88	3A1	19.4	14.1	100.0	0.9				
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UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

ASSOCIATED ELECTRIC: THOMAS HILL 3 (CONT.)

-----PERFORMANCE DATA-----										
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART. HOURS	PER BOILER HOURS	FGD HOURS	CAP. FACTOR
	3A2	25.8	100.0	100.0	6.7					
	3B1	19.4	67.5	100.0	4.3					
	3B2	25.8	100.0	100.0	6.7					
	SYSTEM	30.1	93.9	100.0	6.2		744	47	46	2.8

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT REMAINED OFF-LINE UNTIL OCTOBER 29 FOR THE FALL SCHEDULED MAINTENANCE OUTAGE. THE UNIT OPERATED WITHIN THE 1.2 LB/MM BTU STANDARD FOR ALL BUT 21 HOURS DURING OCTOBER.

11/88	3A2	100.0	73.6	100.0	59.6					
	3B1	100.0	86.6	98.3	70.2					
	3B2	100.0	85.9	95.8	69.6					
	SYSTEM	100.0	100.0	100.0	99.7		720	583	718	583.2

** PROBLEMS/SOLUTIONS/COMMENTS

THOMAS HILL 3 OPERATED WITHIN THE 1.2 LB/MM BTU SO2 STANDARD FOR ALL BUT 19 HOURS DURING NOVEMBER.

12/88	3A1	100.0	84.4	100.0	80.3					
	3A2	100.0	72.1	100.0	68.6					
	3B1	100.0	59.1	100.0	56.2					
	3B2	100.0	85.6	100.0	81.4					
	SYSTEM	100.0	100.0	100.0	95.5		744	708	711	80.0

** PROBLEMS/SOLUTIONS/COMMENTS

THOMAS HILL 3 OPERATED WITHIN THE 1.2 LB/MM BTU SO2 STANDARD FOR ALL BUT 13 HOURS DURING DECEMBER.

SECTION 13
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	BASIN ELECTRIC POWER
PLANT NAME	ANTELOPE VALLEY
UNIT NUMBER	1
CITY	BEULAH
STATE	NORTH DAKOTA
REGULATORY CLASSIFICATION	C
PARTICULATE EMISSION LIMITATION - NG/J	43. (0.100 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	335. (0.780 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	***** (***** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	770
GROSS UNIT GENERATING CAPACITY - MW	490
NET UNIT GENERATING CAPACITY W/FGD - MW	450
NET UNIT GENERATING CAPACITY WO/FGD - MW	467
EQUIVALENT SCRUBBED CAPACITY - MW	490
** UNIT DATA - BOILER AND STACK	COMBUSTION ENGINEERING
BOILER SUPPLIER	PULVERIZED COAL
BOILER TYPE	BASE
BOILER SERVICE LOAD	969.75 (2055000 ACFM)
DESIGN BOILER FLUE GAS FLOW - CU.M/S	154.4 (310 F)
BOILER FLUE GAS TEMPERATURE - C	183. (600 FT)
STACK HEIGHT - M	CONCRETE
STACK SHELL	7.0 (23.0 FT)
STACK TOP DIAMETER - M	
** FUEL DATA	COAL
FUEL TYPE	LIGNITE
FUEL GRADE	15352. (6600 BTU/LB)
AVERAGE HEAT CONTENT - J/G	6093-7350
RANGE HEAT CONTENT - BTU/LB	
AVERAGE ASH CONTENT - %	7.76
RANGE ASH CONTENT - %	5.2-13.8
AVERAGE MOISTURE CONTENT - %	37.00
RANGE MOISTURE CONTENT - %	30.0-42.4
AVERAGE SULFUR CONTENT - %	0.68
RANGE SULFUR CONTENT - %	0.4-1.2
AVERAGE CHLORIDE CONTENT - %	0.01
RANGE CHLORIDE CONTENT - %	0.00-0.02
*** PARTICLE CONTROL	
** FABRIC FILTER	
NUMBER	1
SUPPLIER	WESTERN PREC. DIVISION, JOY
INLET FLUE GAS CAPACITY - CU.M/S	969.8 (2055000 ACFM)
INLET FLUE GAS TEMPERATURE - C	85.0 (185 F)
PRESSURE DROP - KPA	1.0 (4.0 IN-H2O)
PARTICLE REMOVAL EFFICIENCY - %	99.8
TYPICAL GAS/CLOTH RATIO - M/MIN	0.7 (2.2 FT/MIN)
** 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	SPRAY DRYING
PROCESS TYPE	LIME/SPRAY DRYING
SYSTEM SUPPLIER	JOY MFG/NIRO ATOMIZER
A-E FIRM	STEARNS-ROGER

CITY FGD SURVEY: JANUARY - DECEMBER 1988

IN ELECTRIC POWER: ANTELOPE VALLEY 1 (CONT.)

DEVELOPMENT LEVEL	FULL SCALE	
NEW/RETROFIT	NEW	
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.80	
UNIT DESIGN SO ₂ REMOVAL EFFICIENCY - %	60.00	
ENERGY CONSUMPTION - %	3.5	
CURRENT STATUS	1	
COMMERCIAL START-UP	7/1984	
INITIAL START-UP	5/1983	
CONTRACT AWARDED	8/1978	
DESIGN AND OPERATING PARAMETERS		
DESIGN COAL SULFUR CONTENT - %	1.22	
DESIGN CHLORIDE CONTENT - %	*****	
QUENCHER/PRESATURATOR		
CONSTRUCTION MATERIAL GENERIC TYPE	NR	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR	
ABSORBER		
NUMBER	5	
NUMBER OF SPARES	1	
GENERIC TYPE	SPRAY DRYER	
SPECIFIC TYPE	CROSSFLOW	
TRADE NAME/COMMON TYPE	ROTARY ATOMIZER	
SUPPLIER	JOY MFG/NIRO ATOMIZER	
DIMENSIONS - FT	46.0 X 36.0	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	ASTM A-283	
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A	
LINER GENERIC MATERIAL	NONE	
LINER SPECIFIC MATERIAL	N/A	
LINER MATERIAL TRADE NAME/COMMON TYPE	N/A	
GAS CONTACTING DEVICE TYPE	NONE	
NUMBER OF CONTACTING ZONES	2	
LIQUID RECIRCULATION RATE - LITER/S	6.	(100 GPM)
L/G RATIO - L/CU.M	0.0	(0.2 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	3.3	(13.3 IN-H ₂ O)
SUPERFICIAL GAS VELOCITY - M/SEC	20.4	(67.0 FT/S)
INLET GAS FLOW - CU. M/S	242.56	(514000 ACFM)
INLET GAS TEMPERATURE - C	152.8	(307 F)
SO ₂ REMOVAL EFFICIENCY - %	62.0	
PARTICLE REMOVAL EFFICIENCY - %	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	BYPASS	
SPECIFIC TYPE	COLD SIDE	
TRADE NAME/COMMON TYPE	N/A	
PERCENT GAS BYPASSED - AVG	3.2	
INLET FLUE GAS FLOW RATE - CU. M/S	31.62	(67000 ACFM)
INLET FLUE GAS TEMPERATURE - C	446.1	(835 F)
CONSTRUCTION MATERIAL GENERIC TYPE	NR	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR	
* FANS		
NUMBER	4	
DESIGN	CENTRIFUGAL	
SUPPLIER	COMBUSTION ENGINEERING; CEMAX	
FUNCTION	UNIT	
APPLICATION	INDUCED DRAFT	
SERVICE	DRY	
FLUE GAS TEMPERATURE - C	85.0	(185 F)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	

BASIN ELECTRIC POWER: ANTELOPE VALLEY 1 (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	BALL MILL	
DEVICE TYPE	N/A	
NUMBER	1	
FULL LOAD DRY FEED CAPACITY - M.TONS/HR	22.7	(25 TPH)
PRODUCT QUALITY - % SOLIDS	38.0	
** REAGENT PREPARATION EQUIPMENT		
FUNCTION	SLAKER	
DEVICE	NR	
DEVICE TYPE	NR	
NUMBER	1	
FULL LOAD DRY FEED CAPACITY - M.TONS/HR	22.7	(25 TPH)
** TANKS		
SERVICE	NUMBER	
-----	-----	
NR	****	
** PUMPS		
SERVICE	NUMBER	
-----	-----	
NR	****	
** SOLIDS CONCENTRATING/DEWATERING		
DEVICE	NONE	
*** SALEABLE BYPRODUCTS		
NATURE	NONE	
DISPOSITION	N/A	
*** SLUDGE		
** TREATMENT		
METHOD	UNSTABILIZED	
DEVICE	N/A	
PROPRIETARY PROCESS	N/A	
** DISPOSAL		
NATURE	FINAL	
TYPE	LANDFILL	
LOCATION	OFF-SITE	
SITE TRANSPORTATION METHOD	TRUCKED	
SITE TREATMENT	NONE	
** WATER BALANCE		
WATER LOOP TYPE	OPEN	
EVAPORATION WATER LOSS - LITER/S	23.1	(366 GPM)
MAKEUP WATER ADDITION - LITERS/S	1.4	(22 GPM)

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

SIN ELECTRIC POWER: ANTELOPE VALLEY 1 (CONT.)

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

'83	SYSTEM						744		
'83	SYSTEM						720		
** PROBLEMS/SOLUTIONS/COMMENTS									
THE UTILITY REPORTED THAT INITIAL OPERATIONS COMMENCED IN MAY 1983. THE UNIT OPERATED IN A STARTUP PHASE DURING THE MONTHS OF MAY AND JUNE.									
'83	SYSTEM						744		
'83	SYSTEM						744		
'83	SYSTEM						720		
** PROBLEMS/SOLUTIONS/COMMENTS									
THE UTILITY CONTINUED PERFORMANCE TESTING ON THE FGD SYSTEM DURING THE THIRD QUARTER OF 1983.									
'83	SYSTEM						744		
'83	SYSTEM						720		
'83	SYSTEM						744		
** PROBLEMS/SOLUTIONS/COMMENTS									
THE UTILITY REPORTED THAT ANTELOPE VALLEY 1 WAS STILL IN THE START-UP PHASE OF OPERATION DURING THE FOURTH QUARTER OF 1983.									
'84	SYSTEM						744		
'84	SYSTEM						696		
'84	SYSTEM						744		
'84	SYSTEM						720		
'84	SYSTEM						744		
'84	SYSTEM						720		
** PROBLEMS/SOLUTIONS/COMMENTS									
THE UTILITY REPORTED TYPICAL PROBLEMS ASSOCIATED WITH START UP DURING THE PERIOD OF JANUARY THROUGH JUNE 1984.									
'84	SYSTEM						744		
** PROBLEMS/SOLUTIONS/COMMENTS									
COMMERCIAL OPERATION OF THE ANTELOPE VALLEY 1 FGD SYSTEM COMMENCED ON JULY 1, 1984.									
'84	SYSTEM						744		
'84	SYSTEM						720		

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

BASIN ELECTRIC POWER: ANTELOPE VALLEY 1 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD-RELATED PROBLEMS WERE REPORTED FOR AUGUST AND SEPTEMBER.

10/84	SYSTEM					720				
11/84	SYSTEM					720				
12/84	A	93.3	82.1	87.5	82.1					
	B	98.3	87.8	88.9	87.8					
	C	97.6	91.7	93.9	91.7					
	D	98.1	92.7	93.1	92.7					
	E	98.1	82.3	83.8	82.3					
	SYSTEM	100.0	100.0	100.0	100.0	744	744	744	90.6	

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE FGD SYSTEM OPERATED WELL DURING THE FOURTH QUARTER 1984 WITH EXCEPTION OF MINOR INCIDENTS OF PLUGGING OR THE NEED TO REPLACE ATOMIZERS.

1/85	A	88.1	67.9	84.0	62.5					
	B	99.1	86.5	96.6	79.6					
	C	99.3	86.2	98.5	79.4					
	D	96.5	86.2	95.8	79.4					
	D	95.6	90.1	94.9	82.9					
	SYSTEM	100.0	100.0	100.0	96.0	744	685	714	86.5	

** PROBLEMS/SOLUTIONS/COMMENTS

PROBLEMS WERE REPORTED WITH RESPECT TO SPRAY DRYER CHAMBER PLUGGING AND ATOMIZER VIBRATION.

2/85	SYSTEM					672				
3/85	SYSTEM					744				
4/85	SYSTEM					720				
5/85	SYSTEM					744				
6/85	SYSTEM					720				
7/85	SYSTEM					744				
8/85	SYSTEM					744				
9/85	SYSTEM					720				
10/85	SYSTEM					744				
11/85	SYSTEM					720				
12/85	SYSTEM					744				

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT A NUMBER OF MAJOR MODIFICATIONS TO THE REAGENT PREPARATION EQUIPMENT WERE COMPLETED DURING THE SPRING OF 1985. SPRAY DRYER ASH IS NO LONGER RECYCLED BACK TO THE SLURRY MIX TANK. THIS ASH IS NOW SENT DIRECTLY TO AN ASH SILO FOR LATER DISPOSAL. ASH IS NOW ONLY COLLECTED FROM THE BAGHOUSE FOR USE IN THE SLURRY PREPARATION SYSTEM. THE SPRAY DRYER ASH WAS HARD TO CONVEY AND WOULD FORM LARGE CHUNKS MAKING IT

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988
 IN ELECTRIC POWER: ANTELOPE VALLEY 1 (CONT.)

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

HARD TO RESLURRY. ADDITIONAL CHANGES TO THE ASH/SLURRY SYSTEM INCLUDED
 NEW SLURRY FEED PUMPS AND ASH PUMPS. THE UTILITY REPORTED THAT THE FGD
 SYSTEM OPERATED QUITE WELL DURING THE REMAINDER OF THE YEAR.

36	SYSTEM	774
36	SYSTEM	672
36	SYSTEM	774
36	SYSTEM	720
36	SYSTEM	774
36	SYSTEM	720
36	SYSTEM	774
36	SYSTEM	774
36	SYSTEM	720
36	SYSTEM	774
36	SYSTEM	720
36	SYSTEM	774

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED NO SCHEDULED OR FORCED UNIT OR FGD-RELATED OUTAGES
 WERE ENCOUNTERED DURING 1986. ONGOING ASH/SLURRY CHANGES WERE COMPLETED
 DURING THE YEAR.

87	SYSTEM	744
87	SYSTEM	672
87	SYSTEM	744
87	SYSTEM	720
87	SYSTEM	744
87	SYSTEM	720
87	SYSTEM	744
87	SYSTEM	744
87	SYSTEM	720
87	SYSTEM	744
87	SYSTEM	720
87	SYSTEM	744

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED OUTAGES WERE ENCOUNTERED
 DURING THE YEAR 1987. THE UNIT UNDERWENT A SCHEDULED OUTAGE IN MAY WHICH
 LASTED APPROXIMATELY 4 WEEKS.

'88	SYSTEM	774
-----	--------	-----

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

BASIN ELECTRIC POWER: ANTELOPE VALLEY 1 (CONT.)

-----PERFORMANCE DATA-----										
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PER PART. HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
2/88	SYSTEM						672			
3/88	SYSTEM						774			
4/88	SYSTEM						720			
5/88	SYSTEM						774			
6/88	SYSTEM						720			
7/88	SYSTEM						774			
8/88	SYSTEM						774			
9/88	SYSTEM						720			
10/88	SYSTEM						774			
11/88	SYSTEM						720			
12/88	SYSTEM						774			

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR SCHEDULED OR FORCED UNIT OUTAGES WERE ENCOUNTERED DURING THE YEAR. THE PLANT IS SCHEDULED TO HAVE A MAINTENANCE OUTAGE IN THE SPRING OF 1989.

SECTION 13

DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	BASIN ELECTRIC POWER	
PLANT NAME	ANTELOPE VALLEY	
UNIT NUMBER	2	
CITY	BEULAH	
STATE	NORTH DAKOTA	
REGULATORY CLASSIFICATION	A	
PARTICULATE EMISSION LIMITATION - NG/J	43.	(0.100 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	168.	(0.390 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	*****	(***** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	770	
GROSS UNIT GENERATING CAPACITY - MW	490	
NET UNIT GENERATING CAPACITY W/FGD - MW	450	
NET UNIT GENERATING CAPACITY WO/FGD - MW	467	
EQUIVALENT SCRUBBED CAPACITY - MW	490	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	COMBUSTION ENGINEERING	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	969.75	(2055000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	154.4	(310 F)
STACK HEIGHT - M	183.	(600 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	7.0	(23.0 FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	LIGNITE	
AVERAGE HEAT CONTENT - J/G	15352.	(6600 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		6093-7350
AVERAGE ASH CONTENT - %	7.76	
RANGE ASH CONTENT - %	5.2-13.8	
AVERAGE MOISTURE CONTENT - %	37.00	
RANGE MOISTURE CONTENT - %	30.0-42.4	
AVERAGE SULFUR CONTENT - %	0.68	
RANGE SULFUR CONTENT - %	0.4-1.2	
AVERAGE CHLORIDE CONTENT - %	0.01	
RANGE CHLORIDE CONTENT - %	0.00-0.02	
*** PARTICLE CONTROL		
** FABRIC FILTER		
NUMBER	1	
INLET FLUE GAS CAPACITY - CU.M/S	969.8	(2055000 ACFM)
INLET FLUE GAS TEMPERATURE - C	85.0	(185 F)
PRESSURE DROP - KPA	1.0	(4.0 IN-H2O)
PARTICLE REMOVAL EFFICIENCY - %	99.8	
TYPICAL GAS/CLOTH RATIO - M/MIN	0.7	(2.3 FT/MIN)
** 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	
*** FGD SYSTEM		
** GENERAL DATA		
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT	
SO2 REMOVAL MODE	SPRAY DRYING	
PROCESS TYPE	LIME/SPRAY DRYING	
SYSTEM SUPPLIER	JOY MFG/NIRO ATOMIZER	
A-E FIRM	BURNS & MCDONNELL	
DEVELOPMENT LEVEL	FULL SCALE	
NEW/RETROFIT	NEW	

ILITY FGD SURVEY: JANUARY - DECEMBER 1988

IN ELECTRIC POWER: ANTELOPE VALLEY 2 (CONT.)

UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.80	
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	78.00	
ENERGY CONSUMPTION - %	3.5	
CURRENT STATUS	1	
COMMERCIAL START-UP	6/1986	
INITIAL START-UP	10/1985	
CONTRACT AWARDED	2/1981	
DESIGN AND OPERATING PARAMETERS		
DESIGN COAL SULFER CONTENT - %	1.22	
DESIGN CHLORIDE CONTENT - %	*****	
QUENCHER/PRESATURATOR		
CONSTRUCTION MATERIAL GENERIC TYPE	NR	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR	
ABSORBER		
NUMBER	5	
NUMBER OF SPARES	1	
GENERIC TYPE	SPRAY DRYER	
SPECIFIC TYPE	CROSSFLOW	
TRADE NAME/COMMON TYPE	ROTARY ATOMIZER	
SUPPLIER	JOY MFG/NIRO ATOMIZER	
DIMENSIONS - FT	46 FT DIAMETER	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	ASTM A-283	
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A	
LINER GENERIC MATERIAL	NONE	
LINER SPECIFIC MATERIAL	N/A	
LINER MATERIAL TRADE NAME/COMMON TYPE	N/A	
GAS CONTACTING DEVICE TYPE	NONE	
LIQUID RECIRCULATION RATE - LITER/S	6.	(100 GPM)
L/G RATIO - L/CU.M	0.0	(0.2 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	3.3	(13.3 IN-H2O)
SUPERFICIAL GAS VELOCITY - M/SEC	20.4	(67.0 FT/S)
INLET GAS FLOW - CU. M/S	242.56	(514000 ACFM)
INLET GAS TEMPERATURE - C	152.8	(307 F)
SO2 REMOVAL EFFICIENCY - %	78.0	
PARTICLE REMOVAL EFFICIENCY - %	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	NONE	
SPECIFIC TYPE	N/A	
TRADE NAME/COMMON TYPE	N/A	
PERCENT GAS BYPASSED - AVG	0.0	
CONSTRUCTION MATERIAL GENERIC TYPE	NR	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR	
FANS		
DESIGN	NR	
FUNCTION	NA	
APPLICATION	NR	
SERVICE	NA	
CONSTRUCTION MATERIAL GENERIC TYPE	NA	
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	

BASIN ELECTRIC POWER: ANTELOPE VALLEY 2 (CON.)

** 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	BALL MILL	
DEVICE TYPE	N/A	
NUMBER	1	
FULL LOAD DRY FEED CAPACITY - M.TONS/HR	22.7	(25 TPH)
PRODUCT QUALITY - % SOLIDS	38.0	
** REAGENT PREPARATION EQUIPMENT		
FUNCTION	SLAKER	
DEVICE	NR	
DEVICE TYPE	NR	
NUMBER	1	
FULL LOAD DRY FEED CAPACITY - M.TONS/HR	22.7	(25 TPH)
** TANKS		
SERVICE	NUMBER	
-----	-----	
NR	****	
** PUMPS		
SERVICE	NUMBER	
-----	-----	
NR	****	
** SOLIDS CONCENTRATING/DEWATERING		
DEVICE	NONE	
*** SALEABLE BYPRODUCTS		
NATURE	NONE	
DISPOSITION	N/A	
*** SLUDGE		
** TREATMENT		
METHOD	UNSTABILIZED	
DEVICE	N/A	
PROPRIETARY PROCESS	N/A	
** DISPOSAL		
NATURE	FINAL	
TYPE	LANDFILL	
LOCATION	OFF-SITE	
SITE TRANSPORTATION METHOD	TRUCKED	
SITE TREATMENT	NONE	
** WATER BALANCE		
WATER LOOP TYPE	OPEN	
EVAPORATION WATER LOSS - LITER/S	23.1	(366 GPM)
MAKEUP WATER ADDITION - LITERS/S	1.4	(22 GPM)

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988
 SIN ELECTRIC POWER: ANTELOPE VALLEY 2 (CONT.)

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

/85	SYSTEM	744
/85	SYSTEM	720
/85	SYSTEM	744

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE FGD SYSTEM COMMENCED OPERATIONS IN OCTOBER, 1985. THE UNIT IS CURRENTLY UNDERGOING START-UP/SHAKEDOWN OPERATIONS.

/86	SYSTEM	774
/86	SYSTEM	672
/86	SYSTEM	774
/86	SYSTEM	720
/86	SYSTEM	774
/86	SYSTEM	720
/86	SYSTEM	774
/86	SYSTEM	774
/86	SYSTEM	720
/86	SYSTEM	774
/86	SYSTEM	720
/86	SYSTEM	774

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT SIMILAR REAGENT PREPARATION CHANGES TO UNIT 1 WERE MADE TO UNIT 2. THE SPRAY DRYER ASH IS NO LONGER RECYCLED BACK TO THE SLURRY MIX TANK. THIS ASH IS NOW SENT DIRECTLY TO AN ASH SILO FOR LATER DISPOSAL. ASH IS NOW ONLY COLLECTED FROM THE BAGHOUSE FOR USE IN THE SLURRY PREPARATION SYSTEM. THE SPRAY DRYER ASH WAS HARD TO CONVEY AND WOULD FORM LARGE CHUNKS, MAKING IT HARD TO RESLURRY. MOST OF THESE MODIFICATIONS WERE MADE DURING THE SCHEDULED FALL BOILER OUTAGE.

/87	SYSTEM	744
/87	SYSTEM	672
/87	SYSTEM	744
/87	SYSTEM	720
/87	SYSTEM	744
/87	SYSTEM	720
/87	SYSTEM	744
/87	SYSTEM	744
/87	SYSTEM	720
/87	SYSTEM	744

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

BASIN ELECTRIC POWER: ANTELOPE VALLEY 2 (CONT.)

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

11/87	SYSTEM							720		
12/87	SYSTEM							744		

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED OUTAGES WERE ENCOUNTERED DURING THE YEAR 1987.

1/88	SYSTEM							774		
2/88	SYSTEM							672		
3/88	SYSTEM							774		
4/88	SYSTEM							720		
5/88	SYSTEM							774		
6/88	SYSTEM							720		
7/88	SYSTEM							774		
8/88	SYSTEM							774		
9/88	SYSTEM							720		
10/88	SYSTEM							774		
11/88	SYSTEM							720		
12/88	SYSTEM							774		

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED OUTAGES WERE ENCOUNTERED DURING THE YEAR. THE UNIT WAS OFF-LINE IN THE SPRING OF 1988 FOR APPROXIMATELY 4 TO 5 WEEKS FOR A SCHEDULED MAINTENANCE OUTAGE.

SECTION 13
 DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	BASIN ELECTRIC POWER	
PLANT NAME	LARAMIE RIVER	
UNIT NUMBER	1	
CITY	WHEATLAND	
STATE	WYOMING	
REGULATORY CLASSIFICATION	A	
PARTICULATE EMISSION LIMITATION - NG/J	43.	(0.100 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	86.	(0.200 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	301.	(0.700 LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	1500	
GROSS UNIT GENERATING CAPACITY - MW	600	
NET UNIT GENERATING CAPACITY W/FGD - MW	550	
NET UNIT GENERATING CAPACITY WO/FGD - MW	555	
EQUIVALENT SCRUBBED CAPACITY - MW	600	
*** 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	1085.37	(2300000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	141.1	(286 F)
STACK HEIGHT - M	183.	(600 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	8.7	(28.5 FT)
*** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	SUBBITUMINOUS	
AVERAGE HEAT CONTENT - J/G	19538.	(8400 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		8200-8400
AVERAGE ASH CONTENT - %	7.89	
RANGE ASH CONTENT - %	5.5-6.5	
AVERAGE MOISTURE CONTENT - %	28.92	
RANGE MOISTURE CONTENT - %	27.0-30.0	
AVERAGE SULFUR CONTENT - %	0.54	
RANGE SULFUR CONTENT - %	0.30-0.38	
AVERAGE CHLORIDE CONTENT - %	0.04	
RANGE CHLORIDE CONTENT - %	0.01-0.02	
*** PARTICLE CONTROL		
** MECHANICAL COLLECTOR		
NUMBER	0	
TYPE	NONE	
** ESP		
NUMBER	1	
NUMBER OF SPARES	0	
TYPE	COLD SIDE	
SUPPLIER	BABCOCK & WILCOX	
INLET FLUE GAS CAPACITY - CU.M/S	1085.4	(2300000 ACFM)
INLET FLUE GAS TEMPERATURE - C	141.1	(286 F)
PRESSURE DROP - KPA	0.8	(3. 1N-H2O)
PARTICLE REMOVAL EFFICIENCY - %	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		

LITY FGD SURVEY: JANUARY - DECEMBER 1988

IN ELECTRIC POWER: LARAMIE RIVER 1 (CONT.)

GENERAL DATA

SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT
SO2 REMOVAL MODE	WET SCRUBBING
PROCESS TYPE	LIMESTONE
SYSTEM SUPPLIER	RESEARCH-COTTRELL
A-E FIRM	BURNS & MCDONNELL
DEVELOPMENT LEVEL	FULL SCALE
NEW/RETROFIT	NEW
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.60
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	90.00
ENERGY CONSUMPTION - %	0.8
CURRENT STATUS	1
COMMERCIAL START-UP	7/1980
INITIAL START-UP	7/1980
CONTRACT AWARDED	1/1977

DESIGN AND OPERATING PARAMETERS

DESIGN COAL SULFUR CONTENT - %	0.81	
DESIGN COAL HEAT CONTENT - J/G	18931.3	(8139 BTU/LB)
DESIGN COAL ASH CONTENT - %	7.89	
DESIGN MOISTURE CONTENT - %	28.92	
DESIGN CHLORIDE CONTENT - %	0.04	
SPACE REQUIREMENTS - SQ M	2322.5	(25000 SQ FT)
OPER. & MAINT. REQUIREMENT - MANHR/DAY	80.0	

QUENCHER/PRESATURATOR

NUMBER	5	
TYPE	SPRAY ZONE	
SUPPLIER	RESEARCH-COTTRELL	
INLET GAS FLOW - CU. M/S	271.34	(575000 ACFM)
INLET GAS TEMPERATURE - C	141.1	(286 F)
LIQUID RECIRCULATION RATE - LITERS/S	616.	(9770 GPM)
L/G RATIO - L/CU. M	2.3	(17.0 GAL/1000 ACFM)
CONSTRUCTION MATERIAL GENERIC TYPE	HIGH ALLOY	
CONSTRUCTION MATERIAL SPECIFIC TYPE	IRON BASE/NICKEL-CHROMIUM-COPPER-MOLYBDENUM	

ABSORBER

NUMBER	5	
NUMBER OF SPARES	1	
GENERIC TYPE	COMBINATION TOWER	
SPECIFIC TYPE	SPRAY/PACKED	
TRADE NAME/COMMON TYPE	N/A	
SUPPLIER	RESEARCH-COTTRELL	
DIMENSIONS - FT	30.0 X 30.0 X 88.0	
SHELL GENERIC MATERIAL	STAINLESS STEEL; HIGH ALLOY	
SHELL SPECIFIC MATERIAL	AUSTENITIC; IRON BASE/NICKEL-CHROMIUM-COPPER-MOL	
SHELL MATERIAL TRADE NAME/COMMON TYPE	TYPE 316L; ALLOY 904L	
LINER GENERIC MATERIAL	NONE	
LINER SPECIFIC MATERIAL	N/A	
LINER MATERIAL TRADE NAME/COMMON TYPE	N/A	
GAS CONTACTING DEVICE TYPE	VERTICAL CROSS CHANNEL FIXED GRID PACKING	
NUMBER OF CONTACTING ZONES	1	
LIQUID RECIRCULATION RATE - LITER/S	1472.	(23372 GPM)
L/G RATIO - L/CU.M	5.3	(40.0 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	1.5	(6.0 IN-H2O)
SUPERFICIAL GAS VELOCITY - M/SEC	3.0	(10.0 FT/S)
INLET GAS FLOW - CU. M/S	271.34	(575000 ACFM)
INLET GAS TEMPERATURE - C	141.1	(286 F)
SO2 REMOVAL EFFICIENCY - %	95.0	
PARTICLE REMOVAL EFFICIENCY - %	60.0	

* MIST ELIMINATOR

PRE-MIST ELIMINATOR/MIST ELIMINATOR	PRIMARY COLLECTOR
NUMBER PER SYSTEM	5
NUMBER OF SPARES PER SYSTEM	1
NUMBER PER MODULE	1
GENERIC TYPE	IMPINGEMENT
SPECIFIC TYPE	BAFFLE
TRADE NAME/COMMON TYPE	CLOSED VANE
CONFIGURATION	HORIZONTAL

BASIN ELECTRIC POWER: LARAMIE RIVER 1 (CONT.)

NUMBER OF STAGES	2	
NUMBER OF PASSES PER STAGE	3	
PRESSURE DROP - KPA	0.6	(2.6 IN-H2O)
SUPERFICIAL GAS VELOCITY - M/S	3.0	(10.0 FT/S)
CONSTRUCTION MATERIAL GENERIC TYPE	ORGANIC	
CONSTRUCTION MATERIAL SPECIFIC TYPE	POLYPROPYLENE	
WASH WATER SOURCE	COOLING TOWER BLOWDOWN	
WASH FREQUENCY	UNDER-ONCE/15 MIN; TOP-ONCE/8 HRS	
WASH RATE - L/S	18.4	(292 GAL/MIN)
** REHEATER		
GENERIC TYPE	NONE	
SPECIFIC TYPE	N/A	
TRADE NAME/COMMON TYPE	N/A	
** FANS		
NUMBER	2	
NUMBER OF SPARES	0	
DESIGN	AXIAL	
SUPPLIER	BABCOCK & WILCOX	
FUNCTION	UNIT	
APPLICATION	FORCED DRAFT	
SERVICE	DRY	
FLUE GAS FLOW RATE - CU.M/S	542.68	(1150000 ACFM)
FLUE GAS TEMPERATURE - C	141.1	(286 F)
PRESSURE DROP - KPA	7.6	(25.0 IN-H2O)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	
** FANS		
NUMBER	2	
NUMBER OF SPARES	0	
DESIGN	AXIAL	
SUPPLIER	BABCOCK & WILCOX	
FUNCTION	UNIT	
APPLICATION	FORCED DRAFT	
SERVICE	DRY	
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	
** DAMPERS		
NUMBER	4	
FUNCTION	CONTROL	
GENERIC TYPE	LOUVER; LOUVER	
SPECIFIC TYPE	PARALLEL BLADE MULTILOUVRE; OPPOSED BLADE MULTIL	
MANUFACTURER	FORNEY ENGINEERING	
CONSTRUCTION MATERIAL GENERIC TYPE	DRY SIDE-CARBON STEEL; WET SIDE-STAINLESS STEEL	
CONSTRUCTION MATERIAL SPECIFIC TYPE	AIISI 1110; AUSTENITIC	
LINER GENERIC MATERIAL TYPE	NONE	
LINER SPECIFIC MATERIAL TYPE	N/A	
** DAMPERS		
NUMBER	1	
FUNCTION	CONTROL	
GENERIC TYPE	LOUVER; LOUVER	
SPECIFIC TYPE	PARALLEL BLADE MULTILOUVRE; OPPOSED BLADE MULTIL	
MANUFACTURER	FORNEY ENGINEERING	
CONSTRUCTION MATERIAL GENERIC TYPE	DRY SIDE-CARBON STEEL; WET SIDE-STAINLESS STEEL	
CONSTRUCTION MATERIAL SPECIFIC TYPE	AIISI 1110; AUSTENITIC	
LINER GENERIC MATERIAL TYPE	NONE	
LINER SPECIFIC MATERIAL TYPE	N/A	
** DAMPERS		
NUMBER	2	
FUNCTION	CONTROL	
GENERIC TYPE	LOUVER; LOUVER	
SPECIFIC TYPE	PARALLEL BLADE MULTILOUVRE; OPPOSED BLADE MULTIL	
MANUFACTURER	FORNEY ENGINEERING	
CONSTRUCTION MATERIAL GENERIC TYPE	DRY SIDE-CARBON STEEL; WET SIDE-STAINLESS STEEL	
CONSTRUCTION MATERIAL SPECIFIC TYPE	AIISI 1110; AUSTENITIC	
LINER GENERIC MATERIAL TYPE	NONE	
LINER SPECIFIC MATERIAL TYPE	N/A	

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

SIN ELECTRIC POWER: LARAMIE RIVER 1 (CONT.)

* DAMPERS	
NUMBER	10
FUNCTION	5 CONTROL & 5 SHUT-OFF
GENERIC TYPE	LOUVER; LOUVER
SPECIFIC TYPE	PARALLEL BLADE MULTILOUVRE; OPPOSED BLADE MULTIL
MANUFACTURER	FORNEY 'LOUVER!; ANDCO 'GUILLOTINE!
CONSTRUCTION MATERIAL GENERIC TYPE	DRY SIDE-CARBON STEEL; WET SIDE-STAINLESS STEEL
CONSTRUCTION MATERIAL SPECIFIC TYPE	AISI 1110; AUSTENITIC
LINER GENERIC MATERIAL TYPE	NONE
LINER SPECIFIC MATERIAL TYPE	N/A
* DAMPERS	
NUMBER	5
FUNCTION	SHUT-OFF
GENERIC TYPE	LOUVER; LOUVER
SPECIFIC TYPE	PARALLEL BLADE MULTILOUVRE; OPPOSED BLADE MULTIL
MANUFACTURER	FORNEY 'LOUVER!; ANDCO 'GUILLOTINE!
CONSTRUCTION MATERIAL GENERIC TYPE	DRY SIDE-CARBON STEEL; WET SIDE-STAINLESS STEEL
CONSTRUCTION MATERIAL SPECIFIC TYPE	AISI 1110; AUSTENITIC
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	STAINLESS STEEL
SHELL SPECIFIC MATERIAL TYPE	AUSTENITIC
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
* REAGENT PREPARATION EQUIPMENT	
FUNCTION	WET BALL MILL
DEVICE	COMPARTMENTED
DEVICE TYPE	NR
MANUFACTURER	KENNEDY VAN SAUN
NUMBER	2
NUMBER OF SPARES	0
FULL LOAD DRY FEED CAPACITY - M.TONS/HR	13.6 (15 TPH)
PRODUCT QUALITY - % SOLIDS	35.0
* TANKS	
SERVICE	NUMBER
-----	-----
ABSORBER FEED	5
QUENCHER FEED	5
LIMESTONE SLURRY	1
RECLAIM WATER	1
CENTRATE	1
SEAL WATER	1

BASIN ELECTRIC POWER: LARAMIE RIVER 1 (CONT.)

** PUMPS	
SERVICE	NUMBER
-----	-----
ABSORBER FEED	10
QUENCHER FEED	5
MILL PRODUCT	2
LIMESTONE SLURRY TRANSFER	2
MAKEUP WATER SUPPLY	1
RECLAIMED WATER	2
SEAL WATER	2
ABSORBER BLOWDOWN	2
THICKENER UNDERFLOW	9
CENTRATE	2
DEWATERING BUILDING SUMP PUMPS	4
** SOLIDS CONCENTRATING/DEWATERING	THICKENER
DEVICE	3
NUMBER	0
NUMBER OF SPARES	CIRCULAR
CONFIGURATION	110.0 DIA X 10.0
DIMENSIONS - FT	1000000
CAPACITY	INORGANIC
SHELL GENERIC MATERIAL TYPE	HYDRAULICALLY-BONDED CONCRETE
SHELL SPECIFIC MATERIAL TYPE	QUENCHER BLEED
FEED STREAM SOURCE	650 GPM; 10% SOLIDS
FEED STREAM CHARACTERISTICS	100 GPM; 30% SOLIDS
OUTLET STREAM CHARACTERISTICS	550 GPM; 0.5% SOLIDS
OVERFLOW STREAM CHARACTERISTICS	TO CENTRIFUGE
OUTLET STREAM DISPOSITION	TO RECLAIMED WATER & THEN TO QUENCHER
OVERFLOW STREAM DISPOSITION	
** SOLIDS CONCENTRATING/DEWATERING	CENTRIFUGE
DEVICE	4
NUMBER	0
NUMBER OF SPARES	8
DIMENSIONS - FT	110 GPM
CAPACITY	STAINLESS STEEL
SHELL GENERIC MATERIAL TYPE	AUSTENITIC
SHELL SPECIFIC MATERIAL TYPE	NONE
LINER GENERIC MATERIAL TYPE	N/A
LINER SPECIFIC MATERIAL TYPE	N/A
BELT GENERIC MATERIAL TYPE	N/A
BELT SPECIFIC MATERIAL TYPE	THICKENER UNDERFLOW
FEED STREAM SOURCE	35% SOLIDS
FEED STREAM CHARACTERISTICS	70% SOLIDS
OUTLET STREAM CHARACTERISTICS	TO PUG MILL
OUTLET STREAM DISPOSITION	TO CENTRATE TANK & THEN THICKENER
OVERFLOW STREAM DISPOSITION	
*** SALEABLE BYPRODUCTS	
NATURE	NONE
DISPOSITION	N/A
*** SLUDGE	
FULL LOAD SLUDGE QUANTITY - M.TONS/HR (DRY)	0.4 (0.4 TPH)
MOISTURE CONTENT - % TOTAL FREE WATER	30.0
% CASO3 - DRY	8.0
% CASO4 - DRY	90.0
% CAOH2 - DRY	0.0
% CACO3 - DRY	2.0
** TREATMENT	
METHOD	FORCED OXIDATION
DEVICE	SPARGER IN QUENCHER
PROPRIETARY PROCESS	NONE
INLET QUALITY - %	10.0

ELITY FGD SURVEY: JANUARY - DECEMBER 1988

SIN ELECTRIC POWER: LARAMIE RIVER 1 (CONT.)

* DISPOSAL	
NATURE	FINAL
TYPE	LANDFILL
LOCATION	ON-SITE
SITE TRANSPORTATION METHOD	CONVEYED
SITE TREATMENT	PVC LINING
SITE DIMENSIONS	60-90 FT DEEP 160 ACRES TOTAL FOR DISPOSAL
SITE SERVICE LIFE - YRS	35
* PROCESS CONTROL AND INSTRUMENTATION	
PROCESS STREAM	ABSORBER FEED & QUENCHER FEED
CHEMICAL PARAMETERS	PH, SOLIDS, SO2 INLET, ACFM, SO2 OUTLET
PHYSICAL VARIABLES	PERCENT SOLIDS; GAS FLOW
CONTROL LEVELS	PH 5.8-6.2 IN ABSORBER; PH 4.5-5.0 IN QUENCHER;
MONITOR TYPE	GREAT LAKES PH; DYNASCIENCE FOR CONTROL SO2;
MONITOR LOCATION	ABSORBER FEED TANK & QUENCHER; DENSITY ON PUMP
PROCESS CONTROL MANNER	AUTOMATIC
PROCESS CHEMISTRY MODE	FEED BACK PH & DENSITY
* WATER BALANCE	
WATER LOOP TYPE	CLOSED
EVAPORATION WATER LOSS - LITER/S	23.3 (370 GPM)
POND SEEPAGE/RUNOFF WATER LOSS - LITERS/S	0
EFFLUENT WATER LOSS - LITERS/S	0.0 (0 GPM)
RECEIVING WATER STREAM	N/A
MAKEUP WATER ADDITION - LITERS/S	25.2 (400 GPM)
SOURCE OF MAKEUP WATER	COOLING TOWER BLOWDOWN, WELLS & GRAYROCKS RESERV
* CHEMICALS AND CONSUMPTION	
FUNCTION	ABSORBENT
NAME	LIMESTONE
PRINCIPAL CONSTITUENT	95% CaCO3
SOURCE/SUPPLIER	HOLLY SUGAR COMPANY
CONSUMPTION	2000 TONS/MONTH
UTILIZATION - %	90.0
POINT OF ADDITION	BALL MILL
* FGD SPARE CAPACITY INDICES	
ABSORBER - %	25.0
MIST ELIMINATOR - %	25.0
FAN - %	0.0
BALL MILL - %	0.0
EFFLUENT HOLD TANK - %	25.0
RECIRCULATION PUMP - %	25.0
THICKENER - %	33.3
CENTRIFUGE - %	0.0
* FGD SPARE COMPONENT INDICES	
ABSORBER	1.0

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

RIOD MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER BOILER HOURS	FGD HOURS	CAP. HOURS	Factor
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/80 SYSTEM 744

** PROBLEMS/SOLUTIONS/COMMENTS

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

/80 SYSTEM 744

/80 SYSTEM 720

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

BASIN ELECTRIC POWER: LARAMIE RIVER 1 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

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

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

** PROBLEMS/SOLUTIONS/COMMENTS

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

11/80	A	100.0	57.8	100.0	46.4				
	B	100.0	96.2	100.0	77.2				
	C	100.0	72.5	100.0	58.2				
	D	1.9	2.3	100.0	1.9				
	E	100.0	98.3	100.0	78.9				
	SYSTEM	100.0	81.7	100.0	65.6	720	578	568	67.1

** PROBLEMS/SOLUTIONS/COMMENTS

DURING NOVEMBER THE BOILER WAS OUT OF SERVICE APPROXIMATELY 120 HOURS DUE TO REPAIRS.

DURING THE MONTH MODULE D WAS OFF LINE 30 DAYS FOR REPAIRS.

12/80	A	19.6	21.1	100.0	19.6				
	B	100.0	94.4	100.0	87.9				
	C	100.0	96.7	100.0	90.0				
	D	75.7	81.2	100.0	75.7				
	E	100.0	100.0	100.0	93.0				
	SYSTEM	98.8	98.4	100.0	91.5	744	693	692	87.0

** PROBLEMS/SOLUTIONS/COMMENTS

DURING DECEMBER MODULES A AND D WERE OUT OF SERVICE FOR MAINTENANCE ON THE WELDS IN THE QUENCHER SECTION DUE TO CORROSION OF UDDEHOLM 904L.

1/81	A	0.0	0.0		0.0				
	B	100.0	91.3	100.0	88.6				
	C	100.0	97.4	100.0	94.5				
	D	100.0	95.8	100.0	93.0				
	E	100.0	95.7	100.0	92.8				
	SYSTEM	100.0	95.0	100.0	92.2	744	722	686	97.1

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JANUARY MODULE A WAS UNAVAILABLE DUE TO MAINTENANCE ON WELDS IN THE QUENCHER SECTION THAT FAILED DUE TO CORROSION OF THE UDDEHOLM 904L.

2/81	A	0.0	0.0		0.0				
	B	100.0	94.0	100.0	84.2				
	C	100.0	97.7	100.0	87.5				
	D	100.0	97.8	100.0	87.6				
	E	100.0	90.7	100.0	81.3				
	SYSTEM	100.0	95.1	100.0	85.1	672	602	572	81.2

LITY FGD SURVEY: JANUARY - DECEMBER 1988
IN ELECTRIC POWER: LARAMIE RIVER 1 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

DURING FEBRUARY MODULE A REMAINED OUT OF SERVICE DUE TO THE NECESSARY
MAINTENANCE OF THE WELDS IN THE QUENCHER SECTION.

81	A	80.6	81.4	100.0	79.3				
	B	100.0	100.0	100.0	97.4				
	C	25.8	18.2	100.0	17.7				
	D	100.0	99.7	100.0	97.2				
	E	100.0	94.5	100.0	96.0				
	SYSTEM	100.0	99.4	100.0	96.9	744	725	721	96.6

** PROBLEMS/SOLUTIONS/COMMENTS

DURING MARCH MODULES A AND C EXPERIENCED OUTAGE TIME DUE TO MAINTENANCE ON
THE WELDS IN THE QUENCHER SECTION RESULTING FROM CORROSION OF THE UDDEHOLM
904L.

81	A	100.0	91.6	100.0	91.1				
	B	100.0	98.5	100.0	97.9				
	C	0.0	0.0		0.0				
	D	100.0	99.9	100.0	99.3				
	E	100.0	99.4	100.0	98.9				
	SYSTEM	100.0	97.4	100.0	96.8	720	716	697	96.1

** PROBLEMS/SOLUTIONS/COMMENTS

DURING APRIL MODULE C WAS OUT OF SERVICE FOR MAINTENANCE ON THE WELDS IN
THE QUENCHER SECTION DUE TO CORROSION OF THE UDDEHOLM 904L.

81	A	100.0	86.7	100.0	78.2				
	B	100.0	98.0	100.0	88.4				
	C	0.0	0.0		0.0				
	D	100.0	98.3	100.0	88.7				
	E	100.0	99.3	100.0	89.6				
	SYSTEM	100.0	95.6	100.0	86.3	744	671	642	85.5

** PROBLEMS/SOLUTIONS/COMMENTS

DURING MAY MODULE C WAS DOWN FOR MAINTENANCE ON WELDS ON THE QUENCHER
SECTION DUE TO CORROSION OF THE UDDEHOLM 904L.

81	A	100.0	51.5	100.0	50.6				
	B	100.0	98.8	100.0	97.1				
	C	100.0	89.8	100.0	88.3				
	D	70.0	67.8	100.0	66.7				
	E	30.0	27.3	100.0	26.8				
	SYSTEM	100.0	83.8	100.0	82.4	720	708	593	63.5

** PROBLEMS/SOLUTIONS/COMMENTS

D AND E MODULES WERE TAKEN OUT OF SERVICE FOR MAINTENANCE ON THE WELDS IN
THE QUENCHER SECTION. THE UDDEHOLM 904L IS CORRODING.

81	A	100.0	95.5	100.0	95.5				
	B	100.0	99.0	100.0	99.0				
	C	100.0	90.6	100.0	90.6				
	D	100.0	96.6	100.0	96.6				
	E	0.0	0.0		0.0				
	SYSTEM	100.0	95.4	100.0	95.4	744	744	710	86.9

BASIN ELECTRIC POWER: LARAMIE RIVER 1 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

E MODULE WAS TAKEN OUT OF SERVICE FOR MAINTENANCE ON WELDS IN THE QUENCHER SECTION. THE UDDEHOLM 904L IS CORRODING.

8/81	A	100.0	96.8	100.0	92.6				
	B	28.6	29.9	100.0	28.6				
	C	100.0	96.7	100.0	92.5				
	D	100.0	98.9	100.0	94.6				
	E	58.3	61.0	100.0	91.7				
	SYSTEM	96.7	95.8	100.0	91.7	744	711	682	83.7

** PROBLEMS/SOLUTIONS/COMMENTS

B AND E MODULES WERE TAKEN OUT OF SERVICE FOR MAINTENANCE ON WELDS IN THE QUENCHER SECTION. THE UDDEHOLM 904L IS CORRODING.

9/81	A	100.0	96.2	100.0	25.7				
	B	0.0	0.0		0.0				
	C	100.0	91.3	100.0	24.4				
	D	100.0	92.4	100.0	24.7				
	E	100.0	94.0	100.0	25.1				
	SYSTEM	100.0	94.0	100.0	25.1	720	192	181	25.6

** PROBLEMS/SOLUTIONS/COMMENTS

THE B MODULE WAS TAKEN OUT OF SERVICE FOR MAINTENANCE ON WELDS IN THE QUENCHER SECTION. THE UDDEHOLM 904L IS CORRODING.

THE UNIT WAS TAKEN OUT OF SERVICE FOR AN ANNUAL OVERHAUL.

10/81	A	100.0			0.0				
	B	0.0			0.0				
	C	100.0			0.0				
	D	100.0			0.0				
	E	100.0			0.0				
	SYSTEM	100.0			0.0	744	0	0	0.0

** PROBLEMS/SOLUTIONS/COMMENTS

DURING OCTOBER THE UNIT WAS SHUTDOWN FOR SCHEDULED MAINTENANCE.

11/81	A	100.0	37.8	100.0	36.2				
	B	0.0	0.0		0.0				
	C	100.0	75.7	100.0	72.4				
	D	100.0	59.2	100.0	56.6				
	E	100.0	73.1	100.0	69.9				
	SYSTEM	100.0	63.2	100.0	59.0	720	689	423	40.3

** PROBLEMS/SOLUTIONS/COMMENTS

DURING OCTOBER AND NOVEMBER MODULE B WAS DOWN FOR MAINTENANCE IN THE QUENCHER SECTION DUE TO CORROSION OF THE UDDEHOLM 904L.

12/81	A	46.8	47.1	100.0	46.8				
	B	100.0	46.0	100.0	45.7				
	C	69.1	69.5	100.0	69.1				
	D	100.0	89.7	100.0	89.1				
	E	100.0	61.1	100.0	60.7				
	SYSTEM	100.0	78.3	100.0	77.8	744	739	579	70.4

ILITY FGD SURVEY: JANUARY - DECEMBER 1988

IN ELECTRIC POWER: LARAMIE RIVER 1 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

DURING DECEMBER, MODULES A AND C WERE DOWN PART OF THE TIME FOR GENERAL MAINTENANCE.

PROBLEMS WERE ENCOUNTERED WITH THE SEAL COATING IN THE ABSORBER FEED TANK.

32	A	100.0	82.1	100.0	82.1				
	B	100.0	99.0	100.0	99.0				
	C	100.0	92.0	100.0	92.0				
	D	74.2	82.5	100.0	82.5				
	E	25.8	9.9	100.0	9.9				
	SYSTEM	100.0	91.4	100.0	91.4	744	744	680	85.2

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JANUARY THE D AND E ABSORBER FEED TANK WAS DOWN FOR SEAL COATING.

32	A	100.0	51.2	100.0	40.4				
	B	100.0	89.0	100.0	70.1				
	C	100.0	95.0	100.0	74.8				
	D	100.0	92.8	100.0	73.1				
	E	53.6	22.9	100.0	18.1				
	SYSTEM	100.0	82.8	100.0	69.1	672	529	465	76.2

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE E WAS OFF-LINE PART OF FEBRUARY TO MAKE REPAIRS TO THE POTENTIAL PROTECTION.

82	A	74.2	55.6	100.0	55.6				
	B	100.0	61.7	100.0	61.7				
	C	100.0	60.4	100.0	60.4				
	D	100.0	98.0	100.0	98.0				
	E	100.0	99.9	100.0	99.9				
	SYSTEM	100.0	93.9	100.0	93.9	744	744	699	76.1

** PROBLEMS/SOLUTIONS/COMMENTS

DURING MARCH MODULE A WAS DOWN TO REPAIR A LEAK IN THE QUENCHER SECTION RESULTING FROM CORROSION OF THE UDEHOLM 904L.

82	A	50.0	65.4	100.0	25.8				
	B	76.7	100.0	100.0	71.8				
	C	76.7	100.0	100.0	74.9				
	D	50.0	65.4	100.0	47.0				
	E	80.0	100.0	100.0	76.1				
	SYSTEM	83.3	100.0	100.0	73.9	720	550	532	59.3

** PROBLEMS/SOLUTIONS/COMMENTS

DURING APRIL MODULES B, C, D, AND E WERE DOWN PART OF THE TIME TO PERFORM MAINTENANCE ON THE MIXERS AND TO INSPECT THE MODULES.

82	A	100.0	70.9	100.0	49.6				
	B	96.8	90.3	100.0	63.2				
	C	96.8	93.3	100.0	65.3				
	D	0.0	0.0		0.0				
	E	100.0	72.5	100.0	50.8				
	SYSTEM	98.4	81.7	100.0	57.2	744	521	426	75.7

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

BASIN ELECTRIC POWER: LARAMIE RIVER 1 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE D WAS DOWN DURING MAY FOR GENERAL MAINTENANCE AND REPAIR.

6/82	A	100.0	56.6	100.0	39.1				
	B	100.0	92.3	100.0	63.8				
	C	100.0	84.2	100.0	58.2				
	D	0.0	0.0		0.0				
	E	100.0	76.3	100.0	52.8				
	SYSTEM	100.0	77.3	100.0	53.5	720	498	385	56.8

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JUNE MODULE D WAS OUT OF SERVICE FOR NOZZLE REPAIR IN THE QUENCHER SECTION.

7/82	A	64.5	30.0	100.0	27.1				
	B	71.0	58.4	100.0	52.8				
	C	93.5	86.7	100.0	78.3				
	D	67.7	61.6	100.0	55.7				
	E	100.0	95.9	100.0	86.6				
	SYSTEM	99.2	83.2	100.0	75.1	744	672	559	62.6

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JULY MODULES A, B AND D WERE DOWN TO REPAIR NOZZLES IN THE QUENCHER SECTION.

8/82	A	100.0	90.2	100.0	67.3				
	B	100.0	96.3	100.0	71.8				
	C	77.4	80.5	100.0	60.0				
	D	100.0	84.1	100.0	62.8				
	E	12.9	10.3	100.0	7.7				
	SYSTEM	97.6	90.4	100.0	67.4	744	555	501	68.4

** PROBLEMS/SOLUTIONS/COMMENTS

DURING AUGUST MODULES C AND E WERE DOWN FOR MAINTENANCE IN THE QUENCHER SECTION RESULTING FROM CORROSION OF THE UDDEHOLM 904L.

9/82	A	100.0	92.6	100.0	92.6				
	B	100.0	98.0	100.0	98.0				
	C	16.7	16.6	100.0	16.6				
	D	100.0	86.0	100.0	86.0				
	E	86.7	60.0	100.0	60.0				
	SYSTEM	100.0	88.3	100.0	88.3	720	720	636	66.0

** PROBLEMS/SOLUTIONS/COMMENTS

DURING SEPTEMBER MODULE C WAS DOWN FOR MAINTENANCE IN THE QUENCHER SECTION RESULTING FROM CORROSION OF THE UDDEHOLM 904L.

10/82	A	100.0	86.1	100.0	49.9				
	B	16.1	10.2	100.0	5.9				
	C	87.1	70.5	100.0	40.8				
	D	71.0	94.2	100.0	54.6				
	E	100.0	76.3	100.0	44.2				
	SYSTEM	93.5	84.3	100.0	48.8	744	431	363	52.2

LITY FGD SURVEY: JANUARY - DECEMBER 1988
 IN ELECTRIC POWER: LARAMIE RIVER 1 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

DURING OCTOBER MODULES B, C AND D WERE DOWN FOR MAINTENANCE IN THE
 QUENCHER SECTION RESULTING FROM CORROSION OF THE UDDEHOLM 904L.

'82	A	63.3	44.3	100.0	44.3				
	B	92.9	73.3	100.0	73.3				
	C	100.0	90.8	100.0	90.8				
	D	46.7	23.8	100.0	23.8				
	E	100.0	82.7	100.0	82.7				
	SYSTEM	100.0	78.7	100.0	78.7	720	720	567	56.0

** PROBLEMS/SOLUTIONS/COMMENTS

DURING NOVEMBER MODULES A, B AND D WERE DOWN FOR MAINTENANCE ON WELDS IN
 THE QUENCHER SECTION RESULTING FROM CORROSION OF THE UDDEHOLM 904L.

'82	A	93.5	70.0	100.0	57.4				
	B	100.0	79.5	100.0	65.2				
	C	100.0	32.7	100.0	26.8				
	D	100.0	43.9	100.0	36.0				
	E	96.8	57.2	100.0	46.9				
	SYSTEM	100.0	70.8	100.0	58.1	744	610	432	43.4

** PROBLEMS/SOLUTIONS/COMMENTS

DURING DECEMBER MODULE A WAS DOWN FOR MAINTENANCE ON THE QUENCHER TOWER
 MIXERS.

'83	A	100.0	46.1	100.0	41.7				
	B	100.0	57.5	100.0	52.0				
	C	74.2	0.0		0.0				
	D	100.0	99.4	100.0	89.9				
	E	100.0	100.0	100.0	90.6				
	SYSTEM	100.0	75.8	100.0	68.5	744	673	510	46.2

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JANUARY MODULE C WAS DOWN FOR MAINTENANCE ON THE ICI ABSORBER FEED
 PUMP SUCTION VALVE.

/83	A	100.0	79.2	100.0	72.9				
	B	100.0	88.6	100.0	81.5				
	C	71.4	47.1	100.0	43.3				
	D	39.3	38.5	100.0	35.4				
	E	100.0	83.5	100.0	76.8				
	SYSTEM	100.0	84.2	100.0	77.5	672	618	521	56.9

** PROBLEMS/SOLUTIONS/COMMENTS

DURING FEBRUARY MODULE D WAS DOWN DUE TO A LEAK IN THE QUENCHER FLOOR.

/83	A	61.3	55.3	100.0	55.3				
	B	71.0	67.0	100.0	67.0				
	C	100.0	100.0	100.0	100.0				
	D	74.2	69.0	100.0	69.0				
	E	100.0	69.7	100.0	69.7				
	SYSTEM	100.0	90.2	100.0	90.2	744	744	671	66.0

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

BASIN ELECTRIC POWER: LARAMIE RIVER 1 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING MARCH.

4/83	A	99.9	78.3	100.0	60.1				
	B	69.9	58.0	100.0	44.5				
	C	99.9	92.5	100.0	71.0				
	D	99.9	81.7	100.0	62.7				
	E	33.3	8.3	100.0	6.4				
	SYSTEM	100.0	79.7	100.0	61.2	720	553	441	57.0

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE E WAS DOWN DURING APRIL FOR MAINTENANCE, CLEANING AND PACKING OF THE QUENCHER TOWER MIXERS.

5/83	A	41.9	97.3	100.0	40.6				
	B	41.9	94.6	100.0	39.4				
	C	41.9	92.8	100.0	38.7				
	D	41.9	98.9	100.0	41.2				
	E	0.0	0.0		0.0				
	SYSTEM	41.9	95.9	100.0	40.0	744	310	297	80.2

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS DOWN DURING PART OF MAY FOR AN ANNUAL OUTAGE.

6/83	A	0.0			0.0				
	B	0.0			0.0				
	C	0.0			0.0				
	E	0.0			0.0				
	D	0.0			0.0				
	SYSTEM	0.0			0.0	720	0	0	0.0

** PROBLEMS/SOLUTIONS/COMMENTS

ALL MODULES WERE DOWN DURING JUNE FOR MAINTENANCE AND AN ANNUAL OVERHAUL.

7/83	A	22.6	18.5	100.0	9.8				
	B	58.1	2.8	100.0	1.5				
	C	61.3	96.4	100.0	51.2				
	D	83.9	98.4	100.0	52.3				
	E	47.8	93.6	100.0	49.7				
	SYSTEM	68.4	77.4	100.0	41.1	744	395	306	55.5

** PROBLEMS/SOLUTIONS/COMMENTS

MODULES A, B, C, D, AND E WERE DOWN FOR MAINTENANCE DURING PART OF JULY.

8/83	A	100.0	55.1	100.0	50.5				
	B	83.9	50.1	100.0	46.0				
	C	100.0	76.8	100.0	70.5				
	D	87.1	59.8	100.0	54.9				
	E	100.0	84.3	100.0	77.4				
	SYSTEM	100.0	81.5	100.0	74.8	744	683	557	56.6

** PROBLEMS/SOLUTIONS/COMMENTS

MODULES B AND D WERE DOWN DURING PART OF AUGUST FOR MAINTENANCE.

9/83	A	100.0	88.1	100.0	88.1				
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LITY FGD SURVEY: JANUARY - DECEMBER 1988

IN ELECTRIC POWER: LARAMIE RIVER 1 (CONT.)

-----PERFORMANCE DATA-----										
MOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART. HOURS	PER BOILER HOURS	FGD HOURS	CAP. FACTOR
B		100.0	59.5	100.0	59.5					
C		86.7	81.0	100.0	81.0					
C		86.7	81.0	100.0	81.0					
D		10.0	91.0	100.0	91.0					
E		100.0	63.7	100.0	63.7					
SYSTEM		96.7	92.9	100.0	92.9		720	720	669	80.7

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE C WAS DOWN DURING PART OF SEPTEMBER FOR MAINTENANCE REQUIRED ON THE QUENCHER SECTION RESULTING FROM TOWER MIXER PROBLEMS.

83	A	67.7	45.8	100.0	39.5					
	B	100.0	80.6	100.0	69.5					
	C	55.0	54.0	100.0	46.6					
	D	100.0	66.9	100.0	57.7					
	E	100.0	91.9	100.0	79.3					
	SYSTEM	100.0	84.8	100.0	73.2		744	642	544	70.9

** PROBLEMS/SOLUTIONS/COMMENTS

MODULES A AND C WERE DOWN DURING PART OF OCTOBER FOR MAINTENANCE ON THE ABSORBER RECYCLE TANK MIXERS.

83	A	80.0	60.8	100.0	60.8					
	B	100.0	69.6	100.0	69.6					
	C	100.0	97.4	100.0	97.4					
	D	43.3	34.9	100.0	34.9					
	E	100.0	83.9	100.0	83.9					
	SYSTEM	100.0	86.7	100.0	86.7		720	720	624	70.8

83	A	100.0	89.0	100.0	82.4					
	B	100.0	85.3	100.0	79.0					
	C	100.0	44.7	100.0	41.4					
	D	64.5	51.6	100.0	47.8					
	E	100.0	55.4	100.0	51.3					
	SYSTEM	100.0	81.5	100.0	75.5		744	689	561	69.3

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING NOVEMBER AND DECEMBER 1983.

84	A	80.6	54.0	100.0	49.6					
	B	100.0	82.7	100.0	76.0					
	C	100.0	42.4	100.0	39.0					
	D	100.0	57.2	100.0	52.6					
	E	100.0	77.7	100.0	71.4					
	SYSTEM	100.0	78.5	100.0	72.2		744	684	537	62.0

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE A WAS DOWN FOR MAINTENANCE OF TANK MIXERS AND REPAIR OF A FEED PUMP.

84	A	89.7	71.7	100.0	66.1					
	B	100.0	51.1	100.0	47.1					
	C	13.8	13.6	100.0	12.6					
	D	100.0	80.5	100.0	74.3					
	E	100.0	86.5	100.0	79.8					
	SYSTEM	100.0	75.9	100.0	70.0		696	642	487	59.0

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

BASIN ELECTRIC POWER: LARAMIE RIVER 1 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT MODULE C WAS DOWN FOR MAINTENANCE DURING FEBRUARY.

3/84	A	100.0	89.8	100.0	87.7				
	B	100.0	95.4	100.0	93.1				
	C	93.5	45.2	100.0	44.1				
	D	9.7	3.4	100.0	3.3				
	E	100.0	83.1	100.0	81.1				
	SYSTEM	100.0	79.2	100.0	77.3	744	726	575	60.5

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT MODULE D WAS DOWN FOR MAINTENANCE DURING MARCH.

4/84	A	99.9	97.2	100.0	93.1				
	B	20.0	7.2	100.0	6.9				
	C	99.9	88.6	100.0	84.9				
	D	79.9	74.6	100.0	71.5				
	E	99.9	86.4	100.0	82.8				
	SYSTEM	99.9	88.5	100.0	84.8	720	690	611	76.3

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE B WAS DOWN FOR MECHANICAL MAINTENANCE DURING APRIL.

MODULE D WAS DOWN FOR MECHANICAL REVISIONS OF ABSORBER TANK MIXERS.

5/84	A	100.0	97.0	100.0	97.0				
	B	71.0	65.2	100.0	65.2				
	C	100.0	84.2	100.0	84.2				
	D	100.0	79.7	100.0	79.7				
	E	32.3	27.0	100.0	27.0				
	SYSTEM	100.0	88.3	100.0	88.3	744	744	657	67.4

** PROBLEMS/SOLUTIONS/COMMENTS

MODULES B AND E WERE DOWN DURING MAY FOR MAINTENANCE.

6/84	A	53.3	62.2	100.0	9.9				
	B	53.3	0.0	100.0	0.0				
	C	46.7	83.5	100.0	13.3				
	D	100.0	79.0	100.0	12.6				
	E	46.7	92.6	100.0	14.8				
	SYSTEM	75.0	79.3	100.0	12.7	720	115	91	50.2

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT MODULES A, C, D AND E WERE OUT FOR TANK MIXER REPAIRS.

7/84	A	0.0	0.0		0.0				
	B	100.0	94.8	100.0	90.7				
	C	100.0	51.9	100.0	49.7				
	D	100.0	86.9	100.0	83.2				
	E	100.0	84.6	100.0	81.0				
	SYSTEM	100.0	79.6	100.0	76.1	744	712	566	58.6

LITY FGD SURVEY: JANUARY - DECEMBER 1988
IN ELECTRIC POWER: LARAMIE RIVER 1 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS AROSE DURING JULY.

84	A	71.0	45.5	100.0	45.3				
	B	74.2	71.7	100.0	71.4				
	C	71.0	69.1	100.0	68.8				
	D	100.0	79.4	100.0	79.0				
	E	100.0	75.0	100.0	74.7				
	SYSTEM	100.0	85.1	100.0	84.8	744	741	631	61.3

** PROBLEMS/SOLUTIONS/COMMENTS

MODULES A,B AND C WERE DOWN DURING PART OF AUGUST FOR TANK MIXER REPAIRS.

84	A	100.0	99.4	100.0	99.4				
	B	63.3	25.6	100.0	25.6				
	C	100.0	87.7	100.0	87.7				
	D	100.0	84.4	100.0	84.4				
	E	100.0	51.0	58.7	51.0				
	SYSTEM	100.0	87.0	100.0	87.0	720	720	626	68.4

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT MODULE B WAS DOWN MOST OF SEPTEMBER FOR MAINTAINENCE ON QUENCHER TOWER MIXERS.

84	A	100.0	97.5	100.0	95.8				
	B	100.0	75.2	100.0	73.9				
	C	100.0	0.0		0.0				
	D	100.0	61.3	100.0	60.2				
	E	100.0	83.7	100.0	82.3				
	SYSTEM	100.0	79.4	100.0	78.1	744	731	581	62.5

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTE DURING THE MONTH OF OCTOBER.

84	A	70.0	26.7	100.0	22.8				
	B	100.0	77.1	100.0	65.8				
	C	100.0	77.1	100.0	65.8				
	D	100.0	99.2	100.0	84.8				
	E	100.0	99.8	100.0	85.2				
	SYSTEM	100.0	95.0	100.0	81.1	720	615	584	88.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT MODULE A WAS DOWN PART OF THE MONTH OF NOVEMBER FOR MAINTAINENCE ON QUENCHER TOWER MIXERS.

84	A	100.0	99.7	100.0	93.2				
	B	100.0	97.1	100.0	90.9				
	C	100.0	99.7	100.0	93.2				
	D	87.1	90.4	100.0	84.6				
	E	12.9	9.0	100.0	8.4				
	SYSTEM	100.0	99.0	100.0	92.6	744	696	689	100.0

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

BASIN ELECTRIC POWER: LARAMIE RIVER 1 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT MODULE D AND E WERE REMOVED FROM SERVICE PART OF DECEMBER TO CONDUCT QUENCHER REPAIRS.

1/85	A	83.9	80.5	100.0	79.2				
	B	100.0	100.0	100.0	98.4				
	C	100.0	98.4	100.0	96.8				
	D	19.4	19.6	100.0	19.3				
	E	100.0	96.7	100.0	95.2				
	SYSTEM	100.0	98.8	100.0	97.2	744	732	723	99.0

** PROBLEMS/SOLUTIONS/COMMENTS

NO FGD SYSTEM PROBLEMS WERE REPORTED BY THE UTILITY FOR THE MONTH OF JANUARY.

2/85	A	0.0	0.0		0.0				
	B	100.0	100.0	100.0	100.0				
	C	100.0	99.9	100.0	99.9				
	D	100.0	100.0	100.0	100.0				
	E	100.0	98.6	100.0	98.6				
	SYSTEM	100.0	99.6	100.0	99.6	672	672	669	100.7

** PROBLEMS/SOLUTIONS/COMMENTS

THE A-MODULE WAS DOWN FOR REPAIRS ON TANK AGITATORS AND QUENCHER SECTION HEADERS.

3/85	SYSTEM					744			
4/85	SYSTEM					720			
5/85	SYSTEM					744			
6/85	SYSTEM					720			
7/85	SYSTEM					744			
8/85	SYSTEM					744			
9/85	SYSTEM					720			
10/85	SYSTEM					744			

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE UNIT WAS DOWN MOST OF THE MONTH OF OCTOBER DUE TO A SCHEDULED BOILER/TURBINE MAINTENANCE OUTAGE.

11/85	SYSTEM					720			
12/85	SYSTEM					744			

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE REMAINDER OF THE YEAR. ONLY ROUTINE QUENCHER MAINTENANCE SUCH AS SCALE REMOVAL AND PATCH WORK TO THE 904L WERE NECESSARY.

1/86	SYSTEM					774			
2/86	SYSTEM					672			

LITY FGD SURVEY: JANUARY - DECEMBER 1988
IN ELECTRIC POWER: LARAMIE RIVER 1 (CONT.)

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

86	SYSTEM	774
86	SYSTEM	720
86	SYSTEM	774
86	SYSTEM	720
86	SYSTEM	774
86	SYSTEM	774
86	SYSTEM	720
86	SYSTEM	774
86	SYSTEM	720
86	SYSTEM	774

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED HAVING NO BOILER/TURBINE OUTAGES IN 1986. CLEANING AND REPLACEMENT OF QUENCHER INTERNALS WERE MADE DURING THE 3RD QUARTER. MATERIALS REPLACED INCLUDED PIPING, NOZZLES, AND SPRAY HEADERS. NO UNIT OUTAGES OCCURRED DURING THIS TIME DUE TO AVAILABLE SPARE CAPACITY.

'87	SYSTEM	744
'87	SYSTEM	672
'87	SYSTEM	744
'87	SYSTEM	720
'87	SYSTEM	744
'87	SYSTEM	720
'87	SYSTEM	744
'87	SYSTEM	744
'87	SYSTEM	720
'87	SYSTEM	744
'87	SYSTEM	720
'87	SYSTEM	744

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED OUTAGES WERE ENCOUNTERED DURING THE YEAR 1987. THE UNIT HAD A SCHEDULED OUTAGE IN THE FALL WHICH LASTED APPROXIMATELY 4 WEEKS.

/88	SYSTEM	774
/88	SYSTEM	672
/88	SYSTEM	774
/88	SYSTEM	720

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

BASIN ELECTRIC POWER: LARAMIE RIVER 1 (CONT.)

-----PERFORMANCE DATA-----										
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
5/88	SYSTEM						774			
6/88	SYSTEM						720			
7/88	SYSTEM						774			
8/88	SYSTEM						774			
9/88	SYSTEM						720			
10/88	SYSTEM						774			
11/88	SYSTEM						720			
12/88	SYSTEM						774			

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED OUTAGES WERE ENCOUNTERED IN 1988. THE UNIT IS SCHEDULED TO HAVE A 4 TO 5 WEEK MAINTENANCE OUTAGE IN APRIL OF 1989.

SECTION 13
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	BASIN ELECTRIC POWER
PLANT NAME	LARAMIE RIVER
UNIT NUMBER	2
CITY	WHEATLAND
STATE	WYOMING
REGULATORY CLASSIFICATION	A
PARTICULATE EMISSION LIMITATION - NG/J	43. (0.100 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	86. (0.200 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	***** (***** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	1500
GROSS UNIT GENERATING CAPACITY - MW	600
NET UNIT GENERATING CAPACITY W/FGD - MW	550
NET UNIT GENERATING CAPACITY WO/FGD - MW	571
EQUIVALENT SCRUBBED CAPACITY - MW	600
** UNIT DATA - BOILER AND STACK	
BOILER SUPPLIER	BABCOCK & WILCOX
BOILER TYPE	PULVERIZED COAL
BOILER SERVICE LOAD	BASE
DESIGN BOILER FLUE GAS FLOW - CU.M/S	1321.32 (2800000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	56.1 (133 F)
STACK HEIGHT - M	183. (600 FT)
STACK SHELL	CONCRETE
STACK TOP DIAMETER - M	8.7 (28.6 FT)
** FUEL DATA	
FUEL TYPE	COAL
FUEL GRADE	SUBBITUMINOUS
AVERAGE HEAT CONTENT - J/G	19538. (8400 BTU/LB)
RANGE HEAT CONTENT - BTU/LB	****
AVERAGE ASH CONTENT - %	7.89
RANGE ASH CONTENT - %	****
AVERAGE MOISTURE CONTENT - %	28.92
RANGE MOISTURE CONTENT - %	****
AVERAGE SULFUR CONTENT - %	0.54
RANGE SULFUR CONTENT - %	0.2-0.8
AVERAGE CHLORIDE CONTENT - %	0.04
RANGE CHLORIDE CONTENT - %	****
*** PARTICLE CONTROL	
** ESP	
NUMBER	1
TYPE	COLD SIDE
SUPPLIER	BABCOCK & WILCOX
INLET FLUE GAS CAPACITY - CU.M/S	1085.4 (2300000 ACFM)
INLET FLUE GAS TEMPERATURE - C	141.1 (286 F)
PRESSURE DROP - KPA	0.8 (3. IN-H2O)
PARTICLE REMOVAL EFFICIENCY - %	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	THROWAWAY PRODUCT
SO2 REMOVAL MODE	WET SCRUBBING
PROCESS TYPE	LIMESTONE
SYSTEM SUPPLIER	RESEARCH-COTTRELL
A-E FIRM	BURNS & MCDONNELL

ILITY FGD SURVEY: JANUARY - DECEMBER 1988

IN ELECTRIC POWER: LARAMIE RIVER 2 (CONT.)

DEVELOPMENT LEVEL	FULL SCALE
NEW/RETROFIT	NEW
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.60
UNIT DESIGN SO ₂ REMOVAL EFFICIENCY - %	90.00
ENERGY CONSUMPTION - %	3.5
CURRENT STATUS	1
COMMERCIAL START-UP	7/1986
INITIAL START-UP	7/1981
CONTRACT AWARDED	1/1977
DESIGN AND OPERATING PARAMETERS	
DESIGN COAL SULFUR CONTENT - %	0.81
DESIGN CHLORIDE CONTENT - %	*****
QUENCHER/PRESATURATOR	
CONSTRUCTION MATERIAL GENERIC TYPE	NR
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR
ABSORBER	
NUMBER	5
GENERIC TYPE	COMBINATION TOWER
SPECIFIC TYPE	SPRAY/PACKED
TRADE NAME/COMMON TYPE	N/A
SUPPLIER	RESEARCH-COTTRELL
DIMENSIONS - FT	30.0 X 30.0 X 88.0
SHELL GENERIC MATERIAL	STAINLESS STEEL; HIGH ALLOY
SHELL SPECIFIC MATERIAL	AUSTENITIC; IRON BASE/NICKEL-CHROMIUM-COPPER-MOL
SHELL MATERIAL TRADE NAME/COMMON TYPE	TYPE 316L; ALLOY 904L
LINER GENERIC MATERIAL	NONE
LINER SPECIFIC MATERIAL	N/A
LINER MATERIAL TRADE NAME/COMMON TYPE	N/A
GAS CONTACTING DEVICE TYPE	VERTICAL CROSS CHANNEL FIXED GRID PACKING
NUMBER OF CONTACTING ZONES	2
DISTANCE BETWEEN GAS CONTACTING ZONES - CM	61.0 (24.0IN)
L/G RATIO - L/CU.M	8.0 (60.0 GAL/1000 ACF)
SUPERFICIAL GAS VELOCITY - M/SEC	3.0 (10.0 FT/S)
INLET GAS FLOW - CU. M/S	1085.37 (2300000 ACFM)
INLET GAS TEMPERATURE - C	141.1 (286 F)
SO ₂ REMOVAL EFFICIENCY - %	90.0
PARTICLE REMOVAL EFFICIENCY - %	0.0
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	1
NUMBER OF PASSES PER STAGE	1
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	2
DESIGN	CENTRIFUGAL
FUNCTION	UNIT
APPLICATION	FORCED DRAFT
SERVICE	DRY
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL
* FANS	
NUMBER	2
NUMBER OF SPARES	0
DESIGN	AXIAL

BASIN ELECTRIC POWER: LARAMIE RIVER 2 (CONT.)

SUPPLIER	BABCOCK & WILCOX
FUNCTION	UNIT
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
NUMBER	2
FULL LOAD DRY FEED CAPACITY - M.TONS/HR	13.6 (15 TPH)
PRODUCT QUALITY - % SOLIDS	30.0
** TANKS	
SERVICE	NUMBER
-----	-----
NR	****
** PUMPS	
SERVICE	NUMBER
-----	-----
NR	****
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	THICKENER
NUMBER	3
NUMBER OF SPARES	0
DIMENSIONS - FT	110.0 DIA X 10.0
SHELL GENERIC MATERIAL TYPE	INORGANIC
SHELL SPECIFIC MATERIAL TYPE	HYDRAULICALLY-BONDED CONCRETE
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	CENTRIFUGE
NUMBER	1
NUMBER OF SPARES	0
FEED STREAM CHARACTERISTICS	35% SOLIDS
OUTLET STREAM CHARACTERISTICS	60% SOLIDS
*** SALEABLE BYPRODUCTS	
NATURE	NONE
DISPOSITION	N/A
*** SLUDGE	
** TREATMENT	
METHOD	FORCED OXIDATION
DEVICE	OXIDATION TANK
PROPRIETARY PROCESS	N/A

LITY FGD SURVEY: JANUARY - DECEMBER 1988
IN ELECTRIC POWER: LARAMIE RIVER 2 (CONT.)

DISPOSAL
NATURE
TYPE
LOCATION
SITE TRANSPORTATION METHOD
SITE TREATMENT
SITE SERVICE LIFE - YRS

FINAL
LANDFILL
ON-SITE
CONVEYED
NONE
35

PROCESS CONTROL AND INSTRUMENTATION
CHEMICAL PARAMETERS
PROCESS CONTROL MANNER

PH, SOLIDS, SO2 INLET, ACFM, SO2 OUTLET
AUTOMATIC

WATER BALANCE
WATER LOOP TYPE
MAKEUP WATER ADDITION - LITERS/S

CLOSED
16.9 (269 GPM)

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

81 SYSTEM

744

** PROBLEMS/SOLUTIONS/COMMENTS

INITIAL OPERATION OF THE FGD SYSTEM BEGAN DURING JULY 1981.

'81	A	100.0	78.2	100.0	77.6				
	B	52.4	52.8	100.0	52.4				
	C	100.0	82.3	100.0	81.7				
	D	31.9	32.2	100.0	31.9				
	E	100.0	28.8	100.0	28.6				
	SYSTEM	96.1	68.6	100.0	68.1	744	738	506	46.7

** PROBLEMS/SOLUTIONS/COMMENTS

B AND D MODULES WERE OUT OF SERVICE SO THAT BRACING WORK ON ROUND-OFF CORNERS COULD BE PERFORMED.

/81	A	100.0	94.0	100.0	77.4				
	B	100.0	99.0	100.0	81.5				
	C	37.7	31.2	100.0	25.7				
	D	100.0	41.7	100.0	34.3				
	E	100.0	60.4	100.0	49.7				
	SYSTEM	100.0	81.6	100.0	67.2	720	593	483	51.7

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED NO PROBLEMS WITH THE FGD SYSTEM WERE ENCOUNTERED IN THE MONTH OF SEPTEMBER.

/81	A	83.9	78.9	100.0	78.1				
	B	100.0	99.1	100.0	98.1				
	C	100.0	99.2	100.0	98.2				
	D	100.0	96.0	100.0	94.9				
	E	38.7	11.7	100.0	11.6				
	SYSTEM	100.0	96.2	100.0	95.0	744	736	708	88.0

** PROBLEMS/SOLUTIONS/COMMENTS

DURING OCTOBER MODULES E AND A WERE OFF-LINE PART OF THE TIME FOR THE INSTALLATION OF BRACING.

/81	A	100.0	99.9	100.0	99.9				
	B	100.0	99.9	100.0	99.9				
	C	100.0	99.9	100.0	99.9				
	D	100.0	94.0	100.0	94.0				

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

BASIN ELECTRIC POWER: LARAMIE RIVER 2 (CONT.)

-----PERFORMANCE DATA-----									
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER BOILER HOURS	FGD HOURS	CAP. HOURS FACTOR
	E	0.0	0.0		0.0				
	SYSTEM	100.0	98.4	100.0	98.0		720	720	708 95.3

** PROBLEMS/SOLUTIONS/COMMENTS

DURING NOVEMBER MODULE E WAS DOWN FOR MAINTENANCE ON THE WELDS IN THE QUENCHER SECTION DUE TO CORROSION OF THE UDDEHOLM 904L.

12/81	A	100.0	90.9	100.0	73.4				
	B	100.0	94.1	100.0	76.0				
	C	100.0	94.4	100.0	76.2				
	D	20.5	25.4	100.0	20.5				
	E	100.0	65.6	100.0	52.9				
	SYSTEM	100.0	92.6	100.0	74.8		744	601	556 69.4

** PROBLEMS/SOLUTIONS/COMMENTS

OUTAGE TIME DURING DECEMBER RESULTED FROM PROBLEMS WITH THE SEAL COATING I THE ABSORBER FEED TANK. GENERAL MAINTENANCE WAS PERFORMED ON MODULE D, WHICH ALSO ACCOUNTED FOR PART OF THE OUTAGE TIME.

1/82	A	100.0	99.3	100.0	96.3				
	B	100.0	99.5	100.0	96.5				
	C	100.0	99.1	100.0	96.1				
	D	0.0	0.0		0.0				
	E	100.0	94.7	100.0	91.8				
	SYSTEM	100.0	98.1	100.0	95.0		744	722	708 93.3

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JANUARY THE MODULE D ABSORBER FEED TANK WAS RESEALED.

2/82	A	100.0	99.8	100.0	94.7				
	B	100.0	87.6	100.0	83.1				
	C	100.0	75.7	100.0	71.8				
	D	42.9	29.6	100.0	28.1				
	E	100.0	89.2	100.0	84.6				
	SYSTEM	100.0	96.0	100.0	91.0		672	638	609 83.9

** PROBLEMS/SOLUTIONS/COMMENTS

THE SEAL COATING OF THE D ABSORBER FEED TANK CONTINUED INTO FEBRUARY.

THE D MODULE WAS DOWN PART OF THE TIME TO MAKE REPAIRS TO THE POTENTIAL PROTECTION.

3/82	A	48.4	33.8	100.0	31.5				
	B	100.0	69.4	100.0	64.8				
	C	100.0	84.2	100.0	78.6				
	D	100.0	93.0	100.0	86.8				
	E	100.0	74.4	100.0	69.4				
	SYSTEM	100.0	89.0	100.0	83.0		744	694	616 70.2

** PROBLEMS/SOLUTIONS/COMMENTS

DURING MARCH MODULE A WAS OFF-LINE APPROXIMATELY 384 HOURS TO RESEAL THE ABSORBER FEED TANK.

4/82	A	6.7	0.0		0.0				
	B	26.7	33.3	100.0	1.2				
	C	3.3	48.1	100.0	1.8				
	D	23.3	100.0	100.0	3.8				
	E	26.7	77.8	100.0	2.9				
	SYSTEM	21.7	64.8	100.0	2.4		720	27	18 1.3

ITY FGD SURVEY: JANUARY - DECEMBER 1988

N ELECTRIC POWER: LARAMIE RIVER 2 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

THE MODULES WERE DOWN PART OF APRIL TO SEAL COAT THE ABSORBER FEED TANKS.

MAINTENANCE WAS PERFORMED ON THE SPRAY NOZZLES IN THE QUENCHER SECTION OF EACH MODULE.

32	A	93.5	53.6	100.0	50.2				
	B	100.0	78.6	100.0	73.7				
	C	0.0	0.0		0.0				
	D	100.0	80.2	100.0	75.2				
	E	100.0	92.6	100.0	86.8				
	SYSTEM	98.4	76.2	100.0	71.5	744	697	532	75.6

** PROBLEMS/SOLUTIONS/COMMENTS

DURING MAY MODULE C WAS TAKEN OFF-LINE FOR MAINTENANCE AND REPAIRS.

32	A	100.0	89.3	100.0	89.3				
	B	86.7	69.3	100.0	69.3				
	C	16.7	11.7	100.0	11.7				
	D	100.0	76.1	100.0	76.1				
	E	100.0	96.9	100.0	96.9				
	SYSTEM	100.0	85.8	100.0	85.8	720	720	618	66.4

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JUNE MODULE C WAS OUT OF SERVICE PART OF THE TIME FOR NOZZLE REPAIR IN THE QUENCHER SECTION.

32	A	67.7	54.7	100.0	43.6				
	B	61.3	55.2	100.0	44.1				
	C	100.0	77.8	100.0	62.1				
	D	100.0	91.0	100.0	72.7				
	E	74.2	45.9	100.0	36.7				
	SYSTEM	100.0	81.2	100.0	64.8	744	594	482	60.4

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JULY MODULES A, B AND E WERE DOWN TO REPAIR NOZZLES IN THE QUENCHER SECTION.

32	A	80.6	67.0	100.0	63.9				
	B	100.0	93.9	100.0	89.5				
	C	100.0	97.4	100.0	92.8				
	D	22.6	21.7	100.0	20.6				
	E	83.9	58.0	100.0	55.2				
	SYSTEM	96.8	84.5	100.0	80.5	744	709	599	65.4

** PROBLEMS/SOLUTIONS/COMMENTS

DURING AUGUST MODULES A AND D WERE DOWN FOR MAINTENANCE IN THE QUENCHER SECTION RESULTING FROM CORROSION OF THE UDDEHOLM 904L.

82	A	100.0	98.7	100.0	94.3				
	B	100.0	99.9	100.0	95.4				
	C	36.7	38.0	100.0	36.4				
	D	63.3	61.3	100.0	58.6				
	E	0.0	0.0		0.0				
	SYSTEM	75.0	74.5	100.0	71.2	720	688	513	46.0

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

BASIN ELECTRIC POWER: LARAMIE RIVER 2 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

DURING SEPTEMBER MODULES C, D AND E WERE DOWN FOR MAINTENANCE IN THE
 QUENCHER SECTION RESULTING FROM THE CORROSION OF UDDEHOLM 904L.

10/82	A	25.8	24.5	100.0	24.4				
	B	38.7	34.2	100.0	34.0				
	C	77.4	72.5	100.0	72.2				
	D	74.2	72.7	100.0	72.4				
	E	100.0	98.9	100.0	98.5				
	SYSTEM	79.0	75.7	100.0	75.4	744	741	561	41.8

** PROBLEMS/SOLUTIONS/COMMENTS

DURING OCTOBER MODULE A WAS DOWN FOR MAINTENANCE ON WELDS IN THE QUENCHER
 SECTION RESULTING FROM CORROSION OF THE UDDEHOLM 904L.

DURING OCTOBER MODULE D WAS DOWN FOR REPAIRS OF BRACING.

11/82	A	0.0	0.0		0.0				
	B	63.3	33.1	100.0	22.8				
	C	100.0	97.9	100.0	67.3				
	D	100.0	63.4	100.0	43.6				
	E	100.0	93.6	100.0	64.3				
	SYSTEM	90.8	72.0	100.0	49.5	720	495	356	41.0

** PROBLEMS/SOLUTIONS/COMMENTS

DURING NOVEMBER MODULES A AND B WERE DOWN FOR MAINTENANCE ON WELDS IN THE
 QUENCHER SECTION RESULTING FROM CORROSION OF THE UDDEHOLM 904L.

12/82	A	32.3	27.1	100.0	26.2				
	B	100.0	90.4	100.0	87.3				
	C	100.0	97.2	100.0	93.9				
	D	100.0	50.2	100.0	48.6				
	E	100.0	100.0	100.0	96.6				
	SYSTEM	100.0	91.2	100.0	88.2	744	719	656	68.8

** PROBLEMS/SOLUTIONS/COMMENTS

DURING DECEMBER MODULE A WAS DOWN FOR MAINTENANCE ON THE TOWER MIXERS AND
 WETTED FILM CONTACT PACKING.

1/83	A	100.0	92.2	100.0	71.6				
	B	22.6	9.4	100.0	7.3				
	C	100.0	88.1	100.0	68.4				
	D	83.9	74.2	100.0	57.7				
	E	100.0	81.2	100.0	63.1				
	SYSTEM	100.0	86.3	100.0	67.0	744	578	498	61.1

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JANUARY MODULE B WAS DOWN TO ROUND OFF WELDS IN THE SCRUBBER.

2/83	A	25.0	16.5	100.0	15.1				
	B	89.3	72.9	100.0	66.7				
	C	100.0	96.6	100.0	88.4				
	D	100.0	57.8	100.0	52.9				
	E	85.7	72.3	100.0	66.2				
	SYSTEM	100.0	79.0	100.0	72.3	672	615	486	53.1

LITY FGD SURVEY: JANUARY - DECEMBER 1988
IN ELECTRIC POWER: LARAMIE RIVER 2 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

DURING FEBRUARY MODULE A WAS DOWN DUE TO PROBLEMS WITH THE INLET ISOLATION
GUILLLOTINE DAMPER.

DURING FEBRUARY MODULE E WAS DOWN TO CLEAN THE TOWER PACKING.

83	A	100.0	95.4	100.0	90.3				
	B	100.0	83.7	100.0	79.2				
	C	100.0	93.9	100.0	88.8				
	D	100.0	46.6	100.0	44.1				
	E	51.6	28.8	100.0	27.2				
	SYSTEM	100.0	87.1	100.0	82.4	744	704	613	62.4

** PROBLEMS/SOLUTIONS/COMMENTS

DURING MARCH MODULE E WAS DOWN FOR MAINTENANCE IN THE QUENCHER SECTION AND
TO CLEAN THE WETTED CONTACT PACKING.

83	A	99.9	98.9	100.0	98.6				
	B	99.9	74.1	100.0	73.9				
	C	46.7	45.1	100.0	45.0				
	D	99.9	31.5	100.0	31.5				
	E	99.9	96.4	100.0	96.1				
	SYSTEM	100.0	86.5	100.0	86.3	720	718	621	64.0

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE C WAS DOWN DURING APRIL FOR A CLEANING OF THE ABSORBER PACKING
AND GENERAL TOWER MAINTENANCE.

83	A	100.0	95.4	100.0	56.5				
	B	100.0	92.1	100.0	54.6				
	C	0.0	0.0		0.0				
	D	100.0	92.3	100.0	54.7				
	E	100.0	75.4	100.0	44.7				
	SYSTEM	100.0	88.8	100.0	52.6	744	441	392	64.7

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE C WAS DOWN DURING MAY FOR MAINTENANCE IN THE QUENCHER SECTION.

'83	A	100.0	100.0	100.0	100.0				
	B	100.0	76.5	100.0	76.5				
	C	13.3	8.0	100.0	8.0				
	D	100.0	85.6	100.0	85.6				
	E	100.0	81.3	100.0	81.3				
	SYSTEM	100.0	87.9	100.0	87.9	720	720	633	65.0

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE C WAS DOWN DURING JUNE FOR MAINTENANCE.

'83	A	48.1	44.0	100.0	41.4				
	B	100.0	84.0	100.0	79.1				
	C	100.0	98.1	100.0	92.4				
	D	100.0	83.2	100.0	78.4				
	E	64.5	33.8	100.0	31.8				
	SYSTEM	100.0	85.8	100.0	80.8	744	701	601	57.6

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

BASIN ELECTRIC POWER: LARAMIE RIVER 2 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

MODULES A AND E WERE DOWN DURING PART OF JULY FOR REPAIRS IN THE QUENCHER SECTION.

8/83	A	35.5	31.4	100.0	30.9				
	B	71.0	66.6	100.0	65.7				
	C	100.0	95.0	100.0	93.6				
	D	100.0	99.1	100.0	97.6				
	E	100.0	60.4	100.0	59.5				
	SYSTEM	100.0	88.1	100.0	86.8	744	733	646	62.7

** PROBLEMS/SOLUTIONS/COMMENTS

MODULES A AND D WERE DOWN DURING PART OF AUGUST FOR MAINTENANCE.

9/83	A	100.0	64.0	100.0	3.8				
	B	26.7	0.0		0.0				
	C	100.0	98.8	100.0	5.9				
	D	73.3	100.0	100.0	6.0				
	E	100.0	99.4	100.0	5.9				
	SYSTEM	100.0	90.6	100.0	5.4	720	43	39	59.7

** PROBLEMS/SOLUTIONS/COMMENTS

MODULES B AND D WERE DOWN DURING PART OF SEPTEMBER FOR MAINTENANCE ON THE QUENCHER TOWER MIXERS.

10/83	A	100.0	92.7	100.0	16.3				
	B	100.0	93.9	100.0	16.5				
	C	100.0	100.0	100.0	17.8				
	D	0.0	0.0		0.0				
	E	100.0	80.5	100.0	14.2				
	SYSTEM	100.0	91.8	100.0	16.2	744	131	121	72.2

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE D WAS DOWN DURING PART OF OCTOBER FOR MAINTENANCE ON WELDS IN THE QUENCHER SECTION.

ABSORBER RECYCLE TANK MIXERS WERE REPAIRED AT MODULE D DURING THE MONTH.

11/83	A	100.0			0.0				
	B	100.0			0.0				
	C	100.0			0.0				
	D	43.3			0.0				
	E	46.7			0.0				
	SYSTEM	97.5			0.0	720	0	0	0.0

12/83	A	100.0	93.3	100.0	28.0				
	B	100.0	98.7	100.0	29.6				
	C	100.0	91.0	100.0	27.3				
	D	100.0	0.0		0.0				
	E	41.9	0.0		0.0				
	SYSTEM	100.0	70.7	100.0	21.2	744	223	158	42.4

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS DOWN THE ENTIRE MONTH OF NOVEMBER AND MOST OF DECEMBER DUE TO LOW POWER DEMAND.

1/84	A	100.0	99.3	100.0	55.2				
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LITY FGD SURVEY: JANUARY - DECEMBER 1988
IN ELECTRIC POWER: LARAMIE RIVER 2 (CONT.)

-----PERFORMANCE DATA-----											
100		MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
		B	100.0	95.5	100.0	53.1					
		C	100.0	97.7	100.0	54.4					
		D	100.0	0.0		0.0					
		E	100.0	0.0		0.0					
		SYSTEM	100.0	73.1	100.0	40.7		744	414	303	42.9
84	A	100.0				0.0					
	B	100.0				0.0					
	C	100.0				0.0					
	D	100.0				0.0					
	E	100.0				0.0					
	SYSTEM	100.0				0.0		696	0	0	0.0
84	A	100.0				0.0					
	B	100.0				0.0					
	C	100.0				0.0					
	D	100.0				0.0					
	E	100.0				0.0					
	SYSTEM	100.0				0.0		744	0	0	0.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE FIRST QUARTER OF 1984.

'84	A	0.0			0.0					
	B	0.0			0.0					
	C	0.0			0.0					
	D	0.0			0.0					
	E	0.0			0.0					
	SYSTEM	0.0			0.0		720	0	0	0.0

** PROBLEMS/SOLUTIONS/COMMENTS

A UNIT OUTAGE OCCURRED DURING THE MONTH OF APRIL.

'84	A	6.5			0.0					
	B	9.7			0.0					
	C	0.0			0.0					
	D	3.2			0.0					
	E	9.7			0.0					
	SYSTEM	7.3			0.0		744	0	0	0.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE UNIT WAS DOWN FOR MAINTENANCE ON ALL ABSORBER FEED TANKS.

'84	A	100.0	84.6	100.0	72.6					
	B	100.0	91.6	100.0	78.7					
	C	33.3	35.2	100.0	30.2					
	D	93.3	63.2	100.0	54.2					
	E	100.0	95.4	100.0	81.9					
	SYSTEM	100.0	92.5	100.0	79.4		720	618	572	77.0

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE C WAS DOWN FOR MECHANICAL REPAIRS DURING JUNE.

'84	A	100.0	44.2	100.0	44.2					
	B	100.0	85.7	100.0	85.7					
	C	67.7	64.4	100.0	64.4					
	D	90.3	72.8	100.0	72.8					

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

BASIN ELECTRIC POWER: LARAMIE RIVER 2 (CONT.)

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

E	100.0	94.2	100.0	94.2				
SYSTEM	100.0	90.3	100.0	90.3	744	744	672	75.4

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS AROSE DURING JULY.

8/84	A	100.0	76.8	100.0	76.5			
	B	100.0	89.3	100.0	89.0			
	C	29.0	8.4	100.0	8.3			
	D	100.0	92.0	100.0	91.6			
	E	100.0	98.7	100.0	98.3			
	SYSTEM	100.0	91.3	100.0	90.9	744	741	677 70.8

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE C WAS DOWN DURING PART OF AUGUST FOR ABSORBER MIXER REPAIRS.

WELDING WAS DONE IN THE QUENCHER SECTION DURING AUGUST.

9/84	A	100.0	93.8	100.0	78.5			
	B	100.0	56.4	100.0	47.2			
	C	100.0	59.9	100.0	50.2			
	D	100.0	99.5	100.0	83.4			
	E	40.0	40.0	100.0	33.5			
	SYSTEM	100.0	87.4	100.0	73.2	720	603	527 67.6

10/84	A	100.0	96.5	100.0	74.3			
	B	100.0	81.2	100.0	62.6			
	C	100.0	97.4	100.0	75.0			
	D	100.0	97.9	100.0	75.4			
	E	9.7	10.6	100.0	8.1			
	SYSTEM	100.0	95.9	100.0	73.9	744	573	540 81.0

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE E WAS DOWN PART OF SEPTEMBER AND OCTOBER FOR QUENCHER TOWER MIXER REPAIRS.

11/84	A	100.0	83.9	100.0	83.3			
	B	100.0	67.5	100.0	67.0			
	C	100.0	92.3	100.0	91.7			
	D	30.0	22.4	100.0	22.2			
	E	100.0	81.8	100.0	81.3			
	SYSTEM	100.0	87.0	100.0	86.4	720	715	622 69.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT MODULE D WAS DOWN MOST OF NOVEMBER FOR TOWER MIXER MAINTAINENCE.

12/84	A	100.0	0.0		0.0			
	B	100.0	0.0		0.0			
	C	100.0	0.0		0.0			
	D	0.0	0.0		0.0			
	E	100.0	0.0		0.0			
	SYSTEM	100.0	0.0		0.0	744	6	0 11.1

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS OFF LINE MOST OF DECEMBER FOR REPAIRS. MODULE D REMAINED DOWN FOR QUENCHER TOWER REPAIRS.

1/85	A	90.3	33.2	100.0	30.6			
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LITY FGD SURVEY: JANUARY - DECEMBER 1988
IN ELECTRIC POWER: LARAMIE RIVER 2 (CONT.)

-----PERFORMANCE DATA-----										
100	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
B		100.0	65.1	100.0	60.0					
C		100.0	95.7	100.0	88.3					
D		16.1	17.5	100.0	16.1					
E		100.0	74.2	100.0	68.4					
SYSTEM		100.0	71.4	100.0	65.9		744	686	490	55.0

** PROBLEMS/SOLUTIONS/COMMENTS

NO FGD SYSTEM PROBLEMS WERE REPORTED BY THE UTILITY DURING JANUARY.

85	A	0.0	0.0		0.0					
	B	100.0	65.4	100.0	60.4					
	C	100.0	90.0	100.0	83.0					
	D	100.0	99.8	100.0	92.0					
	E	100.0	81.3	100.0	75.0					
	SYSTEM	100.0	84.1	100.0	77.6		672	620	522	64.7

** PROBLEMS/SOLUTIONS/COMMENTS

THE A-MODULE WAS OUT OF SERVICE FOR TANK AGITATOR REPAIRS AND REPAIR OF QUENCHER SECTION HEADERS.

85	SYSTEM						744			
85	SYSTEM						720			

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE UNIT WAS DOWN MOST OF THE MONTH OF APRIL DUE TO A SCHEDULED BOILER/TURBINE MAINTENANCE OUTAGE.

'85	SYSTEM						744			
'85	SYSTEM						720			
'85	SYSTEM						744			
'85	SYSTEM						744			
'85	SYSTEM						720			
'85	SYSTEM						744			
'85	SYSTEM						720			
'85	SYSTEM						744			

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE REMAINDER OF THE YEAR. ONLY ROUTINE QUENCHER MAINTENANCE SUCH AS SCALE REMOVAL AND PATCH WORK TO THE ALLOY 904L WERE NECESSARY.

/86	SYSTEM						774			
/86	SYSTEM						672			
/86	SYSTEM						774			

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THERE WAS A SCHEDULED 4 WEEK BOILER/TURBINE MAINTENANCE OUTAGE DURING THE SPRING OF 1986. DURING THIS OUTAGE PERIOD, CLEANING AND REPLACEMENT OF QUENCHER INTERNALS WERE MADE. MATERIALS

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

BASIN ELECTRIC POWER: LARAMIE RIVER 2 (CONT.)

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

REPLACED INCLUDED PIPING, NOZZLES, AND SPRAY HEADERS.

4/86	SYSTEM								720
5/86	SYSTEM								774
6/86	SYSTEM								720
7/86	SYSTEM								774
8/86	SYSTEM								774
9/86	SYSTEM								720
10/86	SYSTEM								774
11/86	SYSTEM								720
12/86	SYSTEM								774

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR UNIT OR FGD-RELATED OUTAGES WERE REPORTED DURING THE REMAINDER OF 1986.

1/87	SYSTEM								744
2/87	SYSTEM								672
3/87	SYSTEM								744
4/87	SYSTEM								720
5/87	SYSTEM								744
6/87	SYSTEM								720
7/87	SYSTEM								744
8/87	SYSTEM								744
9/87	SYSTEM								720
10/87	SYSTEM								744
11/87	SYSTEM								720
12/87	SYSTEM								744

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED OUTAGES WERE ENCOUNTERED DURING THE YEAR 1987.

1/88	SYSTEM								774
2/88	SYSTEM								672
3/88	SYSTEM								774
4/88	SYSTEM								720
5/88	SYSTEM								774
6/88	SYSTEM								720

LITY FGD SURVEY: JANUARY - DECEMBER 1988
 IN ELECTRIC POWER: LARAMIE RIVER 2 (CONT.)

-----PERFORMANCE DATA-----									
100	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL	PER	BOILER	FGD
						SO2	PART.	HOURS	HOURS
									CAP.
									FACTOR
88	SYSTEM							774	
88	SYSTEM							774	
88	SYSTEM							720	
88	SYSTEM							774	
88	SYSTEM							720	
88	SYSTEM							774	

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED OUTAGES WERE ENCOUNTERED
 IN 1988.

SECTION 13
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	BASIN ELECTRIC POWER	
PLANT NAME	LARAMIE RIVER	
PLANT NUMBER	3	
CITY	WHEATLAND	
STATE	WYOMING	
REGULATORY CLASSIFICATION	A	
PERMIT EMISSION LIMITATION - NG/J	43.	(0.100 LB/MMBTU)
PERMIT EMISSION LIMITATION - NG/J	86.	(0.200 LB/MMBTU)
PERMIT EMISSION LIMITATION - NG/J	*****	(***** LB/MMBTU)
PLANT GENERATING CAPACITY - MW	1500	
PERMIT UNIT GENERATING CAPACITY - MW	600	
PERMIT UNIT GENERATING CAPACITY W/FGD - MW	550	
PERMIT UNIT GENERATING CAPACITY WO/FGD - MW	571	
PERMIT EQUIVALENT SCRUBBED CAPACITY - MW	600	
* UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	BABCOCK & WILCOX	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	1321.32	(2800000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	69.4	(157 F)
STACK HEIGHT - M	183.	(600 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	8.7	(28.6 FT)
* FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	SUBBITUMINOUS	
AVERAGE HEAT CONTENT - J/G	19538.	(8400 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		7906-8244
AVERAGE ASH CONTENT - %	7.89	
RANGE ASH CONTENT - %	4.0-13.0	
AVERAGE MOISTURE CONTENT - %	28.92	
RANGE MOISTURE CONTENT - %	22.2-34.7	
AVERAGE SULFUR CONTENT - %	0.54	
RANGE SULFUR CONTENT - %	0.2-0.5	
AVERAGE CHLORIDE CONTENT - %	0.04	
RANGE CHLORIDE CONTENT - %	0.00-0.04	
* PARTICLE CONTROL		
* FABRIC FILTER		
NUMBER	0	
TYPE	NONE	
* ESP		
NUMBER	1	
TYPE	COLD SIDE	
SUPPLIER	BABCOCK & WILCOX	
INLET FLUE GAS CAPACITY - CU.M/S	1085.4	(2300000 ACFM)
INLET FLUE GAS TEMPERATURE - C	69.4	(157 F)
PRESSURE DROP - KPA	0.2	(1. IN-H2O)
PARTICLE REMOVAL EFFICIENCY - %	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		

BASIN ELECTRIC POWER: LARAMIE RIVER 3 (CONT.)

** GENERAL DATA		
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT	
SO2 REMOVAL MODE	SPRAY DRYING	
PROCESS TYPE	LIME/SPRAY DRYING	
SYSTEM SUPPLIER	BABCOCK & WILCOX	
A-E FIRM	BURNS & MCDONNELL	
DEVELOPMENT LEVEL	FULL SCALE	
NEW/RETROFIT	NEW	
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.60	
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	82.50	
ENERGY CONSUMPTION - %	3.5	
CURRENT STATUS	1	
COMMERCIAL START-UP	11/1982	
INITIAL START-UP	11/1982	
CONTRACT AWARDED	10/1978	
** DESIGN AND OPERATING PARAMETERS		
DESIGN COAL SULFUR CONTENT - %	0.81	
DESIGN CHLORIDE CONTENT - %	*****	
** QUENCHER/PRESATURATOR		
CONSTRUCTION MATERIAL GENERIC TYPE	NR	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR	
** ABSORBER		
NUMBER	4	
NUMBER OF SPARES	1	
GENERIC TYPE	SPRAY DRYER	
SPECIFIC TYPE	NR	
TRADE NAME/COMMON TYPE	HYDRAULIC PRESSURE NOZZLE	
SUPPLIER	BABCOCK & WILCOX	
DIMENSIONS - FT	54'8"W X 46'10"H	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	AISI 1110	
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A	
LINER GENERIC MATERIAL	NONE	
LINER SPECIFIC MATERIAL	N/A	
LINER MATERIAL TRADE NAME/COMMON TYPE	N/A	
GAS CONTACTING DEVICE TYPE	NONE	
NUMBER OF CONTACTING ZONES	2	
LIQUID RECIRCULATION RATE - LITER/S	0.	(0 GPM)
L/G RATIO - L/CU.M	0.0	(0.3 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	1.6	(6.5 IN-H2O)
SUPERFICIAL GAS VELOCITY - M/SEC	1.5	(5.0 FT/S)
INLET GAS FLOW - CU. M/S	377.52	(800000 ACFM)
INLET GAS TEMPERATURE - C	137.2	(279 F)
SO2 REMOVAL EFFICIENCY - %	85.0	
PARTICLE REMOVAL EFFICIENCY - %	99.6	
** 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	
** FANS		
DESIGN	NR	
FUNCTION	NA	
APPLICATION	NR	
SERVICE	DRY	
CONSTRUCTION MATERIAL GENERIC TYPE	NA	
** DAMPERS		
NUMBER	4	
FUNCTION	SHUT-OFF	
GENERIC TYPE	LOUVER	
SPECIFIC TYPE	PARALLEL BLADE MULTILOUVER	
CONSTRUCTION MATERIAL GENERIC TYPE	NR	

LITY FGD SURVEY: JANUARY - DECEMBER 1988

IN ELECTRIC POWER: LARAMIE RIVER 3 (CONT.)

CONSTRUCTION MATERIAL SPECIFIC TYPE	NR
LINER GENERIC MATERIAL TYPE	NR
LINER SPECIFIC MATERIAL TYPE	NR
DAMPERS	
NUMBER	4
FUNCTION	CONTROL
GENERIC TYPE	LOUVER
SPECIFIC TYPE	PARALLEL BLADE MULTILOUVER
DUCTWORK	
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
SHELL SPECIFIC MATERIAL TYPE	AISI 1110
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	5.4 (6 TPH)
PRODUCT QUALITY - % SOLIDS	30.0
REAGENT PREPARATION EQUIPMENT	
FUNCTION	SLAKER
DEVICE	NR
DEVICE TYPE	NR
NUMBER	2
FULL LOAD DRY FEED CAPACITY - M.TONS/HR	5.4 (6 TPH)
TANKS	
SERVICE	NUMBER
-----	-----
ABSORBER RECYCLE	****
NR	****
REAGENT PREP PRODUCT	****
PUMPS	
SERVICE	NUMBER
-----	-----
NR	****
SOLIDS CONCENTRATING/DEWATERING	
DEVICE	NONE
SALEABLE BYPRODUCTS	
NATURE	NONE
DISPOSITION	N/A
SLUDGE	
TREATMENT	
METHOD	UNSTABILIZED
DEVICE	N/A
PROPRIETARY PROCESS	N/A
DISPOSAL	
NATURE	FINAL
TYPE	LANDFILL
LOCATION	ON-SITE
SITE TREATMENT	NONE
PROCESS CONTROL AND INSTRUMENTATION	
CHEMICAL PARAMETERS	SO2, ACFM, SOLIDS
PROCESS CONTROL MANNER	AUTOMATIC

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

BASIN ELECTRIC POWER: LARAMIE RIVER 3 (CONT.)

** WATER BALANCE		
WATER LOOP TYPE	OPEN	
EVAPORATION WATER LOSS - LITER/S	22.9	(363 GPM)
MAKEUP WATER ADDITION - LITERS/S	4.6	(73 GPM)

** CHEMICALS AND CONSUMPTION	
FUNCTION	ABSORBENT
NAME	LIME
CONSUMPTION	3 TPH

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

11/82	SYSTEM						720			
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** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT INITIAL START-UP OCCURRED DURING NOVEMBER 1982.

12/82	SYSTEM						744			
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1/83	SYSTEM						744			
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2/83	SYSTEM						672			
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3/83	SYSTEM						744			
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4/83	SYSTEM						720			
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5/83	SYSTEM						744			
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6/83	SYSTEM						720			
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** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE FGD SYSTEM IS CURRENTLY BEING TESTED AND IS STILL IN THE SHAKEDOWN/DEBUGGING PHASE OF OPERATION.

7/83	SYSTEM						744			
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8/83	SYSTEM						744			
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9/83	SYSTEM						720			
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** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY CONTINUED PERFORMANCE TESTING ON THE FGD SYSTEM DURING THE THIRD QUARTER OF 1983.

10/83	SYSTEM						744			
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11/83	SYSTEM						720			
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12/83	SYSTEM						744			
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** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT LARAMIE RIVER 3 DID NOT OPERATE DURING THE FOURTH QUARTER DUE TO MAJOR DESIGN MODIFICATIONS OF THE SPRAY DRYER AND SLURRY PREPARATION SECTIONS.

1/84	SYSTEM						744			
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2/84	SYSTEM						696			
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3/84	SYSTEM						744			
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UTILITY FGD SURVEY: JANUARY - DECEMBER 1988
 SIN ELECTRIC POWER: LARAMIE RIVER 3 (CONT.)

-----PERFORMANCE DATA-----										
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
'84	SYSTEM								720	
'84	SYSTEM								744	
'84	SYSTEM								720	
'84	SYSTEM								744	
** PROBLEMS/SOLUTIONS/COMMENTS										
THE UTILITY REPORTED THAT THE FGD SYSTEM WAS DOWN DURING THE PERIOD OF JANUARY THROUGH JULY, 1984 DUE TO A CONTINUATION OF MAJOR DESIGN MODIFICATIONS IN THE SPRAY DRYER AND THE SLURRY PREPARATION SYSTEM.										
'84	SYSTEM								744	
'84	SYSTEM								720	
** PROBLEMS/SOLUTIONS/COMMENTS										
INFORMATION WAS UNAVAILABLE FOR AUGUST AND SEPTEMBER 1984.										
'84	SYSTEM								744	
'84	SYSTEM								720	
'84	SYSTEM								744	
** PROBLEMS/SOLUTIONS/COMMENTS										
INFORMATION WAS UNAVAILABLE FOR THE FOURTH QUARTER 1984.										
'85	SYSTEM								744	
'85	SYSTEM								672	
'85	SYSTEM								744	
'85	SYSTEM								720	
'85	SYSTEM								744	
'85	SYSTEM								720	
'85	SYSTEM								744	
'85	SYSTEM								744	
'85	SYSTEM								720	
'85	SYSTEM								744	
'85	SYSTEM								720	
'85	SYSTEM								744	
** PROBLEMS/SOLUTIONS/COMMENTS										
DURING THE YEAR 1985, THE UTILITY STATED THAT WORK WAS DONE TO UPGRADE THE SO2 REMOVAL EFFICIENCY OF THE SPRAY DRYER. THIS WAS ACCOMPLISHED BY CHANGING THE ATOMIZER SPRAY NOZZLES FROM Y-SHAPED NOZZLES TO I-SHAPED ONES. WORK WAS ALSO DONE TO IMPROVE ASH REMOVAL FROM ESP HOPPERS.										
'86	SYSTEM								774	

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

BASIN ELECTRIC POWER: LARAMIE RIVER 3 (CONT.)

-----PERFORMANCE DATA-----										
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
2/86	SYSTEM						672			
3/86	SYSTEM						774			
4/86	SYSTEM						720			
5/86	SYSTEM						774			
6/86	SYSTEM						720			
7/86	SYSTEM						774			
8/86	SYSTEM						774			
9/86	SYSTEM						720			
10/86	SYSTEM						774			
11/86	SYSTEM						720			
12/86	SYSTEM						774			

** PROBLEMS/SOLUTIONS/COMMENTS

WORK CONTINUED THROUGHOUT 1986 ON UPGRADING THE ASH REMOVAL/SLURRY PREPARATION PROCESS. THE UTILITY PLANS TO REPLACE THE CYCLONE ASH SEPARATORS IN THE SPRING OF 1987 WITH BAGHOUSES. THE ASH TAKEN DIRECTLY FROM THE ESP HOPPERS WILL NOW BE COLLECTED BY BAGHOUSES PRIOR TO REAGENT PREPARATION. NO MAJOR UNIT OR FGD-RELATED OUTAGES WERE REPORTED FOR 1986.

1/87	SYSTEM						744			
2/87	SYSTEM						672			
3/87	SYSTEM						744			
4/87	SYSTEM						720			
5/87	SYSTEM						744			

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT HAD A SCHEDULED 4 WEEK OUTAGE DURING THE MONTH OF MAY. DURING THIS OUTAGE PERIOD, THE UTILITY CHANGED THE ASH REMOVAL/SLURRY PREPARATION PROCESS. THE ORIGINAL CYCLONE ASH SEPERATORS FOR THE SLURRY PREPARATION SYSTEM WERE REPLACED WITH FABRIC FILTERS. FLY ASH IS NOW TAKEN DIRECTLY FROM THE ESP HOPPERS AND RECOLLECTED BY FABRIC FILTERS FOR USE IN REAGENT PREPARATION. THE ASH CARRYOVER FROM THE CYCLONES DIRECTLY INTO THE SPRAY DRYERS WAS TOO HIGH.

6/87	SYSTEM						720			
7/87	SYSTEM						744			
8/87	SYSTEM						744			
9/87	SYSTEM						720			
10/87	SYSTEM						744			
11/87	SYSTEM						720			
12/87	SYSTEM						744			

IN ELECTRIC POWER: LARAMIE RIVER 3 (CONT.)

** PROBLEMS/SOLUTIONS/COMMENTS

88	SYSTEM	774
88	SYSTEM	672
88	SYSTEM	774
88	SYSTEM	720
88	SYSTEM	774
88	SYSTEM	720
88	SYSTEM	774
88	SYSTEM	774
88	SYSTEM	720
88	SYSTEM	774
88	SYSTEM	720
88	SYSTEM	774

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED OUTAGES WERE ENCOUNTERED IN 1988.

SECTION 13
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	BIG RIVERS ELECTRIC
PLANT NAME	D.B. WILSON
UNIT NUMBER	1
CITY	CENTERTOWN
STATE	KENTUCKY
POLLUTANT CLASSIFICATION	A
PERMIT EMISSION LIMITATION - NG/J	***** (***** LB/MMBTU)
PERMIT EMISSION LIMITATION - NG/J	***** (***** LB/MMBTU)
PERMIT EMISSION LIMITATION - NG/J	***** (***** LB/MMBTU)
PLANT GENERATING CAPACITY - MW	880
PERMIT UNIT GENERATING CAPACITY - MW	440
PERMIT UNIT GENERATING CAPACITY W/FGD - MW	420
PERMIT UNIT GENERATING CAPACITY WO/FGD - MW	430
PERMIT UNIT SCRUBBED CAPACITY - MW	440
* UNIT DATA - BOILER AND STACK	
BOILER SUPPLIER	FOSTER WHEELER
BOILER TYPE	PULVERIZED COAL
BOILER SERVICE LOAD	BASE
DESIGN BOILER FLUE GAS FLOW - CU.M/S	***** (***** ACFM)
BOILER FLUE GAS TEMPERATURE - C	***** (**** F)
STACK HEIGHT - M	***** (**** FT)
STACK SHELL	CONCRETE
STACK TOP DIAMETER - M	***** (***** FT)
* FUEL DATA	
FUEL TYPE	COAL
FUEL GRADE	BITUMINOUS
AVERAGE HEAT CONTENT - J/G	***** (***** BTU/LB)
RANGE HEAT CONTENT - BTU/LB	9600-11600
AVERAGE ASH CONTENT - %	*****
RANGE ASH CONTENT - %	15.0-25.0
AVERAGE MOISTURE CONTENT - %	*****
RANGE MOISTURE CONTENT - %	8.0-14.0
AVERAGE SULFUR CONTENT - %	3.75
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 CAPACITY - CU.M/S	412.9 (875000 ACFM)
INLET FLUE GAS TEMPERATURE - C	162.8 (325 F)
* 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
SYSTEM SUPPLIER	M.W. KELLOGG
A-E FIRM	BURNS & ROE
DEVELOPMENT LEVEL	FULL SCALE
NEW/RETROFIT	NEW

BIG RIVERS ELECTRIC: D.B. WILSON 1 (CONT.)

ENERGY CONSUMPTION - %	2.3
CURRENT STATUS	1
COMMERCIAL START-UP	9/1984
INITIAL START-UP	9/1984
CONTRACT AWARDED	8/1980
** DESIGN AND OPERATING PARAMETERS	
DESIGN COAL SULFUR CONTENT - %	3.80
DESIGN CHLORIDE CONTENT - %	*****
** QUENCHER/PRESATURATOR	
CONSTRUCTION MATERIAL GENERIC TYPE	NR
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR
** ABSORBER	
NUMBER	4
NUMBER OF SPARES	1
GENERIC TYPE	SPRAY TOWER
SPECIFIC TYPE	OPEN CROSSCURRENT SPRAY
TRADE NAME/COMMON TYPE	HORIZONTAL SPRAY CHAMBER
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
** 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
** FANS	
DESIGN	NR
FUNCTION	NA
APPLICATION	NR
SERVICE	NA
CONSTRUCTION MATERIAL GENERIC TYPE	NA
** 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	NA
DEVICE TYPE	NA
** TANKS	
SERVICE	NUMBER
----	-----
NR	****

LITY FGD SURVEY: JANUARY - DECEMBER 1988

RIVERS ELECTRIC: D.B. WILSON 1 (CONT.)

PUMPS SERVICE ----- NR	NUMBER ----- ****
SOLIDS CONCENTRATING/DEWATERING DEVICE	NA
SALEABLE BYPRODUCTS NATURE DISPOSITION	NONE N/A
SLUDGE	
TREATMENT METHOD DEVICE PROPRIETARY PROCESS	FORCED OXIDATION/FIXATION NA CONVERSION SYSTEMS 'POZ-O-TEC'
DISPOSAL NATURE TYPE SITE TREATMENT	FINAL LANDFILL NA
WATER BALANCE WATER LOOP TYPE	CLOSED

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

84 SYSTEM 720

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT INITIAL START-UP OF THE FGD SYSTEM COMMENCED IN
 SEPTEMBER 1984.

'84 SYSTEM 744

'84 SYSTEM 720

'84 SYSTEM 744

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT COMMERCIAL STATUS HAS BEEN DELAYED TO DATE DUE
 TO PROBLEMS ASSOCIATED WITH THE HORIZONTAL SPRAY ABSORBERS.

'85 SYSTEM 744

'85 SYSTEM 672

'85 SYSTEM 744

'85 SYSTEM 720

'85 SYSTEM 744

'85 SYSTEM 720

'85 SYSTEM 744

'85 SYSTEM 744

BIG RIVERS ELECTRIC: D.B. WILSON 1 (CONT.)

-----PERFORMANCE DATA-----										
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PER PART.	BOILER HOURS	FGD HOURS	CAP. FACTOR
9/85	SYSTEM								720	
10/85	SYSTEM								744	
11/85	SYSTEM								720	
12/85	SYSTEM								744	
** PROBLEMS/SOLUTIONS/COMMENTS										
THE UTILITY REPORTED THAT THE FGD SYSTEM HAS NOT REACHED COMMERCIAL STATUS. THIS HAS BEEN DUE TO THE SYSTEMS POOR SO2 REMOVAL EFFICIENCY WHICH HAS REQUIRED THE UTILITY TO USE THEIR SPARE MODULE (DESIGN) CAPACITY AT ALL TIMES OR REDUCE BOILER LOAD. AN ADDITIONAL ABSORBER MODULE WILL NOW BE INSTALLED BY THE SYSTEM SUPPLIER. INSTALLATION OF THE FOURTH MODULE BEGAN IN THE EARLY FALL OF 1985 AND WILL TAKE ABOUT A YEAR TO COMPLETE.										
1/86	SYSTEM								774	
** PROBLEMS/SOLUTIONS/COMMENTS										
NO MAJOR UNIT OR FGD-RELATED OUTAGES WERE ENCOUNTERED DURING THE FIRST MONTH OF 1986.										
2/86	SYSTEM								672	
3/86	SYSTEM								774	
4/86	SYSTEM								720	
5/86	SYSTEM								774	
** PROBLEMS/SOLUTIONS/COMMENTS										
THE UTILITY REPORTED THAT LIMESTONE IS THE CURRENT REAGENT IN USE, NOT LIME AS PREVIOUSLY REPORTED. LIMESTONE WAS USED FROM START UP IN SEPTEMBER 1984 UNTIL APPROXIMATELY MAY 1985. AT THAT TIME, THE UTILITY SWITCHED TO LIME DUE TO SCALING AND SO2 REMOVAL PROBLEMS. THE UTILITY USED LIME UNTIL FEBRUARY OF 1986 WHEN IT DECIDED TO SWITCH BACK TO LIMESTONE. THE SUPPLIER WILL INSTALL A FOURTH ABSORBER MODULE AND THE UTILITY WILL TEST BOTH DIBASIC ACID AND MGD PROMOTED LIMESTONE TO AID SO2 REMOVAL AND DECREASE SCALE BUILDUP. THE REAGENT CHANGE OVER WAS MADE DURING A MAJOR TURBINE OUTAGE WHICH BEGAN IN FEBRUARY AND LASTED UNTIL MAY.										
6/86	SYSTEM								720	
7/86	SYSTEM								774	
8/86	SYSTEM								774	
9/86	SYSTEM								720	
10/86	SYSTEM								774	
** PROBLEMS/SOLUTIONS/COMMENTS										
INSTALLATION OF THE FOURTH ABSORBER MODULE WAS COMPLETED IN OCTOBER OF 1986. THE UTILITY ALSO REPORTED A 2 WEEK OUTAGE PERIOD IN ORDER TO CLEAN THE MIST ELIMINATORS IN THE EXISTING MODULES. THE UTILITY HAS TO CLEAN THE MIST ELIMINATORS APPROXIMATELY EVERY 6 TO 8 WEEKS TO REMOVE THE SCALE BUILDUP.										

LITY FGD SURVEY: JANUARY - DECEMBER 1988

RIVERS ELECTRIC: D.B. WILSON 1 (CONT.)

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

86 SYSTEM 720

86 SYSTEM 774

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR UNIT OR FGD-RELATED OUTAGES WERE ENCOUNTERED DURING THE MONTHS OF NOVEMBER AND DECEMBER.

87 SYSTEM 744

87 SYSTEM 672

87 SYSTEM 744

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED OUTAGES WERE ENCOUNTERED DURING THE FIRST QUARTER OF 1987. THE UNIT WAS OFF-LINE FOR A SCHEDULED SPRING OUTAGE DURING THE PERIOD FEBRUARY 14 THROUGH MARCH 7.

87 SYSTEM 720

87 SYSTEM 744

87 SYSTEM 720

87 SYSTEM 744

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED OUTAGES WERE ENCOUNTERED DURING THE MONTHS OF APRIL THROUGH JULY 1987. DIBASIC ACID TESTING COMMENCED IN MAY AND WILL LAST UNTIL SPRING OF 1988. DURING THIS SAME PERIOD THE UTILITY WILL BE TESTING DOLOMITE LIME. AS OF APRIL 1987, THE UTILITY ALSO REPORTED THAT THE SYSTEM NOW OPERATES WITHOUT REHEAT EXCEPT ON OCCASIONS OF VERY COLD WEATHER OR FOR COMPLIANCE TESTING.

87 SYSTEM 744

87 SYSTEM 720

87 SYSTEM 744

87 SYSTEM 720

87 SYSTEM 744

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED OUTAGES WERE ENCOUNTERED DURING THE MONTHS OF AUGUST THROUGH DECEMBER 1987. THE UNIT WAS OFF-LINE FOR A SCHEDULED FALL OUTAGE DURING THE PERIOD AUGUST 29 THROUGH SEPTEMBER 11, 1987.

88 SYSTEM 774

88 SYSTEM 672

88 SYSTEM 774

88 SYSTEM 720

88 SYSTEM 774

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

BIG RIVERS ELECTRIC: D.B. WILSON 1 (CONT.)

-----PERFORMANCE DATA-----									
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART. HOURS	PER BOILER HOURS	FGD CAP. HOURS FACTOR
6/88	SYSTEM							720	
7/88	SYSTEM							774	
8/88	SYSTEM							774	
9/88	SYSTEM							720	
10/88	SYSTEM							774	
11/88	SYSTEM							720	
12/88	SYSTEM							774	

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED OUTAGES WERE ENCOUNTERED DURING 1988. A SCHEDULED MAINTENANCE OUTAGE OCCURRED IN THE FALL FROM OCTOBER 22 THROUGH NOVEMBER 5.

THE UTILITY REPORTED THAT REAGENT TESTING WAS CONCLUDED IN 1988. THE UTILITY DECIDED TO UTILIZE DIBASIC ACID ADDITION ALONG WITH LIMESTONE AS THE REAGENT FOR FULL-TIME OPERATION. CONSTRUCTION OF THE DIBASIC ADDITION EQUIPMENT IS SCHEDULED TO COMMENCE DURING THE SUMMER OF 1989.

SECTION 13
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	BIG RIVERS ELECTRIC	
PLANT NAME	GREEN	
UNIT NUMBER	1	
CITY	SEBREE	
STATE	KENTUCKY	
REGULATORY CLASSIFICATION	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	301.	(0.700 LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	444	
GROSS UNIT GENERATING CAPACITY - MW	250	
NET UNIT GENERATING CAPACITY W/FGD - MW	231	
NET UNIT GENERATING CAPACITY WO/FGD - MW	236	
EQUIVALENT SCRUBBED CAPACITY - MW	250	
*** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	BABCOCK & WILCOX	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	471.90	(1000000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	148.9	(300 F)
STACK HEIGHT - M	107.	(350 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	4.6	(15.0 FT)
*** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	BITUMINOUS	
AVERAGE HEAT CONTENT - J/G	22795.	(9800 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		8200-11800
AVERAGE ASH CONTENT - %	15.38	
RANGE ASH CONTENT - %	9.6-27.5	
AVERAGE MOISTURE CONTENT - %	11.40	
RANGE MOISTURE CONTENT - %	5.3-20.1	
AVERAGE SULFUR CONTENT - %	3.91	
RANGE SULFUR CONTENT - %	2.0-6.0	
AVERAGE CHLORIDE CONTENT - %	0.05	
RANGE CHLORIDE CONTENT - %	UNKNOWN	
*** PARTICLE CONTROL		
** MECHANICAL COLLECTOR		
NUMBER	0	
TYPE	NONE	
** ESP		
NUMBER	2	
NUMBER OF SPARES	0	
TYPE	COLD SIDE	
SUPPLIER	AMERICAN AIR FILTER	
INLET FLUE GAS CAPACITY - CU.M/S	235.9	(500000 ACFM)
INLET FLUE GAS TEMPERATURE - C	148.9	(300 F)
PRESSURE DROP - KPA	0.3	(1. IN-H2O)
PARTICLE REMOVAL EFFICIENCY - %	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		

...ITY FGD SURVEY: JANUARY - DECEMBER 1988

RIVERS ELECTRIC: GREEN 1 (CONT.)

GENERAL DATA

SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT
SO2 REMOVAL MODE	WET SCRUBBING
PROCESS TYPE	LIME
PROCESS ADDITIVES	MAGNESIUM OXIDE
SYSTEM SUPPLIER	AMERICAN AIR FILTER
A-E FIRM	BURNS & ROE
DEVELOPMENT LEVEL	FULL SCALE
NEW/RETROFIT	NEW
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.00
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	90.00
ENERGY CONSUMPTION - %	2.0
CURRENT STATUS	1
COMMERCIAL START-UP	12/1979
INITIAL START-UP	12/1979
CONTRACT AWARDED	10/1976

DESIGN AND OPERATING PARAMETERS

DESIGN COAL SULFUR CONTENT - %	4.00	
DESIGN COAL HEAT CONTENT - J/G	23260.0	(10000 BTU/LB)
DESIGN COAL ASH CONTENT - %	20.00	
DESIGN MOISTURE CONTENT - %	11.25	
DESIGN CHLORIDE CONTENT - %	0.05	
SPACE REQUIREMENTS - SQ M	10869.3	(117000 SQ FT)
OPER. & MAINT. REQUIREMENT - MANHR/DAY	272.0	

QUENCHER/PRESATURATOR

NUMBER	0
CONSTRUCTION MATERIAL GENERIC TYPE	NR
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR

ABSORBER

NUMBER	2	
NUMBER OF SPARES	0	
GENERIC TYPE	SPRAY TOWER	
SPECIFIC TYPE	OPEN COUNTERCURRENT SPRAY	
TRADE NAME/COMMON TYPE	N/A	
SUPPLIER	AMERICAN AIR FILTER	
DIMENSIONS - FT	34 X 71.5	
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	MASTIC	
LINER MATERIAL TRADE NAME/COMMON TYPE	PENNGUARD ADHESIVE	
GAS CONTACTING DEVICE TYPE	NONE	
NUMBER OF CONTACTING ZONES	1	
LIQUID RECIRCULATION RATE - LITER/S	1008.	(16000 GPM)
L/G RATIO - L/CU.M	4.3	(32.0 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	0.4	(1.5 IN-H2O)
SUPERFICIAL GAS VELOCITY - M/SEC	2.8	(9.2 FT/S)
INLET GAS FLOW - CU. M/S	235.95	(500000 ACFM)
INLET GAS TEMPERATURE - C	148.9	(300 F)
SO2 REMOVAL EFFICIENCY - %	90.0	

* FANS

NUMBER	2	
NUMBER OF SPARES	0	
DESIGN	CENTRIFUGAL	
SUPPLIER	WESTINGHOUSE	
FUNCTION	UNIT	
APPLICATION	FORCED DRAFT	
SERVICE	DRY	
FLUE GAS FLOW RATE - CU.M/S	274.80	(582330 ACFM)
FLUE GAS TEMPERATURE - C	148.9	(300 F)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	

* FANS

NUMBER	2
NUMBER OF SPARES	0

BIG RIVERS ELECTRIC: GREEN 1 (CONT.)

DESIGN	CENTRIFUGAL
SUPPLIER	WESTINGHOUSE
FUNCTION	UNIT
APPLICATION	INDUCED DRAFT
SERVICE	DRY
FLUE GAS FLOW RATE - CU.M/S	274.80 (582330 ACFM)
FLUE GAS TEMPERATURE - C	148.9 (300 F)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL
** DAMPERS	
NUMBER	2
FUNCTION	SHUT-OFF
GENERIC TYPE	GUILLOTINE
SPECIFIC TYPE	TOP-ENTRY GUILLOTINE/SEAL AIR
MANUFACTURER	AMERICAN AIR FILTER
SERVICE CONDITIONS	350 F/INDEFINITE
** DAMPERS	
NUMBER	1
FUNCTION	SHUT-OFF
GENERIC TYPE	GUILLOTINE
SPECIFIC TYPE	TOP-ENTRY GUILLOTINE/SEAL AIR
MANUFACTURER	AMERICAN AIR FILTER
SERVICE CONDITIONS	350 F/INDEFINITE
** DAMPERS	
NUMBER	1
FUNCTION	SHUT-OFF
GENERIC TYPE	LOUVER
SPECIFIC TYPE	PARALLEL BLADE MULTILOUVER
MANUFACTURER	AMERICAN AIR FILTER
SERVICE CONDITIONS	350 F/INDEFINITE
** DAMPERS	
NUMBER	2
FUNCTION	SHUT-OFF
GENERIC TYPE	GUILLOTINE
SPECIFIC TYPE	BOTTOM ENTRY GUILLOTINE/SEAL AIR
MANUFACTURER	AMERICAN AIR FILTER
MODULATION	OPEN
SERVICE CONDITIONS	350 F/INDEFINITE
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR
** DUCTWORK	
LOCATION	ABSORBER INLET
CONFIGURATION	RECTANGULAR
DIMENSIONS	11 X 11 X 43.5 LENGTH
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
SHELL SPECIFIC MATERIAL TYPE	AISI 1110
LINER GENERIC MATERIAL TYPE	ORGANIC
LINER SPECIFIC MATERIAL TYPE	MASTIC
** DUCTWORK	
LOCATION	ABSORBER OUTLET
CONFIGURATION	RECTANGULAR
DIMENSIONS	10 X 10 X 16 LENGTH
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
SHELL SPECIFIC MATERIAL TYPE	AISI 1110
LINER GENERIC MATERIAL TYPE	INORGANIC
LINER SPECIFIC MATERIAL TYPE	HYDRAULICALLY-BONDED MORTAR
** DUCTWORK	
LOCATION	BYPASS
CONFIGURATION	RECTANGULAR
DIMENSIONS	11 X 11 X 64 LENGTH
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
SHELL SPECIFIC MATERIAL TYPE	HIGH STRENGTH LOW ALLOY 'HSLA'
LINER GENERIC MATERIAL TYPE	ORGANIC/INORGANIC
LINER SPECIFIC MATERIAL TYPE	MASTIC/SYNTHETIC BRICK

LITY FGD SURVEY: JANUARY - DECEMBER 1988

RIVERS ELECTRIC: GREEN 1 (CONT.)

REAGENT PREPARATION EQUIPMENT

FUNCTION	SLAKER
DEVICE	NR
DEVICE TYPE	NR
MANUFACTURER	WALLACE & TIEMAN
NUMBER	4
FULL LOAD DRY FEED CAPACITY - M.TONS/HR	3.6 (4 TPH)
PRODUCT QUALITY - % SOLIDS	22.0

TANKS

SERVICE	NUMBER
-----	-----
REACTION	2
SCREEN	2
THICKENER RETURN WATER	1
MIST ELIMINATOR WASH	1
ADDITIVE HOLD	2
ADDITIVE SURGE	1

PUMPS

SERVICE	NUMBER
-----	-----
ABSORBER RECIRCULATION	3
RECYCLE SLURRY BLEED	4
THICKENER UNDERFLOW	4
ADDITIVE FEED	2
THICKENER RETURN	2
SLUDGE FEED	3
ADDITIVE SUPPLY	2

* SOLIDS CONCENTRATING/DEWATERING

DEVICE	VACUUM FILTER
NUMBER	3
NUMBER OF SPARES	1
DIMENSIONS - FT	12 DIA X 20 LONG
CAPACITY	20 TPH 291 GPM AT 25-30% SOLIDS!
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
SHELL SPECIFIC MATERIAL TYPE	AISI 1110
LINER SPECIFIC MATERIAL TYPE	NYLON
BELT GENERIC MATERIAL TYPE	ORGANIC
BELT SPECIFIC MATERIAL TYPE	POLYPROPYLENE
FEED STREAM SOURCE	THICKENER UNDERFLOW
FEED STREAM CHARACTERISTICS	25% SOLIDS
OUTLET STREAM CHARACTERISTICS	45% SOLIDS
OVERFLOW STREAM CHARACTERISTICS	1% SOLIDS, 360 GPM
OUTLET STREAM DISPOSITION	PUG MILL
OVERFLOW STREAM DISPOSITION	THICKENER

* SOLIDS CONCENTRATING/DEWATERING

DEVICE	THICKENER
NUMBER	2
NUMBER OF SPARES	0
CONFIGURATION	CIRCULAR
DIMENSIONS - FT	125 DIA X 15.5 DEPTH
CAPACITY	900000 GAL
SHELL GENERIC MATERIAL TYPE	INORGANIC
SHELL SPECIFIC MATERIAL TYPE	HYDRAULICALLY-BONDED CONCRETE
LINER GENERIC MATERIAL TYPE	CARBON STEEL
LINER SPECIFIC MATERIAL TYPE	ASTM A-36 1/4"
FEED STREAM SOURCE	BLEED PUMP DISCHARGE
FEED STREAM CHARACTERISTICS	774 GPM, 6% SOLIDS
OUTLET STREAM CHARACTERISTICS	136 GPM, 25% SOLIDS
OVERFLOW STREAM CHARACTERISTICS	638 GPM, 1% SOLIDS
OUTLET STREAM DISPOSITION	TO VACUUM FILTERS
OVERFLOW STREAM DISPOSITION	THICKENER RETURN WATER TANK

* SALEABLE BYPRODUCTS

NATURE	NONE
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BIG RIVERS ELECTRIC: GREEN 1 (CONT.)

QUALITY - %	25.0	
DISPOSITION	N/A	
*** SLUDGE		
FULL LOAD SLUDGE QUANTITY - M.TONS/HR (DRY)	18.2	(20.0 TPH)
MOISTURE CONTENT - % TOTAL FREE WATER	75.0	
% CASO ₃ - DRY	82.4	
% CASO ₄ - DRY	11.8	
% ASH - DRY	5.8	
** TREATMENT		
METHOD	FIXATION	
DEVICE	PUG MILL	
PROPRIETARY PROCESS	CONVERSION SYSTEMS 'POZ-O-TEC'	
INLET FLOW RATE - LITER/S	17.1	(272 GPM)
INLET QUALITY - %	25.0	
** DISPOSAL		
NATURE	FINAL	
TYPE	LANDFILL	
LOCATION	ON-SITE	
SITE TRANSPORTATION METHOD	TRUCK	
SITE TREATMENT	NONE	
SITE DIMENSIONS	200 ACRES	
** PROCESS CONTROL AND INSTRUMENTATION		
PROCESS STREAM	ABSORBER RECYCLE	
CHEMICAL PARAMETERS	PH	
PHYSICAL VARIABLES	% SOLIDS	
CONTROL LEVELS	PH 9, 6% SOLIDS	
MONITOR TYPE	LEEDS & NORTHROP/TEXAS NUCLEAR	
MONITOR LOCATION	SCREEN TANKS	
PROCESS CONTROL MANNER	AUTOMATIC	
PROCESS CHEMISTRY MODE	FEEDBACK	
** WATER BALANCE		
WATER LOOP TYPE	CLOSED	
EVAPORATION WATER LOSS - LITER/S	0.8	(12 GPM)
SLUDGE HYDRATION WATER LOSS - LITER/S	0.3	(4 GPM)
SLUDGE INTERSTITIAL WATER LOSS - LITERS/S	0.3	(4 GPM)
POND SEEPAGE/RUNOFF WATER LOSS - LITERS/S	0	
RECEIVING WATER STREAM	N/A	
MAKEUP WATER ADDITION - LITERS/S	23.1	(366 GPM)
SOURCE OF MAKEUP WATER	COOLING TOWER BLOWDOWN '290 GPM!/RIVER WATER '76	
** CHEMICALS AND CONSUMPTION		
FUNCTION	ABSORBENT	
NAME	LIME 'THIOSORBIC'	
PRINCIPAL CONSTITUENT	92% CAO, 2-6% INERTS, 2-6% MGO	
SOURCE/SUPPLIER	DRAVO LIME	
CONSUMPTION	230 TPD	
UTILIZATION - %	93.2	
POINT OF ADDITION	SLAKER	
** FGD SPARE CAPACITY INDICES		
ABSORBER - %	30.0	
MIST ELIMINATOR - %	0.0	
REHEATER - %	0.0	
FAN - %	0.0	
THICKENER - %	0.0	
VACUUM FILTER - %	33.0	
** FGD SPARE COMPONENT INDICES		
ABSORBER	0.4	
MIST ELIMINATOR	0.0	
REHEATER	0.0	
FAN	0.0	
THICKENER	0.0	
VACUUM FILTER	0.1	

LITY FGD SURVEY: JANUARY - DECEMBER 1988

RIVERS ELECTRIC: GREEN 1 (CONT.)

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

'79	SYSTEM										744
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** PROBLEMS/SOLUTIONS/COMMENTS

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

'80	SYSTEM										744
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'80	SYSTEM										696
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'80	SYSTEM										744
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** PROBLEMS/SOLUTIONS/COMMENTS

NO INFORMATION WAS AVAILABLE FOR THE FIRST QUARTER, 1980.

'80	A	65.0	56.0	78.8	45.0						
	B	65.0	56.0	79.0	45.0						
	SYSTEM	65.0	56.0	79.0	45.0	720	576	324			

** PROBLEMS/SOLUTIONS/COMMENTS

THE FOLLOWING FIVE OUTAGES OCCURRED IN APRIL AND ACCOUNTED FOR THE LOW AVAILABILITY OF THE FGD SYSTEM.

1. LOW ADDITIVE IN TANK
2. INSTRUMENT TROUBLE
3. WATER IN THE PANEL
4. LOW ON LIME IN THE HOLDING TANKS
5. THE ESPS TRIPPED

'80	A	73.7	76.1	79.0	73.7						
	B	73.7	76.0	78.9	73.5						
	SYSTEM	73.7	76.1	79.0	73.7	744	720	548			

** PROBLEMS/SOLUTIONS/COMMENTS

DURING MAY THE FGD SYSTEM WAS OFF LINE FOR APPROXIMATELY 548 HOURS DUE TO THE FOLLOWING PROBLEMS.

1. SULFUR OXIDES TOO HIGH
2. LOW LEVEL IN ADDITIVE TANK
3. INSTRUMENT TROUBLE
4. SCHEDULED MAINTENANCE OUTAGE
5. SOLIDS ON CARRY OVER
6. SOLID WASTE PROBLEM
7. UNIT TRIPPED
8. CONSTRUCTION WORK

'80	SYSTEM										720
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** PROBLEMS/SOLUTIONS/COMMENTS

INFORMATION WAS NOT AVAILABLE FOR THE MONTH OF JUNE.

'80	SYSTEM										744
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'80	SYSTEM										744
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'80	SYSTEM				40.7			720		293	
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UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

BIG RIVERS ELECTRIC: GREEN 1 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

DURING SEPTEMBER THE VENDOR INSTALLED NEW SWITCHES ON BOTH MODULES' TRAVELING SCREENS.

10/80 SYSTEM 80.4 40.9 744 304

** PROBLEMS/SOLUTIONS/COMMENTS

ON SEPTEMBER 12 THE FGD SYSTEM WAS TAKEN OFF-LINE FOR A SCHEDULED OUTAGE. THE SYSTEM WAS PLACED BACK IN SERVICE ON OCTOBER 13.

DURING OCTOBER A CONTROL SYSTEM MALFUNCTION CAUSED APPROXIMATELY 2 1/2 DAYS OF OUTAGE TIME.

DUE TO LOST LEVEL IN ADDITIVE HOLD TANK THE SCREW CONVEYOR TRIPPED OUT.

THE THICKENER WAS CLEANED OUT AND THE LEAKS REPAIRED DURING THE MONTH.

LEAKS WERE ENCOUNTERED ON THE EXPANSION JOINTS LOCATED ON THE ABSORBER OUTLET DUCT. THESE EXPANSION JOINTS WERE REPLACED DURING THE MONTH.

11/80 SYSTEM 97.5 96.0 720 691

** PROBLEMS/SOLUTIONS/COMMENTS

A LEAK IN MODULE A BLEED LINE DURING NOVEMBER CAUSED APPROXIMATELY 10 HOURS OF OUTAGE TIME.

12/80 SYSTEM 97.9 93.5 744 695

** PROBLEMS/SOLUTIONS/COMMENTS

DURING DECEMBER SEVEN HOURS OF DOWN TIME WAS DUE TO PROBLEMS AT THE SOLID WASTE FACILITY.

LEAKS WERE ENCOUNTERED WITH THE MIST ELIMINATOR WASH LINES.

PROBLEMS WERE ENCOUNTERED WITH THE CLARIFIERS AT THE COOLING TOWER CAUSING THE FGD SYSTEM TO BE TAKEN OUT OF SERVICE FOR APPROXIMATELY 23 HOURS.

1/81 SYSTEM 88.4 82.9 744 617

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE FIRST PART OF JANUARY THE UTILITY EXPERIENCED PROBLEMS WITH HAULING THE WASTE PRODUCT. THIS CAUSED THE SYSTEM TO BE TAKEN OFF LINE APPROXIMATELY THREE DAYS.

DURING THE MONTH IT WAS NECESSARY TO WASH THE ID FAN.

PROBLEMS WERE ENCOUNTERED WITH THE RECYCLE PUMP PACKING.

2/81 SYSTEM 90.9 84.9 696 591

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY HAS EXPERIENCED BYPASS DAMPER PROBLEMS AND IN FEBRUARY INSTALLED A SOLENOID ON THE DAMPER TO RESOLVE THE PROBLEM.

REPAIR WORK ON THE MIST ELIMINATOR LEAKS WAS PERFORMED DURING THE MONTH.

THICKENER MAINTENANCE CAUSED AN OUTAGE WHICH LASTED 22 HOURS.

ILITY FGD SURVEY: JANUARY - DECEMBER 1988

3 RIVERS ELECTRIC: GREEN 1 (CONT.)

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

THE ADDITIVE FEED LINE TO MODULE A REACTION TANK PLUGGED.

81 SYSTEM 100.0 51.4 744 382

** PROBLEMS/SOLUTIONS/COMMENTS

THE SYSTEM WAS SHUT DOWN DURING THE FIRST TWO WEEKS OF MARCH FOR SCHEDULED MAINTENANCE.

81 SYSTEM 100.0 60.7 720 437

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING APRIL.

81 SYSTEM 84.7 79.3 744 590

** PROBLEMS/SOLUTIONS/COMMENTS

AT THE FIRST OF MAY GENERAL MAINTENANCE WAS PERFORMED ON THE SYSTEM.

PLUGGING WAS EXPERIENCED IN THE LINES ASSOCIATED WITH THE SLAKER.

THICKENER MAINTENANCE CAUSED THE SYSTEM TO BE OFF-LINE APPROXIMATELY 15 HOURS.

TWO OUTAGES WERE CAUSED BY THE THICKENER RAKE.

A LINE LEAK IN THE MIST ELIMINATOR WASH TANK WAS ENCOUNTERED. FIVE HOURS OF OUTAGE TIME WAS NEEDED TO MAKE THE NECESSARY REPAIRS.

PLUGGED ADDITIVE LINES CAUSED TWO OUTAGES DURING THE MONTH.

81 SYSTEM 95.1 95.1 720 684

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JUNE THE ADDITIVE LINES TO BOTH MODULES PLUGGED CAUSING THE SYSTEM TO SHUT DOWN THREE SEPARATE TIMES.

THE BYPASS DAMPER SOLENOID MALFUNCTIONED AND HAD TO BE REPLACED.

PROBLEMS HAVE BEEN ENCOUNTERED WITH THE MODULE B INLET DAMPER.

81 A 98.3 96.2 96.2 96.2
 B 98.3 96.2 96.2 96.2
 SYSTEM 98.3 96.2 96.2 96.2 744 744 716 93.9

** PROBLEMS/SOLUTIONS/COMMENTS

THE MAJORITY OF THE OUTAGE TIME DURING THE MONTH RESULTED FROM PLUGGING OF THE ADDITIVE FEED LINES AND CONTROL VALVES, AS WELL AS MECHANICAL PROBLEMS WITH THE LIMIT SWITCHES ON THE DAMPERS.

81 A 95.2 92.6 92.6 85.3
 B 95.2 92.6 92.6 85.3
 SYSTEM 95.2 92.6 92.6 85.3 744 686 635 88.9

81 A 84.5 96.4 96.4 79.9
 B 84.5 96.4 96.4 79.9
 SYSTEM 84.5 96.4 96.4 79.9 720 597 575 71.0

BIG RIVERS ELECTRIC: GREEN 1 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

DURING SEPTEMBER, THE FGD SYSTEM AVAILABILITY WAS SLIGHTLY LIMITED DUE TO THE REPLACEMENT OF THE CHEVRON MIST ELIMINATORS ON BOTH MODULES. THE MIST ELIMINATORS WERE REPLACED DUE TO THEIR MDRYL MATERIAL OF CONSTRUCTION WHICH MELTED AT TEMPERATURES GREATER THAN 180 F. THE REPLACEMENT MIST ELIMINATORS ARE CONSTRUCTED OF FIBERGLASS FIRST STAGE! AND RYTON SECOND STAGE! RATED FOR TEMPERATURES GREATER THAN 300 F.

10/81	A	75.3	98.3	98.3	74.8				
	B	75.3	98.3	98.3	74.8				
	SYSTEM	75.3	98.3	98.3	74.8	744	566	557	69.7

** PROBLEMS/SOLUTIONS/COMMENTS

DURING OCTOBER A PROBLEM WAS ENCOUNTERED WITH THE BY-PASS SOLENOID CAUSING DOWN TIME.

OUTAGE TIME WAS NECESSARY TO REPAIR LEAKS ON THE INLET DAMPERS AND TO INSPECT THE CHEVRONS.

A LOW PH CAUSED THE ADDITIVE LINE TO MODULE A TO PLUG RESULTING IN AN OUTAGE.

THE BLEED LINE TO MODULE A RUPTURED ACCOUNTING FOR ADDITIONAL DOWN TIME.

11/81	A	96.2	94.9	94.9	94.9				
	B	94.9	94.9	94.9	94.9				
	SYSTEM	95.6	94.9	94.9	94.9	720	720	683	97.1

** PROBLEMS/SOLUTIONS/COMMENTS

DURING NOVEMBER THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS OCCURRED.

12/81	A	98.9	97.6	97.6	97.6				
	B	98.9	97.6	97.6	97.6				
	SYSTEM	98.9	97.6	97.4	97.6	744	744	726	91.2

** PROBLEMS/SOLUTIONS/COMMENTS

DURING DECEMBER NO MAJOR FGD-RELATED PROBLEMS WERE EXPERIENCED.

1/82	A	92.9	90.6	90.6	90.6				
	B	94.8	91.3	91.3	91.3				
	SYSTEM	93.8	91.0	91.0	91.0	744	744	677	88.2

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING JANUARY.

2/82	A	95.4	93.1	93.1	93.1				
	B	97.0	93.1	93.1	93.1				
	SYSTEM	96.2	93.1	93.1	93.1	672	672	626	87.6
3/82	A	98.4	94.4	94.4	93.8				
	B	98.4	94.4	94.4	93.8				
	SYSTEM	98.4	94.4	94.4	93.8	744	739	698	89.6

LITY FGD SURVEY: JANUARY - DECEMBER 1988

RIVERS ELECTRIC: GREEN 1 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

DURING FEBRUARY AND MARCH NO MAJOR FGD-RELATED PROBLEMS WERE REPORTED.

82	A	86.9	96.4	96.4	58.8				
	B	86.9	96.4	96.4	58.8				
	SYSTEM	86.9	96.4	96.4	58.8	720	439	423	56.4
82	A	99.1	98.1	98.1	98.1				
	B	98.1	98.1	98.1	98.1				
	SYSTEM	98.6	98.1	98.1	98.1	744	744	730	88.8

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING APRIL AND MAY.

82	G1-A	98.5	98.5	98.5	98.5				
	G1-B	98.5	98.5	98.5	98.5				
	SYSTEM	98.5	98.5	98.5	98.5	720	720	709	79.8

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING JUNE.

82	G1-A	98.2	96.2	96.2	96.2				
	G1-B	98.2	96.2	96.2	96.2				
	SYSTEM	98.2	96.2	96.2	96.2	744	744	716	93.9

** PROBLEMS/SOLUTIONS/COMMENTS

PLUGGING OF ADDITIVE FEED LINES AND CONTROL VALVES CONTRIBUTED TO THE OUTAGE TIME DURING JULY.

MECHANICAL PROBLEMS WITH LIMIT SWITCHES ON THE DAMPERS ALSO CONTRIBUTED TO OUTAGE TIME DURING THE MONTH.

'82	G1-A	100.0	99.2	99.2	91.8				
	G1-B	100.0	99.2	99.2	91.8				
	SYSTEM	100.0	99.2	99.2	91.8	744	689	683	70.8

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING AUGUST.

/82	SYSTEM					720			
/82	SYSTEM					744			
/82	SYSTEM					720			
/82	SYSTEM					744			
/83	SYSTEM					744			
/83	SYSTEM					672			
/83	SYSTEM					744			

BIG RIVERS ELECTRIC: GREEN 1 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

INFORMATION WAS UNAVAILABLE FOR THE PERIOD OF SEPTEMBER 1982 THROUGH MARCH 1983.

4/83	SYSTEM	720
5/83	SYSTEM	744
6/83	SYSTEM	720

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE MONTHS OF APRIL AND MAY THE FOLLOWING REPAIRS WERE MADE:

BOTH DOUBLE-LOUVRE SEAL AIR DAMPERS LOCATED AT THE INLET OF THE ABSORBER VESSELS WERE REPLACED WITH BOTTOM-ENTRY GUILLotine SEAL AIR DAMPERS. THE DOUBLE-LOUVRE DAMPERS DID NOT PROVIDE ADEQUATE ISOLATION TO ALLOW MAINTENANCE DURING BOILER OPERATION. THE UTILITY ALSO REPORTED THAT THE DOUBLE-LOUVRE DAMPERS CLOSED TOO SLOWLY DURING BYPASS (REASON WHY ORIGINAL NORYL MIST ELIMINATORS WERE MELTED). THE FAULTY PRE-KRETE G-8 LINER MATERIAL IN THE ABSORBER VESSELS WAS REPLACED WITH PENNGUARD MASTIC. THE PENNGUARD MASTIC WAS APPLIED TO THE ABSORBER AND DUCTWORK FROM THE MIST ELIMINATORS TO THE OUTLET ABSORBER GUILLotine DAMPERS. PENNGUARD MASTIC AND PENNGUARD BLOCK WERE BOTH APPLIED TO THE DUCTWORK LOCATED BETWEEN THE OUTLET ABSORBER GUILLotine DAMPERS AND THE STACK INLET.

THE UTILITY ALSO REPORTED REDUCING THE L/G RATIO ON BOTH ABSORBER VESSELS (PUMP SPEEDS WERE REDUCED). THE UTILITY REPORTS STILL MEETING COMPLIANCE LIMITS BUT HAVING A 14 PERCENT DECREASE IN LIME USAGE OVER LAST YEAR.

7/83	SYSTEM	744
8/83	SYSTEM	744
9/83	SYSTEM	720

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE THIRD QUARTER. THE NEXT SCHEDULED UNIT OUTAGE IS SET TO BEGIN THE FIRST WEEK OF NOVEMBER AND WILL LAST TWO WEEKS.

ABSORBER LIQUID RECIRCULATION WAS DECREASED IN CONJUNCTION WITH CHANGES TO NOZZLE HEADER DESIGN IN ORDER TO SAVE ON LIME CONSUMPTION. THE UTILITY REPORTED THAT THE FGD SYSTEM WAS REMOVING MORE SO₂ THAN REQUIRED BY LAW. THE LIQUID RECIRCULATION RATE FOR EACH OF THE TWO ABSORBERS WAS DECREASED FROM A DESIGN FLOW RATE OF 20,280 GPM (L/G OF 40.6) TO 16,000 GPM (L/G OF 32.0). THREE OF THE SIX SPRAY HEADERS ON HALF OF THE PIG TAIL NOZZLES WERE CHANGED TO FULL-FLOW TYPE (BASICALLY A 1-7/8 INCH OPEN HOLE) NOZZLES. DURING NORMAL OPERATIONS 1 PIG TAIL HEADER IS USED IN CONJUNCTION WITH 2 COMBINATION HEADERS. WHEN THESE BECOME PLUGGED, AN ADDITIONAL COMBINATION HEADER IS VALVED IN. WHEN ALL SIX HEADERS ARE USED THE LIQUID RECIRCULATION RATE IS 16,000 GPM. HOWEVER, ONLY THREE OF THE FOUR HEADERS ARE USED FOR NORMAL OPERATING CONDITIONS HAVING A LIQUID RECIRCULATION RATE OF APPROXIMATELY 11,000 TO 13,000 GPM. BECAUSE OF THIS CHANGE THE UTILITY REPORTED SAVING 11,200 TONS OF LIMESTONE AT A SAVINGS OF \$392,000 (COMPARED TO 1982 BASED ON A 9-MONTH PERIOD) WHILE STILL MEETING ITS SO₂ LIMITATIONS.

10/83	SYSTEM	744
11/83	SYSTEM	720

LITY FGD SURVEY: JANUARY - DECEMBER 1988

RIVERS ELECTRIC: GREEN 1 (CONT.)

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

'83 SYSTEM

744

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED OUTAGES WERE ENCOUNTERED DURING THE PERIOD. THE UNIT WAS DOWN FOR THE FIRST AND SECOND WEEKS OF NOVEMBER FOR SCHEDULED MAINTENANCE.

DURING 1983, THE UNIT AND FGD SYSTEM OPERATED A TOTAL OF 7854.5 AND 7592.7 HOURS, RESPECTIVELY. TOTAL FGD SYSTEM AVAILABILITY FOR THE YEA WAS 96.7 PERCENT.

THE AVERAGE COAL SULFUR CONTENT FOR THE YEAR WAS 3.58 PERCENT AND THE LIME TO COAL USAGE RATIO FOR THE YEAR WAS 16:1.

'84 SYSTEM

744

'84 SYSTEM

696

'84 SYSTEM

744

'84 SYSTEM

720

'84 SYSTEM

744

'84 SYSTEM

720

'84 SYSTEM

744

'84 SYSTEM

744

'84 SYSTEM

720

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE PENNGUARD BLOCKS INSTALLED IN THE OUTLET DUC DURING THE SPRING OF 1983 HAVE WORKED FAVORABLY TO DATE.

THE UTILITY REPORTED THAT THE NEW DAMPERS, WHICH HAVE BEEN IN USE 18 MONTH TO DATE, HAVE OPERATED FAVORABLY.

MIST ELIMINATOR WASH PIPE PLUGGAGE WAS REPORTED. A HIGH PRESSURE WASH (5000 PSI) WAS REQUIRED TO CLEAR THE PLUGGED LINES.

OVERALL FGD SYSTEM AVAILABILITY DURING THE FIRST THREE QUARTERS OF 1984 WA ESTIMATED AT 90%. NO MAJOR OUTAGES OCCURRED DURING THIS TIME.

/84 SYSTEM

744

/84 SYSTEM

720

/84 SYSTEM

744

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE FOURTH QUARTER OF 1984. THE FGD SYSTEM AVAILABILITY FOR THE PERIOD WAS ESTIMATED AT 90% TO 95%.

/85 SYSTEM

744

/85 SYSTEM

672

/85 SYSTEM

744

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

BIG RIVERS ELECTRIC: GREEN 1 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE FIRST QUARTER OF 1985.

4/85	SYSTEM	720
5/85	SYSTEM	744

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE BOILER AND FGD SYSTEM WAS OFF-LINE APRIL 20 - MAY 5 FOR A SCHEDULED MAINTENANCE OUTAGE.

THE UTILITY REPORTED THAT AN UNPLANNED OUTAGE OCCURRED MAY 25-29 FOR BYPASS DUCT REPAIR. THE SAUERISEN REFRACTORY MATERIAL REQUIRED PATCH WORK REPAIR.

6/85	SYSTEM	720
7/85	SYSTEM	744
8/85	SYSTEM	744
9/85	SYSTEM	720
10/85	SYSTEM	744
11/85	SYSTEM	720
12/85	SYSTEM	744

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED OUTAGES WERE ENCOUNTERED FOR THE PERIOD OF JUNE THROUGH DECEMBER 1985. A SCHEDULED BOILER/TURBINE OUTAGE FOR GENERAL MAINTENANCE TOOK PLACE BETWEEN OCTOBER 19 THROUGH NOVEMBER 27. DURING THIS OUTAGE, GENERAL CLEANING WAS CONDUCTED ON THE FGD SYSTEM.

1/86	SYSTEM	774
2/86	SYSTEM	672
3/86	SYSTEM	774
4/86	SYSTEM	720
5/86	SYSTEM	774

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE UNIT WAS DOWN APPROXIMATELY 318 HOURS BEGINNING MAY 11 FOR A SCHEDULED BOILER/TURBINE OUTAGE. DURING THIS PERIOD, REPLACEMENT WORK WAS BEGUN ON THE FLOOR OF THE BYPASS OUTLET DUCTWORK. THE FLOOR OF THE DUCT WILL BE COMPLETELY REPLACED WITH 1/8 INCH HASTELLOY G AND FERRALUM 255. THE REMAINDER OF THE WORK WILL BE COMPLETED DURING THE FALL OUTAGE. THE SIDE WALL AND CEILING OF THE DUCTWORK WILL NOT BE REPLACED. THE CONSTRUCTION OF THAT PART OF THE DUCTWORK WILL REMAIN COR-TEN CARBON STEEL LINED WITH SAUERISEN REFRACTORY.

6/86	SYSTEM	720
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LITY FGD SURVEY: JANUARY - DECEMBER 1988

RIVERS ELECTRIC: GREEN 1 (CONT.)

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

86 SYSTEM 774
 86 SYSTEM 774
 86 SYSTEM 720
 86 SYSTEM 774

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE UNIT WAS DOWN APPROXIMATELY 278 HOURS BEGINNING OCTOBER 25 FOR A SCHEDULED BOILER/TURBINE OUTAGE. DURING THIS PERIOD, THE BYPASS OUTLET DUCTWORK REPAIRS WERE COMPLETED.

86 SYSTEM 720
 86 SYSTEM 774

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE YEAR 1986, THE FGD SYSTEM HAD A TOTAL OF 171.8 UNPLANNED OUTAGE HOURS AND WAS IN SERVICE FOR A TOTAL OF 8214.7 HOURS.

THE UTILITY REPORTED THAT THEY HAVE BEEN OPERATING WITHOUT REHEAT SINCE MARCH OF 1985. THE IN-DIRECT HOT AIR STEAM REHEAT SYSTEM WAS REMOVED DUE TO HIGH MAINTENANCE COSTS AND ITS INABILITY TO KEEP FLUE GAS EXIT TEMPERATURES ABOVE THE DESIGNED TEMPERATURE OF 145 F. THE CURRENT EXIT GAS TEMPERATURE OUT OF THE STACK WITHOUT REHEAT IS 130 F. NO ILL EFFECTS TO THE STACK REFRACTORY LINING HAS BEEN NOTICED TO DATE. THE UTILITY HAD TO MOVE THEIR OPACITY METERS TO JUST AFTER THE ID FAN DISCHARGE SINCE THE WATER DROPLETS IN THE STACK PRODUCED FALSE READINGS. SINCE EPA CONSIDERED THIS TO BE A MAJOR MODIFICATION TO THE SYSTEM, THE UTILITY WAS ALSO REQUIRED TO LOWER THEIR SO2 LIMITATIONS FROM 1.2 LB/MMBTU TO 0.816 LB/MMBTU.

THE UNIT CAME BACK ON-LINE NEAR THE MIDDLE OF NOVEMBER AND OPERATED THE REMAINDER OF THE YEAR WITHOUT ANY MAJOR UNIT OR FGD-RELATED OUTAGES. THERE WAS A MINOR UNIT OUTAGE ON DECEMBER 24 WHICH LASTED ONLY 38 HOURS DUE TO A AIR PREHEATER PROBLEM.

'87 SYSTEM 744
 '87 SYSTEM 672

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED OUTAGES WERE ENCOUNTERED DURING THE MONTHS OF JANUARY AND FEBRUARY 1987.

'87 SYSTEM 744
 '87 SYSTEM 720

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE UNIT UNDERWENT A SCHEDULED SPRING OUTAGE WHICH LASTED FROM MARCH 23 TO APRIL 10.

'87 SYSTEM 744
 '87 SYSTEM 720
 '87 SYSTEM 744

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

BIG RIVERS ELECTRIC: GREEN 1 (CONT.)

-----PERFORMANCE DATA-----									
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER BOILER HOURS	FGD HOURS	CAP. FACTOR
8/87	SYSTEM						744		
9/87	SYSTEM						720		
10/87	SYSTEM						744		
11/87	SYSTEM						720		
12/87	SYSTEM						744		

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE UNIT UNDERWENT A SCHEDULED FALL OUTAGE WHICH BEGAN LATE IN NOVEMBER AND LASTED APPROXIMATELY 3 WEEKS. DURING THIS OUTAGE, THE UTILITY RELINED THE SCRUBBER OUTLET DUCTWORK (APPROXIMATELY 15-20 FEET) AND STACK WITH 1/8 INCH TITANIUM SHEET. THE METAL SURROUNDING THE ANCHORS HOLDING THE PENNWALT BLOCK TO THE FERRALIUM 255 LINED FLOOR OF THE DUCTWORK FAILED. THE PENNWALT BLOCK HAD ALSO BEEN COATED WITH SAUERISEN 72. INSTALLATION AND FABRICATION WAS PERFORMED BY RDM COMPANY. THE ORIGINAL STACK CONSISTED OF A CONCRETE SHELL WITH A REFRACTORY FLUE LINING.

1/88	SYSTEM						774		
2/88	SYSTEM						672		
3/88	SYSTEM						774		
4/88	SYSTEM						720		
5/88	SYSTEM						774		
6/88	SYSTEM						720		
7/88	SYSTEM						774		
8/88	SYSTEM						774		
9/88	SYSTEM						720		
10/88	SYSTEM						774		

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE UNIT WAS OFF-LINE FROM SEPTEMBER 25 TO OCTOBER 22, 1988 FOR A SCHEDULED MAINTENANCE OUTAGE. NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE PERIOD JANUARY THROUGH OCTOBER, 1988.

11/88	SYSTEM						720		
12/88	SYSTEM						774		

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT A TEN DAY FORCED UNIT OUTAGE OCCURRED IN DECEMBER DUE TO STACK INLET DUCTWORK FAILURE CAUSED BY CORROSION. THE CORROSION OF THE NEWLY LINED TITANIUM DUCTWORK WAS DUE TO FLUORIDES LEAKED FROM THE NEWLY INSTALLED SDX COATING UPSTREAM IN THE ABSORBER OUTLET DUCTWORK. A COATING WAS APPLIED OVER THE SDX COATING IN AN ATTEMPT TO STOP THE LEAKING PROCESS. PORTIONS OF THE TITANIUM CLADDED OUTLET DUCT (I.E., BETWEEN THE ABSORBER OUTLET EXPANSION JOINT AND STACK INLET) WERE REPLACED.

SECTION 13

DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	BIG RIVERS ELECTRIC
PLANT NAME	GREEN
UNIT NUMBER	2
CITY	SEBREE
STATE	KENTUCKY
REGULATORY CLASSIFICATION	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	301. (0.700 LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	444
GROSS UNIT GENERATING CAPACITY - MW	242
NET UNIT GENERATING CAPACITY W/FGD - MW	223
NET UNIT GENERATING CAPACITY WO/FGD - MW	228
EQUIVALENT SCRUBBED CAPACITY - MW	242
*** UNIT DATA - BOILER AND STACK	
BOILER SUPPLIER	BABCOCK & WILCOX
BOILER TYPE	PULVERIZED COAL
BOILER SERVICE LOAD	BASE
DESIGN BOILER FLUE GAS FLOW - CU.M/S	471.90 (1000000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	148.9 (300 F)
STACK HEIGHT - M	107. (350 FT)
STACK SHELL	CONCRETE
STACK TOP DIAMETER - M	4.6 (15.0 FT)
*** FUEL DATA	
FUEL TYPE	COAL
FUEL GRADE	BITUMINOUS
AVERAGE HEAT CONTENT - J/G	22795. (9800 BTU/LB)
RANGE HEAT CONTENT - BTU/LB	8200-11800
AVERAGE ASH CONTENT - %	15.38
RANGE ASH CONTENT - %	9.6-27.5
AVERAGE MOISTURE CONTENT - %	11.40
RANGE MOISTURE CONTENT - %	5.3-20.1
AVERAGE SULFUR CONTENT - %	3.91
RANGE SULFUR CONTENT - %	2.0-6.0
AVERAGE CHLORIDE CONTENT - %	0.05
RANGE CHLORIDE CONTENT - %	UNKNOWN
*** PARTICLE CONTROL	
** MECHANICAL COLLECTOR	
NUMBER	0
TYPE	NONE
** ESP	
NUMBER	2
NUMBER OF SPARES	0
TYPE	COLD SIDE
SUPPLIER	AMERICAN AIR FILTER
INLET FLUE GAS CAPACITY - CU.M/S	235.9 (500000 ACFM)
INLET FLUE GAS TEMPERATURE - C	148.9 (300 F)
PRESSURE DROP - KPA	0.3 (1. IN-H2O)
PARTICLE REMOVAL EFFICIENCY - %	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	

LITY FGD SURVEY: JANUARY - DECEMBER 1988

3 RIVERS ELECTRIC: GREEN 2 (CONT.)

* GENERAL DATA

SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT
SO2 REMOVAL MODE	WET SCRUBBING
PROCESS TYPE	LIME
PROCESS ADDITIVES	MAGNESIUM OXIDE; DIBASIC
SYSTEM SUPPLIER	AMERICAN AIR FILTER
A-E FIRM	BURNS & ROE
DEVELOPMENT LEVEL	FULL SCALE
NEW/RETROFIT	NEW
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.00
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	90.00
ENERGY CONSUMPTION - %	2.1
CURRENT STATUS	1
COMMERCIAL START-UP	12/1980
INITIAL START-UP	11/1980
CONTRACT AWARDED	5/1977

* DESIGN AND OPERATING PARAMETERS

DESIGN COAL SULFUR CONTENT - %	4.00	
DESIGN COAL HEAT CONTENT - J/G	23260.0	(10000 BTU/LB)
DESIGN COAL ASH CONTENT - %	20.00	
DESIGN MOISTURE CONTENT - %	11.25	
DESIGN CHLORIDE CONTENT - %	0.05	
SPACE REQUIREMENTS - SQ M	10869.3	(117000 SQ FT)
OPER. & MAINT. REQUIREMENT - MANHR/DAY	272.0	

* QUENCHER/PRESATURATOR

NUMBER	0
CONSTRUCTION MATERIAL GENERIC TYPE	NR
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR

* ABSORBER

NUMBER	2	
NUMBER OF SPARES	0	
GENERIC TYPE	SPRAY TOWER	
SPECIFIC TYPE	OPEN COUNTERCURRENT SPRAY	
TRADE NAME/COMMON TYPE	N/A	
SUPPLIER	AMERICAN AIR FILTER	
DIMENSIONS - FT	34 X 71.5	
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	MASTIC	
LINER MATERIAL TRADE NAME/COMMON TYPE	PENNGUARD ADHESIVE	
GAS CONTACTING DEVICE TYPE	NONE	
NUMBER OF CONTACTING ZONES	1	
LIQUID RECIRCULATION RATE - LITER/S	1008.	(16000 GPM)
L/G RATIO - L/CU.M	4.3	(32.0 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	0.4	(1.5 IN-H2O)
SUPERFICAL GAS VELOCITY - M/SEC	2.8	(9.2 FT/S)
INLET GAS FLOW - CU. M/S	235.95	(500000 ACFM)
INLET GAS TEMPERATURE - C	148.9	(300 F)
SO2 REMOVAL EFFICIENCY - %	90.0	

* FANS

NUMBER	2	
NUMBER OF SPARES	0	
DESIGN	CENTRIFUGAL	
SUPPLIER	WESTINGHOUSE	
FUNCTION	UNIT	
APPLICATION	FORCED DRAFT	
SERVICE	DRY	
FLUE GAS FLOW RATE - CU.M/S	274.80	(582330 ACFM)
FLUE GAS TEMPERATURE - C	148.9	(300 F)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	

* FANS

NUMBER	2
NUMBER OF SPARES	0

BIG RIVERS ELECTRIC: GREEN 2 (CONT.)

DESIGN	CENTRIFUGAL
SUPPLIER	WESTINGHOUSE
FUNCTION	UNIT
APPLICATION	INDUCED DRAFT
SERVICE	DRY
FLUE GAS FLOW RATE - CU.M/S	274.80 (582330 ACFM)
FLUE GAS TEMPERATURE - C	148.9 (300 F)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL
** DAMPERS	
NUMBER	2
FUNCTION	SHUT-OFF
GENERIC TYPE	GUILLOTINE
SPECIFIC TYPE	TOP-ENTRY GUILLOTINE/SEAL AIR
MANUFACTURER	AMERICAN AIR FILTER
SERVICE CONDITIONS	350 F/INDEFINITE
** DAMPERS	
NUMBER	1
FUNCTION	SHUT-OFF
GENERIC TYPE	GUILLOTINE
SPECIFIC TYPE	TOP-ENTRY GUILLOTINE/SEAL AIR
MANUFACTURER	AMERICAN AIR FILTER
SERVICE CONDITIONS	350 F/INDEFINITE
** DAMPERS	
NUMBER	1
FUNCTION	SHUT-OFF
GENERIC TYPE	LOUVER
SPECIFIC TYPE	PARALLEL BLADE MULTILOUVER
MANUFACTURER	AMERICAN AIR FILTER
SERVICE CONDITIONS	350 F/INDEFINITE
** DAMPERS	
NUMBER	2
FUNCTION	SHUT-OFF
GENERIC TYPE	GUILLOTINE
SPECIFIC TYPE	BOTTOM ENTRY GUILLOTINE/SEAL AIR
MANUFACTURER	AMERICAN AIR FILTER
MODULATION	OPEN
SERVICE CONDITIONS	350 F/INDEFINITE
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR
** DUCTWORK	
LOCATION	ABSORBER INLET
CONFIGURATION	RECTANGULAR
DIMENSIONS	11 X 11 X 43.5 LENGTH
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
SHELL SPECIFIC MATERIAL TYPE	AISI 1110
LINER GENERIC MATERIAL TYPE	ORGANIC
LINER SPECIFIC MATERIAL TYPE	MASTIC
** DUCTWORK	
LOCATION	ABSORBER OUTLET
CONFIGURATION	RECTANGULAR
DIMENSIONS	10 X 10 X 16 LENGTH
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
SHELL SPECIFIC MATERIAL TYPE	AISI 1110
LINER GENERIC MATERIAL TYPE	INORGANIC
LINER SPECIFIC MATERIAL TYPE	HYDRAULICALLY-BONDED MORTAR
** DUCTWORK	
LOCATION	BYPASS
CONFIGURATION	RECTANGULAR
DIMENSIONS	11 X 11 X 64 LENGTH
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
SHELL SPECIFIC MATERIAL TYPE	HIGH STRENGTH LOW ALLOY 'HSLA'
LINER GENERIC MATERIAL TYPE	ORGANIC
LINER SPECIFIC MATERIAL TYPE	MASTIC

LITY FGD SURVEY: JANUARY - DECEMBER 1988

RIVERS ELECTRIC: GREEN 2 (CONT.)

REAGENT PREPARATION EQUIPMENT

FUNCTION	SLAKER
DEVICE	NR
DEVICE TYPE	NR
MANUFACTURER	WALLACE & TIEMAN
NUMBER	4
FULL LOAD DRY FEED CAPACITY - M.TONS/HR	3.6 (4 TPH)
PRODUCT QUALITY - % SOLIDS	22.0

TANKS

SERVICE	NUMBER
-----	-----
REACTION	2
SCREEN	2
THICKENER RETURN WATER	1
MIST ELIMINATOR WASH	1
ADDITIVE HOLD	2
ADDITIVE SURGE	1

PUMPS

SERVICE	NUMBER
-----	-----
ABSORBER RECIRCULATION	3
RECYCLE SLURRY BLEED	4
THICKENER UNDERFLOW	4
ADDITIVE FEED	2
THICKENER RETURN	2
SLUDGE FEED	3
ADDITIVE SUPPLY	2

* SOLIDS CONCENTRATING/DEWATERING

DEVICE	VACUUM FILTER
NUMBER	3
NUMBER OF SPARES	1
DIMENSIONS - FT	12 DIA X 20 LONG
CAPACITY	20 TPH 291 GPM AT 25-30% SOLIDS!
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
SHELL SPECIFIC MATERIAL TYPE	AISI 1110
LINER SPECIFIC MATERIAL TYPE	NYLON
BELT GENERIC MATERIAL TYPE	ORGANIC
BELT SPECIFIC MATERIAL TYPE	POLYPROPYLENE
FEED STREAM SOURCE	THICKENER UNDERFLOW
FEED STREAM CHARACTERISTICS	25% SOLIDS
OUTLET STREAM CHARACTERISTICS	45% SOLIDS
OVERFLOW STREAM CHARACTERISTICS	1% SOLIDS, 360 GPM
OUTLET STREAM DISPOSITION	PUG MILL
OVERFLOW STREAM DISPOSITION	THICKENER

* SOLIDS CONCENTRATING/DEWATERING

DEVICE	THICKENER
NUMBER	2
CONFIGURATION	CIRCULAR
DIMENSIONS - FT	125 DIA X 15.5 DEPTH
CAPACITY	900000 GAL
SHELL GENERIC MATERIAL TYPE	INORGANIC
SHELL SPECIFIC MATERIAL TYPE	HYDRAULICALLY-BONDED CONCRETE
LINER GENERIC MATERIAL TYPE	CARBON STEEL
LINER SPECIFIC MATERIAL TYPE	ASTM A-36 1/4"
FEED STREAM SOURCE	BLEED PUMP DISCHARGE
FEED STREAM CHARACTERISTICS	774 GPM, 6% SOLIDS
OUTLET STREAM CHARACTERISTICS	136 GPM, 25% SOLIDS
OVERFLOW STREAM CHARACTERISTICS	638 GPM, 1% SOLIDS
OUTLET STREAM DISPOSITION	TO VACUUM FILTERS
OVERFLOW STREAM DISPOSITION	THICKENER RETURN WATER TANK

* SALEABLE BYPRODUCTS

NATURE	NONE
QUALITY - %	25.0

BIG RIVERS ELECTRIC: GREEN 2 (CONT.)

DISPOSITION	N/A
*** SLUDGE	
FULL LOAD SLUDGE QUANTITY - M.TONS/HR (DRY)	18.2 (20.0 TPH)
MOISTURE CONTENT - % TOTAL FREE WATER	75.0
% CASO3 - DRY	82.4
% CASO4 - DRY	11.8
% ASH - DRY	5.8
** TREATMENT	
METHOD	FIXATION
DEVICE	PUG MILL
PROPRIETARY PROCESS	CONVERSION SYSTEMS 'POZ-O-TEC'
INLET FLOW RATE - LITER/S	17.1 (272 GPM)
INLET QUALITY - %	25.0
** DISPOSAL	
NATURE	FINAL
TYPE	LANDFILL
LOCATION	ON-SITE
SITE TRANSPORTATION METHOD	TRUCK
SITE TREATMENT	NONE
SITE DIMENSIONS	200 ACRES
** PROCESS CONTROL AND INSTRUMENTATION	
PROCESS STREAM	ABSORBER RECYCLE
CHEMICAL PARAMETERS	PH
PHYSICAL VARIABLES	% SOLIDS
CONTROL LEVELS	PH 9, 6% SOLIDS
MONITOR TYPE	LEEDS & NORTHROP/TEXAS NUCLEAR
MONITOR LOCATION	SCREEN TANKS
PROCESS CONTROL MANNER	AUTOMATIC
PROCESS CHEMISTRY MODE	FEEDBACK
** WATER BALANCE	
WATER LOOP TYPE	CLOSED
EVAPORATION WATER LOSS - LITER/S	0.8 (12 GPM)
SLUDGE HYDRATION WATER LOSS - LITER/S	0.3 (4 GPM)
SLUDGE INTERSTITIAL WATER LOSS - LITERS/S	0.3 (4 GPM)
POND SEEPAGE/RUNOFF WATER LOSS - LITERS/S	0
RECEIVING WATER STREAM	N/A
MAKEUP WATER ADDITION - LITERS/S	23.1 (366 GPM)
SOURCE OF MAKEUP WATER	COOLING TOWER BLOWDOWN '290 GPM!/RIVER WATER '76
** CHEMICALS AND CONSUMPTION	
FUNCTION	ABSORBENT
NAME	LIME 'THIOSORBIC!
PRINCIPAL CONSTITUENT	92% CAO, 2-6% INERTS, 2-6% MGO
SOURCE/SUPPLIER	DRAVO LIME
CONSUMPTION	230 TPD
UTILIZATION - %	93.2
POINT OF ADDITION	SLAKER
** FGD SPARE CAPACITY INDICES	
ABSORBER - %	30.0
MIST ELIMINATOR - %	0.0
REHEATER - %	0.0
FAN - %	0.0
THICKENER - %	0.0
VACUUM FILTER - %	33.0
** FGD SPARE COMPONENT INDICES	
ABSORBER	0.4
MIST ELIMINATOR	0.0
REHEATER	0.0
FAN	0.0
THICKENER	0.0
VACUUM FILTER	0.1

LITY FGD SURVEY: JANUARY - DECEMBER 1988

RIVERS ELECTRIC: GREEN 2 (CONT.)

-----PERFORMANCE DATA-----										
100 MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION					% REMOVAL SO2	PER PART.	BOILER HOURS	FGD HOURS	CAP. FACTOR	
80	SYSTEM	94.2			91.8		720		661	
** PROBLEMS/SOLUTIONS/COMMENTS										
ON NOVEMBER 14, 1980 OPERATION OF UNIT 2 COMMENCED.										
DURING THE MONTH TWO OUTAGES WERE CAUSED BY THICKENER RAKE PROBLEMS.										
THE ADDITIVE FEED LINE PLUGGED CAUSING ABOUT EIGHT HOURS OF DOWN TIME.										
DURING OPERATION ON LOW RECYCLE FLOW, A WELD ON THE BYPASS DAMPER ADJUSTMENT ARM ROD FAILED.										
80	SYSTEM	96.2			26.1		744		194	
** PROBLEMS/SOLUTIONS/COMMENTS										
THE BOILER WAS DOWN FOR 18 DAYS AT THE BEGINNING OF DECEMBER.										
PROBLEMS WITH THE BYPASS DAMPER WAS ENCOUNTERED DURING THE MONTH.										
81	SYSTEM	94.3			68.1		744		506	
** PROBLEMS/SOLUTIONS/COMMENTS										
THE DAMPERS MALFUNCTIONED ON MODULE B, WHEN THE RECYCLE PUMP TRIPPED, CAUSING ABOUT SEVEN HOURS OF OUTAGE TIME.										
THE UTILITY IS EXPERIENCING PROBLEMS WITH HAULING THE WASTE PRODUCT.										
THE MODULE B REACTION TANK HAS EXPERIENCED PLUGGING DUE TO THE INABILITY TO MAINTAIN THE PH.										
'81	SYSTEM	94.5			94.0		696		654	
** PROBLEMS/SOLUTIONS/COMMENTS										
DURING FEBRUARY THICKENER MAINTENANCE WAS PERFORMED.										
'81	SYSTEM	97.9			97.9		744		728	
'81	SYSTEM	99.9			99.5		720		716	
** PROBLEMS/SOLUTIONS/COMMENTS										
NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING MARCH AND APRIL.										
'81	SYSTEM	92.7			92.0		744		684	
** PROBLEMS/SOLUTIONS/COMMENTS										
THE ADDITIVE LINE TO THE REACTION TANK PLUGGED CAUSING OUTAGE TIME DURING MAY.										
'81	SYSTEM	96.2			95.6		720		688	
** PROBLEMS/SOLUTIONS/COMMENTS										
THE MODULE A DISCHARGE LINE SEPARATED DURING THE MONTH CAUSING A 10 HOUR OUTAGE.										
PROBLEMS WERE ENCOUNTERED WITH THE INLET PRESSURE SWITCH ON BOTH MODULES. THE SWITCHES FOULED APPROXIMATELY SIX TIMES DURING JUNE CAUSING A TOTAL OF										

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

BIG RIVERS ELECTRIC: GREEN 2 (CONT.)

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

14 HOURS OF OUTAGE TIME.

7/81	A	94.0	89.1	89.1	77.2				
	B	94.0	89.1	89.1	77.2				
	SYSTEM	94.0	89.1	89.1	77.2	744	645	574	77.5

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JULY, PLUGGING OF THE ADDITIVE FEED LINES AND CONTROL VALVES, AS WELL AS MECHANICAL PROBLEMS WITH THE LIMIT SWITCHES ON THE DAMPERS CONTRIBUTED TO THE MAJORITY OF THE OUTAGE TIME.

8/81	A	96.4	94.0	94.0	86.0				
	B	97.8	94.0	94.0	86.0				
	SYSTEM	97.1	94.0	94.0	86.0	744	681	640	85.1

9/81	A	99.7	98.5	98.5	98.4				
	B	99.7	98.5	98.5	98.4				
	SYSTEM	99.7	98.5	98.5	98.4	720	719	708	84.7

** PROBLEMS/SOLUTIONS/COMMENTS

NO FGD-RELATED PROBLEMS WERE REPORTED FOR THE MONTHS OF AUGUST AND SEPTEMBER.

10/81	A	76.3	96.2	96.2	72.9				
	B	76.1	96.2	96.2	72.9				
	SYSTEM	76.2	96.2	96.2	72.9	744	564	542	66.4

** PROBLEMS/SOLUTIONS/COMMENTS

DURING OCTOBER THE UTILITY REPORTED THAT PROBLEMS WERE ENCOUNTERED WITH A RECYCLE PUMP VALVE.

THE BELT ON THE C MODULE RECYCLE PUMP WAS ADJUSTED ACCOUNTING FOR SOME DOWN TIME.

DURING THE MONTH THE FALL SCHEDULED MAINTENANCE OUTAGE COMMENCED.

11/81	A	62.6	87.4	87.4	44.5				
	B	62.6	87.4	87.4	44.5				
	SYSTEM	62.6	87.4	87.4	44.5	720	367	320	45.5

** PROBLEMS/SOLUTIONS/COMMENTS

THE FALL SCHEDULED MAINTENANCE OUTAGE CONTINUED THROUGH THE BEGINNING OF NOVEMBER.

THE ADDITIVE MASS VALVE ON THE A MODULE REACTION TANK WAS REPAIRED.

ADDITIONAL OUTAGE TIME WAS CAUSED BY A BROKEN REHEAT ISOLATION DAMPER DRIVE AND A LEAK IN THE MIST ELIMINATOR MAKE UP.

THE B MODULE ADDITIVE MASS LINE PLUGGED CAUSING A PH DROP.

THE MIST ELIMINATORS WERE REPLACED DUE TO THEIR NORYL MATERIAL OF CONSTRUCTION WHICH MELTED AT TEMPERATURES GREATER THAN 180 F. THE REPLACEMENT MIST ELIMINATORS ARE CONSTRUCTED OF FIBERGLASS FIRST STAGE! AND RYTON SECOND STAGE! RATED FOR TEMPERATURES GREATER THAN 300 F.

12/81	A	99.9	98.1	98.1	87.0				
	B	99.9	98.1	98.1	87.0				
	SYSTEM	99.9	98.1	98.1	87.0	744	660	647	78.5

LITY FGD SURVEY: JANUARY - DECEMBER 1988

1 RIVERS ELECTRIC: GREEN 2 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING DECEMBER.

'82	A	96.5	95.1	95.1	95.1				
	B	96.8	94.4	94.4	94.4				
	SYSTEM	96.6	94.8	94.8	94.8	744	744	705	86.9

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING JANUARY.

'82	A	99.7	97.8	97.8	97.8				
	B	99.7	97.8	97.8	97.8				
	SYSTEM	99.7	97.8	97.8	97.8	672	672	657	88.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED EXPERIENCING NO MAJOR FGD-RELATED PROBLEMS DURING FEBRUARY.

'82	A	39.9	91.9	91.9	39.9				
	B	39.9	91.9	91.9	39.9				
	SYSTEM	39.9	91.9	91.9	39.9	744	323	297	40.5

** PROBLEMS/SOLUTIONS/COMMENTS

DURING MARCH THE SYSTEM WAS TAKEN OFF-LINE PART OF THE TIME FOR A SCHEDULED OUTAGE.

'82	A	61.8	92.6	92.6	55.6				
	B	61.8	92.6	92.6	55.6				
	SYSTEM	61.8	92.6	92.6	55.6	720	432	401	50.1

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT AND SYSTEM WERE DOWN PART OF APRIL FOR A SPRING OUTAGE.

'82	A	99.6	97.8	97.8	90.1				
	B	99.6	97.8	97.8	90.1				
	SYSTEM	99.6	97.8	97.8	90.1	744	685	671	77.8

** PROBLEMS/SOLUTIONS/COMMENTS

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

'82	G2-A	99.3	97.7	97.7	95.9				
	G2-B	99.3	97.7	97.7	95.9				
	SYSTEM	99.3	97.7	97.7	95.9	720	707	690	80.4

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING JUNE.

'82	G2-A	94.0	89.1	89.1	77.2				
	G2-B	94.0	89.1	89.1	77.2				
	SYSTEM	94.0	89.1	89.1	77.2	744	645	574	77.5

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

BIG RIVERS ELECTRIC: GREEN 2 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

PLUGGING OF ADDITIVE FEED LINES AND CONTROL VALVES CONTRIBUTED TO THE
 OUTAGE TIME DURING JULY.

MECHANICAL PROBLEMS WITH LIMIT SWITCHES ON THE DAMPERS ALSO CONTRIBUTED TO
 OUTAGE TIME DURING THE MONTH.

8/82	G2-A	98.5	98.5	98.5	98.5				
	G2-B	98.5	98.5		98.5				
	SYSTEM	98.5	98.5	98.5	98.5	744	744	733	78.4

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED
 DURING AUGUST.

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

INFORMATION WAS UNAVAILABLE FOR THE PERIOD OF SEPTEMBER 1982 THROUGH MARCH
 1983.

4/83	SYSTEM	720
5/83	SYSTEM	744
6/83	SYSTEM	720

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE MONTHS OF APRIL AND MAY THE FOLLOWING REPAIRS WERE MADE:

BOTH DOUBLE-LOUVRE SEAL AIR DAMPERS LOCATED AT THE INLET OF THE ABSORBER
 VESSELS WERE REPLACED WITH BOTTOM-ENTRY GUILLOTINE SEAL AIR DAMPERS. THE
 DOUBLE-LOUVRE DAMPERS DID NOT PROVIDE ADEQUATE ISOLATION TO ALLOW MAIN-
 TENANCE DURING BOILER OPERATION. THE UTILITY ALSO REPORTED THAT THE
 DOUBLE-LOUVRE DAMPERS CLOSED TOO SLOWLY DURING BYPASS (REASON WHY ORIGINAL
 NORYL MIST ELIMINATORS WERE MELTED). THE FAULTY PRE-KRETE G-8 LINER MATE-
 RIAL IN THE ABSORBER VESSELS WAS REPLACED WITH PENNGUARD MASTIC. THE PENN
 GUARD MASTIC WAS APPLIED TO THE ABSORBER AND DUCTWORK FROM THE MIST ELIM-
 INATORS TO THE ABSORBER OUTLET GUILLOTINE DAMPERS. PENNGUARD MASTIC AND
 PENNGUARD BLOCK WILL BE APPLIED DURING THE NEXT MAJOR OUTAGE PERIOD TO THE
 DUCTWORK LOCATED BETWEEN THE ABSORBER OUTLET GUILLOTINE DAMPERS AND THE
 STACK INLET.

THE UTILITY ALSO REPORTED REDUCING THE L/G RATIO ON BOTH ABSORBER VESSELS
 (PUMP SPEEDS WERE REDUCED). THE UTILITY REPORTS STILL MEETING COMPLIANCE
 LIMITS BUT HAVING A 14 PERCENT DECREASE IN LIME USAGE OVER LAST YEAR.

7/83 SYSTEM

744

LITY FGD SURVEY: JANUARY - DECEMBER 1988

RIVERS ELECTRIC: GREEN 2 (CONT.)

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

83 SYSTEM 744
 83 SYSTEM 720

** PROBLEMS/SOLUTIONS/COMMENTYS

ABSORBER LIQUID RECIRCULATION WAS DECREASED IN CONJUNCTION WITH CHANGES TO NOZZLE HEADER DESIGN IN ORDER TO SAVE ON LIME CONSUMPTION. THE UTILITY REPORTED THAT THE FGD SYSTEM WAS REMOVING MORE SO2 THAN REQUIRED BY LAW. THE LIQUID RECIRCULATION RATE FOR EACH OF THE TWO ABSORBERS WAS DECREASED FROM A DESIGN FLOW RATE OF 20,280 GPM (L/G OF 40.6) TO 16,00 GPM (L/G OF 32.0). THREE OF THE SIX SPRAY HEADERS ON HALF OF THE PIG TAIL NOZZLES WERE CHANGED TO A FULL-FLOW TYPE (BASICALLY A 1-7/8 INCH OPEN HOLE) NOZZLES. DURING NORMAL OPERATIONS 1 PIG TAIL HEADER IS USED IN CONJUNCTION WITH 2 COMBINATION HEADERS. WHEN THESE BECOME PLUGGED, AN ADDITIONAL COMBINATION HEADER IS VALVED IN. WHEN ALL SIX HEADERS ARE USED THE LIQUID RECIRCULATION RATE IS 16,000 GPM. HOWEVER, ONLY THREE OF THE FOUR HEADERS ARE USED FOR NORMAL OPERATING CONDITIONS HAVING A LIQUID RECIRCULATION RATE OF APPROXIMATELY 11,000 TO 13,000 GPM. BECAUSE OF THIS CHANGE THE UTILITY REPORTED SAVING 11,200 TONS OF LIMESTONE AT A SAVINGS OF \$392,000 (COMPARED TO 1982 BASED ON A 9-MONTH PERIOD) WHILE STILL MEETING ITS SO2 LIMITATIONS.

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE THIRD QUARTER. THE NEXT SCHEDULED UNIT OUTAGE IS SET TO BEGIN THE FIRST WEEK OF NOVEMBER AND WILL LAST TWO WEEKS.

83 SYSTEM 744
 83 SYSTEM 720
 83 SYSTEM 744

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED OUTAGES WERE ENCOUNTERED DURING THE PERIOD. THE UNIT WAS DOWN FOR THE THIRD AND FOURTH WEEKS OF NOVEMBER FOR SCHEDULED MAINTENANCE.

DURING 1983, THE UNIT AND FGD SYSTEM OPERATED A TOTAL OF 7966.7 AND 7742.7 HOURS, RESPECTIVELY. TOTAL FGD SYSTEM AVAILABILITY FOR THE YEA WAS 97.2 PERCENT.

THE AVERAGE COAL SULFUR CONTENT FOR THE YEAR WAS 3.58 PERCENT AND THE LIME TO COAL RATIO FOR THE YEAR WAS 16:1.

/84 SYSTEM 744
 /84 SYSTEM 696
 /84 SYSTEM 744
 /84 SYSTEM 720
 /84 SYSTEM 744
 /84 SYSTEM 720
 /84 SYSTEM 744
 /84 SYSTEM 744
 /84 SYSTEM 720

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

BIG RIVERS ELECTRIC: GREEN 2 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT A NEW OUTLET DUCT LINING (STEBBINS TILE) WAS INSTALLED AT THE OUTLET DUCT MIXING ZONE DURING THE FIRST THREE QUARTERS OF 1984.

THE UTILITY REPORTED THAT THE NEW DAMPERS, WHICH HAVE BEEN IN USE 18 MONTH TO DATE, HAVE OPERATED FAVORABLY.

MIST ELIMINATOR WASH PIPE PLUGGAGE WAS REPORTED. A HIGH PRESSURE WASH (5000 PSI) WAS REQUIRED TO CLEAR THE PLUGGED LINES.

OVERALL FGD SYSTEM AVAILABILITY DURING THE FIRST THREE QUARTERS OF 1984 WAS ESTIMATED AT 90%. NO MAJOR OUTAGES OCCURRED DURING THIS TIME.

10/84	SYSTEM	744
11/84	SYSTEM	720
12/84	SYSTEM	744

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE NEW TILE INSTALLED IN THE ABSORBER OUTLET DUCT WAS WORKING SATISFACTORILY ON DUCT WALLS BUT NOT ON FLOOR AREAS OF THE DUCTING. THESE TILES WERE REPORTED TO HAVE EXPANDED AND BUCKLED. THE UTILITY DECIDED TO CUT HALF INCH LINES IN THESE TILES AND GROUT THEM WITH PENNGUARD MASTIC.

OVERALL FGD SYSTEM AVAILABILITY WAS ESTIMATED AT 90% TO 95%. NO MAJOR FGD-RELATED OUTAGES OR PROBLEMS WERE REPORTED FOR THE PERIOD.

1/85	SYSTEM	744
2/85	SYSTEM	672
3/85	SYSTEM	744
4/85	SYSTEM	720
5/85	SYSTEM	744
6/85	SYSTEM	720
7/85	SYSTEM	744
8/85	SYSTEM	744
9/85	SYSTEM	720
10/85	SYSTEM	744
11/85	SYSTEM	720
12/85	SYSTEM	744

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO FGD-RELATED OUTAGES WERE ENCOUNTERED DURING THE YEAR 1985. BOILER/TURBINE SCHEDULED OUTAGES OCCURRED ON MAY 6 - MAY 24 AND SEPTEMBER 27 - OCTOBER 6. THE UTILITY ALSO REPORTED THAT THE GUNNITE STACK LINING WAS WEARING MORE RAPIDLY THAN ANTICIPATED AND WOULD POSSIBLY NEED REPLACEMENT IN FOUR YEARS.

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

3 RIVERS ELECTRIC: GREEN 2 (CONT.)

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

'86	SYSTEM						774			
'86	SYSTEM						672			
'86	SYSTEM						774			
'86	SYSTEM						720			

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE UNIT WAS DOWN APPROXIMATELY 326 HOURS BEGINNING APRIL 13 FOR A SCHEDULED BOILER/TURBINE OUTAGE. DURING THIS PERIOD REPLACEMENT WORK WAS BEGUN ON THE FLOOR OF THE BYPASS OUTLET DUCTWORK. THE FLOOR OF THE DUCT WILL BE COMPLETELY REPLACED WITH 1/8 INCH HASTELLOY G AND FERRALUM 255. THE REMAINDER OF THE WORK WILL BE COMPLETED DURING THE FALL OUTAGE. THE SIDE WALL AND CEILING OF THE DUCTWORK WILL NOT BE REPLACED. THE CONSTRUCTION OF THAT PART OF THE DUCTWORK WILL REMAIN COR-TEN CARBON STEEL LINED WITH SAUERISEN RE-FRACTORY.

'86	SYSTEM						774			
'86	SYSTEM						720			
'86	SYSTEM						774			
'86	SYSTEM						774			

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE BOILER WAS FORCED OFF-LINE FOR 92 HOURS IN AUGUST DUE TO BOILER TUBE FAILURES AND FGD REPAIRS.

'86	SYSTEM						720			
'86	SYSTEM						774			
'86	SYSTEM						720			

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE UNIT WAS DOWN APPROXIMATELY 323 HOURS BEGINNING NOVEMBER 22 FOR A SCHEDULED BOILER/TURBINE OUTAGE. DURING THIS PERIOD, THE BYPASS OUTLET DUCTWORK REPAIRS WERE COMPLETED.

'86	SYSTEM						774			
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** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT CAME BACK ON-LINE NEAR THE BEGINNING OF DECEMBER AND OPERATED THE REMAINDER OF THE YEAR WITHOUT ANY MAJOR UNIT OR FGD-RELATED OUTAGES. THERE WAS A MINOR UNIT OUTAGE ON DECEMBER 7 WHICH LASTED ONLY 47 HOURS DUE TO A SECONDARY TUBE FAILURE.

DURING THE YEAR 1986, THE FGD SYSTEM HAD A TOTAL OF 125.3 UNPLANNED OUTAGE HOURS AND WAS IN SERVICE FOR A TOTAL OF 8343.7 HOURS.

THE UTILITY REPORTED THAT THEY HAVE BEEN OPERATING WITHOUT REHEAT SINCE MARCH OF 1985. THE IN-DIRECT HOT AIR STEAM REHEAT SYSTEM WAS REMOVED DUE TO HIGH MAINTENANCE COSTS AND ITS INABILITY TO KEEP FLUE GAS EXIT TEMPERATURES ABOVE THE DESIGNED TEMPERATURE OF 145 F. THE CURRENT EXIT GAS TEMPERATURE OUT OF THE STACK WITHOUT REHEAT IS 130 F. NO ILL EFFECTS TO THE STACK REFRACTORY LINING HAS BEEN NOTICED TO DATE. THE

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

BIG RIVERS ELECTRIC: GREEN 2 (CONT.)

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

UTILITY HAD TO MOVE THEIR OPACITY METERS TO JUST AFTER THE ID FAN DIS-
 CHARGE SINCE THE WATER DROPLETS IN THE STACK PRODUCED FALSE READINGS.
 SINCE EPA CONSIDERED THIS TO BE A MAJOR MODIFICATION TO THE SYSTEM, THE
 UTILITY WAS ALSO REQUIRED TO LOWER THEIR SO2 LIMITATIONS FROM 1.2 LB/
 MMBTU TO 0.816 LB/MMBTU.

1/87	SYSTEM	744
2/87	SYSTEM	672
3/87	SYSTEM	744

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED OUTAGES WERE ENCOUNTERED
 DURING THE PERIOD JANUARY THROUGH MARCH 1987.

4/87	SYSTEM	720
5/87	SYSTEM	744

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE UNIT UNDERWENT A SCHEDULED
 SPRING OUTAGE WHICH LASTED FROM APRIL 24 TO MAY 10.

6/87	SYSTEM	720
7/87	SYSTEM	744
8/87	SYSTEM	744
9/87	SYSTEM	720
10/87	SYSTEM	744
11/87	SYSTEM	720
12/87	SYSTEM	744

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED REPLACING FAILED STEBBINS TILE IN THE SCRUBBER
 OUTLET DUCTWORK (USUALLY THE WALLS AND CEILING) WITH PENNWALT BLOCK
 WHICH HAS BECOME A COMMON MAINTENANCE PRACTICE.

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED OUTAGES WERE ENCOUNTERED
 DURING THE PERIOD JUNE THROUGH DECEMBER 1987.

1/88	SYSTEM	774
2/88	SYSTEM	672
3/88	SYSTEM	774
4/88	SYSTEM	720
5/88	SYSTEM	774

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE UNIT WAS OFF-LINE FROM MAY 10 THROUGH MAY 24
 FOR A SCHEDULED MAINTENANCE OUTAGE. NO MAJOR FGD-RELATED PROBLEMS WERE
 ENCOUNTERED DURING THE PERIOD.

LITY FGD SURVEY: JANUARY - DECEMBER 1988

RIVERS ELECTRIC: GREEN 2 (CONT.)

-----PERFORMANCE DATA-----										
MOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
'88	SYSTEM							720		
'88	SYSTEM							774		
'88	SYSTEM							774		
'88	SYSTEM							720		
'88	SYSTEM							774		
'88	SYSTEM							720		
'88	SYSTEM							774		

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED OUTAGES WERE ENCOUNTERED DURING THE MONTHS OF JUNE THROUGH DECEMBER 1988. THE UNIT IS SCHEDULED TO BE OFF-LINE BEGINNING IN APRIL OF 1989 FOR APPROXIMATELY 47 DAYS TO RELINE THE STACK FLUE WITH TITANIUM CLADDING. UNLIKE UNIT 1, THE STACK INLET DUCT WILL NOT BE RELINED WITH TITANIUM AND UPSTREAM ABSORBER OUTLET DUCTWORK ON THE TWO ABSORBER TOWERS WILL NOT HAVE THE SDX COATING APPLIED OVER THE PENNWALT BLOCK LINING MATERIAL.

SECTION 13
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

PANY NAME	CENTRAL ILLINOIS LIGHT
NT NAME	DUCK CREEK
T NUMBER	1
Y	CANTON
TE	ILLINOIS
ULATORY CLASSIFICATION	D
TICULATE EMISSION LIMITATION - NG/J	43. (0.100 LB/MMBTU)
EMISSION LIMITATION - NG/J	516. (1.200 LB/MMBTU)
EMISSION L'IMITATION - NG/J	301. (0.700 LB/MMBTU)
PLANT GENERATING CAPACITY - MW	378
SS UNIT GENERATING CAPACITY - MW	396
UNIT GENERATING CAPACITY W/FGD - MW	366
UNIT GENERATING CAPACITY WO/FGD - MW	377
IVALENT SCRUBBED CAPACITY - MW	396
UNIT DATA - BOILER AND STACK	
BOILER SUPPLIER	RILEY STOKER
BOILER TYPE	PULVERIZED COAL
BOILER SERVICE LOAD	BASE
DESIGN BOILER FLUE GAS FLOW - CU.M/S	717.29 (1520000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	135.0 (275 F)
STACK HEIGHT - M	152. (500 FT)
STACK SHELL	CONCRETE
STACK TOP DIAMETER - M	5.8 (19.0 FT)
FUEL DATA	
FUEL TYPE	COAL
FUEL GRADE	BITUMINOUS
AVERAGE HEAT CONTENT - J/G	24181. (10396 BTU/LB)
RANGE HEAT CONTENT - BTU/LB	9800-11000
AVERAGE ASH CONTENT - %	9.12
RANGE ASH CONTENT - %	6-18
AVERAGE MOISTURE CONTENT - %	15.43
RANGE MOISTURE CONTENT - %	13-23
AVERAGE SULFUR CONTENT - %	3.40
RANGE SULFUR CONTENT - %	2.4-4.0
AVERAGE CHLORIDE CONTENT - %	0.06
RANGE CHLORIDE CONTENT - %	****
* PARTICLE CONTROL	
* MECHANICAL COLLECTOR	
NUMBER	0
TYPE	NONE
* ESP	
NUMBER	2
NUMBER OF SPARES	0
TYPE	COLD SIDE
SUPPLIER	POLLUTION CONTROL-WALTHER
INLET FLUE GAS CAPACITY - CU.M/S	358.6 (760000 ACFM)
INLET FLUE GAS TEMPERATURE - C	135.0 (275 F)
PRESSURE DROP - KPA	0.1 (1. IN-H2O)
PARTICLE REMOVAL EFFICIENCY - %	99.8
* 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	

CENTRAL ILLINOIS LIGHT: DUCK CREEK 1 (CONT.)

** GENERAL DATA	
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT
SO2 REMOVAL MODE	WET SCRUBBING
PROCESS TYPE	LIMESTONE
PROCESS ADDITIVES	DIBASIC ACID
SYSTEM SUPPLIER	ENVIRONEERING, RILEY STOKER
A-E FIRM	GILBERT/COMMONWEALTH ASSOCIATES
DEVELOPMENT LEVEL	FULL SCALE
NEW/RETROFIT	NEW
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	85.30
ENERGY CONSUMPTION - %	2.8
CURRENT STATUS	1
COMMERCIAL START-UP	8/1978
INITIAL START-UP	7/1976
CONTRACT AWARDED	8/1973
** DESIGN AND OPERATING PARAMETERS	
DESIGN COAL SULFUR CONTENT - %	3.40
DESIGN COAL HEAT CONTENT - J/G	22794.8 (9800 BTU/LB)
DESIGN COAL ASH CONTENT - %	18.00
DESIGN MOISTURE CONTENT - %	23.00
DESIGN CHLORIDE CONTENT - %	0.05
OPER. & MAINT. REQUIREMENT - MANHR/DAY	144.0
** QUENCHER/PRESATURATOR	
NUMBER	0
CONSTRUCTION MATERIAL GENERIC TYPE	NR
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR
** ABSORBER	
NUMBER	4
NUMBER OF SPARES	0
GENERIC TYPE	PACKED TOWER
SPECIFIC TYPE	ROD DECK
TRADE NAME/COMMON TYPE	VENTRI-SORBER
SUPPLIER	ENVIRONEERING, RILEY STOKER
DIMENSIONS - FT	40.0 X 5.0 X 40.0
SHELL GENERIC MATERIAL	STAINLESS STEEL; HIGH ALLOY ATOP ABSORBER!
SHELL SPECIFIC MATERIAL	AUSTENITIC; NICKEL BASE/CHROMIUM-IRON-COPPER-MOL
SHELL MATERIAL TRADE NAME/COMMON TYPE	TYPE 316L; HASTELLOY G
LINER GENERIC MATERIAL	NONE
LINER SPECIFIC MATERIAL	N/A
LINER MATERIAL TRADE NAME/COMMON TYPE	N/A
GAS CONTACTING DEVICE TYPE	ROD DECKS
NUMBER OF CONTACTING ZONES	8
LIQUID RECIRCULATION RATE - LITER/S	992. (15750 GPM)
L/G RATIO - L/CU.M	5.9 (44.5 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	3.0 (12.0 IN-H2O)
SUPERFICAL GAS VELOCITY - M/SEC	3.7 (12.0 FT/S)
INLET GAS FLOW - CU. M/S	167.05 (354000 ACFM)
INLET GAS TEMPERATURE - C	135.0 (275 F)
SO2 REMOVAL EFFICIENCY - %	85.3
** MIST ELIMINATOR	
PRE-MIST ELIMINATOR/MIST ELIMINATOR	PRIMARY COLLECTOR
NUMBER PER SYSTEM	4
NUMBER OF SPARES PER SYSTEM	0
NUMBER PER MODULE	1
GENERIC TYPE	IMPINGEMENT
SPECIFIC TYPE	BAFFLE
TRADE NAME/COMMON TYPE	CLOSED VANE
CONFIGURATION	VERTICAL
NUMBER OF STAGES	2
NUMBER OF PASSES PER STAGE	3
FREEBOARD DISTANCE - M	3.66 (12.0 FT)
DISTANCE BETWEEN STAGES - CM	121.92 (48.0 IN)
DISTANCE BETWEEN VANES - CM	6.3 (2.50 IN)
VANE ANGLES - DEGREES	90
PRESSURE DROP - KPA	0.2 (1.0 IN-H2O)
SUPERFICAL GAS VELOCITY - M/S	4.0 (13.0 FT/S)

LITY FGD SURVEY: JANUARY - DECEMBER 1988

ITRAL ILLINOIS LIGHT: DUCK CREEK 1 (CONT.)

CONSTRUCTION MATERIAL GENERIC TYPE	HIGH ALLOY
CONSTRUCTION MATERIAL SPECIFIC TYPE	NICKEL BASE/CHROMIUM-IRON-COPPER-MOLYBDENUM
WASH WATER SOURCE	SUPERNATANT
WASH FREQUENCY	EVERY 20 MINUTES
WASH RATE - L/S	102.8 (1630 GAL/MIN)
REHEATER	
NUMBER	0
GENERIC TYPE	NONE
SPECIFIC TYPE	N/A
TRADE NAME/COMMON TYPE	N/A
CONSTRUCTION MATERIAL GENERIC TYPE	N/A
CONSTRUCTION MATERIAL SPECIFIC TYPE	N/A
FANS	
NUMBER	4
NUMBER OF SPARES	0
DESIGN	CENTRIFUGAL
SUPPLIER	BUFFALO FORGE
FUNCTION	UNIT
APPLICATION	FORCED DRAFT
SERVICE	DRY
FLUE GAS FLOW RATE - CU.M/S	167.05 (354000 ACFM)
FLUE GAS TEMPERATURE - C	135.0 (275 F)
PRESSURE DROP - KPA	11.6 (38.0 IN-H2O)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL
DAMPERS	
NUMBER	4
FUNCTION	SHUT-OFF
GENERIC TYPE	LOUVER
SPECIFIC TYPE	PARALLEL BLADE MULTILOUVER
MANUFACTURER	AMERICAN STANDARD
SEAL AIR FLOW - CU. M/S	1.96 (4150 ACFM)
SERVICE CONDITIONS	450
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL
CONSTRUCTION MATERIAL SPECIFIC TYPE	AISI 1110
LINER GENERIC MATERIAL TYPE	NONE
LINER SPECIFIC MATERIAL TYPE	N/A
DAMPERS	
NUMBER	8
FUNCTION	SHUT-OFF
GENERIC TYPE	GUILLOTINE
SPECIFIC TYPE	NR
MANUFACTURER	ENVIRONMENTAL ELEMENTS
SEAL AIR FLOW - CU. M/S	0.57 (1200 ACFM)
SERVICE CONDITIONS	450
CONSTRUCTION MATERIAL GENERIC TYPE	HIGH ALLOY
CONSTRUCTION MATERIAL SPECIFIC TYPE	NICKEL BASE/CHROMIUM-IRON-COPPER-MOLYBDENUM
LINER GENERIC MATERIAL TYPE	NONE
LINER SPECIFIC MATERIAL TYPE	N/A
* DAMPERS	
NUMBER	1
FUNCTION	SHUT-OFF
GENERIC TYPE	LOUVER
SPECIFIC TYPE	PARALLEL BLADE MULTILOUVER
MANUFACTURER	AMERICAN STANDARD
SEAL AIR FLOW - CU. M/S	0.00 (0 ACFM)
SERVICE CONDITIONS	450
CONSTRUCTION MATERIAL GENERIC TYPE	HIGH ALLOY
CONSTRUCTION MATERIAL SPECIFIC TYPE	NICKEL BASE/CHROMIUM-IRON-COPPER-MOLYBDENUM
LINER GENERIC MATERIAL TYPE	NONE
LINER SPECIFIC MATERIAL TYPE	N/A
* DAMPERS	
NUMBER	1
FUNCTION	CONTROL
GENERIC TYPE	LOUVER
SPECIFIC TYPE	PARALLEL BLADE MULTILOUVER

CENTRAL ILLINOIS LIGHT: DUCK CREEK 1 (CONT.)

MANUFACTURER	AMERICAN STANDARD
SEAL AIR FLOW - CU. M/S	0.00 (0 ACFM)
SERVICE CONDITIONS	NR
CONSTRUCTION MATERIAL GENERIC TYPE	HIGH ALLOY
CONSTRUCTION MATERIAL SPECIFIC TYPE	NICKEL BASE/CHROMIUM-IRON-COPPER-MOLYBDENUM
LINER GENERIC MATERIAL TYPE	NONE
LINER SPECIFIC MATERIAL TYPE	N/A
** DAMPERS	
NUMBER	8
FUNCTION	CONTROL
GENERIC TYPE	NR
SPECIFIC TYPE	NR
MANUFACTURER	BUFFALO FORGE
SERVICE CONDITIONS	NR
CONSTRUCTION MATERIAL GENERIC TYPE	NR
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR
LINER GENERIC MATERIAL TYPE	NONE
LINER SPECIFIC MATERIAL TYPE	N/A
** DAMPERS	
NUMBER	4
FUNCTION	SHUT-OFF
GENERIC TYPE	LOUVER
SPECIFIC TYPE	PARALLEL BLADE MULTILOUVER
MANUFACTURER	AMERICAN STANDARD
SEAL AIR FLOW - CU. M/S	1.96 (4150 ACFM)
SERVICE CONDITIONS	700
CONSTRUCTION MATERIAL GENERIC TYPE	NR
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR
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 & BYPASS
CONFIGURATION	CIRCULAR
SHELL GENERIC MATERIAL TYPE	HIGH ALLOY
SHELL SPECIFIC MATERIAL TYPE	NICKEL BASE/CHROMIUM-IRON-COPPER-MOLYBDENUM
LINER GENERIC MATERIAL TYPE	NONE
LINER SPECIFIC MATERIAL TYPE	N/A
** DUCTWORK	
LOCATION	TRANSITION DUCT AT BASE OF STACK
CONFIGURATION	CIRCULAR TO SQUARE
SHELL GENERIC MATERIAL TYPE	HIGH ALLOY
SHELL SPECIFIC MATERIAL TYPE	NICKEL BASE/CHROMIUM-IRON-COPPER-MOLYBDENUM
LINER GENERIC MATERIAL TYPE	NONE
LINER SPECIFIC MATERIAL TYPE	N/A
** REAGENT PREPARATION EQUIPMENT	
FUNCTION	WET BALL MILL
DEVICE	COMPARTMENTED
DEVICE TYPE	NR
MANUFACTURER	KENNEDY VAN SAUN
NUMBER	1
NUMBER OF SPARES	0
FULL LOAD DRY FEED CAPACITY - M.TONS/HR	36.3 (40 TPH)
PRODUCT QUALITY - % SOLIDS	35.0

ILITY FGD SURVEY: JANUARY - DECEMBER 1988
 NTRAL ILLINOIS LIGHT: DUCK CREEK 1 (CONT.)

* TANKS	
SERVICE	NUMBER
-----	-----
ABSORBER RECYCLE	4
WASTE SLURRY BLEED	1
REAGENT PREP PRODUCT	1
MIST ELIMINATOR WASH	4
MILL SLURRY	1
* PUMPS	
SERVICE	NUMBER
-----	-----
POND RETURN	2
MIST ELIMINATOR WASH	8
ABSORBER RECIRCULATION	12
SLURRY TRANSFER	2
MILL SLURRY	2
* SOLIDS CONCENTRATING/DEWATERING	
DEVICE	NONE
* SALEABLE BYPRODUCTS	
NATURE	NONE
DISPOSITION	N/A
* 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	CLAY LINING
SITE DIMENSIONS	57 ACRES
SITE CAPACITY - CU.M	125969 (103.0 ACRE-FT)
SITE SERVICE LIFE - YRS	5
* PROCESS CONTROL AND INSTRUMENTATION	
PROCESS STREAM	ABSORBER RECYCLE
CHEMICAL PARAMETERS	PH
PHYSICAL VARIABLES	PERCENT SOLIDS, LIQUID LEVEL
CONTROL LEVELS	PH 6.0 AT INLET, 5.5 AT OUTLET
MONITOR LOCATION	RECYCLE TANK
PROCESS CONTROL MANNER	AUTOMATIC
PROCESS CHEMISTRY MODE	FEEDBACK
** WATER BALANCE	
WATER LOOP TYPE	CLOSED
RECEIVING WATER STREAM	NONE
MAKEUP WATER ADDITION - LITERS/S	37.8 (600 GPM)
* CHEMICALS AND CONSUMPTION	
FUNCTION	ABSORBENT
NAME	LIMESTONE
PRINCIPAL CONSTITUENT	95% CaCO3
CONSUMPTION	40 TPH
UTILIZATION - %	67.0
POINT OF ADDITION	RECYCLE TANK

CENTRAL ILLINOIS LIGHT: DUCK CREEK 1 (CONT.)

** FGD SPARE CAPACITY INDICES	
ABSORBER - %	0.0
MIST ELIMINATOR - %	0.0
FAN - %	0.0
BALL MILL - %	0.0
EFFLUENT HOLD TANK - %	0.0
RECIRCULATION PUMP - %	33.0
** FGD SPARE COMPONENT INDICES	
ABSORBER	0.0
MIST ELIMINATOR	0.0
FAN	0.0
BALL MILL	0.0
EFFLUENT HOLD TANK	0.0
RECIRCULATION PUMP	4.0

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

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER BOILER HOURS	FGD HOURS	CAP. HOURS	FGD CAP. FACTOR
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7/76	SYSTEM				1.1	91.60	744		8	
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** PROBLEMS/SOLUTIONS/COMMENTS

CONSTRUCTION OF DUCK CREEK 1 BEGAN IN EARLY 1972 AND WAS VIRTUALLY COMPLETED BY SPRING 1976. COMMERCIAL OPERATION WAS INITIATED IN JUNE 1976 WITH THE ESP MODULES IN THE GAS PATH. THE FIRST MODULE OF THE 4-MODULE SCRUBBING SYSTEM WAS INSTALLED BY JUNE 1976 AND START-UP FOR SHAKEDOWN/DEBUGGING PURPOSES OCCURRED IN JULY 1976. THE REMAINING THREE MODULES WILL BE INSTALLED LATER WITH A 4-MODULE START-UP SCHEDULED FOR THE SUMMER OF 1978.

INITIAL OPERATION OF THE FIRST SCRUBBER MODULE FOR SHAKEDOWN AND DEBUGGING PURPOSES OCCURRED DURING THE MONTH. LIMITED SERVICE TIME RESULTED FROM PROBLEMS WITH BAD WELDS, FAULTY PIPE HANGERS, AND ABSORBER LEAKS.

8/76	SYSTEM				2.4		744		18	
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** PROBLEMS/SOLUTIONS/COMMENTS

LIMITED OPERATIONS CONTINUED THROUGHOUT AUGUST BECAUSE OF THE START-UP AND CONSTRUCTION PROBLEMS MENTIONED FOR JULY, 1976. THE MODULE WAS TAKEN OUT OF THE GAS PATH AT THIS POINT TO CONCENTRATE ON RESOLVING THESE PROBLEM AREAS.

9/76	SYSTEM				50.0		744		360	
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** PROBLEMS/SOLUTIONS/COMMENTS

MODULE RESTART OCCURRED ON SEPTEMBER 9. OPERATION CONTINUED THROUGHOUT THE REMAINDER OF THE MONTH ON AN INTERMITTANT BASIS. MAJOR PROBLEMS INCLUDED PIPE BREAKING, PUMP LINER FAILURES, PLUGGING AND SCALING OF MIST ELIMINATORS, AND SOME BOILER-RELATED PROBLEMS. THE MODULE REMAINED IN SERVICE FOR APPROXIMATELY 15 DAYS OF NON-CONTINUOUS OPERATION. THE ESP MODULES HAVE REMAINED IN SERVICE WITHOUT THE OCCURRENCE OF ANY MAJOR PROBLEMS.

10/76	SYSTEM				51.8		744		385	
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** PROBLEMS/SOLUTIONS/COMMENTS

TOTAL OPERATION TIME DURING THE MONTH WAS APPROXIMATELY 16 DAYS (NON-CONTINUOUS). THE MAJOR PROBLEM AREA WAS THE CONTINUATION OF MASSIVE SCALE DEVELOPMENT ON THE MIST ELIMINATORS, RESULTING IN PLUGGING OF THE PIPING AND NOZZLES TO THE COMPONENTS SPRAY SYSTEM.

11/76	SYSTEM				3.3		720		24	
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LITY FGD SURVEY: JANUARY - DECEMBER 1988
 TRAL ILLINOIS LIGHT: DUCK CREEK 1 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

SPORADIC OPERATION RESULTED FROM CONTINUED SCALING PROBLEMS IN THE MIST ELIMINATOR SECTION. RILEY AND CILCO INITIATED MODIFICATIONS TO THE DESIGN OF THE MODULE. SPECIFICALLY, A ROD DECK WAS CHANGED IN THE ABSORBER, PRESSURE DROP ACROSS THE ABSORBER WAS INCREASED, PIPING AND PUMP LINER MATERIALS WERE MODIFIED/REPLACED, AND A FRESH WATER WASH SYSTEM WAS INSTALLED FOR THE MIST ELIMINATOR.

76 SYSTEM 0.0 744 0

** PROBLEMS/SOLUTIONS/COMMENTS

THE MODULE REMAINED OUT OF SERVICE THE ENTIRE MONTH. DURING THIS TIME, THE BOILER FIRED LOW SULFUR (0.6%) KENTUCKY COAL.

77 SYSTEM 0.0 744 0 0 0.0

77 SYSTEM 0.0 672 0 0 0.0

** PROBLEMS/SOLUTIONS/COMMENTS

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

77 SYSTEM 47.0 744 350

** PROBLEMS/SOLUTIONS/COMMENTS

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

THE MIST ELIMINATOR SPRAY WASH SYSTEM PIPING WAS CHANGED FROM PVC TO FRP MATERIALS. ALSO, AN ADDITIONAL SPRAY HEADER WAS ADDED.

THE SLURRY CIRCULATION SYSTEM WAS REVAMPED.

NEOPRENE PUMP LINERS HAVE REPLACED THE ORIGINAL RUBBER LINERS.

FLUSH/DRAIN SYSTEMS HAVE BEEN INCLUDED TO MINIMIZE SOLIDS BUILD UP.

PIPING VALVES MOVED CLOSER TO THE RECYCLE TANK.

SLURRY STORAGE TANKS EQUIPPED WITH FLUSH/DRAIN SYSTEMS.

ADDITIONAL MIXERS ADDED FOR GREATER AGITATION TO PROMOTE PROCESS CHEMISTRY.

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

/77 SYSTEM 0.0 720 0

/77 SYSTEM 0.0 744 0

/77 SYSTEM 0.0 720 0

/77 SYSTEM 0.0 744 0

/77 SYSTEM 0.0 744 0

/77 SYSTEM 0.0 720 0

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

CENTRAL ILLINOIS LIGHT: DUCK CREEK 1 (CONT.)

-----PERFORMANCE DATA-----											
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
10/77	SYSTEM				0.0			744		0	
11/77	SYSTEM				0.0			720		0	
12/77	SYSTEM				0.0			744		0	
1/78	SYSTEM				0.0			744		0	
2/78	SYSTEM				0.0			672		0	
3/78	SYSTEM				0.0			744		0	
4/78	SYSTEM				0.0			720		0	
5/78	SYSTEM				0.0			744		0	
6/78	SYSTEM				0.0			720	0	0	0.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT CONTINUED TO FIRE LOW-SULFUR COLORADO COAL DURING THE REPORT PERIOD. THE RESTART OF SCRUBBER OPERATIONS CONTINUES TO BE SCHEDULED FOR AUGUST 1978.

7/78 SYSTEM

720

** PROBLEMS/SOLUTIONS/COMMENTS

ALL FOUR MODULES BECAME OPERATIONAL ON JULY 24.

MODIFICATIONS WERE MADE TO THE UNDER DESIGNED SLURRY TRANSFER TANK.

A PLUGGING PROBLEM CAUSED BY COAL FINES IN THE SLURRY WAS EXPERIENCED. THE FINES RESULTED FROM A COMMON COAL AND LIMESTONE HANDLING SYSTEM.

8/78	SYSTEM	45.0	46.0	46.0	42.0	744	691	315	62.5
9/78	SYSTEM	46.0	46.0	46.0	44.0	720	691	317	62.5

** PROBLEMS/SOLUTIONS/COMMENTS

SCREEN BASKETS WERE USED TO KEEP COAL PARTICLES FROM THE LIMESTONE. THE COAL PARTICLES RESULT FROM THE COMMON COAL-LIMESTONE HANDLING SYSTEM.

THE SLURRY TRANSFER SYSTEM PREVENTED PROPER SLURRY FLOW DUE TO UNDER DESIGN. THE OLD SYSTEM WAS REPLACED WITH A NEW PIPING SYSTEM.

PLUGGING OF THE RECYCLE PUMP SHUT-OFF VALVES OCCURED. THE VALVES ARE BEING REPLACED WITH PINCH VALVES.

THE SCRUBBER WASTE WATER SUMP PUMPS HAVE BEEN PLUGGING. NEW PUMPS ARE BEING INVESTIGATED.

10/78	A	19.1	31.6	31.6	19.1				
	B	22.5	37.2	37.2	22.5				
	C	0.8	1.3	1.3	0.8				
	D	20.5	33.9	33.9	20.5				
	SYSTEM	15.7	26.0	26.0	15.7	744	449	117	32.9

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

** PROBLEMS/SOLUTIONS/COMMENTS

THE MAJOR CAUSES FOR DOWNTIME OCCURRING IN OCTOBER WERE VALVE LEAKS AND SUBSEQUENT RECYCLE GLAND SEAL CONTAMINATION AND THE INSTALLATION OF A LIQUID/SOLID SEPARATOR.

A LEAKING VALVE RESULTED IN CONTAMINATION OF THE RECYCLE PUMP GLAND SEAL WATER SYSTEM WITH POND RETURN WATER CAUSING SCALING AND PLUGGING FORCING SHUTDOWN OF THE RECYCLE PUMPS. A NEW VALVE SYSTEM WAS INSTALLED AND THE OPERATING PRESSURES WERE CHANGED TO PREVENT RECURRENCE OF THE CONTAMINATION.

THE RECYCLE PUMPS WERE SHUT DOWN WHEN CONTAMINATION OF THE GLAND SEAL WATER SYSTEM CAUSED BY A FAULTY VALVE OCCURRED.

A FLOW CONTROL VALVE ON THE D-MODULE WAS REMOVED BECAUSE IT CAUSED ABRASION AND FAILURE OF THE RECYCLE HEADER. NONE OF THE MODULES NOW UTILIZE FLOW CONTROL VALVES.

THE MIST ELIMINATOR SPRAY NOZZLES PLUGGED BY COAL PARTICLES WERE CLEANED THE COAL PARTICLES RESULT FROM A COMMON COAL/LIMESTONE HANDLING SYSTEM. A LIQUID/SOLID SEPARATOR HAS BEEN INSTALLED IN THE SLURRY SYSTEM TO PREVENT RECURRENCE.

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

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

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

** PROBLEMS/SOLUTIONS/COMMENTS

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

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

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

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

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

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

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

CENTRAL ILLINOIS LIGHT: DUCK CREEK 1 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

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

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

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

1/79	SYSTEM	0.0	0.0	0.0	0.0	744	738	0	77.0
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** PROBLEMS/SOLUTIONS/COMMENTS

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

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

2/79	SYSTEM	0.0	0.0	0.0	0.0	672	533	0	63.8
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** PROBLEMS/SOLUTIONS/COMMENTS

RECYCLE PUMP SUCTION VALVE FAILURES AND A SLURRY TRANSFER PUMP FAILURE
 CONTRIBUTED TO THE NON-OPERATION OF THE FGD SYSTEM.

FROZEN MIST ELIMINATOR DRAINS, ABSORBER DRAINS AND INSTRUMENT LINES WERE
 A MAJOR PROBLEM DURING FEBRUARY.

3/79	A	33.7	31.1	31.1	31.1				
	B	6.7	6.7	6.7	6.7				
	C	0.0	0.0	0.0	0.0				
	D	0.0	0.0	0.0	0.0				
	SYSTEM	10.1	9.5	9.5	9.5	744	744	70	

** PROBLEMS/SOLUTIONS/COMMENTS

FREEZING PROBLEMS CONTINUED TO HAMPER FGD OPERATIONS DURING MARCH. THE
 C AND D MODULE WERE STILL NOT BACK IN SERVICE DUE TO MAJOR CLEAN-UP FROM
 THE FREEZING PROBLEMS.

BROKEN MIST ELIMINATOR SPRAY LINES AND PLUGGED MIST ELIMINATOR NOZZLES
 WERE PROBLEM AREAS DURING MARCH.

RECYCLE PUMP FAILURES AND WASTE WATER PUMP FAILURES WERE EXPERIENCED
 DURING MARCH.

PLUGGED SLURRY NOZZLES AND GENERAL INSTRUMENTATION PROBLEMS WERE REPORTED
 BY THE UTILITY.

4/79	A	100.0	71.9	60.0	67.3				
	B	84.3	50.5	75.0	47.3				
	C	86.5	81.2	84.9	76.0				
	D	21.3	22.7	21.3	21.3				
	SYSTEM	73.0	56.6	70.3	53.0	720	674	380	55.9

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

CENTRAL ILLINOIS LIGHT: DUCK CREEK 1 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

INLET DAMPER MALFUNCTIONS HINDERED FGD OPERATION DURING APRIL.
 PLUGGED MIST ELIMINATOR SPRAY NOZZLES DURING APRIL HINDERED FGD OPERATION.
 SLURRY CONTROL VALVE MALFUNCTIONS WERE REPORTED BY THE UTILITY.
 RECYCLE TANK MIXER FAILURES WERE EXPERIENCED DURING APRIL.
 RECYCLE PUMP BELT AND BEARING FAILURES AND SLURRY SUPPLY LINE FAILURES
 WERE REPORTED BY THE UTILITY.

1/79	A	95.7	37.4	69.7	9.9				
	B	95.7	44.2	73.2	11.7				
	C	94.7	41.8	71.1	11.1				
	D	1.3	5.0	1.3	1.3				
	SYSTEM	71.9	32.1	53.8	8.5	744	197	63	14.8

** PROBLEMS/SOLUTIONS/COMMENTS

MIST ELIMINATOR PUMP MALFUNCTIONS WERE REPORTED DURING MAY. MODULE D
 WAS UNAVAILABLE DUE TO A MIST ELIMINATOR WASH LINE FAILURE.
 MILL SHAKER BASKET DRIVE MOTOR FAILURES WERE ENCOUNTERED.
 SLURRY SUPPLY LINE FAILURES OCCURRED DURING THE MONTH.
 STACK LINER BLISTERING WAS DISCOVERED DURING A SPRING INSPECTION. RE-
 PAIRS WERE MADE. THE STACK WILL BE INSPECTED AGAIN IN MARCH 1980.

1/79	A	81.9	76.9	79.6	70.6				
	B	89.2	86.9	88.1	79.8				
	C	86.6	83.0	85.1	76.2				
	D	92.0	90.0	91.1	82.7				
	SYSTEM	87.4	84.2	86.0	77.3	720	661	557	70.0

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JUNE SOME PROBLEMS WITH THE MIST ELIMINATOR WERE ENCOUNTERED. THESE
 PROBLEMS INCLUDED PLUGGING IN THE MIST ELIMINATOR AND THE MIST ELIMINATOR
 LINES AND A BROKEN MIST ELIMINATOR RETURN LINE.
 THE UTILITY REPORTED STORAGE PUMP LEAKS, RECYCLE PUMP FAILURES, SLURRY
 SUPPLY LINE PLUGGING AND DAMPER AND MILL SHAKER BASKET FAILURES.

1/79	A	93.1	85.6	89.7	59.9				
	B	94.9	88.3	92.3	61.7				
	C	95.8	87.9	93.6	61.5				
	D	96.1	86.4	93.9	60.4				
	SYSTEM	95.0	87.1	92.4	60.9	744	520	453	48.7

** PROBLEMS/SOLUTIONS/COMMENTS

IN JULY THE MIST ELIMINATOR PLUGGED CAUSING OPERATIONAL PROBLEMS.
 RECYCLE PUMP FAILURES WERE ENCOUNTERED DURING THE PERIOD.

1/79	A	3.0	4.0	3.0	3.0				
	B	26.1	31.4	24.0	23.4				
	C	13.6	18.3	13.6	13.6				
	D	9.5	12.7	9.5	9.5				
	SYSTEM	13.1	16.6	12.5	12.4	744	555	92	53.8

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

CENTRAL ILLINOIS LIGHT: DUCK CREEK 1 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

IN AUGUST THE MIST ELIMINATOR AND THE MIST ELIMINATOR DRAIN LINES PLUGGED CAUSING EXTENSIVE DOWNTIME FOR MODULE CLEANING.

FAILURES WITH THE LIMESTONE SLURRY FORWARDING PUMP AND THE RECYCLE PUMP WERE ENCOUNTERED.

DAMPER MALFUNCTIONS WERE REPORTED BY THE UTILITY.

9/79	A	63.9	53.9	58.0	49.8				
	B	61.2	48.4	53.5	44.7				
	C	49.0	38.9	41.4	35.9				
	D	88.8	86.2	87.6	79.6				
	SYSTEM	65.7	56.9	60.1	52.5	720	665	378	69.1

** PROBLEMS/SOLUTIONS/COMMENTS

PLUGGING IN THE MIST ELIMINATOR, MIST ELIMINATOR HEADER AND NOZZLES WERE ENCOUNTERED IN AUGUST CONTINUED IN SEPTEMBER.

THE DAMPER FAILED CAUSING A PROBLEM DURING SEPTEMBER.

THE UTILITY REPORTED MIST ELIMINATOR PUMP CAVITATION PROBLEMS RELATED TO MIST ELIMINATOR PROBLEMS ENCOUNTERED IN AUGUST.

PLUGGED SLURRY NOZZLES AND LIMESTONE CONVEYOR FAILURES CONTRIBUTED TO THE OUTAGES EXPERIENCED.

SCRUBBER UNAVAILABILITY WAS PRIMARILY A RESULT OF CARRY-OVER PLUGGING PROBLEMS FROM AUGUST AND SUBSEQUENT CLEAN-UP.

10/79	A	84.8	82.3	89.2	82.3				
	B	93.7	86.2	92.4	86.2				
	C	91.7	75.8	90.5	75.8				
	D	93.5	91.9	93.4	91.9				
	SYSTEM	90.9	84.1	91.4	84.1	744	744	625	72.4

** PROBLEMS/SOLUTIONS/COMMENTS

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

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

THE SLURRY SUPPLY LINE NEEDED REPAIRS.

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

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE ISOLATION DAMPER PROBLEMS CONTINUED DURING NOVEMBER.

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

ALL RECYCLE PUMP SUCTION VALVES WERE REPLACED DURING THE MONTH. THIS

LITY FGD SURVEY: JANUARY - DECEMBER 1988

TRAL ILLINOIS LIGHT: DUCK CREEK 1 (CONT.)

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

WAS THE PRIMARY CAUSE FOR THE LOW SYSTEM AVAILABILITY.

SLURRY SUPPLY LINES FAILED AGAIN, DURING NOVEMBER.

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

** PROBLEMS/SOLUTIONS/COMMENTS

THE ISOLATION DAMPER FAILURES CONTINUED.

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

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

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

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

** PROBLEMS/SOLUTIONS/COMMENTS

MOST OF THE JANUARY OUTAGE TIME WAS REQUIRED FOR RECYCLE TANK COVERING WORK.

THE MIST ELIMINATOR SECTION PLUGGED ALONG WITH THE NOZZLES HINDERING SYSTEM OPERATIONS. THE MIST ELIMINATOR DRAIN LINE WAS MODIFIED ALSO CAUSING OUTAGE TIME.

OTHER PROBLEMS ENCOUNTERED DURING THE MONTH INCLUDED A PLUGGED LIMESTONE FEEDER, INLET DAMPER PROBLEMS, SLURRY SUPPLY HEADER LEAKS AND STORAGE PUMP DISCHARGE VALVE REPAIRS.

80	A	11.8	11.8	12.5	11.8				
	B	72.7	72.7	73.5	72.7				
	C	70.7	70.7	71.5	70.7				
	D	41.3	41.3	47.9	41.3				
	SYSTEM	49.1	49.1	51.4	49.1	696	696	342	73.5

** PROBLEMS/SOLUTIONS/COMMENTS

DURING FEBRUARY SOME OUTAGE TIME WAS DUE TO MODULE D CLEANING AND THE CLEANING OF THE MODULE D MIST ELIMINATOR SECTION.

THE INLET DAMPER DRIVE WAS REPLACED DURING THE MONTH.

REPAIR OF THE FIBERGLASS ON THE SLURRY RECYCLE LINE HINDERED OPERATIONS DURING THIS MONTH.

THE MODULES A AND D RECYCLE DISCHARGE VALVE WERE REPLACED CAUSING EXTENSIVE DOWN TIME.

'80	A	52.9	62.5	64.7	52.9
	B	73.2	86.6	86.9	73.2

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

CENTRAL ILLINOIS LIGHT: DUCK CREEK 1 (CONT.)

-----PERFORMANCE DATA-----										
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PER PART.	BOILER HOURS	FGD HOURS	CAP. HOURS FACTOR
	C	51.0	60.3	60.5	51.0					
	D	34.0	40.2	45.9	34.0					
	SYSTEM	52.8	62.4	65.1	52.8		744	629	393	68.6

** PROBLEMS/SOLUTIONS/COMMENTS

DURING MARCH NEW RECYCLE PUMP DISCHARGE VALVES WERE INSTALLED IN ORDER TO ELIMINATE RESTRICTED FLOW OF THE OLD VALVES.

CARRIER BEARINGS ON THE INLET DAMPER WERE REPLACED IN ORDER TO MAINTAIN MODULE ISOLATION CAPABILITY.

THE MIST ELIMINATOR WASH SYSTEM WAS CONVERTED TO RETURN WATER IN ORDER TO ACHIEVE A HIGHER QUALITY ELIMINATION WASH WATER.

FIBERGLASS LINES ON THE RECYCLE PUMP DISCHARGE WERE ALSO REPAIRED DURING EXTENSIVE

4/80	A	53.0	81.7	95.9	52.9					
	B	54.2	83.6	87.5	54.2					
	C	57.2	88.3	95.3	57.2					
	D	26.0	40.1	71.9	26.0					
	SYSTEM	47.6	73.4	89.2	47.6		720	466	342	35.3

** PROBLEMS/SOLUTIONS/COMMENTS

THE MAJOR PROBLEM HINDERING SYSTEM OPERATIONS DURING APRIL WAS THE REBUILD OF THE RECYCLE TANK MIXER.

MINOR PROBLEMS DURING THE MONTH WERE CAUSED BY THE INOPERABILITY OF THE LIMESTONE HANDLING SYSTEM.

5/80	A	44.6	68.6	72.0	44.6					
	B	45.7	70.3	73.5	45.7					
	C	34.7	53.3	59.1	34.7					
	D	43.6	67.0	73.9	43.6					
	SYSTEM	42.1	64.8	69.7	42.1		744	484	314	49.4

** PROBLEMS/SOLUTIONS/COMMENTS

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

EXPANSION JOINT LEAKS WERE ALSO REPAIRED DURING THE MONTH.

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

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

** PROBLEMS/SOLUTIONS/COMMENTS

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

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

7/80	A	91.2	81.0	87.6	70.1					
	B	83.5	70.0	80.0	60.6					

LITY FGD SURVEY: JANUARY - DECEMBER 1988
 TRAL ILLINOIS LIGHT: DUCK CREEK 1 (CONT.)

-----PERFORMANCE DATA-----									
100	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART. HOURS	PER BOILER HOURS	FGD CAP. HOURS FACTOR
	C	90.5	78.8	86.4	68.2				
	D	87.5	74.9	85.4	64.8				
	SYSTEM	88.2	76.2	84.9	65.9		744	644	490 67.4

** PROBLEMS/SOLUTIONS/COMMENTS

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

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

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

** PROBLEMS/SOLUTIONS/COMMENTS

THE SLURRY SUPPLY ISOLATION VALVE WAS REPAIRED IN AUGUST.

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

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

80	A	43.1	39.2	41.5	39.2				
	B	47.8	47.2	48.2	47.2				
	C	45.6	43.2	45.9	43.2				
	D	46.3	46.0	47.6	46.0				
	SYSTEM	45.6	43.9	45.9	43.9		720	720	316 81.3

** PROBLEMS/SOLUTIONS/COMMENTS

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

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

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

** PROBLEMS/SOLUTIONS/COMMENTS

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

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

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

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

CENTRAL ILLINOIS LIGHT: DUCK CREEK 1 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

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

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

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

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

** PROBLEMS/SOLUTIONS/COMMENTS

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

1/81	A	92.2	92.1	94.9	92.1				
	B	94.9	94.9	97.8	94.8				
	C	94.2	94.1	98.0	94.1				
	D	88.6	88.6	94.4	88.6				
	SYSTEM	92.5	92.4	96.3	92.4	744	744	687	77.9

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JANUARY SOME OUTAGE TIME WAS DUE TO THE PLUGGING OF THE RECYCLE TANK PUMP SUCTION SCREENS.

REPAIRS WERE MADE TO THE INLET DAMPER OF MODULE C AND THE RECYCLE TANK PUMP OF MODULE D DURING THE MONTH.

2/81	A	95.2	95.8	100.0	94.2				
	B	80.2	81.5	96.9	80.2				
	C	95.1	95.6	100.0	94.0				
	D	94.0	94.6	99.8	93.0				
	SYSTEM	91.1	91.8	99.2	90.3	672	661	607	59.3

** PROBLEMS/SOLUTIONS/COMMENTS

DURING FEBRUARY PROBLEMS WERE ENCOUNTERED THAT NECESSITATED REPAIRS TO THE LIMESTONE CONVEYOR BELT AND THE SLURRY SUPPLY TANK AND LINES.

3/81	A	93.8	88.5	91.6	85.1				
	B	82.5	79.9	84.7	76.9				
	C	84.7	81.5	85.5	78.4				
	D	86.8	84.1	90.8	80.8				
	SYSTEM	86.9	83.5	88.2	80.2	744	715	597	68.4

** PROBLEMS/SOLUTIONS/COMMENTS

DURING MARCH OUTAGE TIME WAS DUE TO THE REPLACEMENT OF THE LIMESTONE MILL HIGH LIFT PUMP AND THE SLURRY STORAGE TANK PUMP, BOTH LIMITING THE LIMESTONE SLURRY SUPPLY. THE RECYCLE TANK PUMP ON MODULE C WAS ALSO REPLACED.

ADDITIONAL OUTAGE TIME WAS CAUSED BY PLUGGING IN THE MIST ELIMINATOR SECTION OF ALL THE MODULES.

LITY FGD SURVEY: JANUARY - DECEMBER 1988
 TRAL ILLINOIS LIGHT: DUCK CREEK 1 (CONT.)

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

81	A		26.2	27.1	28.1	23.3					
	B		27.1	28.1	29.5	24.2					
	C		44.8	29.1	30.2	25.0					
	D		52.1	28.4	29.5	24.4					
	SYSTEM		37.5	28.1	29.2	24.2		720	619	174	58.6

** PROBLEMS/SOLUTIONS/COMMENTS

EXTENSIVE PLUGGING THROUGHOUT EACH MODULE WAS OBSERVED AT THE BEGINNING OF APRIL, RESULTING IN THE NEED FOR EXTENSIVE MAINTENANCE CLEANING, REPAIRS, AND UPGRADING OF EACH MODULE. THE MODULES WERE TAKEN OUT OF SERVICE TWO AT A TIME SO THAT THE WORK COULD BE PERFORMED.

THE ISOLATION DAMPERS ON ALL FOUR MODULES HAVE BEEN A CONTINUAL PROBLEM. THE DAMPERS STICK AND FAIL TO SEAL TIGHTLY RESULTING IN GASEOUS CONDITIONS FOR MAINTENANCE CREWS. THE UTILITY IS PRESENTLY INVESTIGATING THE SITUATION.

81	A	68.7	67.0	69.1	65.9					
	B	68.1	66.4	69.2	65.3					
	C	76.4	69.9	71.4	68.7					
	D	71.4	69.8	73.4	68.5					
	SYSTEM	69.9	68.3	70.8	67.1		744	731	499	64.0

** PROBLEMS/SOLUTIONS/COMMENTS

DURING MAY MAJOR REPAIR TO THE MODULE C FAN RESULTED IN LOW SYSTEM AVAILABILITY DUE TO THE NEED FOR BYPASSING AROUND THE MODULE. PROBLEMS WITH OPERATION OF THE MODULE C ISOLATION DAMPER AS WELL AS EXPANSION JOINT LEAKAGE, RESULTED IN GASEOUS WORKING CONDITIONS SUCH THAT REPAIR WORK COULD NO BE PERFORMED WITH THE SCRUBBER IN SERVICE.

PROBLEMS PERSIST WITH ALL THE ISOLATION DAMPERS.

'81	1	69.9	60.0	67.4	51.5					
	B	71.3	63.9	71.2	54.8					
	C	72.4	65.2	70.5	55.9					
	D	70.3	61.6	69.5	52.9					
	SYSTEM	71.0	62.7	69.6	53.8		720	618	387	52.8

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JUNE WORK ON THE MODULE C ID FAN CONTINUED. DUE TO THE CONTINUAL DAMPER PROBLEMS THE MODULE WAS TAKEN OUT OF SERVICE SO THAT THE REPAIRS COULD BE COMPLETED.

'81	A	78.2	62.4	73.0	53.4					
	B	75.8	62.3	75.7	53.2					
	C	80.5	64.2	75.1	54.8					
	D	53.6	62.7	75.1	53.6					
	SYSTEM	72.0	62.9	74.7	53.8		744	636	400	56.4

** PROBLEMS/SOLUTIONS/COMMENTS

PROBLEMS WITH OPERATION OF THE ISOLATION DAMPERS AND EXPANSION JOINT LEAKAGE DURING THE MONTH RESULTED IN LOW SYSTEM AVAILABILITY DUE TO THE NEED FOR BYPASSING FLUE GAS TO ELIMINATE GASEOUS WORKING CONDITIONS DURING MAINTENANCE OPERATIONS.

SIGNIFICANT REPAIR WORK WAS REQUIRED DURING THE MONTH ON THE MODULE A,B, AND D RECYCLE PUMPS.

/81	A	79.4	78.6	80.0	78.6					
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UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

CENTRAL ILLINOIS LIGHT: DUCK CREEK 1 (CONT.)

-----PERFORMANCE DATA-----									
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER BOILER HOURS	FGD HOURS	CAP. HOURS FACTOR
	B	79.7	78.9	79.6	78.9				
	C	79.6	78.9	80.3	78.9				
	D	60.3	60.3	62.6	60.3				
	SYSTEM	74.8	74.2	75.6	74.2		744	744	552 75.0

** PROBLEMS/SOLUTIONS/COMMENTS

ISOLATION DAMPER AND EXPANSION JOINT PROBLEMS CONTINUED TO LOWER THE OVER-ALL FGD SYSTEM AVAILABILITY.

MIXER REPAIR ON THE MODULE D RECYCLE TANK RESULTED IN LOW MODULE AVAILABILITY.

10/81	SYSTEM	0.0			0.0		744	0	0 0.0
11/81	A	32.9	82.6	93.7	26.9				
	B	32.9	82.6	93.7	26.9				
	C	32.6	82.1	93.4	26.8				
	D	24.5	67.9	81.9	22.2				
	SYSTEM	30.7	78.8	90.8	25.7		720	235	185 20.7

** PROBLEMS/SOLUTIONS/COMMENTS

A MAJOR UNIT OUTAGE STARTED ON SEPTEMBER 18 AND CONTINUED THROUGH OCTOBER AND ENDED ON NOVEMBER 21. DURING THIS TIME THE SCRUBBER WAS DRAINED OF SLURRY AND CLEANED. ISOLATION DAMPER SEAL AIR PROBLEMS RESULTED IN LOW AVAILABILITY DURING OPERATING PERIODS. IT WAS NECESSARY TO BYPASS THE SYSTEM TO ELIMINATE HAZARDOUS WORKING CONDITIONS DURING MAINTENANCE OPERATIONS.

12/81	A	80.3	81.2	81.5	68.1				
	B	81.0	81.6	83.6	68.4				
	C	76.9	81.0	82.5	67.9				
	D	82.1	83.8	84.1	70.3				
	SYSTEM	80.1	81.9	82.9	68.7		744	624	511 63.1

** PROBLEMS/SOLUTIONS/COMMENTS

DURING DECEMBER ISOLATION DAMPER SEAL AIR PROBLEMS RESULTED IN LOW AVAILABILITY DURING OPERATING PERIODS. IT WAS NECESSARY TO BYPASS THE SYSTEM TO ELIMINATE HAZARDOUS WORKING CONDITIONS DURING MAINTENANCE OPERATIONS.

1/82	A	79.1	74.4	76.7	72.4				
	B	73.4	68.6	71.5	66.7				
	C	73.8	69.0	71.0	67.1				
	D	67.3	69.1	71.9	67.3				
	SYSTEM	73.4	70.3	72.8	68.4		744	724	509 70.5

** PROBLEMS/SOLUTIONS/COMMENTS

THE SCHEDULED BOILER OUTAGE THAT STARTED AT THE END OF DECEMBER ENDED ON JANUARY 4.

THE LOW SYSTEM AVAILABILITY DURING JANUARY WAS PARTIALLY DUE TO THE LIMESTONE IN THE STORAGE PILE BEING FROZEN LIMITING ITS DELIVERY TO THE FGD SYSTEM.

LOW AVAILABILITY WAS ALSO DUE TO ISOLATION DAMPER SEAL AIR PROBLEMS REQUIRING THE NEED FOR BY-PASSING FLUE GAS TO ELIMINATE HAZARDOUS WORKING CONDITIONS DURING MAINTENANCE OPERATIONS.

2/82	A	53.6	53.6	53.6	53.6				
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LITY FGD SURVEY: JANUARY - DECEMBER 1988

TRAL ILLINOIS LIGHT: DUCK CREEK 1 (CONT.)

-----PERFORMANCE DATA-----										
100	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PER PART.	BOILER HOURS	FGD HOURS	CAP. FACTOR
	B	54.5	54.5	54.5	54.5					
	C	49.3	49.3	49.3	49.3					
	D	55.5	55.5	55.5	55.5					
	SYSTEM	53.2	53.2	53.2	53.2			672	672	358 76.7

** PROBLEMS/SOLUTIONS/COMMENTS

THE LOW AVAILABILITY DURING THE MONTH OF FEBRUARY WAS PRIMARILY DUE TO SEVERE PLUGGING OF THE MODULES.

THE ISOLATION DAMPER SEAL AIR PROBLEMS CONTINUED THROUGHOUT FEBRUARY.

82	A	32.9	46.6	46.8	32.9						
	B	35.5	50.2	50.4	35.5						
	C	35.7	50.5	50.7	35.7						
	D	34.4	48.7	48.8	34.4						
	SYSTEM	34.6	49.0	49.2	34.6			744	526	258	53.9

** PROBLEMS/SOLUTIONS/COMMENTS

THE LOW AVAILABILITY IN MARCH WAS DUE TO SEVERE PLUGGING OF THE ABSORBER MODULES.

MODULE ISOLATION DAMPER SEAL AIR PROBLEMS CONTINUED THROUGH MARCH.

ON MARCH 23 THE UNIT WAS TAKEN OUT OF SERVICE FOR A SCHEDULED OUTAGE. THE UNIT REMAINED OFF-LINE THROUGH THE END OF THE MONTH.

82	A	12.2	37.7	46.1	11.0						
	B	19.0	58.9	65.3	15.6						
	C	21.3	66.0	65.6	15.7						
	D	21.3	66.2	65.8	15.8						
	SYSTEM	18.4	57.2	60.7	14.5			720	232	105	17.8

** PROBLEMS/SOLUTIONS/COMMENTS

THE SCHEDULED OUTAGE STARTED IN MARCH CONTINUED THROUGH TO APRIL 26. DURING THE OUTAGE THE MODULES WERE CLEANED EXTENSIVELY. THIS HAS SHOWN MUCH IMPROVEMENT IN THE SYSTEM'S RELIABILITY.

82	A	91.1	91.1	91.1	91.1						
	B	92.2	92.2	92.2	92.2						
	C	91.9	91.9	91.9	91.9						
	D	91.7	91.7	91.7	91.7						
	SYSTEM	91.7	91.7	91.7	91.7			744	744	682	66.9

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE ISOLATION DAMPER SEAL AIR PROBLEMS CONTINUE TO REDUCE THE AVAILABILITY DUE TO THE NEED FOR BY-PASSING FLUE GAS TO ELIMINATE GASEOUS WORKING CONDITIONS DURING MAINTENANCE OPERATIONS.

82	A	83.6	83.6	83.6	83.6						
	B	91.6	91.6	91.6	91.6						
	C	91.7	91.7	91.7	91.7						
	D	92.5	92.5	92.5	92.5						
	SYSTEM	89.9	89.9	89.9	89.9			720	720	647	68.2

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE DOWN TIME DURING JUNE WAS TO REMOVE ANY SCALE ACCUMULATION AND TO CLEAN THE MODULES.

82	A	85.5	87.3	89.9	78.3						
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UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

CENTRAL ILLINOIS LIGHT: DUCK CREEK 1 (CONT.)

-----PERFORMANCE DATA-----										
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART. HOURS	PER BOILER HOURS	FGD HOURS	CAP. FACTOR
	B	88.8	90.6	93.2	81.2					
	C	98.0	79.8	89.6	71.6					
	D	87.3	78.4	89.4	70.3					
	SYSTEM	89.9	84.0	90.5	75.3		744	667	560	57.1

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING JULY.

8/82	A	95.0	95.0	98.5	95.0					
	B	97.4	97.4	98.3	97.4					
	C	91.6	91.1	96.9	91.1					
	D	96.5	93.5	97.6	93.5					
	SYSTEM	95.1	94.3	97.8	94.3		744	744	702	69.4

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING AUGUST.

9/82	A	83.3	81.5	95.3	76.6					
	B	88.3	86.5	96.0	81.3					
	C	87.5	86.5	95.9	81.3					
	D	84.7	82.4	99.4	77.5					
	SYSTEM	85.9	84.2	96.6	79.2		720	677	570	65.5

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING SEPTEMBER. SYSTEM AVAILABILITY WAS REDUCED ONLY BY BOILER OUTAGE TIME. RELIABILITY MORE ACCURATELY REFLECTS THE OPERATION OF THE SCRUBBER DURING SEPTEMBER.

10/82	A	93.6	93.4	96.0	93.4					
	B	95.9	95.9	96.3	95.9					
	C	95.5	91.5	96.0	91.5					
	D	92.7	92.7	94.6	92.7					
	SYSTEM	94.4	93.4	95.7	93.4		744	744	695	72.2

** PROBLEMS/SOLUTIONS/COMMENTS

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

11/82	A	64.7	85.0	97.4	56.7					
	B	65.5	90.1	97.7	60.1					
	C	65.6	89.5	97.6	59.7					
	D	66.7	90.8	97.8	60.5					
	SYSTEM	65.6	88.9	97.6	59.2		720	480	426	43.8

** PROBLEMS/SOLUTIONS/COMMENTS

DURING NOVEMBER THE UNIT WAS DOWN FOR CLEANING AND INSPECTION OF THE MODULES.

12/82	A	83.0	76.3	88.4	76.3					
	B	87.0	85.7	89.3	85.7					
	C	87.1	87.1	89.8	87.1					
	D	83.8	83.2	89.2	83.2					
	SYSTEM	85.2	83.1	89.2	83.1		744	744	618	63.0

ITY FGD SURVEY: JANUARY - DECEMBER 1988
 RAL ILLINOIS LIGHT: DUCK CREEK 1 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

A MAJOR PROBLEM OCCURRED WITH THE LIMESTONE PREPARATION EQUIPMENT FROM DECEMBER 16 TO 23, 1982. THE LIMESTONE BALL MILL MOTOR FAILED AND HAD TO BE EXTENSIVELY REPAIRED. DURING THIS TIME AN EMERGENCY SYSTEM WAS SET UP SO THAT LIMESTONE IN A POWDERED FORM COULD BE CONVEYED TO THE SCRUBBER.

13	A	93.1	96.9	99.9	89.0				
	B	91.9	95.6	99.9	87.9				
	C	93.3	96.1	99.9	88.3				
	D	88.8	92.2	99.9	84.8				
	SYSTEM	91.7	95.2	99.9	87.5	744	684	651	63.8

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING JANUARY.

13	A	61.9	97.2	100.0	61.9				
	B	61.4	96.3	100.0	61.4				
	C	62.3	97.8	100.0	62.3				
	D	57.4	90.1	100.0	57.4				
	SYSTEM	60.7	95.3	100.0	60.7	672	428	408	45.7

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS OFF LINE FROM FEBRUARY 18 TO 28, 1983 TO REPAIR THE EXHAUST STACK.

33	SYSTEM	0.0		0.0		744	0	0	0.0
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** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS OFF LINE FOR THE ENTIRE MONTH OF MARCH TO CONTINUE REPAIRING THE EXHAUST STACK.

33	A	0.0		0.0					
	B	0.0		0.0					
	C	0.0		0.0					
	D	0.0		0.0					
	SYSTEM	0.0		0.0		720	0	0	0.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS OFF LINE DURING APRIL TO CONTINUE STACK LINER REPAIRS.

83	A	60.8	85.2	99.1	53.5				
	B	60.1	94.0	99.2	59.0				
	C	60.2	87.1	99.1	54.7				
	D	59.7	92.0	96.9	57.8				
	SYSTEM	60.2	89.6	98.6	56.2	744	467	418	40.1

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS OUT OF SERVICE UNTIL MAY 13, 1983 DUE TO CONTINUED MAINTENANCE ON THE STACK LINER.

83	A	97.3	95.1	99.3	95.1				
	B	99.3	96.3	99.4	96.3				
	C	98.5	95.2	99.3	95.2				
	D	98.1	96.6	98.6	96.6				
	SYSTEM	98.3	95.8	99.1	95.8	720	720	690	71.0

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

CENTRAL ILLINOIS LIGHT: DUCK CREEK 1 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING JUNE.

7/83	A	100.0	98.7	100.0	98.7				
	B	100.0	97.7	100.0	97.7				
	C	100.0	98.0	100.0	98.0				
	D	100.0	97.8	100.0	97.8				
	SYSTEM	100.0	98.1	100.0	98.1	744	744	730	71.7
8/83	A	100.0	96.4	100.0	96.4				
	B	100.0	94.4	100.0	94.4				
	C	97.8	94.7	100.0	94.7				
	D	100.0	95.3	100.0	95.3				
	SYSTEM	99.5	95.2	100.0	95.2	744	744	708	70.3
9/83	A	93.3	89.4	100.0	89.1				
	B	100.0	95.0	100.0	94.7				
	C	97.2	92.5	100.0	92.3				
	D	99.7	95.3	100.0	95.0				
	SYSTEM	97.6	93.0	100.0	92.8	720	718	668	62.2

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE PERIOD OF JULY THROUGH SEPTEMBER, 1983.

10/83	A	99.9	95.7	100.0	76.8				
	B	100.0	98.3	100.0	78.9				
	C	100.0	98.2	100.0	78.8				
	D	100.0	97.5	100.0	78.3				
	SYSTEM	100.0	97.4	100.0	78.2	744	597	582	54.6
11/83	A	97.5	91.0	100.0	81.9				
	B	100.0	91.9	100.0	82.7				
	C	100.0	94.0	100.0	84.6				
	C	100.0	94.0	100.0	84.6				
	D	98.6	91.6	100.0	82.5				
	SYSTEM	99.2	92.5	100.0	83.3	720	648	600	55.2

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE UNIT WAS OFF LINE FROM OCTOBER 25 TO NOVEMBER 4, 1983.

12/83	A	88.5	85.2	88.2	85.2				
	B	88.5	85.2	88.2	85.2				
	C	88.5	85.6	88.2	85.6				
	D	88.5	86.7	88.3	86.7				
	SYSTEM	88.5	85.7	88.2	85.7	744	744	638	69.6

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT SEVERE COLD WEATHER BETWEEN DECEMBER 24 AND 28 DISABLED THE COAL AND LIMESTONE HANDLING EQUIPMENT. LIMESTONE COULD NOT BE LOADED INTO THE FACILITY RESULTING IN THE LOSS OF THE LIMESTONE SLURRY SUPPLY. ALL FOUR MODULES WERE CONSIDERED UNAVAILABLE DURING THIS PERIOD.

1/84	A	94.1	89.0	93.5	81.9				
	B	94.3	86.4	93.6	79.4				
	C	94.0	89.2	93.2	82.0				

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

GRAND ILLINOIS LIGHT: DUCK CREEK 1 (CONT.)

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

34	D		93.7	87.6	92.7	80.5					
	SYSTEM		94.0	88.0	93.2	80.9		744	684	602	60.2
	A		100.0	96.0	100.0	96.0					
	B		100.0	96.9	100.0	96.9					
	C		100.0	98.2	100.0	98.2					
	D		100.0	95.8	100.0	95.8					
	SYSTEM		100.0	96.7	100.0	96.7		696	696	673	70.3
	34	A		100.0	96.1	100.0	91.3				
B			100.0	95.1	100.0	90.4					
C			97.8	94.2	97.5	89.5					
D			100.0	93.7	100.0	89.1					
SYSTEM			99.5	94.8	99.9	90.1		744	707	670	69.1

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE EXPERIENCED DURING THE FIRST QUARTER OF 1984.

34	A	88.9	97.4	100.0	86.6					
	B	88.9	90.6	100.0	80.5					
	C	88.9	96.4	100.0	85.7					
	D	86.9	89.2	100.0	79.3					
	SYSTEM	88.4	93.4	100.0	83.0		720	640	598	58.1

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS TAKEN OFF LINE ON APRIL 27 FOR INSPECTIONS AND MAINTENANCE.

84	A	35.1	84.6	100.0	27.8					
	B	32.1	80.2	100.0	26.3					
	C	35.1	84.8	100.0	27.8					
	D	34.1	81.7	100.0	26.8					
	SYSTEM	34.1	82.8	100.0	27.2		744	244	202	14.5

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS OFF LINE UNTIL MAY 20 DUE TO INSPECTION AND MAINTENANCE.

84	A	99.6	95.4	99.5	89.5					
	B	99.4	95.3	99.4	89.4					
	C	99.6	94.1	99.5	88.3					
	D	99.1	94.6	99.5	88.8					
	SYSTEM	99.4	94.8	99.5	89.0		720	676	641	64.4

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE UNIT WAS OFF LINE FROM JUNE 15 UNTIL JUNE 18 FOR UNSPECIFIED REASONS.

'84	A	99.5	98.2	99.9	97.8					
	B	99.5	97.9	99.9	97.5					
	C	99.5	98.4	99.9	98.0					
	D	99.5	92.7	99.9	92.3					
	SYSTEM	99.5	96.8	99.9	96.4		744	741	717	67.2

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD-RELATED PROBLEMS WERE REPORTED DURING JULY.

'84	A	100.0	92.5	100.0	86.5					
	B	100.0	92.4	100.0	86.3					

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

CENTRAL ILLINOIS LIGHT: DUCK CREEK 1 (CONT.)

-----PERFORMANCE DATA-----										
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	C	100.0	91.7	100.0	85.7					
	D	100.0	92.1	100.0	86.1					
	SYSTEM	100.0	92.2	100.0	86.1		744	695	641	65.0
9/84	A	100.0	93.7	100.0	85.4					
	B	100.0	91.8	100.0	83.6					
	C	100.0	96.1	100.0	87.5					
	D	100.0	93.6	100.0	85.3					
	SYSTEM	100.0	93.8	100.0	85.5		720	656	615	59.1
10/84	A	100.0	95.5	100.0	95.6					
	B	100.0	98.3	100.0	98.5					
	C	100.0	94.7	100.0	94.9					
	D	99.0	96.0	100.0	96.1					
	SYSTEM	99.9	96.1	100.0	96.3		744	745	716	71.1
11/84	A	100.0	93.7	100.0	87.6					
	B	100.0	95.0	100.0	88.8					
	C	100.0	95.3	100.0	89.1					
	D	100.0	95.1	100.0	88.9					
	SYSTEM	100.0	94.8	100.0	88.6		720	673	638	63.4
12/84	A	100.0	91.4	100.0	60.9					
	B	99.7	94.0	100.0	62.6					
	C	82.8	69.7	100.0	46.4					
	D	100.0	89.2	100.0	59.4					
	SYSTEM	95.6	86.0	100.0	57.4		744	496	427	33.2

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED FOR THE MONTHS OF AUGUST THROUGH DECEMBER 1984.

1/85	A	89.7	88.1	100.0	88.1					
	B	83.4	82.1	100.0	82.1					
	C	74.8	73.1	100.0	73.1					
	D	91.9	90.2	100.0	90.2					
	SYSTEM	84.9	83.4	100.0	83.4		744	744	620	62.6

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT EACH OF THE MODULES WAS REMOVED FROM SERVICE FOR APPROXIMATELY A WEEK ON A ROTATING BASIS FOR SLURRY TANK SCALE REMOVAL.

2/85	A	100.0	98.4	100.0	98.4					
	B	100.0	97.8	100.0	97.8					
	C	100.0	98.0	100.0	98.0					
	D	100.0	98.7	100.0	98.7					
	SYSTEM	100.0	98.2	100.0	98.2		672	672	660	73.4
3/85	A	100.0	93.9	100.0	89.5					
	B	100.0	96.1	100.0	91.6					
	C	100.0	96.3	100.0	91.7					
	D	100.0	95.4	100.0	91.0					
	SYSTEM	100.0	95.4	100.0	91.0		744	709	677	70.2
4/85	A	100.0	96.0	100.0	82.8					
	B	99.7	95.9	99.7	82.7					
	C	100.0	94.1	100.0	81.2					
	D	100.0	90.8	100.0	78.3					
	SYSTEM	99.9	94.2	99.9	81.2		720	621	585	56.6

LITY FGD SURVEY: JANUARY - DECEMBER 1988

TRAL ILLINOIS LIGHT: DUCK CREEK 1 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

NO FGD SYSTEM PROBLEMS WERE REPORTED BY THE UTILITY FOR THE MONTHS OF
 FEBRUARY THROUGH APRIL.

85	A	100.0	90.1	100.0	38.0				
	B	100.0	92.6	100.0	39.1				
	C	100.0	91.0	100.0	38.4				
	D	100.0	86.3	100.0	36.4				
	SYSTEM	100.0	90.0	100.0	38.0	744	314	283	25.9

** PROBLEMS/SOLUTIONS/COMMENTS

A SCHEDULED UNIT OUTAGE BEGAN ON MAY 1ST AND EXTENDED THROUGH MAY 19TH.
 NO FGD SYSTEM PROBLEMS WERE REPORTED BY THE UTILITY.

85	A	99.5	95.6	100.0	91.8				
	B	99.0	94.1	100.0	90.5				
	C	96.9	94.6	100.0	91.0				
	D	94.2	90.7	100.0	87.2				
	SYSTEM	97.4	93.8	100.0	90.1	720	692	649	62.6

85	A	100.0	96.5	100.0	89.7				
	B	98.8	93.5	100.0	86.9				
	C	100.0	96.1	100.0	89.4				
	D	100.0	95.3	100.0	88.7				
	SYSTEM	99.7	95.4	100.0	88.7	744	692	660	60.8

85	A	99.7	98.0	99.7	98.0				
	B	99.7	96.9	99.7	96.9				
	C	99.7	98.1	99.7	98.1				
	D	99.7	98.0	99.7	98.0				
	SYSTEM	99.7	97.7	99.7	97.7	744	744	727	68.0

85	A	94.1	93.3	100.0	93.3				
	B	100.0	98.9	100.0	98.9				
	C	100.0	98.2	100.0	98.2				
	D	94.4	93.4	100.0	93.4				
	SYSTEM	97.1	95.9	100.0	95.9	720	720	691	69.8

'85	A	98.1	95.9	99.7	96.1				
	B	98.7	95.2	100.0	95.3				
	C	81.6	80.4	99.3	80.6				
	D	97.3	92.9	100.0	93.0				
	SYSTEM	93.9	91.1	99.8	91.2	744	745	679	65.1

'85	A	96.7	84.7	100.0	53.7				
	B	93.1	90.2	100.0	57.1				
	C	100.0	91.7	100.0	58.1				
	D	100.0	91.7	100.0	58.1				
	SYSTEM	97.4	89.6	100.0	56.7	720	456	408	39.3

'85	A	97.8	94.7	100.0	89.7				
	B	97.2	91.4	100.0	86.6				
	C	96.3	88.8	100.0	84.2				
	D	95.7	90.9	100.0	86.2				
	SYSTEM	96.7	91.4	100.0	86.7	744	705	645	68.7

** PROBLEMS/SOLUTIONS/COMMENTS

NO FGD SYSTEM PROBLEMS WERE REPORTED BY THE UTILITY FOR THE MONTH OF
 JUNE THROUGH DECEMBER.

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

CENTRAL ILLINOIS LIGHT: DUCK CREEK 1 (CONT.)

		-----PERFORMANCE DATA-----								
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PER PART.	BOILER HOURS	FGD HOURS	CAP. FACTOR
1/86	A	92.8	87.5	100.0	59.1					
	B	98.9	97.5	100.0	65.8					
	C	96.7	93.4	100.0	63.0					
	D	100.0	96.0	100.0	64.8					
	SYSTEM	97.1	93.6	100.0	63.2			744	502	470 47.6

** PROBLEMS/SOLUTIONS/COMMENTS

A FORCED UNIT OUTAGE OCCURRED ON JANUARY 22 THROUGH 31. NO FGD SYSTEM-RELATED PROBLEMS WERE REPORTED.

2/86	A	100.0	91.2	100.0	57.7					
	B	100.0	91.4	100.0	57.8					
	C	100.0	92.6	100.0	58.6					
	D	99.7	90.8	100.0	57.4					
	SYSTEM	99.9	91.5	100.0	57.9			672	425	389 44.8

** PROBLEMS/SOLUTIONS/COMMENTS

THE FORCED UNIT OUTAGE REPORTED LAST MONTH CONTINUED THROUGH FEBRUARY 9 AS REPAIRS WERE MADE IN RESPONSE TO A MAIN STEAM HEADER CRACK.

3/86	A	100.0	92.0	100.0	78.5					
	B	99.7	92.0	100.0	78.5					
	C	100.0	93.2	100.0	79.5					
	D	100.0	92.4	100.0	78.9					
	SYSTEM	99.9	92.4	100.0	78.8			744	635	587 62.0

** PROBLEMS/SOLUTIONS/COMMENTS

NO FGD SYSTEM-RELATED PROBLEMS WERE REPORTED FOR THE FIRST QUARTER OF 1986.

4/86	A	96.3	92.0	99.4	66.7					
	B	99.5	88.3	99.3	64.0					
	C	99.6	88.4	99.4	64.1					
	D	99.6	84.8	99.3	61.5					
	SYSTEM	98.7	88.4	99.3	64.1			720	522	461 49.7

5/86	A	99.7	96.5	99.7	87.0					
	B	99.3	93.2	99.5	84.1					
	C	99.7	95.2	99.7	85.9					
	D	99.7	97.3	99.7	87.8					
	SYSTEM	99.6	95.6	99.6	86.2			744	671	641 67.6

6/86	A	99.7	96.2	99.7	91.6					
	B	99.7	95.7	99.8	91.1					
	C	99.7	95.6	99.7	91.1					
	D	99.7	97.2	99.7	92.6					
	SYSTEM	99.7	96.2	99.7	91.6			720	686	660 68.6

** PROBLEMS/SOLUTIONS/COMMENTS

NO FGD SYSTEM-RELATED PROBLEMS WERE REPORTED FOR THE SECOND QUARTER OF 1986.

7/86	A	100.0	98.0	100.0	98.0					
	B	100.0	96.5	100.0	96.5					
	C	100.0	96.6	100.0	96.6					
	D	100.0	98.2	100.0	98.2					
	SYSTEM	100.0	97.3	100.0	97.3			744	744	724 77.2

8/86	A	100.0	97.5	100.0	89.2					
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LITY FGD SURVEY: JANUARY - DECEMBER 1988

TRAL ILLINOIS LIGHT: DUCK CREEK 1 (CONT.)

-----PERFORMANCE DATA-----										
100	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER BOILER HOURS	FGD HOURS	CAP. FACTOR
	B	100.0	96.4	100.0	88.2					
	C	98.8	93.4	99.9	85.5					
	D	100.0	97.6	100.0	89.4					
	SYSTEM	99.7	96.2	100.0	88.1			744	681	655 65.2
86	A	100.0	93.9	100.0	87.3					
	B	100.0	96.6	100.0	89.8					
	C	100.0	94.5	100.0	87.8					
	D	100.0	97.2	100.0	90.4					
	SYSTEM	100.0	95.6	100.0	88.8			720	669	639 69.7

** PROBLEMS/SOLUTIONS/COMMENTS

NO FGD SYSTEM-RELATED PROBLEMS WERE REPORTED FOR THE THIRD QUARTER OF 1986.

86	A	100.0	84.0	100.0	7.6					
	B	100.0	60.1	100.0	5.4					
	C	100.0	84.0	100.0	7.6					
	D	92.9	29.1	90.7	2.6					
	SYSTEM	98.2	64.3	97.7	5.8			744	67	43 5.5

** PROBLEMS/SOLUTIONS/COMMENTS

ON OCTOBER 3, 1986, THE DUCKCREEK 1 UNIT WAS TAKEN OUT OF SERVICE TO PERFORM A SCHEDULED OVERHAUL OF THE TURBINE-GENERATOR EQUIPMENT. THE OUTAGE WAS SCHEDULED THROUGH THE END OF NOVEMBER.

86	A	100.0			0.0					
	B	100.0			0.0					
	C	100.0			0.0					
	D	100.0			0.0					
	SYSTEM	100.0			0.0			720	0	0 0.0
86	A	99.5	83.6	99.1	56.8					
	B	99.5	82.6	99.1	56.2					
	C	96.2	81.8	97.9	55.6					
	D	99.5	82.2	99.0	55.9					
	SYSTEM	98.7	82.5	98.8	56.1			744	506	418 39.6

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT OUTAGE THAT BEGAN ON OCTOBER 3, 1986 CONTINUED THROUGH DECEMBER 5, 1986. NO FGD SYSTEM-RELATED PROBLEMS WERE REPORTED FOR THE FOURTH QUARTER OF 1986.

'87	A	100.0	97.1	100.0	93.0					
	B	99.9	96.1	99.9	92.1					
	C	95.0	92.7	100.0	88.8					
	D	100.0	91.7	100.0	87.8					
	SYSTEM	98.7	94.4	100.0	90.4			744	713	673 62.1
'87	A	94.1	91.6	100.0	85.7					
	B	94.0	91.6	100.0	85.7					
	C	83.8	76.9	99.6	72.0					
	D	96.2	95.1	100.0	89.0					
	SYSTEM	92.0	88.8	99.9	83.1			672	629	559 62.8
'87	A	100.0	96.8	100.0	93.3					
	B	96.8	94.6	100.0	91.1					
	C	100.0	96.1	100.0	92.6					
	D	94.8	91.9	100.0	88.6					
	SYSTEM	97.9	94.9	100.0	91.4			744	717	680 74.8

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

CENTRAL ILLINOIS LIGHT: DUCK CREEK 1 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

NO FGD SYSTEM-RELATED PROBLEMS WERE REPORTED FOR THE PERIOD JANUARY
 THROUGH MARCH, 1987.

4/87	A	100.0	85.3	100.0	27.8				
	B	100.0	93.6	100.0	30.6				
	C	100.0	84.9	100.0	27.7				
	D	100.0	91.8	100.0	30.0				
	SYSTEM	100.0	88.9	100.0	29.0	720	235	209	22.1

** PROBLEMS/SOLUTIONS/COMMENTS

UNIT 1 WAS OUT OF SERVICE FROM APRIL 10-30 FOR A SCHEDULED
 MAINTENANCE OUTAGE.

5/87	A	96.3	88.4	99.6	76.0				
	B	99.7	90.0	100.0	77.4				
	C	99.7	90.2	99.7	77.6				
	D	96.7	88.8	100.0	76.3				
	SYSTEM	98.1	89.3	99.8	76.8	744	640	572	62.3

6/87	A	100.0	93.4	100.0	83.9				
	B	100.0	94.8	100.0	85.2				
	C	100.0	91.4	100.0	82.2				
	D	100.0	94.6	100.0	85.0				
	SYSTEM	100.0	93.6	100.0	84.1	720	647	605	69.4

7/87	A	100.0	99.2	100.0	99.2				
	B	100.0	96.7	100.0	96.7				
	C	99.1	99.1	100.0	99.1				
	D	100.0	100.0	100.0	100.0				
	SYSTEM	99.8	98.7	100.0	98.7	744	744	735	77.2

8/87	A	100.0	95.6	100.0	88.7				
	B	99.2	97.1	100.0	90.0				
	C	100.0	98.7	100.0	91.5				
	D	100.0	98.0	99.3	90.9				
	SYSTEM	99.8	97.3	99.8	90.3	744	690	672	71.3

9/87	A	100.0	100.0	100.0	100.0				
	B	100.0	99.0	100.0	99.0				
	C	100.0	99.8	100.0	99.8				
	D	95.1	94.2	100.0	94.2				
	SYSTEM	98.8	98.3	100.0	98.3	720	720	707	75.0

10/87	A	98.6	93.3	98.3	84.8				
	B	99.3	95.6	99.2	86.8				
	C	99.3	95.6	99.2	86.9				
	D	99.3	95.5	99.2	86.7				
	SYSTEM	99.1	95.0	99.0	86.3	744	676	642	63.6

** PROBLEMS/SOLUTIONS/COMMENTS

NO FGD SYSTEM-RELATED PROBLEMS WERE REPORTED FOR THE PERIOD MAY THROUGH
 OCTOBER 1987.

11/87	A	100.0	92.2	100.0	55.7				
	B	100.0	92.6	100.0	55.9				
	C	100.0	92.6	100.0	55.9				
	D	83.5	66.1	100.0	39.9				
	SYSTEM	95.9	85.9	100.0	51.9	720	435	374	38.3

LITY FGD SURVEY: JANUARY - DECEMBER 1988

TRAL ILLINOIS LIGHT: DUCK CREEK 1 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

UNIT 1 WAS OUT OF SERVICE FROM NOVEMBER 13-24 FOR A SCHEDULED MAINTENANCE
 OUTAGE.

87	A	100.0	98.3	100.0	98.3				
	B	99.9	97.2	100.0	97.2				
	C	100.0	98.9	100.0	98.9				
	D	100.0	98.1	100.0	98.1				
	SYSTEM	100.0	98.1	100.0	98.1	744	744	730	72.1

** PROBLEMS/SOLUTIONS/COMMENTS

NO FGD SYSTEM-RELATED PROBLEMS WERE REPORTED FOR THE MONTH OF DECEMBER
 1987.

NO FGD SYSTEM-RELATED PROBLEMS WERE REPORTED FOR 1987.

88	A	99.5	94.8	99.4	89.3				
	B	97.0	93.3	99.4	87.9				
	C	99.5	95.0	99.4	89.5				
	D	99.5	96.7	99.4	91.2				
	SYSTEM	98.8	95.0	99.4	89.5	744	701	666	67.5

'88	A	98.3	95.3	99.8	92.2				
	B	99.9	97.5	99.8	94.3				
	C	99.9	94.5	99.8	91.4				
	D	99.9	97.3	99.8	94.1				
	SYSTEM	99.5	96.2	99.8	93.0	696	673	647	74.6

'88	A	100.0	99.0	100.0	99.0				
	B	100.0	99.3	100.0	99.3				
	C	100.0	99.0	100.0	99.0				
	D	100.0	98.2	100.0	98.2				
	SYSTEM	100.0	98.9	100.0	98.9	744	744	736	74.3

'88	A	100.0	98.2	100.0	84.7				
	B	98.8	94.2	100.0	81.3				
	C	100.0	98.2	100.0	84.7				
	D	98.8	95.4	100.0	82.3				
	SYSTEM	99.4	96.5	100.0	83.2	720	621	599	58.2

/88	A	100.0	93.4	100.0	47.0				
	B	100.0	93.4	100.0	46.9				
	C	100.0	93.4	100.0	47.0				
	D	100.0	91.4	100.0	46.0				
	SYSTEM	100.0	92.9	100.0	46.7	744	374	348	36.1

/88	A	80.1	77.0	100.0	68.3				
	B	100.0	95.7	100.0	85.0				
	C	100.0	96.8	100.0	85.9				
	D	90.9	88.6	100.0	78.6				
	SYSTEM	92.8	89.5	100.0	79.5	720	639	572	58.2

/88	A	99.1	96.8	100.0	87.1				
	B	100.0	97.8	100.0	88.0				
	C	99.2	96.2	100.0	86.5				
	D	100.0	96.4	100.0	86.7				
	SYSTEM	99.6	96.8	100.0	87.1	744	669	648	66.0

/88	A	100.0	95.5	100.0	89.6				
	B	98.3	94.3	100.0	88.5				

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

CENTRAL ILLINOIS LIGHT: DUCK CREEK 1 (CONT.)

-----PERFORMANCE DATA-----										
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	C	100.0	95.8	100.0	89.8					
	D	100.0	95.8	100.0	89.8					
	SYSTEM	99.6	95.3	100.0	89.4		744	698	665	69.7
9/88	A	99.7	99.2	100.0	98.9					
	B	99.7	100.0	100.0	99.7					
	C	99.7	100.0	100.0	99.7					
	D	99.7	100.0	100.0	99.7					
	SYSTEM	99.7	99.8	100.0	99.5		720	718	716	77.7

** PROBLEMS/SOLUTIONS/COMMENTS

NO FGD SYSTEM-RELATED PROBLEMS WERE REPORTED BY THE UTILITY FOR THE PERIOD JANUARY THROUGH SEPTEMBER 1988.

10/88	SYSTEM						774			
11/88	A	100.0	92.9	100.0	74.1					
	B	100.0	93.0	100.0	74.2					
	C	98.3	91.0	100.0	72.5					
	D	100.0	92.8	100.0	74.0					
	SYSTEM	99.6	92.4	100.0	73.7		720	574	531	56.9

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT UNIT 1 WAS OUT OF SERVICE FROM OCTOBER 1 THROUGH NOVEMBER 6 FOR A SCHEDULED MAINTENANCE OUTAGE.

12/88	A	100.0	97.5	100.0	93.8					
	B	100.0	97.2	100.0	93.5					
	C	100.0	97.1	100.0	93.5					
	D	100.0	97.2	100.0	93.5					
	SYSTEM	100.0	97.2	100.0	93.6		744	716	696	76.3

** PROBLEMS/SOLUTIONS/COMMENTS

NO FGD SYSTEM-RELATED PROBLEMS WERE REPORTED BY THE UTILITY DURING THE MONTH OF DECEMBER.

SECTION 13
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	CENTRAL ILLINOIS PUBLIC SERV
PLANT NAME	NEWTON
UNIT NUMBER	1
CITY	NEWTON
STATE	ILLINOIS
REGULATORY CLASSIFICATION	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	575
GROSS UNIT GENERATING CAPACITY - MW	590
NET UNIT GENERATING CAPACITY W/FGD - MW	555
NET UNIT GENERATING CAPACITY WO/FGD - MW	570
EQUIVALENT SCRUBBED CAPACITY - MW	590
** UNIT DATA - BOILER AND STACK	
BOILER SUPPLIER	COMBUSTION ENGINEERING
BOILER TYPE	PULVERIZED COAL
BOILER SERVICE LOAD	BASE
DESIGN BOILER FLUE GAS FLOW - CU.M/S	1020.95 (2163480 ACFM)
BOILER FLUE GAS TEMPERATURE - C	163.9 (327 F)
STACK HEIGHT - M	162. (530 FT)
STACK SHELL	CONCRETE
STACK TOP DIAMETER - M	***** (***** FT)
** FUEL DATA	
FUEL TYPE	COAL
FUEL GRADE	BITUMINOUS
AVERAGE HEAT CONTENT - J/G	25353. (10900 BTU/LB)
RANGE HEAT CONTENT - BTU/LB	****
AVERAGE ASH CONTENT - %	12.70
RANGE ASH CONTENT - %	****
AVERAGE MOISTURE CONTENT - %	9.50
RANGE MOISTURE CONTENT - %	****
AVERAGE SULFUR CONTENT - %	3.00
RANGE SULFUR CONTENT - %	2.8-3.2
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	1080.7 (2290000 ACFM)
INLET FLUE GAS TEMPERATURE - C	162.8 (325 F)
PRESSURE DROP - KPA	0.0 (0. IN-H2O)
PARTICLE REMOVAL EFFICIENCY - %	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

LITY FGD SURVEY: JANUARY - DECEMBER 1988

TRAL ILLINOIS PUBLIC SERV: NEWTON 1 (CONT.)

FGD SYSTEM

GENERAL DATA

SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT
SO2 REMOVAL MODE	WET SCRUBBING
PROCESS TYPE	DUAL ALKALI
SYSTEM SUPPLIER	GE ENVIRONMENTAL SERVICES
A-E FIRM	BUELL DIVISION, ENVIROTECH
DEVELOPMENT LEVEL	FULL SCALE
NEW/RETROFIT	NEW
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.50
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	90.00
ENERGY CONSUMPTION - %	2.5
CURRENT STATUS	1
COMMERCIAL START-UP	12/1979
INITIAL START-UP	9/1979
CONTRACT AWARDED	8/1975

DESIGN AND OPERATING PARAMETERS

DESIGN COAL SULFER CONTENT - %	4.00
DESIGN CHLORIDE CONTENT - %	*****

QUENCHER/PRESATURATOR

NUMBER	4
TYPE	PRECOOLER
CONSTRUCTION MATERIAL GENERIC TYPE	NR

ABSORBER

NUMBER	4
NUMBER OF SPARES	0
GENERIC TYPE	PACKED TOWER
SPECIFIC TYPE	MOBILE BED PACKING
TRADE NAME/COMMON TYPE	POLYSPHERE SCRUBBER
SUPPLIER	BUELL DIVISION, ENVIROTECH
DIMENSIONS - FT	18.0 X 48.0 X 72.0
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
LINER MATERIAL TRADE NAME/COMMON TYPE	NR
GAS CONTACTING DEVICE TYPE	PLASTIC/RUBBER MOBILE BALLS
NUMBER OF CONTACTING ZONES	1
DISTANCE BETWEEN GAS CONTACTING ZONES - CM	45.7 (18.0IN)
LIQUID RECIRCULATION RATE - LITER/S	148. (2351 GPM)
L/G RATIO - L/CU.M	1.3 (10.0 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	1.5 (6.0 IN-H2O)
SUPERFICAL GAS VELOCITY - M/SEC	2.5 (8.3 FT/S)
SO2 REMOVAL EFFICIENCY - %	90.0

* MIST ELIMINATOR

PRE-MIST ELIMINATOR/MIST ELIMINATOR	PRIMARY COLLECTOR
NUMBER PER SYSTEM	8
GENERIC TYPE	IMPINGEMENT
SPECIFIC TYPE	BAFFLE
TRADE NAME/COMMON TYPE	CLOSED VANE
CONFIGURATION	VERTICAL
CONSTRUCTION MATERIAL GENERIC TYPE	NR
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR

* FANS

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

CENTRAL ILLINOIS PUBLIC SERV: NEWTON 1 (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
** REAGENT PREPARATION EQUIPMENT	
FUNCTION	MIX TANK
DEVICE	N/A
DEVICE TYPE	AGITATED TANK
** TANKS	
SERVICE	NUMBER
-----	-----
NR	****
** PUMPS	
SERVICE	NUMBER
-----	-----
NR	****
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	VACUUM FILTER
NUMBER	1
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	THICKENER
NUMBER	2
DIMENSIONS - FT	100.0 DIA
SHELL GENERIC MATERIAL TYPE	INORGANIC
SHELL SPECIFIC MATERIAL TYPE	HYDRAULICALLY-BONDED CONCRETE
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	THICKENER
NUMBER	1
DIMENSIONS - FT	100.0 DIA
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
*** SALEABLE BYPRODUCTS	
NATURE	NONE
DISPOSITION	N/A
*** SLUDGE	
** TREATMENT	
METHOD	FIXATION
DEVICE	PUG MILL
PROPRIETARY PROCESS	CONVERSION SYSTEMS "POZ-O-TEC"
** DISPOSAL	
NATURE	FINAL
TYPE	LANDFILL

LITY FGD SURVEY: JANUARY - DECEMBER 1988

ITRAL ILLINOIS PUBLIC SERV: NEWTON 1 (CONT.)

SITE TREATMENT	NR
WATER BALANCE	
WATER LOOP TYPE	CLOSED
FGD SPARE CAPACITY INDICES	
ABSORBER - %	33.0
FGD SPARE COMPONENT INDICES	
ABSORBER	1.0

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

79	SYSTEM								720	
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** PROBLEMS/SOLUTIONS/COMMENTS

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

79	SYSTEM								744	
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79	SYSTEM								720	
----	--------	--	--	--	--	--	--	--	-----	--

** PROBLEMS/SOLUTIONS/COMMENTS

TESTING OPERATIONS CONTINUED THROUGH OCTOBER AND NOVEMBER.

79	SYSTEM	75.3	60.1	74.1	59.0		744	730	439	
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** PROBLEMS/SOLUTIONS/COMMENTS

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

INITIAL START UP PROBLEMS HAVE INCLUDED MIST ELIMINATOR PLUGGING.

LINING FAILURES HAVE ALSO BEEN ENCOUNTERED DURING START UP PHASE.

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

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

** PROBLEMS/SOLUTIONS/COMMENTS

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

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

780	A	61.1	42.4	45.0	42.4					
	B	74.4	55.7	57.7	55.7					
	C	78.2	58.5	59.1	58.5					
	D	0.0	0.0	0.0	0.0					
	SYSTEM	53.4	39.2	40.4	39.2		696	696	273	

CENTRAL ILLINOIS PUBLIC SERV: NEWTON 1 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

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

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

3/80	A	53.4	52.6	53.1	52.3			
	B	47.0	42.3	48.0	42.1			
	C	44.5	41.1	46.5	41.0			
	D	0.0	0.0	0.0	0.0			
	SYSTEM	36.2	34.0	36.9	33.9	744	740	252

** PROBLEMS/SOLUTIONS/COMMENTS

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

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

** PROBLEMS/SOLUTIONS/COMMENTS

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

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

5/80	A	0.0	0.0	0.0	0.0			
	B	9.7	9.6	9.6	6.2			
	C	9.7	9.6	9.6	6.2			
	D	0.0	0.0	0.0	0.0			
	SYSTEM	4.8	4.8	4.8	3.1	744	477	23 45.5

** PROBLEMS/SOLUTIONS/COMMENTS

DURING MAY, THE FGD SYSTEM WAS DOWN BECAUSE THE FLUIDIZING STONES WERE CAKED WITH FLY ASH. THIS WAS CAUSED BY IMPROPER WIRING OF THE HEATER WHICH BLOWS OVER THE STONES. THE HEATER WAS REWIRED AND THE FLUIDIZING STONES REPLACED. FLUIDIZING STONES ARE LOCATED IN THE FLYASH SILO. HEATED AIR PASSES THROUGH THESE POROUS STONES TO AERATE OR "FLUIDIZE" THE FLYASH SO THAT IT CAN BE CONVEYED TO THE FLYASH/SLUDGE MIXER. WHEN THE FLYASH SUPPLY IS DEPLETED OR THE MATERIAL CANNOT BE DELIVERED TO THE MIXER THE SCRUBBING SYSTEM IS SHUT DOWN. THE SLUDGE MUST BE TREATED WITH FLYASH BEFORE DISPOSAL.

6/80	A	0.0	0.0	0.0	0.0			
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ILITY FGD SURVEY: JANUARY - DECEMBER 1988
 NTRAL ILLINOIS PUBLIC SERV: NEWTON 1 (CONT.)

-----PERFORMANCE DATA-----										
RIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	B	40.3	40.3	40.3	40.3					
	C	40.4	40.4	40.4	40.4					
	D	0.0	0.0	0.0	0.0					
	SYSTEM	20.2	20.2	20.2	20.2		720	720	145	63.0

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JUNE THE A AND D MODULES WERE UNAVAILABLE FOR OPERATION BECAUSE THE MIST ELIMINATORS COLLAPSED.

THE SYSTEM WAS SHUTDOWN DURING THE FIRST HALF OF THE MONTH TO REPAIR THE DRY FLYASH COLLECTION SYSTEM WHICH ACCOUNTED FOR THE LOW B AND C MODULE FIGURES.

/80	A	3.5	3.7	3.7	3.5					
	B	3.6	3.9	3.9	3.6					
	C	0.0	0.0	0.0	0.0					
	D	0.0	0.0	0.0	0.0					
	SYSTEM	1.8	1.9	1.9	1.8		744	698	13	67.8

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JULY PROBLEMS WERE ENCOUNTERED WITH THE MIST ELIMINATORS.

SOME OF THE SYSTEM OUTAGE TIME RESULTED FROM REPAIRS MADE NECESSARY BY THE OCCURRENCE OF CORROSION IN THE PRESATURATOR.

SCRUBBER PLUGGING DURING JULY CONTRIBUTED TO THE LOW FGD SYSTEM AVAILABILITY.

/80	A	0.0	0.0	0.0	0.0					
	B	64.7	50.2	50.2	49.3					
	C	51.2	34.1	36.9	33.5					
	D	37.6	21.9	24.0	21.5					
	SYSTEM	53.8	36.4	39.9	35.8		744	731	266	68.2

** PROBLEMS/SOLUTIONS/COMMENTS

PLUGGING PROBLEMS WITHIN THE FGD SYSTEM WERE THE CAUSE OF DOWN TIME IN AUGUST.

BECAUSE OF CHANGES IN SYSTEM OPERATIONS, ONLY 3 MODULES ARE NEEDED TO MEET CURRENT SO2 REGULATIONS.

2/80	A	69.0	20.3	48.6	10.0					
	B	99.6	74.6	80.3	36.8					
	C	96.9	35.8	66.8	17.6					
	D	99.6	80.8	80.8	39.9					
	SYSTEM	99.1	67.8	82.5	33.4		720	355	241	33.2

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER WAS TAKEN OUT OF SERVICE ON SEPTEMBER 16, 1980 FOR A SCHEDULED MAINTENANCE OUTAGE.

1/80	A	75.9	38.5	46.3	16.9					
	B	83.7	47.9	56.5	21.1					
	C	81.0	51.6	54.5	22.7					
	D	62.4	7.0	13.7	3.1					
	SYSTEM	81.5	48.4	46.3	21.3		744	328	119	30.4

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

CENTRAL ILLINOIS PUBLIC SERV: NEWTON 1 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

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

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

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR OUTAGES OCCURRED DURING NOVEMBER.

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

** PROBLEMS/SOLUTIONS/COMMENTS

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

1/81	A	90.5	75.0	99.1	75.0				
	B	73.9	58.1	99.5	58.1				
	C	96.2	79.8	100.0	79.8				
	D	88.3	57.1	100.0	57.1				
	SYSTEM	99.1	89.5	100.0	89.5	744	744	425	71.4
2/81	A	93.2	49.8	100.0	49.7				
	B	96.0	81.1	100.0	81.0				
	C	92.3	72.3	100.0	72.2				
	D	100.0	82.4	100.0	82.3				
	SYSTEM	100.0	95.1	100.0	94.9	672	671	639	66.6
3/81	A	94.1	56.9	100.0	52.7				
	B	87.1	80.6	100.0	75.0				
	C	86.4	65.9	100.0	61.0				
	D	94.1	65.5	100.0	60.6				
	SYSTEM	90.4	67.2	100.0	62.2	744	689	463	63.3

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE FIRST QUARTER 1981.

4/81	A	96.1	73.3	100.0	73.3				
	B	98.2	82.8	100.0	82.8				
	C	96.1	60.6	100.0	60.6				
	D	98.6	85.1	100.0	85.1				
	SYSTEM	99.9	94.5	100.0	94.5	720	720	680	73.2

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING APRIL.

5/81	A	93.3	66.9	98.3	61.4				
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ILITY FGD SURVEY: JANUARY - DECEMBER 1988

NTRAL ILLINOIS PUBLIC SERV: NEWTON 1 (CONT.)

-----PERFORMANCE DATA-----									
RIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER BOILER HOURS	FGD CAP. HOURS FACTOR
	B	85.3	78.0	98.5	71.6				
	C	91.9	76.6	98.5	70.3				
	D	93.4	43.2	97.4	39.7				
	SYSTEM	100.0	88.3	98.4	81.0			744 683	603 60.5

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING MAY.

/81	A	96.5	64.9	100.0	64.6				
	B	92.2	72.1	100.0	71.7				
	C	88.3	46.4	100.0	46.1				
	D	96.7	92.2	100.0	91.7				
	SYSTEM	100.0	91.9	100.0	91.3			720 716	658 64.3

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JUNE NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED.

/81	A	79.6	44.5	79.2	42.9				
	B	85.3	64.6	84.8	62.2				
	C	84.5	35.0	74.3	33.7				
	D	82.5	68.2	84.9	65.7				
	SYSTEM	89.2	70.2	98.9	67.6			744 717	503 55.4

/81	A	92.7	55.6	100.0	55.6				
	B	90.5	64.5	100.0	64.5				
	C	100.0	67.1	100.0	67.1				
	D	81.3	57.0	100.0	57.0				
	SYSTEM	100.0	81.6	100.0	81.6			744 744	607 57.9

/81	A	88.8	45.3	100.0	38.9				
	B	99.0	78.4	100.0	67.4				
	C	100.0	79.5	100.0	68.3				
	D	97.9	38.8	100.0	33.3				
	SYSTEM	100.0	80.7	100.0	69.3			720 619	499 47.2

** PROBLEMS/SOLUTIONS/COMMENTS

A SCHEDULED MAINTENANCE OUTAGE (BOTH BOILER AND FGD SYSTEM) BEGAN ON SEPTEMBER 26.

/81	SYSTEM	100.0	0.0	0.0	0.0			744 7	0 0.1
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** PROBLEMS/SOLUTIONS/COMMENTS

DURING OCTOBER A SCHEDULED MAINTENANCE OUTAGE OF THE GENERATING UNIT OCCURRED.

1/81	A	98.6	63.9	76.2	63.5				
	B	85.8	27.8	63.0	27.6				
	C	97.5	55.5	73.0	55.1				
	D	85.7	61.3	73.1	60.8				
	SYSTEM	100.0	69.5	95.1	68.7			720 715	497 61.1

2/81	A	94.8	55.8	99.8	53.8				
	B	84.8	42.2	100.0	40.7				
	C	100.0	82.0	100.0	79.0				
	D	100.0	73.5	100.0	70.8				
	SYSTEM	100.0	84.5	100.0	81.4			744 717	612 52.6

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

CENTRAL ILLINOIS PUBLIC SERV: NEWTON 1 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

DURING NOVEMBER AND DECEMBER THE UTILITY REPORTED THAT NO MAJOR FGD-RELATE
 PROBLEMS WERE ENCOUNTERED.

1/82	A	100.0	58.5	100.0	58.2				
	B	100.0	97.9	100.0	97.4				
	C	50.5	42.3	100.0	42.1				
	D	93.4	79.6	100.0	79.3				
	SYSTEM	100.0	92.7	100.0	92.3	744	740	687	63.5
2/82	A	90.0	37.2	100.0	37.2				
	B	93.8	79.6	100.0	79.6				
	C	100.0	92.1	100.0	92.1				
	D	91.1	82.0	100.0	82.0				
	SYSTEM	100.0	97.0	100.0	97.0	672	672	652	70.1
3/82	A	90.9	40.1	84.2	40.1				
	B	93.1	91.4	92.4	91.4				
	C	80.8	61.7	90.0	61.7				
	D	90.5	61.7	89.1	61.7				
	SYSTEM	100.0	85.2	100.0	85.2	744	744	634	66.4

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED
 DURING THE FIRST QUARTER 1982.

4/82	A	100.0	60.9	100.0	46.5				
	B	98.2	78.9	100.0	60.3				
	C	94.9	91.7	100.0	70.0				
	D	95.0	23.5	100.0	17.9				
	SYSTEM	100.0	85.0	100.0	64.9	720	550	467	43.3
5/82	A	71.0	0.0		0.0				
	B	100.0	94.3	100.0	26.5				
	C	100.0	40.7	100.0	11.4				
	D	99.3	95.7	100.0	26.9				
	SYSTEM	100.0	76.9	100.0	21.6	744	209	161	13.1
6/82	A	0.0	0.0		0.0				
	B	99.7	97.7	100.0	97.5				
	C	100.0	62.7	100.0	62.6				
	D	98.3	52.6	100.0	52.5				
	SYSTEM	99.4	71.0	100.0	70.9	720	719	510	38.2

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED
 DURING THE SECOND QUARTER.

7/82	A	22.3	14.0	92.8	13.8				
	B	86.6	79.8	98.8	79.0				
	C	94.1	50.0	97.4	49.5				
	D	98.9	81.1	98.7	80.2				
	SYSTEM	97.8	75.2	100.0	74.4	744	737	553	45.5
8/82	A	98.5	97.8	99.5	97.8				
	B	0.0	0.0		0.0				
	C	98.9	76.2	100.0	76.2				
	D	100.0	48.4	100.0	48.4				
	SYSTEM	99.1	74.2	99.8	74.2	744	744	522	43.7

LITY FGD SURVEY: JANUARY - DECEMBER 1988

TRAL ILLINOIS PUBLIC SERV: NEWTON 1 (CONT.)

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

'82	A		100.0	78.7	100.0	76.4					
	B		0.0	0.0		0.0					
	C		100.0	70.8	100.0	68.8					
	D		100.0	71.2	100.0	69.2					
	SYSTEM		100.0	73.6	100.0	71.4			720	699	514 41.6

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE THIRD QUARTER OF 1982.

'82	A	48.3	45.7	90.8	45.2						
	B	48.4	35.5	96.0	35.1						
	C	96.5	58.8	94.3	58.2						
	D	93.3	87.8	96.1	86.8						
	SYSTEM	95.5	75.9	100.0	75.1			744	736	559	50.6

'82	A	0.0	0.0		0.0						
	B	92.4	88.0	97.9	76.3						
	C	95.4	42.1	95.3	36.5						
	D	97.1	89.9	97.7	77.9						
	SYSTEM	96.8	73.3	97.4	63.6			720	624	458	38.9

'82	A	51.1	35.1	91.7	23.8						
	B	94.6	70.8	96.0	48.0						
	C	91.1	45.4	94.2	30.8						
	D	74.6	63.1	96.4	42.7						
	SYSTEM	93.3	73.4	100.0	49.7			744	504	370	30.5

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE FOURTH QUARTER OF 1982.

'83	A	77.3	28.0	100.0	19.0						
	B	100.0	100.0	100.0	91.3						
	C	99.3	39.3	88.8	26.6						
	D	88.3	100.0	100.0	82.4						
	SYSTEM	100.0	77.5	100.0	73.1			744	504	544	48.0

'83	A	99.6	70.5	100.0	70.5						
	B	41.8	36.0	99.2	36.0						
	C	100.0	18.2	100.0	18.2						
	D	100.0	100.0	100.0	100.0						
	SYSTEM	99.9	74.3	100.0	74.3			672	672	500	54.4

'83	A	81.7	56.9	100.0	56.9						
	B	94.4	94.1	99.7	94.1						
	C	19.4	3.0	100.0	3.0						
	D	94.1	94.1	100.0	94.1						
	SYSTEM	97.6	81.5	99.7	81.5			744	744	606	64.4

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE FIRST QUARTER OF 1983.

'83	A	99.4	95.6	100.0	95.6						
	B	97.8	89.3	100.0	89.3						
	C	0.0	0.0		0.0						
	D	93.3	88.9	100.0	88.9						
	SYSTEM	96.8	91.3	100.0	100.0			720	720	720	76.8

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

CENTRAL ILLINOIS PUBLIC SERV: NEWTON 1 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE C WAS OUT OF SERVICE DURING THE ENTIRE MONTH OF APRIL FOR LINING REPAIRS.

5/83	A	100.0	100.0	100.0	1.3				
	B	100.0	50.0	100.0	0.7				
	C	0.0	0.0		0.0				
	D	100.0	100.0	100.0	1.3				
	SYSTEM	100.0	83.5	100.0	1.1	744	10	8	0.6

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS REMOVED FROM SERVICE ON MAY 1 FOR AN ANNUAL MAINTENANCE OUTAGE.

MODULE C REMAINED OUT OF SERVICE DURING MAY FOR REPAIR OF THE FLAEGGLASS LINING.

6/83	A	99.9	77.9	99.7	45.0				
	B	100.0	71.2	100.0	41.1				
	C	100.0	73.6	100.0	42.5				
	D	0.0	0.0		0.0				
	SYSTEM	99.9	76.2	100.0	44.0	720	416	317	43.1

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT REMAINED OUT OF SERVICE UNTIL JUNE 15 FOR THE ANNUAL MAINTENANCE OUTAGE.

MODULE D WAS OUT OF SERVICE ALL MONTH FOR REPAIR OF THE FLAEGGLASS LINING.

7/83	A	100.0	93.3	100.0	93.3				
	B	98.9	98.9	100.0	98.9				
	C	100.0	100.0	100.0	100.0				
	D	0.0	0.0		0.0				
	SYSTEM	99.6	97.4	100.0	97.4	744	744	725	

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE D WAS OUT OF SERVICE DURING THE ENTIRE MONTH OF JULY FOR ABSORBER LINING REPAIRS.

8/83	A	100.0	87.0	100.0	87.0				
	B	94.6	82.9	100.0	82.9				
	C	100.0	99.6	100.0	99.6				
	D	16.8	15.1	100.0	15.1				
	SYSTEM	100.0	94.8	100.0	94.8	744	744	706	

** PROBLEMS/SOLUTIONS/COMMENTS

ABSORBER LINER REPAIRS AT MODULE D CONTINUED IN AUGUST.

9/83	A	65.9	56.7	99.3	56.7				
	B	71.3	32.8	100.0	32.8				
	C	100.0	94.9	100.0	94.9				
	D	100.0	96.7	100.0	96.7				
	SYSTEM	100.0	93.7	100.0	93.7	720	720	674	85.2

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988
CENTRAL ILLINOIS PUBLIC SERV: NEWTON 1 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE A WAS UNAVAILABLE DURING PART OF SEPTEMBER DUE TO REPAIR OF THE
ABSORBER'S FLAKEGLASS LINING.

MODULE B WAS UNAVAILABLE DURING PART OF SEPTEMBER DUE TO SCALE AND TRASH
BUILD UP IN THE RECIRCULATION PUMP SUCTION STRAINERS CAUSING PLUGGING PRO-
BLEMS.

/83	A	82.3	57.8	100.0	57.8				
	B	61.3	31.9	100.0	31.9				
	C	100.0	68.8	100.0	68.8				
	D	84.7	57.8	100.0	57.8				
	SYSTEM	100.0	72.1	100.0	72.1	744	744	536	0.0

** PROBLEMS/SOLUTIONS/COMMENTS

MODULES A AND D WERE DOWN DURING PART OF OCTOBER DUE TO DUCTWORK LINING
REPAIRS.

MODULE B WAS OUT OF SERVICE DURING PART OF THE MONTH DUE TO PUMP PACKING
SLEEVE FAILURE.

/83	A	100.0	99.8	100.0	85.0				
	B	10.6	0.0		0.0				
	C	98.9	98.4	100.0	83.8				
	D	100.0	96.7	100.0	82.4				
	SYSTEM	100.0	98.3	100.0	83.7	720	613	603	0.0

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE B WAS DOWN DURING NOVEMBER DUE TO RECIRCULATING PUMP FAILURE.

/83	A	80.6	67.3	100.0	57.9				
	B	93.5	88.4	99.1	76.1				
	C	91.9	57.3	95.1	49.3				
	D	98.1	89.5	99.5	77.0				
	SYSTEM	100.0	100.0	100.0	86.8	744	640	646	0.0

** PROBLEMS/SOLUTIONS/COMMENTS

A UNIT OUTAGE OCCURRED FROM DECEMBER 1 TO DECEMBER 5, 1983.

/84	A	98.1	93.1	99.9	93.1				
	B	61.3	41.0	99.7	41.0				
	C	93.1	49.7	99.7	49.7				
	D	99.9	89.9	99.9	89.9				
	SYSTEM	100.0	91.3	100.0	91.3	744	744	679	

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED
DURING JANUARY.

/84	A	59.5	12.0	100.0	10.2				
	B	92.8	97.6	100.0	83.2				
	C	92.7	84.5	100.0	72.0				
	D	88.8	52.4	100.0	44.7				
	SYSTEM	100.0	82.2	100.0	70.0	696	593	487	

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

CENTRAL ILLINOIS PUBLIC SERV: NEWTON 1 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE A WAS UNAVAILABLE DURING PART OF FEBRUARY DUE TO A PLUGGED SPRAY NOZZLE.

3/84	A	89.0	9.9	100.0	9.5			
	B	100.0	98.5	100.0	95.0			
	C	100.0	99.2	100.0	95.7			
	D	89.7	51.6	100.0	49.7			
	SYSTEM	100.0	86.4	100.0	83.3	744	718	620

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING MARCH.

4/84	A	81.1	55.6	100.0	50.1			
	B	94.7	88.2	100.0	79.6			
	C	100.0	90.5	100.0	81.7			
	D	38.5	28.0	100.0	25.3			
	SYSTEM	100.0	87.5	100.0	78.9	720	650	568

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE UNIT WAS REMOVED FROM SERVICE APRIL 28 FOR MAINTENANCE.

5/84	A	100.0			0.0			
	B	100.0			0.0			
	B	100.0			0.0			
	C	100.0			0.0			
	D	100.0			0.0			
	SYSTEM	100.0			0.0	744	0	0

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT REMAINED OUT OF SERVICE THROUGHOUT MAY DUE TO THE ANNUAL MAINTENANCE OUTAGE.

6/84	A	0.0	0.0		0.0			
	B	57.2	96.8	99.7	51.0			
	C	56.9	61.2	98.7	32.2			
	D	56.1	74.4	98.6	39.2			
	SYSTEM	56.8	77.5	99.0	40.8	720	379	294

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT MODULE A WAS BEING RELINED DURING JUNE.

7/84	A	62.5	53.5	100.0	53.5			
	B	100.0	50.3	100.0	50.3			
	C	100.0	34.4	100.0	34.4			
	D	100.0	82.1	100.0	82.1			
	SYSTEM	100.0	73.4	100.0	73.4	744	744	546

** PROBLEMS/SOLUTIONS/COMMENTS

RELINING CONTINUED AT MODULE A DURING JULY.

8/84	A	94.0	40.5	100.0	40.1			
	B	100.0	65.2	100.0	64.5			
	C	85.6	21.7	100.0	21.5			

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

CENTRAL ILLINOIS PUBLIC SERV: NEWTON 1 (CONT.)

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

MOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	D	88.3	72.6	100.0	71.9					
	SYSTEM	100.0	66.7	100.0	66.0		744	737	491	

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD RELATED PROBLEMS AROSE IN AUGUST.

'84	A	85.3	7.8	38.7	7.4					
	B	88.3	57.0	81.9	53.5					
	C	88.3	39.6	75.9	37.2					
	D	87.6	20.1	61.8	18.9					
	SYSTEM	100.0	41.5	86.1	39.0		720	676	281	

'84	A	94.4	69.1	92.4	69.1					
	B	39.7	39.7	87.5	39.7					
	C	94.4	90.1	94.1	90.1					
	D	88.2	27.2	100.0	27.2					
	SYSTEM	100.0	75.3	100.0	75.3		744	744	560	

** PROBLEMS/SOLUTIONS/COMMENTS

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

'84	A	70.8	75.0	100.0	52.9					
	B	30.0	16.1	100.0	11.4					
	C	100.0	92.3	100.0	65.1					
	D	100.0	50.8	100.0	35.8					
	SYSTEM	100.0	78.1	100.0	55.1		720	508	397	

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT MODULES A AND B WERE UNAVAILABLE MOST OF THE MONTH OF NOVEMBER FOR RELINING.

'84	A	29.8	28.0	100.0	28.0					
	B	63.2	42.5	100.0	42.5					
	C	48.7	18.8	100.0	18.8					
	D	66.0	59.1	100.0	59.1					
	SYSTEM	69.2	49.5	100.0	49.5		744	744	368	

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD WAS NOT AVAILABLE TO OPERATE MOST OF DECEMBER DUE TO INSUFFICIENT FLY ASH FOR WASTE STABILIZATION.

'85	A	87.9	68.4	99.0	68.4					
	B	100.0	74.1	100.0	74.1					
	C	89.7	24.9	100.0	24.9					
	D	92.7	81.9	100.0	81.9					
	SYSTEM	100.0	83.1	100.0	83.1		744	744	618	

** PROBLEMS/SOLUTIONS/COMMENTS

NO FGD SYSTEM PROBLEMS WERE REPORTED BY THE UTILITY FOR THE MONTH OF JANUARY.

'85	A	100.0	99.1	100.0	95.7					
	B	100.0	87.7	100.0	84.7					
	C	98.7	44.5	99.7	43.0					
	D	65.6	55.2	100.0	53.3					
	SYSTEM	100.0	95.5	100.0	92.2		672	649	620	

CENTRAL ILLINOIS PUBLIC SERV: NEWTON 1 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

THE D-MODULE PRESATURATOR WAS OUT OF SERVICE DURING PART OF THE MONTH
 FOR RUBBER LINING REPAIR.

3/85	A	100.0	73.1	100.0	70.3			
	B	100.0	95.9	100.0	92.2			
	C	100.0	40.5	100.0	39.0			
	D	72.3	62.1	100.0	59.7			
	SYSTEM	100.0	90.6	100.0	87.1	744	715	648
4/85	A	100.0	61.5	100.0	61.5			
	B	100.0	98.8	100.0	98.8			
	C	100.0	25.4	100.0	25.4			
	D	76.0	75.6	100.0	75.6			
	SYSTEM	100.0	87.1	100.0	87.1	720	720	627

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED NO FGD-RELATED PROBLEMS FOR THE MONTHS OF MARCH AND
 APRIL.

5/85	A	100.0	58.7	100.0	3.0			
	B	100.0	100.0	100.0	5.0			
	C	100.0	0.0		0.0			
	D	100.0	100.0	100.0	5.0			
	SYSTEM	100.0	86.2	100.0	4.3	744	38	32

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE GENERATING UNIT WAS OUT OF SERVICE FOR A
 SCHEDULED ANNUAL MAINTENANCE OUTAGE THROUGH MOST OF MAY.

6/85	A	99.9	95.9	99.7	48.3			
	B	53.3	0.0		0.0			
	C	99.9	26.7	99.0	13.5			
	D	99.9	91.2	99.7	46.0			
	SYSTEM	100.0	71.3	99.5	35.9	720	363	259

** PROBLEMS/SOLUTIONS/COMMENTS

THE ANNUAL UNIT OUTAGE CONTINUED INTO JUNE.

7/85	A	98.1	42.2	100.0	37.5			
	B	100.0	65.4	100.0	58.1			
	C	29.0	6.1	100.0	5.4			
	D	100.0	98.0	100.0	87.1			
	SYSTEM	100.0	70.5	100.0	62.7	744	661	466
8/85	A	97.8	19.5	100.0	19.1			
	B	100.0	94.3	100.0	92.2			
	C	100.0	57.2	100.0	55.9			
	D	100.0	60.1	100.0	58.7			
	SYSTEM	100.0	77.0	100.0	75.3	744	728	560
9/85	A	99.0	57.4	100.0	55.4			
	B	91.1	66.9	100.0	64.6			
	C	96.4	86.8	100.0	83.8			
	D	100.0	69.4	100.0	66.9			
	SYSTEM	100.0	93.5	100.0	90.2	720	695	650
10/85	A	96.1	56.2	100.0	54.4			

LITY FGD SURVEY: JANUARY - DECEMBER 1988

TRAL ILLINOIS PUBLIC SERV: NEWTON 1 (CONT.)

-----PERFORMANCE DATA-----									
100	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD CAP. HOURS FACTOR
	B	99.2	98.5	100.0	95.4				
	C	99.9	50.9	100.0	49.3				
	D	99.2	82.0	100.0	79.4				
	SYSTEM	100.0	95.9	100.0	92.9		744	721	691

** PROBLEMS/SOLUTIONS/COMMENTS

NO FGD SYSTEM-RELATED PROBLEMS WERE REPORTED BY THE UTILITY FOR THE MONTHS OF JULY THROUGH OCTOBER.

'85	A	83.5	63.1	99.5	53.6				
	B	86.4	97.0	99.7	82.4				
	C	23.9	21.9	95.7	18.6				
	D	85.6	97.8	98.7	83.1				
	SYSTEM	93.1	93.3	100.0	79.2		720	612	570

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE C WAS OUT OF SERVICE FOR PART OF THE MONTH. THE UTILITY DID NOT SPECIFY THE REPAIR DETAILS.

'85	A	100.0	98.4	100.0	91.8				
	B	63.7	20.9	100.0	19.5				
	C	79.6	81.1	100.0	75.7				
	D	100.0	98.5	100.0	91.9				
	SYSTEM	100.0	99.6	100.0	93.0		744	694	692

** PROBLEMS/SOLUTIONS/COMMENTS

NO FGD SYSTEM-RELATED PROBLEMS WERE REPORTED BY THE UTILITY FOR THE MONTH OF DECEMBER.

'86	A	83.2	78.1	94.5	72.2				
	B	83.2	71.4	95.3	66.0				
	C	83.2	79.7	94.6	73.7				
	D	8.7	5.8	100.0	5.4				
	SYSTEM	86.1	78.4	100.0	72.4		744	687	539

** PROBLEMS/SOLUTIONS/COMMENTS

THE LOWER THAN EXPECTED FGD SYSTEM AVAILABILITY DURING JANUARY RESULTED FROM A THICKENER RAKE DRIVE FAILURE.

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

'86	A	99.1	93.0	99.5	91.2				
	B	34.2	19.3	100.0	18.9				
	C	99.6	94.8	99.5	93.0				
	D	69.9	61.6	99.3	60.4				
	SYSTEM	100.0	89.5	100.0	87.8		672	659	590

** PROBLEMS/SOLUTIONS/COMMENTS

THE SCRUBBING SYSTEM WAS REMOVED FROM SERVICE FOR PART OF THE MONTH TO ALLOW INSPECTION OF THE MAIN STACK.

'86	A	100.0	50.9	100.0	39.2				
	B	30.5	28.2	100.0	21.8				
	C	100.0	44.1	100.0	34.0				
	D	77.8	21.6	100.0	16.7				
	SYSTEM	100.0	48.3	100.0	37.2		744	574	277
'86	A	98.3	68.6	100.0	68.5				

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

CENTRAL ILLINOIS PUBLIC SERV: NEWTON 1 (CONT.)

-----PERFORMANCE DATA-----									
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART. HOURS	PER BOILER HOURS	FGD CAP. HOURS FACTOR
	B	100.0	72.0	100.0	71.9				
	C	98.5	59.8	100.0	59.7				
	D	96.3	18.8	100.0	18.8				
	SYSTEM	100.0	73.1	100.0	73.0		720	719	525
5/86	A	84.9	71.4	100.0	64.8				
	B	89.4	37.5	100.0	34.0				
	C	77.0	17.8	100.0	16.1				
	D	89.1	60.3	100.0	54.7				
	SYSTEM	100.0	62.3	100.0	56.5		744	675	421
6/86	A	71.0	66.7	100.0	66.7				
	B	100.0	52.5	100.0	52.5				
	C	79.0	66.8	100.0	66.8				
	D	90.0	38.9	100.0	38.9				
	SYSTEM	100.0	75.0	100.0	75.0		720	720	540
7/86	A	95.7	94.4	100.0	94.4				
	B	88.0	28.5	100.0	28.5				
	C	100.0	96.5	100.0	96.5				
	D	98.9	14.7	100.0	14.7				
	SYSTEM	100.0	78.0	100.0	78.0		744	744	580
8/86	A	100.0	78.8	100.0	73.8				
	B	69.0	0.4	100.0	0.4				
	C	100.0	78.8	100.0	73.8				
	D	100.0	8.5	100.0	7.9				
	SYSTEM	100.0	55.5	100.0	52.0		744	697	387
9/86	A	100.0			0.0				
	B	100.0			0.0				
	C	100.0			0.0				
	D	100.0			0.0				
	SYSTEM	100.0			0.0		720	0	0

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT AND FGD SYSTEM WERE OFF-LINE FOR THE ENTIRE MONTH OF SEPTEMBER FOR A SCHEDULED UNIT OUTAGE.

10/86	A	100.0	79.7	100.0	51.9				
	B	20.2	12.8	100.0	8.3				
	C	58.1	85.7	100.0	55.8				
	D	0.0	0.0		0.0				
	SYSTEM	59.4	59.4	100.0	38.7		744	485	288
11/86	A	100.0	72.2	100.0	72.2				
	B	99.2	44.0	100.0	44.0				
	C	100.0	89.0	100.0	89.0				
	D	18.1	14.9	100.0	14.9				
	SYSTEM	100.0	73.4	100.0	73.4		720	720	528
12/86	A	100.0	98.9	100.0	89.5				
	B	67.3	6.1	100.0	5.5				
	C	49.5	33.1	100.0	30.0				
	D	99.1	78.3	100.0	70.8				
	SYSTEM	100.0	72.1	100.0	65.3		744	673	486

** PROBLEMS/SOLUTIONS/COMMENTS

NO FGD SYSTEM-RELATED PROBLEMS WERE REPORTED FOR THE MONTHS OF APRIL THROUGH DECEMBER 1986.

1/87	A	49.5	14.4	100.0	13.4				
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ILITY FGD SURVEY: JANUARY - DECEMBER 1988

NTRAL ILLINOIS PUBLIC SERV: NEWTON 1 (CONT.)

-----PERFORMANCE DATA-----										
R100 MODULE		AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR

	B	100.0	99.2	100.0	92.3					
	C	66.0	50.4	100.0	46.9					
	D	99.3	81.4	100.0	75.8					
	SYSTEM	100.0	81.8	100.0	76.2		744	693	567	
/87	A	64.4	55.4	98.4	53.5					
	B	95.7	78.6	98.5	75.9					
	C	98.8	69.7	98.3	67.3					
	D	67.1	53.0	100.0	51.1					
	SYSTEM	100.0	85.6	100.0	82.6		672	649	555	
/87	A	95.3	84.1	100.0	66.9					
	B	94.2	86.9	100.0	69.2					
	C	61.4	55.0	100.0	43.8					
	D	100.0	64.6	100.0	51.5					
	SYSTEM	100.0	96.9	100.0	77.2		744	593	574	
/87	A	41.5	17.3	100.0	16.1					
	B	100.0	98.4	100.0	91.5					
	C	93.3	80.4	100.0	74.9					
	D	100.0	89.6	100.0	83.3					
	SYSTEM	100.0	95.2	100.0	88.6		720	670	638	
/87	A	78.5	36.9	100.0	32.5					
	B	83.5	74.0	100.0	65.2					
	C	96.4	82.7	100.0	72.8					
	D	100.0	91.2	100.0	80.4					
	SYSTEM	100.0	94.9	100.0	83.6		744	656	622	
/87	A	98.3	97.1	100.0	82.6					
	B	58.6	50.0	100.0	42.5					
	C	89.7	80.7	100.0	68.6					
	D	82.9	53.2	100.0	45.3					
	SYSTEM	100.0	93.7	100.0	79.7		720	613	574	
/87	A	100.0	41.9	100.0	34.9					
	B	100.0	83.1	100.0	69.2					
	C	100.0	86.6	100.0	72.2					
	D	90.9	55.5	100.0	46.2					
	SYSTEM	100.0	89.0	100.0	74.2		744	620	552	
/87	A	98.9	90.9	100.0	66.5					
	B	99.6	70.7	100.0	51.7					
	C	88.0	56.2	100.0	41.1					
	D	80.5	48.7	100.0	35.6					
	SYSTEM	100.0	88.8	100.0	65.0		744	545	484	
/87	A	100.0	70.2	100.0	32.1					
	B	100.0	58.4	100.0	26.7					
	C	100.0	82.4	100.0	37.6					
	D	100.0	26.7	100.0	12.2					
	SYSTEM	100.0	79.2	100.0	36.2		720	329	261	
/87	A	100.0	95.0	100.0	95.0					
	B	97.6	37.0	100.0	37.0					
	C	99.6	54.2	100.0	54.2					
	D	92.5	89.8	100.0	89.8					
	SYSTEM	100.0	92.0	100.0	92.0		744	744	684	
/87	A	70.0	48.8	100.0	43.8					
	B	84.3	65.6	100.0	58.7					
	C	87.6	60.4	100.0	54.2					
	D	100.0	79.3	100.0	71.1					
	SYSTEM	100.0	84.7	100.0	75.9		720	645	547	

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

CENTRAL ILLINOIS PUBLIC SERV: NEWTON 1 (CONT.)

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

12/87	A	100.0	81.3	100.0	81.3					
	B	84.9	38.8	100.0	38.8					
	C	100.0	80.9	100.0	80.9					
	D	87.1	35.2	100.0	35.2					
	SYSTEM	100.0	78.8	100.0	78.8		744	744	586	
12/87	SYSTEM						744			

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED NO MAJOR FGD-RELATED PROBLEMS FOR THE YEAR 1987.

1/88	A	85.5	97.4	100.0	76.2					
	B	95.4	28.2	100.0	22.0					
	C	87.9	64.1	100.0	50.1					
	D	83.7	76.9	100.0	60.2					
	SYSTEM	100.0	88.9	100.0	69.5		744	582	517	
2/88	A	88.6	78.3	100.0	75.1					
	B	90.7	53.0	100.0	50.9					
	C	100.0	98.4	100.0	94.4					
	D	76.3	29.8	100.0	28.6					
	SYSTEM	100.0	86.5	100.0	83.0		696	668	578	
3/88	A	96.1	68.3	100.0	66.1					
	B	99.5	59.8	100.0	57.9					
	C	76.7	56.2	100.0	54.4					
	D	100.0	82.9	100.0	80.2					
	SYSTEM	100.0	89.1	100.0	86.2		744	721	642	
4/88	A	81.3	10.6	100.0	10.3					
	B	100.0	99.2	100.0	96.3					
	C	100.0	71.9	100.0	69.7					
	D	100.0	72.2	100.0	70.0					
	SYSTEM	100.0	84.6	100.0	82.1		720	699	591	
5/88	A	100.0			0.0					
	B	100.0			0.0					
	C	100.0			0.0					
	D	100.0			0.0					
	SYSTEM	100.0			0.0		744	0	0	
6/88	A	64.4	18.0	100.0	11.0					
	B	100.0	80.9	100.0	49.4					
	C	100.0	60.7	100.0	37.1					
	D	100.0	92.0	100.0	56.3					
	SYSTEM	100.0	83.9	100.0	51.3		720	440	369	
7/88	A	100.0	98.2	100.0	98.1					
	B	77.0	38.7	100.0	38.7					
	C	96.5	91.4	100.0	91.3					
	D	96.0	24.4	100.0	24.3					
	SYSTEM	100.0	84.2	100.0	84.1		744	743	626	
8/88	A	98.9	83.6	100.0	83.6					
	B	98.8	47.7	100.0	47.7					
	C	98.9	84.9	100.0	84.9					
	D	98.9	35.8	100.0	35.8					
	SYSTEM	100.0	84.0	100.0	84.0		744	744	625	
9/88	A	100.0	69.9	94.9	69.9					
	B	100.0	47.1	100.0	47.1					

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

CENTRAL ILLINOIS PUBLIC SERV: NEWTON 1 (CONT.)

-----PERFORMANCE DATA-----										
MOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	C	100.0	51.4	100.0	51.4					
	D	100.0	88.3	100.0	88.3					
	SYSTEM	100.0	85.6	100.0	85.6		720	720	616	
/88	A	85.6	42.3	100.0	40.2					
	B	100.0	86.6	100.0	82.3					
	C	88.2	76.0	100.0	72.2					
	D	93.5	69.4	100.0	65.9					
	SYSTEM	100.0	91.4	100.0	86.8		744	707	646	
/88	A	87.8	50.1	100.0	43.8					
	B	95.4	81.0	100.0	70.7					
	C	100.0	88.1	100.0	76.9					
	D	95.0	56.5	100.0	49.3					
	SYSTEM	100.0	91.9	100.0	80.2		720	629	578	
/88	A	90.5	43.8	99.1	43.8					
	B	89.8	73.9	100.0	73.9					
	C	100.0	93.0	100.0	93.0					
	D	95.6	63.0	100.0	63.0					
	SYSTEM	100.0	91.3	100.0	91.3		744	744	679	

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED NO MAJOR FGD-RELATED PROBLEMS FOR THE YEAR 1988.

SECTION 13
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	CINCINNATI GAS & ELECTRIC
PLANT NAME	EAST BEND
UNIT NUMBER	2
CITY	RABBIT HASH
STATE	KENTUCKY
REGULATORY CLASSIFICATION	C
PARTICULATE EMISSION LIMITATION - NG/J	43. (0.100 LB/MMBTU)
SO ₂ EMISSION LIMITATION - NG/J	516. (1.200 LB/MMBTU)
CO EMISSION LIMITATION - NG/J	301. (0.700 LB/MMBTU)
PLANT GENERATING CAPACITY - MW	650
GROSS UNIT GENERATING CAPACITY - MW	643
UNIT GENERATING CAPACITY W/FGD - MW	600
UNIT GENERATING CAPACITY WO/FGD - MW	619
EQUIVALENT SCRUBBED CAPACITY - MW	643
* 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	1763.96 (3738000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	357.2 (675 F)
STACK HEIGHT - M	198. (650 FT)
STACK SHELL	CONCRETE
STACK TOP DIAMETER - M	7.2 (23.5 FT)
* FUEL DATA	
FUEL TYPE	COAL
FUEL GRADE	BITUMINOUS
AVERAGE HEAT CONTENT - J/G	25586. (11000 BTU/LB)
RANGE HEAT CONTENT - BTU/LB	10800-13000
AVERAGE ASH CONTENT - %	11.90
RANGE ASH CONTENT - %	9.0-14.0
AVERAGE MOISTURE CONTENT - %	10.00
RANGE MOISTURE CONTENT - %	9.0-11.0
AVERAGE SULFUR CONTENT - %	2.60
RANGE SULFUR CONTENT - %	1.0-4.0
AVERAGE CHLORIDE CONTENT - %	*****
RANGE CHLORIDE CONTENT - %	****
** PARTICLE CONTROL	
** MECHANICAL COLLECTOR	
NUMBER	0
TYPE	NONE
** FABRIC FILTER	
NUMBER	0
TYPE	NONE
** ESP	
NUMBER	1
NUMBER OF SPARES	0
TYPE	HOT SIDE
SUPPLIER	WESTERN PREC. DIVISION, JOY
INLET FLUE GAS CAPACITY - CU.M/S	1764.0 (3738000 ACFM)
INLET FLUE GAS TEMPERATURE - C	357.2 (675 F)
PRESSURE DROP - KPA	0.1 (1. IN-H ₂ O)
PARTICLE REMOVAL EFFICIENCY - %	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

CINCINNATI GAS & ELECTRIC: EAST BEND 2 (CONT.)

*** FGD SYSTEM

** GENERAL DATA

SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT
SO2 REMOVAL MODE	WET SCRUBBING
PROCESS TYPE	LIME
PROCESS ADDITIVES	NONE
SYSTEM SUPPLIER	BABCOCK & WILCOX
A-E FIRM	SARGENT & LUNDY
DEVELOPMENT LEVEL	FULL SCALE
NEW/RETROFIT	NEW
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.00
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	87.00
ENERGY CONSUMPTION - %	3.0
CURRENT STATUS	1
COMMERCIAL START-UP	3/1981
INITIAL START-UP	3/1981
CONTRACT AWARDED	3/1978

** DESIGN AND OPERATING PARAMETERS

DESIGN COAL SULFUR CONTENT - %	5.20	
DESIGN COAL HEAT CONTENT - J/G	25586.0	(11000 BTU/LB)
DESIGN COAL ASH CONTENT - %	11.90	
DESIGN MOISTURE CONTENT - %	10.00	
DESIGN CHLORIDE CONTENT - %	*****	
SPACE REQUIREMENTS - SQ M	13461.2	(144900 SQ FT)
OPER. & MAINT. REQUIREMENT - MANHR/DAY	144.0	

** QUENCHER/PRESATURATOR

NUMBER	3	
TYPE	VENTURI	
SUPPLIER	BABCOCK & WILCOX	
INLET GAS FLOW - CU. M/S	398.49	(844433 ACFM)
INLET GAS TEMPERATURE - C	136.7	(278 F)
PRESSURE DROP - KPA	0.2	(1.0 IN-H2O)
LIQUID RECIRCULATION RATE - LITERS/S	552.	(8760 GPM)
L/G RATIO - L/CU. M	1.3	(10.0 GAL/1000 ACFM)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	
CONSTRUCTION MATERIAL SPECIFIC TYPE	AISI 1110	

** ABSORBER

NUMBER	3	
NUMBER OF SPARES	0	
GENERIC TYPE	COUNTER CURRENT TRAY TOWER	
SPECIFIC TYPE	SIEVE TRAY	
TRADE NAME/COMMON TYPE	N/A	
SUPPLIER	BABCOCK & WILCOX	
DIMENSIONS - FT	43.0 DIA X 95.0	
SHELL GENERIC MATERIAL	STAINLESS STEEL	
SHELL SPECIFIC MATERIAL	AUSTENITIC	
SHELL MATERIAL TRADE NAME/COMMON TYPE	TYPE 316	
LINER GENERIC MATERIAL	NA	
LINER SPECIFIC MATERIAL	NA	
LINER MATERIAL TRADE NAME/COMMON TYPE	NA	
GAS CONTACTING DEVICE TYPE	PERFORATED TRAYS	
NUMBER OF CONTACTING ZONES	1	
LIQUID RECIRCULATION RATE - LITER/S	2205.	(35000 GPM)
L/G RATIO - L/CU.M	6.7	(50.0 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	0.6	(2.5 IN-H2O)
SUPERFICIAL GAS VELOCITY - M/SEC	2.4	(8.0 FT/S)
INLET GAS FLOW - CU. M/S	329.66	(698585 ACFM)
INLET GAS TEMPERATURE - C	50.6	(123 F)
SO2 REMOVAL EFFICIENCY - %	87.0	

** MIST ELIMINATOR

PRE-MIST ELIMINATOR/MIST ELIMINATOR	PRIMARY COLLECTOR
NUMBER PER SYSTEM	6
NUMBER OF SPARES PER SYSTEM	0
NUMBER PER MODULE	2
GENERIC TYPE	IMPINGEMENT

ILITY FGD SURVEY: JANUARY - DECEMBER 1988

VCINWATI GAS & ELECTRIC: EAST BEND 2 (CONT.)

SPECIFIC TYPE	BAFFLE	
TRADE NAME/COMMON TYPE	CLOSED VANE	
MANUFACTURER	BABCOCK & WILCOX	
CONFIGURATION	HORIZONTAL	
NUMBER OF STAGES	2	
NUMBER OF PASSES PER STAGE	1	
FREEBOARD DISTANCE - M	2.13	(7.0 FT)
DISTANCE BETWEEN STAGES - CM	182.88	(72.0 IN)
DISTANCE BETWEEN VANES - CM	7.6	(3.00 IN)
VANE ANGLES - DEGREES	90	
PRESSURE DROP - KPA	0.1	(0.5 IN-H2O)
SUPERFICIAL GAS VELOCITY - M/S	2.4	(8.0 FT/S)
CONSTRUCTION MATERIAL GENERIC TYPE	ORGANIC	
CONSTRUCTION MATERIAL SPECIFIC TYPE	FIBER-REINFORCED POLYESTER	
WASH WATER SOURCE	BLENDED	
WASH FREQUENCY	INTERMITTENT	
WASH RATE - L/S	58.4	(926 GAL/MIN)
* REHEATER		
NUMBER	1	
NUMBER OF SPARES	0	
NUMBER PER MODULE	0	
GENERIC TYPE	INDIRECT HOT AIR	
SPECIFIC TYPE	STEAM	
TRADE NAME/COMMON TYPE	STEAM TUBE BUNDLE	
LOCATION	PLENUM COMBINING GAS FLOW FROM INDIVIDUAL ABSORB	
TEMPERATURE INCREASE - C	13.9	(25 F)
INLET FLUE GAS TEMPERATURE - C	51.7	(125 F)
NUMBER OF HEAT EXCHANGER BANKS	2	
CONSTRUCTION MATERIAL GENERIC TYPE	NA	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NA	
* FANS		
NUMBER	4	
NUMBER OF SPARES	0	
DESIGN	CENTRIFUGAL	
SUPPLIER	WESTINGHOUSE	
FUNCTION	UNIT	
APPLICATION	INDUCED DRAFT	
SERVICE	DRY	
FLUE GAS FLOW RATE - CU.M/S	1175.12	(2490185 ACFM)
FLUE GAS TEMPERATURE - C	136.7	(278 F)
PRESSURE DROP - KPA	7.3	(23.8 IN-H2O)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	
* FANS		
NUMBER	2	
NUMBER OF SPARES	0	
DESIGN	CENTRIFUGAL	
SUPPLIER	WESTINGHOUSE	
FUNCTION	UNIT	
APPLICATION	FORCED DRAFT	
SERVICE	DRY	
FLUE GAS FLOW RATE - CU.M/S	639.25	(1354635 ACFM)
FLUE GAS TEMPERATURE - C	37.8	(100 F)
PRESSURE DROP - KPA	5.3	(17.5 IN-H2O)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	
** FANS		
NUMBER	3	
NUMBER OF SPARES	0	
DESIGN	CENTRIFUGAL	
SUPPLIER	WESTINGHOUSE	
FUNCTION	BOOSTER	
APPLICATION	INDUCED DRAFT	
SERVICE	DRY	
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	
** DAMPERS		
NUMBER	3	
FUNCTION	SHUT-OFF	

CINCINNATI GAS & ELECTRIC: EAST BEND 2 (CONT.)

GENERIC TYPE	LOUVER
SPECIFIC TYPE	OPPOSED BLADE
MANUFACTURER	BABCOCK & WILCOX
MODULATION	OPEN
SERVICE CONDITIONS	278
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR
LINER GENERIC MATERIAL TYPE	NR
LINER SPECIFIC MATERIAL TYPE	NR
** DAMPERS	
FUNCTION	CONTROL
MODULATION	OPEN
** DUCTWORK	
LOCATION	AFTER SCRUBBER
CONFIGURATION	CIRCULAR
DIMENSIONS	17 FT. DIAMETER
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
SHELL SPECIFIC MATERIAL TYPE	NR
LINER GENERIC MATERIAL TYPE	NR
LINER SPECIFIC MATERIAL TYPE	40 MILS PLASITE 4005/2 INCHES KAOCRETE HS
** REAGENT PREPARATION EQUIPMENT	
FUNCTION	SLAKER
DEVICE	COMPARTMENTED
DEVICE TYPE	PASTE
MANUFACTURER	WALLACE & TIERNAN
NUMBER	8
NUMBER OF SPARES	2
FULL LOAD DRY FEED CAPACITY - M.TONS/HR	3.6 (4 TPH)
PRODUCT QUALITY - % SOLIDS	15.8
** TANKS	
SERVICE	NUMBER
-----	-----
ABSORBER RECYCLE	3
REAGENT PREP PRODUCT	1
THICKENER OVERFLOW	1
THICKENER UNDERFLOW	1
** PUMPS	
SERVICE	NUMBER
-----	-----
FEED SLURRY	2
ABSORBER RECIRCULATION	12
QUENCHER RECIRCULATION	6
THICKENER UNDERFLOW	4
CLARIFIED RECYCLE	2
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	VACUUM FILTER
NUMBER	4
NUMBER OF SPARES	0
CONFIGURATION	HORIZONTAL-PARALLEL
DIMENSIONS - FT	12 FT. DIAMETER X 20 FT.
CAPACITY	22 TONS/HR
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
SHELL SPECIFIC MATERIAL TYPE	AISI 1110
LINER GENERIC MATERIAL TYPE	ORGANIC
LINER SPECIFIC MATERIAL TYPE	POLYPROPYLENE
BELT GENERIC MATERIAL TYPE	RUBBER
BELT SPECIFIC MATERIAL TYPE	USBM 28
FEED STREAM SOURCE	THICKENER UNDERFLOW
FEED STREAM CHARACTERISTICS	668 GPM, 30% SOLIDS
OUTLET STREAM CHARACTERISTICS	47.5% SOLIDS
OVERFLOW STREAM CHARACTERISTICS	200 GPM, 30% SOLIDS
OUTLET STREAM DISPOSITION	MIXED WITH FLYASH & LIME
OVERFLOW STREAM DISPOSITION	THICKENERS

LITY FGD SURVEY: JANUARY - DECEMBER 1988

ICINNATI GAS & ELECTRIC: EAST BEND 2 (CONT.)

* SOLIDS CONCENTRATING/DEWATERING

DEVICE	THICKENER
NUMBER	2
NUMBER OF SPARES	0
CONFIGURATION	CYLINDRICAL
DIMENSIONS - FT	190.0 DIA X 25.0
CAPACITY	5000000 GALLONS
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
SHELL SPECIFIC MATERIAL TYPE	N/A
LINER GENERIC MATERIAL TYPE	POLYESTER RESIN
LINER SPECIFIC MATERIAL TYPE	FLAKE GLASS
BELT GENERIC MATERIAL TYPE	N/A
BELT SPECIFIC MATERIAL TYPE	N/A
FEED STREAM SOURCE	ABSORBER BLEED
FEED STREAM CHARACTERISTICS	1458 GPM, 7% SOLIDS
OUTLET STREAM CHARACTERISTICS	655 GPM, 30% SOLIDS
OVERFLOW STREAM CHARACTERISTICS	1129 GPM, 0% SOLIDS
OUTLET STREAM DISPOSITION	PUMPED TO WASTE STABILIZATION SYSTEM
OVERFLOW STREAM DISPOSITION	RECYCLED

* SALEABLE BYPRODUCTS

NATURE	NONE
DISPOSITION	N/A

* SLUDGE

FULL LOAD SLUDGE QUANTITY - M.TONS/HR (DRY)	16.6	(18.3 TPH)
MOISTURE CONTENT - % TOTAL FREE WATER	75.0	
% CASO3 - DRY	77.0	
% CASO4 - DRY	17.0	
% CAOH2 - DRY	3.0	
% CACO3 - DRY	1.0	
% ASH - DRY	0.0	
% SODIUM COMPOUNDS - DRY	0.0	
% OTHER COMPOUNDS - DRY	2.0	

* TREATMENT

METHOD	FIXATION	
DEVICE	PUG MILL	
PROPRIETARY PROCESS	CONVERSION SYSTEMS 'POZ-O-TEC'	
INLET FLOW RATE - LITER/S	42.1	(668 GPM)
INLET QUALITY - %	30.0	

* DISPOSAL

NATURE	FINAL	
TYPE	LANDFILL	
LOCATION	ON-SITE	
SITE TRANSPORTATION METHOD	TRUCK	
SITE TREATMENT	UNLINED	
SITE DIMENSIONS	160 ACRES/120 FEET	
SITE CAPACITY - CU.M	23481600	(19200.0 ACRE-FT)
SITE SERVICE LIFE - YRS	35	

* WATER BALANCE

WATER LOOP TYPE	CLOSED	
EVAPORATION WATER LOSS - LITER/S	21.9	(348 GPM)
SLUDGE HYDRATION WATER LOSS - LITER/S	0.4	(7 GPM)
SLUDGE INTERSTITIAL WATER LOSS - LITERS/S	6.9	(109 GPM)
POND SEEPAGE/RUNOFF WATER LOSS - LITERS/S	0	
EFFLUENT WATER LOSS - LITERS/S	0.0	(0 GPM)
RECEIVING WATER STREAM	NONE	
MAKEUP WATER ADDITION - LITERS/S	29.2	(464 GPM)
SOURCE OF MAKEUP WATER	OHIO RIVER	

* CHEMICALS AND CONSUMPTION

FUNCTION	ABSORBENT
NAME	THIOSORBIC LIME

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

CINCINNATI GAS & ELECTRIC: EAST BEND 2 (CONT.)

PRINCIPAL CONSTITUENT	90% CAO, 5% MGO, 5% INERT
SOURCE/SUPPLIER	DRAVO LIME
CONSUMPTION	250 TONS/DAY
UTILIZATION - %	96.6
POINT OF ADDITION	RECIRCULATION TANK

** FGD SPARE CAPACITY INDICES

SCRUBBER - %	0.0
ABSORBER - %	0.0
MIST ELIMINATOR - %	0.0
REHEATER - %	0.0
FAN - %	0.0
SLAKER - %	25.0
EFFLUENT HOLD TANK - %	0.0
RECIRCULATION PUMP - %	25.0
THICKENER - %	0.0
VACUUM FILTER - %	0.0

** FGD SPARE COMPONENT INDICES

SCRUBBER	0.0
ABSORBER	0.0
MIST ELIMINATOR	0.0
REHEATER	0.0
FAN	0.0
SLAKER	2.0
EFFLUENT HOLD TANK	0.0
RECIRCULATION PUMP	3.0
THICKENER	0.0
VACUUM FILTER	0.0

-----PERFORMANCE DATA-----										
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER BOILER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
3/81	A	98.3	55.3	100.0	14.1					
	B	97.6	48.4	100.0	12.4					
	C	74.4	0.0		0.0					
	SYSTEM	100.0	51.8	100.0	13.2	47.70	744	190	99	12.6

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM BEGAN INITIAL AND COMMERCIAL OPERATIONS IN MARCH 1981. NO MAJOR PROBLEMS WERE ENCOUNTERED DURING THIS TIME.

4/81	A	96.3	69.2	100.0	59.0					
	B	89.7	50.6	100.0	43.2					
	C	86.3	47.9	100.0	40.8					
	SYSTEM	100.0	83.8	100.0	71.5	78.70	720	614	515	60.4
5/81	A	84.5	76.6	100.0	60.3					
	B	71.5	35.9	100.0	28.2					
	C	41.2	10.3	100.0	8.1					
	SYSTEM	98.6	61.5	100.0	48.3	96.10	744	586	360	41.4
6/81	A	100.0	82.4	100.0	70.5					
	B	67.8	44.8	100.0	38.3					
	C	94.9	72.0	100.0	61.6					
	SYSTEM	100.0	99.6	100.0	85.2	84.60	720	616	614	62.6

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE FGD SYSTEM HAS OPERATED SINCE MID-MARCH WITH NO MAJOR PROBLEMS.

7/81	A	89.3	56.4	100.0	56.3					
	B	91.7	72.0	100.0	71.9					
	C	97.4	57.2	100.0	57.1					
	SYSTEM	100.0	92.7	100.0	92.6	92.40	744	743	689	79.6

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

WINNATI GAS & ELECTRIC: EAST BEND 2 (CONT.)

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

/81	A	45.9	15.8	100.0	15.3					
	B	96.0	92.5	100.0	89.7					
	C	97.5	81.8	100.0	79.3					
	SYSTEM	100.0	95.0	100.0	92.1	82.30	744	721	685	76.2
/81	A	85.7	67.5	100.0	62.9					
	B	96.6	84.6	100.0	78.8					
	C	33.5	10.4	100.0	9.7					
	SYSTEM	100.0	81.3	100.0	75.7	77.40	720	671	545	65.3

** PROBLEMS/SOLUTIONS/COMMENTS

THE ONLY PROBLEM ENCOUNTERED DURING THE THIRD QUARTER INVOLVED ONE OF THE TWO THICKENERS. THE PROBLEM NECESSITATED USE OF THE EMERGENCY ASH POND FOR A SHORT PERIOD OF TIME TO HANDLE THE SLUDGE BEING GENERATED.

THE UTILITY REPORTED THAT TESTING WITH STRAIGHT LIME WILL TAKE PLACE FOR A TWO TO THREE MONTH PERIOD BEGINNING IN NOVEMBER. CURRENTLY, THIOSORBIC LIME IS BEING USED. THE FGD SYSTEM WAS DESIGNED TO OPERATE WITH STRAIGHT LIME AS THE REAGENT AND, AS SUCH, THE TESTING WILL BE PERFORMED TO SEE IF THE SYSTEM CAN MEET DESIGN GUARANTEES.

/81	A	92.4	31.4	100.0	29.3					
	B	97.6	89.3	100.0	83.3					
	C	91.7	75.0	100.0	85.1					
	SYSTEM	100.0	97.8	100.0	91.3	81.60	744	695	679	68.2
/81	A	96.4	61.2	100.0	22.6					
	B	96.4	75.8	100.0	28.0					
	C	96.4	12.6	100.0	4.6					
	SYSTEM	100.0	74.5	100.0	27.6	86.70	720	266	198	30.0
/81	A	93.4	53.7	100.0	49.7					
	B	93.4	56.4	100.0	52.2					
	C	81.0	63.1	100.0	58.4					
	SYSTEM	100.0	86.6	100.0	80.1	85.70	744	689	596	68.0

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE FOURTH QUARTER THE BOILER AND THE FGD SYSTEM WERE TAKEN OFF-LIN FOR AN INSPECTION. THE UTILITY REPORTED THAT THERE WERE NO SIGNS OF ANY CORROSION OR EROSION. THE SYSTEM HAS PERFORMED WELL WITH NO PROBLEMS.

/82	A	64.1	57.6	100.0	50.5					
	B	97.0	94.5	100.0	82.8					
	C	48.7	34.4	100.0	30.1					
	SYSTEM	100.0	93.2	100.0	81.8	80.60	744	653	608	75.9

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JANUARY PROBLEMS WERE ENCOUNTERED WITH ICE BUILDUP ON THE FANS.

/82	SYSTEM						672			
/82	SYSTEM						744			
/82	SYSTEM						720			
/82	SYSTEM						744			
/82	SYSTEM						720			

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

CINCINNATI GAS & ELECTRIC: EAST BEND 2 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

INFORMATION WAS UNAVAILABLE FOR THE PERIOD OF MARCH 1982 TO JUNE 1982.

7/82	SYSTEM	100.0	99.0	100.0	98.1	744	733	730	68.7
8/82	SYSTEM	100.0	100.0	100.0	100.0	744	744	744	77.9
9/82	SYSTEM	100.0	99.7	100.0	98.9	720	714	712	61.5

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE PERIOD OF JULY THROUGH SEPTEMBER, 1982.

10/82	SYSTEM	100.0	100.0	100.0	2.5	744	19	19	1.6
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** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS REMOVED FROM SERVICE DURING OCTOBER FOR A MAINTENANCE OUTAGE.

11/82	SYSTEM	100.0		100.0		720	0		
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** PROBLEMS/SOLUTIONS/COMMENTS

OUTAGE TIME DURING NOVEMBER WAS DUE TO THE RETURN OF SERVICE ON UNIT 2 FROM THE MAINTENANCE OUTAGE IN OCTOBER. BOILER OUTLET TEMPERATURE WAS INSUFFICIENT FOR OPERATION OF THE PRECIPITATORS OR FGD SYSTEM.

12/82	SYSTEM	100.0	99.4	100.0	95.6	744	715	711	52.2
1/83	SYSTEM	100.0	99.7	100.0	98.4	744	734	732	67.1
2/83	SYSTEM	100.0	100.0	100.0	100.0	672	672	672	74.5
3/83	SYSTEM	100.0	98.9	100.0	89.9	744	677	669	69.2
4/83	SYSTEM	100.0	98.6	100.0	75.1	720	547	541	71.2
5/83	SYSTEM	100.0	99.2	100.0	99.2	744	741	738	91.8
6/83	SYSTEM	100.0	99.4	100.0	90.4	720	655	651	81.7

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE PERIOD OF DECEMBER 1982 THROUGH JUNE 1983.

7/83	SYSTEM	100.0	99.5	100.0	92.9	744	694	691	80.1
8/83	SYSTEM	100.0	99.7	100.0	99.5	744	742	740	85.5

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING JULY AND AUGUST.

9/83	SYSTEM					720			
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UTILITY FGD SURVEY: JANUARY - DECEMBER 1988
 CINCINNATI GAS & ELECTRIC: EAST BEND 2 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

INFORMATION WAS UNAVAILABLE FOR THE MONTH OF SEPTEMBER.

83	SYSTEM	744
83	SYSTEM	720
83	SYSTEM	744

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD-RELATED PROBLEMS WERE REPORTED DURING THE FOURTH QUARTER OF 1983. AVAILABILITY WAS REPORTED AS 100%.

84	SYSTEM	744
84	SYSTEM	696
84	SYSTEM	744
84	SYSTEM	720
84	SYSTEM	744
84	SYSTEM	720
84	SYSTEM	744
84	SYSTEM	744
84	SYSTEM	720

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE FGD SYSTEM WAS 100% AVAILABLE DURING THE FIRST THREE QUARTERS OF 1984.

84	SYSTEM	744
84	SYSTEM	720
84	SYSTEM	744

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE FGD SYSTEM WAS DOWN FROM SEPTEMBER 29 THRU OCTOBER 27, FOR A SCHEDULED BOILER/TURBINE OUTAGE. NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE QUARTER.

85	SYSTEM	744
85	SYSTEM	672
85	SYSTEM	744
85	SYSTEM	720
85	SYSTEM	744
85	SYSTEM	720
85	SYSTEM	744

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

CINCINNATI GAS & ELECTRIC: EAST BEND 2 (CONT.)

-----PERFORMANCE DATA-----							
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER BOILER FGD CAP. HOURS HOURS HOURS FACTOR
8/85	SYSTEM						744
9/85	SYSTEM						720
10/85	SYSTEM						744
11/85	SYSTEM						720
12/85	SYSTEM						744

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT DURING THE YEAR 1985 THERE WERE NO BOILER OR FGD SYSTEM OUTAGES. THE UNIT EXPERIENCED ONLY 5 MINOR TRIPS ALL YEAR DUE TO MINOR DAMPER DRIVE PROBLEMS AND AIR PREHEATER ALIGNMENT. DUE TO LOWERING SULFUR COAL CONTENTS, THE UTILITY OPERATED 1 MODULE 25% OF THE TIME AND 2 MODULES 75% OF THE TIME. THE UTILITY VERY RARELY HAD TO USE ALL 3 MODULES. THE SYSTEM WAS ORIGINALLY DESIGNED TO HANDLE 3.5% SULFUR COAL AND THE UTILITY IS CURRENTLY BURNING 2.5 - 3.0% SULFUR COAL.

THE UTILITY STATED THEY ARE CURRENTLY EXPERIMENTING WITH OPERATING WITHOUT SPRAY NOZZLES TO LOWER PUMPING COSTS AND REDUCE THE MAINTENANCE REQUIRED FOR CLEANING NOZZLES. THE UTILITY FEELS THEY WILL BE ABLE TO MAINTAIN LIQUID/GAS CONTACT WELL ENOUGH WITHOUT THE USE OF THE NOZZLES.

1/86	SYSTEM						774
2/86	SYSTEM						672
3/86	SYSTEM						774
4/86	SYSTEM						720
5/86	SYSTEM						774
6/86	SYSTEM						720
7/86	SYSTEM						774
8/86	SYSTEM						774
9/86	SYSTEM						720
10/86	SYSTEM						774
11/86	SYSTEM						720
12/86	SYSTEM						774

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE YEAR 1986, NO MAJOR FGD-RELATED OUTAGES WERE ENCOUNTERED. DURING VARIOUS MINOR BOILER/TURBINE OUTAGES, NOZZLE REPLACEMENT WORK AND THE REDESIGNING OF THE SPRAY HEADER FEED SYSTEM WERE CONDUCTED. TO DATE, THE NEW NOZZLES REPORTEDLY HAVE LOWERED THE SO2 REMOVAL EFFICIENCY BY ONLY A FEW PERCENT.

1/87	SYSTEM						744
2/87	SYSTEM						672
3/87	SYSTEM						744
4/87	SYSTEM						720

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

NCINWAT GAS & ELECTRIC: EAST BEND 2 (CONT.)

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

1/87	SYSTEM						744			
4/87	SYSTEM						720			
7/87	SYSTEM						744			
8/87	SYSTEM						744			
9/87	SYSTEM						720			

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED OUTAGES WERE ENCOUNTERED DURING THE PERIOD JANUARY THROUGH SEPTEMBER 1987.

1/87	SYSTEM						744			
7/87	SYSTEM						720			
9/87	SYSTEM						744			

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE UNIT WAS TAKEN OUT OF SERVICE FOR A MAJOR SCHEDULED OUTAGE ON OCTOBER 3, 1987. THE BOILER/TURBINE MAINTENANCE OUTAGE LASTED APPROXIMATELY 2 MONTHS WITH THE UNIT COMING BACK ON-LINE THE FIRST WEEK OF DECEMBER. DURING THIS OUTAGE PERIOD, THE UTILITY REPLACED THE MIST ELIMINATOR IN ONE OF THE THREE ABSORBER MODULES.

THE REMAINING TWO WILL BE REPLACED IN THE FALL OF 1988 WHILE THE UNIT IS ON-LINE. THE MIST ELIMINATORS ARE CONSTRUCTED OF A DIFFERENT MATERIAL BUT HAVE THE SAME DESIGN AND ARE SUPPLIED BY THE SAME CONTRACTOR AS THE ORIGINALS.

1/88	SYSTEM						774			
2/88	SYSTEM						672			
3/88	SYSTEM						774			
4/88	SYSTEM						720			
5/88	SYSTEM						774			
6/88	SYSTEM						720			
7/88	SYSTEM						774			
8/88	SYSTEM						774			
9/88	SYSTEM						720			
10/88	SYSTEM						774			
11/88	SYSTEM						720			
12/88	SYSTEM						774			

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED OUTAGES WERE ENCOUNTERED DURING THE YEAR. THE UNIT 1 FGD SYSTEM AVAILABILITY WAS GREATER THAN 99 PERCENT. THE MIST ELIMINATOR REPLACEMENT WORK WAS CONCLUDED IN 1988. THE ORIGINAL MIST ELIMINATORS LASTED APPROXIMATELY EIGHT YEARS BEFORE BECOMING

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

CINCINNATI GAS & ELECTRIC: EAST BEND 2 (CONT.)

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

SECTION 13
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	CITY UTILITIES OF SPRINGFIELD	
PLANT NAME	SOUTHWEST	
UNIT NUMBER	1	
CITY	SPRINGFIELD	
STATE	MISSOURI	
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	301.	(0.700 LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	173	
GROSS UNIT GENERATING CAPACITY - MW	195	
NET UNIT GENERATING CAPACITY W/FGD - MW	173	
NET UNIT GENERATING CAPACITY WO/FGD - MW	182	
EQUIVALENT SCRUBBED CAPACITY - MW	195	
*** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	RILEY STOKER	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	375.16	(795000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	165.6	(330 F)
STACK HEIGHT - M	117.	(385 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	3.7	(12.0 FT)
*** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	BITUMINOUS	
AVERAGE HEAT CONTENT - J/G	25586.	(11000 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		10500-12500
AVERAGE ASH CONTENT - %	12.00	
RANGE ASH CONTENT - %	10.0-22.0	
AVERAGE MOISTURE CONTENT - %	9.00	
RANGE MOISTURE CONTENT - %	6.0-12.0	
AVERAGE SULFUR CONTENT - %	3.50	
RANGE SULFUR CONTENT - %	2.5-4.5	
AVERAGE CHLORIDE CONTENT - %	0.30	
RANGE CHLORIDE CONTENT - %	****	
*** PARTICLE CONTROL		
** MECHANICAL COLLECTOR		
NUMBER	0	
TYPE	NONE	
** ESP		
NUMBER	1	
NUMBER OF SPARES	0	
TYPE	COLD SIDE	
SUPPLIER	AIR CORRECTION DIVISION, UOP	
INLET FLUE GAS CAPACITY - CU.M/S	375.2	(795000 ACFM)
INLET FLUE GAS TEMPERATURE - C	148.9	(300 F)
PRESSURE DROP - KPA	0.1	(1. IN-H2O)
PARTICLE REMOVAL EFFICIENCY - %	99.7	
** 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	
*** FGD SYSTEM		

ILITY FGD SURVEY: JANUARY - DECEMBER 1988

TY UTILITIES OF SPRINGFIELD: SOUTHWEST 1 (CONT.)

* GENERAL DATA

SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT
SO2 REMOVAL MODE	WET SCRUBBING
PROCESS TYPE	LIMESTONE
PROCESS ADDITIVES	ADIPIC ACID
SYSTEM SUPPLIER	AIR CORRECTION DIVISION, UOP
A-E FIRM	BURNS & MCDONNELL
DEVELOPMENT LEVEL	FULL SCALE
NEW/RETROFIT	NEW
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.70
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	80.00
ENERGY CONSUMPTION - %	4.6
CURRENT STATUS	1
COMMERCIAL START-UP	9/1977
INITIAL START-UP	4/1977
CONTRACT AWARDED	8/1973

* DESIGN AND OPERATING PARAMETERS

DESIGN COAL SULFUR CONTENT - %	3.50	
DESIGN COAL HEAT CONTENT - J/G	25697.6	(11048 BTU/LB)
DESIGN COAL ASH CONTENT - %	11.01	
DESIGN MOISTURE CONTENT - %	14.00	
DESIGN CHLORIDE CONTENT - %	0.30	
SPACE REQUIREMENTS - SQ M	1393.5	(15000 SQ FT)
OPER. & MAINT. REQUIREMENT - MANHR/DAY	105.0	

* QUENCHER/PRESATURATOR

NUMBER	2
TYPE	QUENCH DUCT
SUPPLIER	AIR CORRECTION DIVISION, UOP
INLET GAS FLOW - CU. M/S	165.16 (350000 ACFM)
INLET GAS TEMPERATURE - C	165.6 (330 F)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL
CONSTRUCTION MATERIAL SPECIFIC TYPE	ASTM A-36

* ABSORBER

NUMBER	2
NUMBER OF SPARES	0
GENERIC TYPE	TRAY TOWER
SPECIFIC TYPE	NR
TRADE NAME/COMMON TYPE	NR
SUPPLIER	AIR CORRECTION DIVISION, UOP
DIMENSIONS - FT	16 X 30 X 54.5 'QUENCHER!; 13 X 30 X 12 'ABSORBE
SHELL GENERIC MATERIAL	CARBON STEEL
SHELL SPECIFIC MATERIAL	ASTM A-36
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A
LINER GENERIC MATERIAL	ORGANIC
LINER SPECIFIC MATERIAL	SYNTHETIC RUBBER
LINER MATERIAL TRADE NAME/COMMON TYPE	NEOPRENE LS-576
GAS CONTACTING DEVICE TYPE	TRAYS
NUMBER OF CONTACTING ZONES	3
DISTANCE BETWEEN GAS CONTACTING ZONES - CM	121.9 (48.01IN)
LIQUID RECIRCULATION RATE - LITER/S	819. (13000 GPM)
L/G RATIO - L/CU.M	5.2 (39.1 GAL/1000 ACF)
SUPERFICIAL GAS VELOCITY - M/SEC	3.0 (10.0 FT/S)
INLET GAS FLOW - CU. M/S	156.91 (332500 ACFM)
INLET GAS TEMPERATURE - C	57.2 (135 F)
SO2 REMOVAL EFFICIENCY - %	85.0

** 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	UOP
CONFIGURATION	HORIZONTAL
NUMBER OF STAGES	2

CITY UTILITIES OF SPRINGFIELD: SOUTHWEST 1 (CONT.)

NUMBER OF PASSES PER STAGE	3	
DISTANCE BETWEEN STAGES - CM	1.52	(0.6 IN)
DISTANCE BETWEEN VANES - CM	2.5	(1.00 IN)
SUPERFICIAL GAS VELOCITY - M/S	3.0	(10.0 FT/S)
CONSTRUCTION MATERIAL GENERIC TYPE	ORGANIC	
CONSTRUCTION MATERIAL SPECIFIC TYPE	FIBER-REINFORCED POLYESTER	
WASH WATER SOURCE	FRESH	
WASH FREQUENCY	CONTINUOUS	
WASH RATE - L/S	6.9	(110 GAL/MIN)
** REHEATER		
GENERIC TYPE	NONE	
SPECIFIC TYPE	N/A	
TRADE NAME/COMMON TYPE	N/A	
CONSTRUCTION MATERIAL GENERIC TYPE	N/A	
CONSTRUCTION MATERIAL SPECIFIC TYPE	N/A	
** FANS		
NUMBER	2	
NUMBER OF SPARES	0	
DESIGN	CENTRIFUGAL	
SUPPLIER	GREEN FAN	
FUNCTION	UNIT	
APPLICATION	FORCED DRAFT	
SERVICE	DRY	
FLUE GAS FLOW RATE - CU.M/S	192.06	(407000 ACFM)
FLUE GAS TEMPERATURE - C	168.3	(335 F)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	
** DAMPERS		
NUMBER	2	
FUNCTION	SHUT-OFF	
GENERIC TYPE	LOUVER	
SPECIFIC TYPE	PARALLEL BLADE MULTILOUVER	
MANUFACTURER	AMERICAN WARMING & VENTILATING	
SEAL AIR FLOW - CU. M/S	0.00	(0 ACFM)
SERVICE CONDITIONS	335	
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	
CONSTRUCTION MATERIAL SPECIFIC TYPE	AISI 1110	
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	AMERICAN WARMING & VENTILATING	
SEAL AIR FLOW - CU. M/S	0.00	(0 ACFM)
SERVICE CONDITIONS	335	
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	
CONSTRUCTION MATERIAL SPECIFIC TYPE	AISI 1110	
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	AMERICAN WARMING & VENTILATING	
SEAL AIR FLOW - CU. M/S	0.00	(0 ACFM)
SERVICE CONDITIONS	161	
CONSTRUCTION MATERIAL GENERIC TYPE	HIGH ALLOY	
CONSTRUCTION MATERIAL SPECIFIC TYPE	IRON BASE/NICKEL-CHROMIUM-COPPER-MOLYBDENUM	
LINER GENERIC MATERIAL TYPE	NONE	
LINER SPECIFIC MATERIAL TYPE	N/A	
** DUCTWORK		
LOCATION	INLET	
CONFIGURATION	RECTANGULAR	

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

TY UTILITIES OF SPRINGFIELD: SOUTHWEST 1 (CONT.)

DIMENSIONS	153 IN. HEIGHT X 93.5 IN. WIDTH
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
SHELL SPECIFIC MATERIAL TYPE	ASTM A-36
LINER GENERIC MATERIAL TYPE	NONE
LINER SPECIFIC MATERIAL TYPE	N/A
* DUCTWORK	
LOCATION	BYPASS
CONFIGURATION	RECTANGULAR
DIMENSIONS	135 IN. HEIGHT X 96 IN. WIDTH
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
SHELL SPECIFIC MATERIAL TYPE	ASTM A-36
LINER GENERIC MATERIAL TYPE	NONE
LINER SPECIFIC MATERIAL TYPE	N/A
* DUCTWORK	
LOCATION	OUTLET
CONFIGURATION	RECTANGULAR
DIMENSIONS	109 IN. HEIGHT X 101.5 IN. WIDTH
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
SHELL SPECIFIC MATERIAL TYPE	ASTM A-36
LINER GENERIC MATERIAL TYPE	ORGANIC
LINER SPECIFIC MATERIAL TYPE	GLASS FLAKE-FILLED POLYESTER
* REAGENT PREPARATION EQUIPMENT	
FUNCTION	WET BALL MILL
DEVICE	COMPARTMENTED
DEVICE TYPE	TUBE MILL
MANUFACTURER	KENNEDY VAN SAUN
NUMBER	2
NUMBER OF SPARES	0
FULL LOAD DRY FEED CAPACITY - M.TONS/HR	7.3 (8 TPH)
PRODUCT QUALITY - % SOLIDS	65.0
** TANKS	
SERVICE	NUMBER
-----	-----
REAGENT PREP PRODUCT	1
ABSORBER RECYCLE	2
MIST ELIMINATOR WASH	1
PRESATURATOR	1
BALL MILL SUMP	1
SLURRY DRAW-OFF SUMP	1
SUPERNATANT	1
WASH WATER RETURN	1
** PUMPS	
SERVICE	NUMBER
-----	-----
ABSORBER RECIRCULATION	4
MIST ELIMINATOR WASH	2
THICKENER FEED	2
SLURRY FEED	4
SLURRY TRANSFER	2
PRESATURATOR WATER-TRAP OUT TRAY WAS	2
SLUDGE TRANSFER	2
WASH WATER RETURN	2
SUPERNATANT	2
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	VACUUM FILTER
NUMBER	1
NUMBER OF SPARES	0
DIMENSIONS - FT	38.6 X 13.0
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
SHELL SPECIFIC MATERIAL TYPE	AISI 1110
LINER GENERIC MATERIAL TYPE	NONE
LINER SPECIFIC MATERIAL TYPE	N/A
BELT GENERIC MATERIAL TYPE	CLOTH
BELT SPECIFIC MATERIAL TYPE	N/A
FEED STREAM SOURCE	THICKENER UNDERFLOW

CITY UTILITIES OF SPRINGFIELD: SOUTHWEST 1 (CONT.)

FEED STREAM CHARACTERISTICS	40-55% SOLIDS
OUTLET STREAM CHARACTERISTICS	70% SOLIDS
OUTLET STREAM DISPOSITION	TO PUG MILL
OVERFLOW STREAM DISPOSITION	TO THICKENER
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	THICKENER
NUMBER	1
NUMBER OF SPARES	0
CONFIGURATION	CIRCULAR
DIMENSIONS - FT	110 DIAMETER X 8.5 SIDEWALL, 15.7 CENTER DEPTH
CAPACITY	860000
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
SHELL SPECIFIC MATERIAL TYPE	AISI 1110
LINER GENERIC MATERIAL TYPE	ORGANIC
LINER SPECIFIC MATERIAL TYPE	BITUMASTIC
FEED STREAM SOURCE	ABSORBER BLEED
FEED STREAM CHARACTERISTICS	15% SOLIDS
OUTLET STREAM CHARACTERISTICS	40-55% SOLIDS
OVERFLOW STREAM CHARACTERISTICS	1200 GPM
OUTLET STREAM DISPOSITION	TO VACUUM FILTER
OVERFLOW STREAM DISPOSITION	TO QUENCHER AND ME WASH
*** SALEABLE BYPRODUCTS	
NATURE	NONE
DISPOSITION	N/A
*** SLUDGE	
** TREATMENT	
METHOD	STABILIZATION
DEVICE	PUG MILL
PROPRIETARY PROCESS	N/A
INLET QUALITY - %	70.0
** DISPOSAL	
NATURE	FINAL
TYPE	LANDFILL
LOCATION	ON-SITE
SITE TRANSPORTATION METHOD	TRUCK
SITE TREATMENT	CLAY LINING
** PROCESS CONTROL AND INSTRUMENTATION	
PROCESS STREAM	PH
CHEMICAL PARAMETERS	PH, SLURRY DENSITY
PHYSICAL VARIABLES	SLURRY DENSITY
CONTROL LEVELS	PH 5.4-5.5
MONITOR TYPE	BECKMAN IN-LINE PROBE
MONITOR LOCATION	RECYCLE SLURRY LINE
PROCESS CONTROL MANNER	MANUAL
PROCESS CHEMISTRY MODE	FEEDBACK
** WATER BALANCE	
WATER LOOP TYPE	CLOSED
** CHEMICALS AND CONSUMPTION	
FUNCTION	ABSORBENT
NAME	LIMESTONE
PRINCIPAL CONSTITUENT	CAC03 MAXIMUM OF 2% INERTS!
SOURCE/SUPPLIER	CONCO, GRIESEMER
CONSUMPTION	7 TPH
UTILIZATION - %	89.0
POINT OF ADDITION	BALL MILL
** FGD SPARE CAPACITY INDICES	
ABSORBER - %	20.0
MIST ELIMINATOR - %	0.0

SRVEY: JANUARY - DECEMBER 1988

5 OF SPRINGFIELD: SOUTHWEST 1 (CONT.)

- - %	0.0
2 - %	0.0
ILTER - %	0.0
COMPONENT INDICES	
MINATOR	0.3
	0.3
	0.0
	0.0
	0.0
ILTER	0.0

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

3LEMS/SOLUTIONS/COMMENTS

INSTALLATION OF THE LIMESTONE FGD SYSTEM WAS COMPLETED DURING THE FIRST QUARTER OF 1977 (BEHIND SCHEDULE, PRIMARILY BECAUSE OF DELAYS IN ELECTRICAL WORK). FOLLOWING AIR/WATER TESTS AND CHECKOUT OF LIMESTONE PREPARATION FACILITIES, THE FGD PLANT WAS STARTED UP IN EARLY APRIL 1977 FOR MECHANICAL SHUTDOWN/DEBUGGING OPERATIONS WHICH CONTINUED THROUGHOUT THE SUMMER. COMPLIANCE TESTING AND CERTIFICATION OF COMMERCIAL AVAILABILITY WERE SUCCESSFULLY COMPLETED IN SEPTEMBER, JUST BEFORE A SCHEDULED 3-MONTH FALL SHUTDOWN. OPERATION OF THE SYSTEM HAS BEEN HAMPERED BY A NUMBER OF PROBLEMS: MIST ELIMINATOR PLUGGING (PIPING TO M.E. SPRAY SYSTEM HAS BEEN MODIFIED), CORROSION IN THE PRESATURATOR (WAS RELINED WITH PRECRETE), CORROSION OF THE INLET/OUTLET GAS DAMPERS (REPLACED WITH 316 SS DAMPERS), AND FAILURE OF PRECRETE LINING IN THE SCRUBBER AND CEILCOTE IN THE STACK (BOTH FAILURES IDENTIFIED AS APPLICATION PROBLEMS). THE UTILITY ALSO FOUND IT NECESSARY TO CHANGE THE SYSTEM PH CONTROL FROM 5.9 TO 5.6 TO INCREASE LIMESTONE UTILIZATION AND DECREASE PLUGGING WITHIN THE SYSTEM.

720

3LEMS/SOLUTIONS/COMMENTS

FGD OPERATIONS BEGAN IN EARLY APRIL. THE SYSTEM IS CURRENTLY EXPERIENCING MIST ELIMINATOR PLUGGING AND INSTRUMENTATION PROBLEMS.

744

720

3LEMS/SOLUTIONS/COMMENTS

THE SCRUBBER EXPERIENCED CORROSION IN THE PRESATURATOR AREAS THAT WILL WILL REQUIRE RELINING.

744

744

720

3LEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS OPERATED ROUGHLY 60% OF THE AUGUST-SEPTEMBER PERIOD. A NEW SOURCE PERFORMANCE TEST WAS RUN DURING THE SECOND WEEK OF SEPTEMBER. LATER, THE UNIT WAS SHUT DOWN FOR THE FIRST TURBINE INSPECTION.

744

CITY UTILITIES OF SPRINGFIELD: SOUTHWEST 1 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

A SCHEDULED OCTOBER-NOVEMBER OUTAGE WAS INITIATED. THE UNIT IS SCHEDULED TO START UP AGAIN IN JANUARY.

DURING OCTOBER THE OUTLET DAMPERS WERE MODIFIED. THE 316 SS DAMPERS WERE REPLACED WITH 316L SS DAMPERS.

THE PRESATURATOR WAS RELINED WITH HIGH MOLYBDENUM STEEL AS A RESULT OF THE PRECRETE FAILURE NOTED EARLIER (JUNE).

OUTLET DUCTWORK WAS RELINED WITH CEILCOTE DURING THE OUTAGE.

HOLLOW PACKING BALLS WERE REPLACED WITH HEAVIER WALLED PLASTIC BALLS. THE BALLS WERE RUPTURING AND FILLING WITH SLURRY MAKING THEM INEFFECTIVE.

LEAKING AROUND OUTLET DAMPERS WAS MINIMIZED BY SEAL-AIR FANS.

11/77 SYSTEM

720

12/77 SYSTEM

744

** PROBLEMS/SOLUTIONS/COMMENTS

THE PLANT SHUTDOWN CONTINUED UNTIL JANUARY 28 WHEN THE BOILER RESTARTED. THE FGD SYSTEM WAS EXPECTED TO BE PUT BACK ON LINE IN FEBRUARY 1978. DURING THE OUTAGE ALL REMAINING MODIFICATIONS TO THE FGD SYSTEM WERE COMPLETED.

1/78 SYSTEM

744

2/78 SYSTEM

672

** PROBLEMS/SOLUTIONS/COMMENTS

THE ABSORBERS DID NOT OPERATE DUE TO AN EXPANSION JOINT FAILURE BETWEEN THE ID FAN AND THE ABSORBERS.

THE ABSORBERS ARE CURRENTLY BEING BY-PASSED. THE FGD SYSTEM IS EXPECTED TO BE BACK ON LINE BY THE END OF APRIL.

3/78 SYSTEM

744

4/78 SYSTEM

720

** PROBLEMS/SOLUTIONS/COMMENTS

ONLY ONE ABSORBER MODULE IS CURRENTLY OPERATING. THE EXPANSION JOINT FAILURE MENTIONED PREVIOUSLY WAS DIRECTLY RELATED TO THE DAMPER FAILURE WHICH DIRECTED THE BOILER FLUE GAS TO THE SEALED OFF FGD SYSTEM.

THE DAMPER LOUVERS HAVE BEEN STICKING. THERE ARE NO MANUAL CONTROLS FOR THE DOUBLE LOUVER DAMPERS SO THAT WHEN INSTRUMENTATION FAILURES OCCUR THE UNIT MUST BE SHUT DOWN. OF THE 12 DAMPERS (6 PAIRS) ON THIS SYSTEM 6 HAVE BEEN REBUILT.

AN FRP LINER FAILURE OCCURRED DURING THIS PERIOD.

A PUMP FAILURE OCCURRED DURING THE PERIOD. THE PROBLEM DOES NOT APPEAR TO BE SEVERE.

5/78 SYSTEM

744

IRVEY: JANUARY - DECEMBER 1988

OF SPRINGFIELD: SOUTHWEST 1 (CONT.)

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

720

LEMS/SOLUTIONS/COMMENTS

THE S-1 MODULE RAN STEADILY FOR OVER 11 DAYS. THE S-2 MODULE WAS STILL DOWN WITH EXPANSION JOINT PROBLEMS.

DURING THE MONTH THE MIST ELIMINATOR WASH SYSTEM WAS ALTERED FROM A SEPARATE CLOSED LOOP FOR EACH MODULE TO A COMMON SYSTEM FOR BOTH MODULES. THE NEW SYSTEM TAKES SUPERNATANT FROM THE TOP OF THE THICKENER FOR MIST ELIMINATOR SPRAY.

INSTRUMENTATION PROBLEMS WERE ENCOUNTERED DURING THE MONTH. PH PROBES WERE LOST, THE MAG-FLOW METER FOR LIMESTONE SLURRY FAILED, AND THE AUTOMATIC GAS ANALYZERS DID NOT OPERATE PROPERLY.

SOME PIPES EXPERIENCED PLUGGING DUE TO NEOPRENE PEELING FROM VALVES. IT IS EXPECTED THAT VALVE REPAIR OR REPLACEMENT SHOULD STOP THE PLUGGING.

THE SLUDGE SYSTEM EXPERIENCED SOME FILTER BELT PROBLEMS DURING THE MONTH. REPAIRS WERE MADE BUT INSUFFICIENT SLUDGE HAS BEEN GENERATED TO DETERMINE IF THE PROBLEMS HAVE BEEN SOLVED.

16.7	16.7	16.7	16.7				
0.0	0.0	0.0	0.0				
8.3	8.3	8.3	8.3	744	744	62	70.1

LEMS/SOLUTIONS/COMMENTS

PROBLEMS WERE ENCOUNTERED WITH THE S-1 MODULE TRANSFER PUMPS. NINE DAYS WERE REQUIRED TO TRACE THE ELECTRICAL-RELATED PROBLEM.

A 17-DAY OUTAGE WAS CAUSED BY PROBLEMS WITH THE BALL MILL AIR SUPPLY WHICH RESULTED IN THE UNAVAILABILITY OF SLURRY.

THE S-2 MODULE WAS STILL DOWN IN JULY WHILE THE UTILITY WAITED FOR THE REPLACEMENT EXPANSION JOINT.

WORK WAS DONE DURING THE MONTH TO IMPROVE THE INSTRUMENTATION. IT WAS DISCOVERED THAT MANY OF THE PROBLEMS WERE DUE TO SCALE ACCUMULATION ON THE PROBES.

59.0	59.0	59.0	59.0				
0.0	0.0	0.0	0.0				
29.5	29.5	29.5	29.5	744	744	220	56.6

LEMS/SOLUTIONS/COMMENTS

THE S-2 MODULE REMAINED DOWN THROUGHOUT AUGUST BECAUSE THE REPLACEMENT EXPANSION JOINT HAD NOT YET ARRIVED.

EXPANSION JOINT REPAIRS ON THE S-1 MODULE SCRUBBER FORCED THE MODULE OUT OF SERVICE FOR 84 HOURS.

PROBLEMS WITH THE THICKENER AND PLUGGED LINES FORCED THE S-1 MODULE OUT OF SERVICE FOR 211 HOURS.

22.1	28.6	28.6	22.1				
0.0	0.0	0.0	0.0				
11.1	14.3	14.3	11.1	720	557	80	49.1

CITY UTILITIES OF SPRINGFIELD: SOUTHWEST 1 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

CONTINUATION OF THE EXPANSION JOINT PROBLEM RESULTED IN THE S-2 MODULE REMAINING DOWN THROUGHOUT THE MONTH.

S-1 MODULE DOWN TIME WAS DUE TO PLUGGING OF THE THICKENER SLURRY MAKEUP LINES AND FAILURE OF THE BALLS WITHIN THE MODULE.

THE HEAVIER-WALLED PING PONG BALLS THAT WERE INSTALLED DURING THE DECEMBER 1977-JANUARY 1978 PERIOD WERE REPLACED WITH 1.25 INCH DIAMETER SOLID RUBBER BALLS DURING SEPTEMBER 1978.

10/78	SYSTEM	0.0	0.0	0.0	0.0	744	26	0
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** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER WAS DOWN FOR A SCHEDULED OUTAGE DURING THE MONTH

CONSIDERABLE CLEANING OF THE S-1 MODULE WAS DONE AS THE LOWER TWO LEVELS OF THE MODULE HAD BEGUN TO PLUG WHEN THE BALLS FAILED (SEE SEPTEMBER 1978).

A THOROUGH CLEANING OF THE ENTIRE FGD SYSTEM OCCURRED DURING THIS PERIOD.

A BEARING WAS REPLACED ON THE SLURRY DRAW OFF PUMP. WORK WAS ALSO REQUIRED ON A WASTE DRAW OFF PUMP.

THE OUTLET DUCT WAS CLEANED AND A PLASITE LINER WAS INSTALLED. REPAIR WAS MADE TO THE BYPASS DUCT TOGGLE (A PAIR OF EXPANSION JOINTS WITH TWO TO THREE FT. OF DUCT BETWEEN THEM) DUE TO METAL DETERIORATION.

THE RUBBER COATING ON HOLD TANK AGITATORS AND SLURRY STORAGE TANK AGITATORS WERE REPAIRED.

MAINTENANCE WAS PERFORMED ON FANS, DAMPERS AND VALVES.

MAINTENANCE AND MODIFICATIONS TO THE INSTRUMENTATION HAVE YIELDED SOME IMPROVEMENT IN OPERATIONS. SOME INSTRUMENTATION PROBLEMS RESULTED FROM SCALE ACCUMULATION ON PROBES. MODIFICATIONS TO THE PRESATURATOR TEMPERATURE PROBES WHICH WERE COMPLETELY COATED WITH MATERIAL ARE EXPECTED TO PERMANENTLY RECTIFY THE PROBLEM IN THIS AREA.

THE FILTER BELTS HAVE STILL BEEN TEARING AS MENTIONED EARLIER (JUNE, 1978). THERE HAVE BEEN PROBLEMS BOTH UPSTREAM AND DOWNSTREAM OF THE FILTER BELTS IN THE SLUDGE DISPOSAL SYSTEM.

THE UTILITY REPORTED THAT THERE HAS BEEN NO SIGN OF SCALE ACCUMULATION ON THE MIST ELIMINATORS SINCE THE WASH SYSTEM WAS MODIFIED AS REPORTED IN JUNE, 1978.

11/78	S-1	68.1	64.7	64.7	64.3			
	S-2	34.9	22.4	22.4	22.3			
	SYSTEM	51.5	43.6	43.6	43.3	720	716	312 52.1

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER OUTAGE LASTED INTO THE FIRST PART OF NOVEMBER DURING WHICH TIME SCRUBBER REPAIR WORK CONTINUED.

AN FGD OUTAGE WAS CAUSED BY A FAN BEARING FAILURE ON THE S-2 MODULE DURING NOVEMBER.

ALL DAMPERS WERE SERVICED, REPAIRED AND EXERCISED.

SURVEY: JANUARY - DECEMBER 1988

S OF SPRINGFIELD: SOUTHWEST 1 (CONT.)

-----PERFORMANCE DATA-----							
AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER BOILER HOURS	FGD HOURS	CAP. HOURS FACTOR
45.2	32.9	32.9	29.7				
81.7	76.2	76.2	68.7				
63.4	54.6	54.6	49.2		744	671	366 58.9

BLEMS/SOLUTIONS/COMMENTS

PRESATURATOR NOZZLE PLUGGING OCCURRED IN THE S-1 MODULE DURING DECEMBER. AFTER THE SPRAY NOZZLES WERE REPLACED FROZEN LINES PREVENTED MODULE STARTUP.

SEVERAL LINES BROKE OR DEVELOPED LEAKS AS A RESULT OF FREEZE UPS.

ALL THE MAJOR OUTAGES CAN BE ATTRIBUTED TO THE COLD WEATHER. THE SYSTEM WAS NOT DESIGNED WITH DUE REGARD TO WEATHER CONDITIONS.

ONE OR TWO MINOR SCRUBBER SHUTDOWNS RESULTED FROM FROZEN INSTRUMENTATION.

0.0	0.0	0.0	0.0				
42.6	47.3	47.3	29.0				
21.3	24.9	24.9	14.5	744	457	108	43.9

BLEMS/SOLUTIONS/COMMENTS

THE S-2 MODULE WAS UNAVAILABLE FOR 117 HOURS BECAUSE OF VALVE FREEZE-UPS.

FROZEN VALVES AND EQUIPMENT CONTRIBUTED TO THE OUTAGES OF THE S-1 MODULE.

DURING THE FIRST 15 DAYS OF JANUARY THE SECOND BALL MILL WAS UNUSEABLE BECAUSE OF A COMPRESSED AIR SYSTEM FAILURE. THIS RESULTED IN AN INSUFFICIENT LIMESTONE SLURRY SUPPLY TO THE S-1 MODULE.

28.7	0.0	0.0	0.0				
24.2	32.0	32.0	24.2				
26.5	16.0	16.0	12.1	672	508	81	48.2

BLEMS/SOLUTIONS/COMMENTS

THE S-1 MODULE EXPERIENCED PLUGGING PROBLEMS IN THE FIRST AND SECOND STAGES DURING FEBRUARY AND DID NOT OPERATE. DUE TO FLUE GAS LEAKING INTO THE MODULE, ACCESS COULD NOT BE OBTAINED TO CLEAN THE MODULE.

EXPANSION JOINT PROBLEMS AND BROKEN LINES THROUGHOUT THE SYSTEM WERE REPORTED.

SCRUBBING OPERATIONS WERE HAMPERED DURING THE LATTER PART OF FEBRUARY BECAUSE OF INSUFFICIENT LIMESTONE SLURRY.

THE S-2 MODULE PROBLEMS INCLUDED FROZEN VALVES AND LINES.

62.0	39.5	39.5	38.8				
55.1	14.0	14.0	13.7				
58.6	26.8	26.8	26.3	744	730	195	46.2

BLEMS/SOLUTIONS/COMMENTS

THE MAJORITY OF MODULE S-1 DOWNTIME WAS DUE TO A BROKEN SUPERNATE LINE AND MAKEUP CROSS TIE.

THE UTILITY REPORTED THAT THE MODULE WAS UNABLE TO RUN FOR A TIME DUE TO A DESIGN PROBLEM WITH THE WESTINGHOUSE 500 HP MOTORS.

42.6	30.9	30.9	18.5				
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UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

CITY UTILITIES OF SPRINGFIELD: SOUTHWEST 1 (CONT.)

-----PERFORMANCE DATA-----										
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART. HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	S-2	51.6	45.0	45.0	27.0					
	SYSTEM	47.1	38.0	38.0	22.8		720	432	164	28.4

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE S-1 EXPERIENCED AN EXPANSION JOINT FAILURE ON THE ID FAN DISCHARGE.

LOW DENSITY AT THE SLURRY HOLD TANK WAS A MAJOR PROBLEM.

SOME PLUGGING OF THE FIRST STAGE OF THE S-2 MODULE WAS REPORTED BY THE UTILITY.

5/79	S-1	84.1	77.5	77.5	67.0					
	S-2	0.0	0.0	0.0	0.0					
	SYSTEM	42.1	38.8	38.8	33.5		744	644	249	37.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE S-2 MODULE WAS NOT OPERATED DURING MAY DUE TO A BROKEN RECYCLE TANK AGITATOR SHAFT. A NEW ONE HAS BEEN ORDERED. RUBBER LINING OF THE SHAFT AND REPAIR OF DAMAGED LINING ON THE IMPELLER WILL BE DONE ON SITE.

6/79	S-1	55.0	53.0	53.0	52.9					
	S-2	0.0	0.0	0.0	0.0					
	SYSTEM	27.5	26.5	26.5	26.5		720	719	191	53.8

** PROBLEMS/SOLUTIONS/COMMENTS

THE BROKEN AGITATOR SHAFT ON THE S-2 MODULE WAS REPLACED AND LINED DURING JUNE.

THE S-1 MODULE WAS OUT OF SERVICE ON THREE OCCASIONS DUE TO PLUGGING OF THE FIRST AND SECOND STAGES. THE UTILITY REPORTED THAT WITH THE EXCEPTION OF THE PLUGGING PROBLEM ONLY A FEW MINOR SHORT DURATION TRIPS WERE NOTED.

7/79	S-1	59.2	34.1	34.1	34.1					
	S-2	55.3	47.4	47.4	47.3					
	SYSTEM	57.3	40.8	40.8	40.7		744	743	303	52.7

** PROBLEMS/SOLUTIONS/COMMENTS

THE S-1 MODULE WAS NOT OPERATED DURING THE FIRST PART OF THE PERIOD DUE TO PLUGGING IN THE FIRST AND SECOND STAGES. TWO OTHER OUTAGES OCCURRED. ONE RESULTED FROM A BROKEN SLURRY LINE AND THE OTHER FROM PROCESS CONTROL TROUBLE ATTRIBUTED TO A MINI COMPUTER MALFUNCTION.

THE S-2 MODULE WAS NOT OPERATED FOR TWO PERIODS. ONCE WHEN THE TANK WAS BEING REFILLED AFTER AN AGITATOR WAS INSTALLED AND ONCE TO CLEAN THE FIRST AND SECOND STAGES.

8/79	S-1	74.6	53.8	53.8	50.7					
	S-2	94.8	70.9	70.9	66.8					
	SYSTEM	84.7	62.4	62.4	58.8		744	701	437	58.6

** PROBLEMS/SOLUTIONS/COMMENTS

THE S-1 MODULE WAS DOWN FOR TWO PERIODS DUE TO PLUGGING IN THE ABSORBER SECTION. THE MODULE ALSO TRIPPED OFF AS A RESULT OF SUPERNATE PUMP FAILURES.

9/79	S-1	55.3	58.3	58.3	45.8					
	S-2	87.3	60.2	78.8	47.4					
	SYSTEM	71.3	59.3	65.7	46.6		720	566	336	45.6

URVEY: JANUARY - DECEMBER 1988

S OF SPRINGFIELD: SOUTHWEST 1 (CONT.)

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

BLEMS/SOLUTIONS/COMMENTS

THE S-1 MODULE WAS OFF LINE DUE TO PLUGGING IN THE ABSORBER SECTION FOR TWO PERIODS AND IT ALSO TRIPPED AS A RESULT OF SUPERNATE PUMP FAILURES.

THE S-2 MODULE WAS OFF LINE ONCE DUE TO BROKEN SUPERNATE LINE, AND ONCE DUE TO FAULTY PH PROBES IN SEPTEMBER. THE SCRUBBING SYSTEM WAS OFF LINE FOR SEVERAL SHORT PERIODS DUE TO MINOR PROBLEMS.

0.0 0.0 744 0 0 0.0

BLEMS/SOLUTIONS/COMMENTS

A SCHEDULED BOILER/SCRUBBER OVERHAUL BEGAN ON SEPTEMBER 29 AND CONTINUED THROUGH OCTOBER 31.

BOTH SCRUBBER TOWERS WERE COMPLETELY CLEANED DURING THE OUTAGE.

THE SLURRY TANKS AND RELATED PIPING WERE CLEANED DURING OCTOBER.

THE SCRUBBER OUTLET DUCTWORK WAS RELINED WITH PLASITE.

ON AREAS OF THE SCRUBBING SYSTEM WHERE FIBERGLASS PIPING WAS BEING USED, REPLACEMENTS WERE MADE WITH LINED CARBON STEEL PIPING.

THE PH PROBES WERE REPAIRED.

REPAIRS WERE MADE TO THE LIMESTONE FEED BELT ON THE CONVEYOR SYSTEM.

REPAIRS WERE MADE TO THE S-2 MODULE HOLD TANK AGITATOR SHAFT DURING THE OUTAGE.

A PRESATURATOR SPRAY NOZZLE WAS REPLACED.

THE SCRUBBER DAMPERS WERE REPAIRED AND ADJUSTED.

THE SLUDGE DISPOSAL CONVEYOR SYSTEM WAS REPAIRED AND MODIFIED.

PUMP REPAIRS WERE MADE ON THE SUPERNATE PUMPS AND NEW STANDBY PUMPS WERE INSTALLED AT THE SCRUBBING SYSTEM FACILITY.

0.0 0.0 0.0 0.0
 41.9 41.3 41.3 40.6
 20.9 20.6 20.6 20.3 720 708 145 58.1

BLEMS/SOLUTIONS/COMMENTS

FOR THE FIRST WEEK OF NOVEMBER NEITHER MODULE WAS AVAILABLE DUE TO AN OVERRUN ON SCHEDULED OUTAGE CAUSED BY A LACK OF MANPOWER.

THE S-1 MODULE WAS UNAVAILABLE FOR THE LAST THREE WEEKS OF THE MONTH BECAUSE OF THE LACK OF MANPOWER TO FINISH THE ABSORBER SECTION AND HOLD TANK CLEANOUT.

PROBLEMS WITH THE S-2 MODULE RECYCLE PUMPS WERE ENCOUNTERED. THE MODULE WAS REMOVED FROM SERVICE SO THAT THE REPAIRS COULD BE MADE.

SEVERAL ATTEMPTS TO RETURN THE S-1 MODULE TO SERVICE WERE ABORTED DUE TO VARIOUS PIPING PROBLEMS.

53.7 23.7 23.7 21.2

CITY UTILITIES OF SPRINGFIELD: SOUTHWEST 1 (CONT.)

-----PERFORMANCE DATA-----										
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	S-2	64.8	40.6	40.6	36.2					
	SYSTEM	59.3	32.2	32.2	28.7		744	664	213	53.2

** PROBLEMS/SOLUTIONS/COMMENTS

THE S-1 ABSORBER SECTION AND HOLD TANK CLEANOUT WAS COMPLETED DURING DECEMBER. THE MODULE WAS RETURNED TO SERVICE.

THE PRESATURATION NOZZLES CAUSED SOME PROBLEMS AND HAD TO BE REMOVED AND CLEANED.

AT THE END OF THE MONTH THE ID FAN EXPANSION JOINT BROKE AND HAD TO BE REPLACED.

THE DENSITY METER ON THE RECYCLE LINE WAS REMOVED AND REPAIRED.

THE DRAINS ON THE MIST ELIMINATOR PUMPS HAD TO BE REPLACED.

THE WEIGH FEEDER WEIGH BELT AND CALIBRATED FEEDER WERE REPLACED AND THE CALIBRATION FEEDER WAS CHECKED DURING DECEMBER.

1/80	S-1	54.5	38.7	47.9	36.3					
	S-2	68.7	72.6	73.1	68.1					
	SYSTEM	61.6	55.7	60.5	52.2		744	698	388	65.4

** PROBLEMS/SOLUTIONS/COMMENTS

AT THE BEGINNING OF JANUARY AN S-1 ID FAN EXPANSION JOINT FAILED. THE BOILER WAS SHUTDOWN SOON AFTER FOR BOILER-RELATED PROBLEMS.

DURING THE LATTER PART OF THIS PERIOD THE S-1 MIST ELIMINATOR AND TRAP OUT TRAY HEADER FROZE. AFTER REPAIRS WERE MADE BOTH MODULES WERE PUT ON LINE. BOTH WERE KEPT RUNNING UNTIL JANUARY 20 WHEN A FLANGE BROKE LOOSE ON THE MIST ELIMINATOR HEADER.

AFTER MIST ELIMINATOR REPAIRS WERE COMPLETED THE S-1 MODULE OPERATED UNTIL JANUARY 27 WHEN FREEZING AIR LINES TO THE BALL MILLS PREVENTED THE USE OF BOTH MODULES DUE TO THE LACK OF SLURRY.

THE S-2 MODULE WAS ON LINE AT THE BEGINNING OF THE MONTH BUT DEVELOPED PRESATURATOR SPRAY NOZZLE PROBLEMS. WHILE THIS WAS BEING REPAIRED THE UNIT WAS TAKEN OFF LINE. APART FROM THIS TIME THE MODULE WAS ON LINE.

2/80	S-1	36.7	29.1	31.5	29.1					
	S-2	73.8	71.7	73.2	71.6					
	SYSTEM	55.3	50.4	52.4	50.4		696	695	350	59.9

** PROBLEMS/SOLUTIONS/COMMENTS

THE S-1 MODULE WAS OUT OF SERVICE IN THE FIRST PART OF FEBRUARY DUE TO FROZEN AND BROKEN LINES. THE SUPERNATE LINE BROKE IN SEVERAL PLACES TAKING BOTH MODULES OUT OF SERVICE FOR SEVERAL DAYS. ONCE THIS WAS REPAIRED BOTH MODULES WERE IN SERVICE AS REQUIRED BY LOAD EXCEPT FOR A FEW MINOR TRIPS.

THE S-2 MODULE WAS EITHER IN SERVICE OR AVAILABLE FOR MOST OF THE MONTH.

3/80	S-1	64.5	64.1	64.4	64.1					
	S-2	22.0	5.8	6.9	5.8					
	SYSTEM	43.3	35.0	35.7	35.0		744	744	260	57.7

SRVEY: JANUARY - DECEMBER 1988

S OF SPRINGFIELD: SOUTHWEST 1 (CONT.)

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

BLEMS/SOLUTIONS/COMMENTS

DURING MARCH THE S-1 MODULE WAS OUT FOR 11 DAYS TO CLEAN THE ABSORBER SECTION.

THE S-2 MODULE WAS OUT OF SERVICE FOR CLEANING THE ABSORBER SECTIONS AND MIST ELIMINATORS FOR NEARLY ALL THE PERIOD BUT WAS AVAILABLE ON MARCH 25. IT WAS NOT OPERATED, HOWEVER, BECAUSE OF LOW UNIT LOAD DEMANDS.

78.2	69.1		59.6				
15.1	6.9		6.0				
46.7	37.9	37.9	32.8	720	621	236	42.4

BLEMS/SOLUTIONS/COMMENTS

THE S-1 MODULE EXPERIENCED SHORT OUTAGES DURING APRIL CAUSED BY SLURRY DRAW-OFF PUMP FAILURES AND MIST ELIMINATOR AND PRESATURATOR SPRAY SYSTEM PROBLEMS.

THE S-2 MODULE EXPERIENCED RECURRING HIGH FLUE GAS TEMPERATURE-RELATED PROBLEMS DURING THE MONTH. THIS WAS CORRECTED BY REPAIRING THE SCRUBBER INLET SCREEN.

72.9	60.7	69.1	60.6				
43.6	30.7	35.2	30.7				
58.3	45.7	52.2	45.7	744	744	340	56.7

BLEMS/SOLUTIONS/COMMENTS

DURING MAY THE S-1 SCRUBBER REQUIRED CLEANING.

PUMP AND PUMP CONTROL PROBLEMS ON THE S-1 SCRUBBING TRAIN OCCURRED DURING THE PERIOD.

THE S-2 MODULE WAS OFF LINE SEVERAL DAYS BECAUSE OF RECYCLE PUMP AND RECYCLE SYSTEM REPAIRS.

FLUE GAS OUTLET DUCT REPAIRS WERE REQUIRED ON THE S-2 MODULE IN MAY.

85.6	85.6	85.5	84.9				
12.8	6.8	7.2	6.8				
49.2	45.8	47.4	45.8	720	720	330	66.6

BLEMS/SOLUTIONS/COMMENTS

THE S-1 MODULE WAS IN CONTINUOUS SERVICE DURING JUNE WITH SHORT DURATION OUTAGES FOR CLEANING, CONTROL SYSTEM DAMAGE CAUSED BY LIGHTNING, AND OTHER MINOR MISCELLANEOUS PROBLEMS.

THE S-2 MODULE WAS OUT OF SERVICE FOR APPROXIMATELY 23 DAYS IN JUNE BECAUS OF A BROKEN SLURRY HOLD TANK AGITATOR SHAFT.

IN ADDITION TO THE OUTAGE CAUSED BY THE BROKEN SHAFT, THE S-2 MODULE HAD SHORT DURATION OUTAGES CAUSED BY RECYCLE PUMP AGITATOR PROBLEMS, CONTROL SYSTEM PROGRAMMING, AND OTHER MINOR MISCELLANEOUS PROBLEMS.

80.5	69.6		69.5				
57.0	39.0		39.0				
68.7	54.3	72.4	54.3	744	743	404	80.6

CITY UTILITIES OF SPRINGFIELD: SOUTHWEST 1 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JULY THE S-1 MODULE WAS CLEANED AND THE SPHERES WERE REPLACED.

THE S-1 MODULE DUCTWORK NEEDED REPAIR DURING JULY CAUSING SOME OUTAGE TIME

THE SLUDGE DEWATERING FILTER BELT AND THE HOLD TANK BEARING FAILED ACCOUNTING FOR SOME OF THE S-1 MODULE DOWNTIME.

THE S-1 MODULE SPRAY CONTROL VALVE FAILED ADDING TO THE OUTAGE TIME.

HIGH FLUE GAS TEMPERATURE CONDITIONS RESULTED IN A SHUTDOWN OF BOTH THE FGD MODULES.

THE S-2 MODULE AGITATOR SHAFT IN THE HOLD TANK FAILED CAUSING THE MODULE TO COME OFF LINE.

PROBLEMS WERE ENCOUNTERED WITH THE SLURRY DRAW OFF PUMP, SUPERNATANT PUMP AND THE RECYCLE PUMP CAUSING THE S-2 MODULE TO SHUTDOWN.

A POWER SUPPLY EQUIPMENT FAILURE RESULTED IN A S-2 MODULE OUTAGE.

AN EXPANSION JOINT FAILURE OCCURRED ON THE S-2 MODULE SEAL AIR FAN.

A HIGH LEVEL CONDITION IN THE DRAW OFF SUMP WAS ALSO A CAUSE OF THE S-2 MODULE LOW AVAILABILITY. THE PROBLEMS EXPERIENCED WITH THE CONTROL SYSTEM CONTRIBUTED ALSO.

8/80	S-1	73.7	67.4		67.4				
	S-2	71.9	55.4		55.4				
	SYSTEM	72.8	61.4	62.4	61.4	744	744	457	86.2

** PROBLEMS/SOLUTIONS/COMMENTS

THICKENER PROBLEMS ENCOUNTERED DURING AUGUST CAUSED BOTH MODULES TO SHUT DOWN FOR PART OF THE MONTH.

THE OUTLET DUCT EXPERIENCED LEAKAGE CAUSING SOME SYSTEM DOWN TIME.

THE S-1 MODULE DAMPER DRIVE FAILED CAUSED ADDITIONAL OUTAGE TIME.

THE LIMESTONE FEEDER FOR MODULE S-2 FAILED CAUSING THE S-2 MODULE TO SHUT DOWN FOR PART OF THE MONTH.

THE FGD SYSTEM WAS SHUT DOWN DURING PART OF THE MONTH SO THAT VALVE REPAIR COULD BE MADE.

PROBLEMS WERE ENCOUNTERED WITH THE S-2 MODULE RECYCLE PUMP.

9/80	S-1	78.5	85.8	87.4	78.5				
	S-2	57.5	0.6	0.2	0.2				
	SYSTEM	68.0	43.2	43.8	39.4	720	658	283	80.3

** PROBLEMS/SOLUTIONS/COMMENTS

DURING SEPTEMBER, THE SCRUBBER OUTLET DUCTS EXPERIENCED LEAKING CAUSING THE SYSTEM TO SHUTDOWN FOR PART OF THE MONTH.

THE S-1 MODULE EXPERIENCED INLET DAMPER PROBLEMS.

THE RECYCLE SPRAY NOZZLES ON THE S-2 MODULE PLUGGED CAUSING ADDITIONAL OUTAGE TIME.

SRVEY: JANUARY - DECEMBER 1988

S OF SPRINGFIELD: SOUTHWEST 1 (CONT.)

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

THE RADIAN CORP. BEGAN PREPARING THE SYSTEM FOR TESTING IN THE FORCED
OXIDATION MODE. THIS IS IN CONJUNCTION WITH THE ADIPIC ACID TEST PROGRAM.

0.0 0.0 0.0 0.0 744 572 0 67.3

BLEMS/SOLUTIONS/COMMENTS

BOTH SCRUBBER MODULES WERE OUT OF SERVICE FOR THE ENTIRE PERIOD DUE TO
MAINTENANCE REQUIREMENTS THAT COULD NO LONGER BE DEFERRED.

THE BOILER WAS BROUGHT OFF LINE ON OCTOBER 24 FOR AN ANNUAL MAINTENANCE
OUTAGE. THIS OUTAGE HAD BEEN DELAYED FOR APPROXIMATELY ONE MONTH BECAUSE
OF SYSTEM ELECTRICAL DEMAND AND THE UNAVAILABILITY OF ALTERNATE POWER
PRODUCTION FACILITIES.

0.0 0.0 0.0 0.0 720 147 0 11.9

BLEMS/SOLUTIONS/COMMENTS

THE SCRUBBER MODULES WERE NOT RETURNED TO SERVICE AT THE CONCLUSION OF THE
ANNUAL MAINTENANCE OUTAGE DURING NOVEMBER. WORK WAS IN PROGRESS TO
PREPARE THE MODULES FOR TESTING IN THE FORCED OXIDATION MODE OF OPERATION
IN CONJUNCTION WITH THE EPA ADIPIC ACID TEST PROGRAM.

37.4 0.0 0.0 0.0
48.4 12.5 16.9 8.7
42.9 6.3 7.7 4.4 744 520 65 49.3

BLEMS/SOLUTIONS/COMMENTS

DURING DECEMBER, DOWN TIME RESULTED DUE TO PIPING SYSTEM MODIFICATIONS,
AN INLET DAMPER DRIVE FAILURE, FROZEN AND BROKEN PIPING, AND PROGRAMMABLE
CONTROLLER PROBLEMS.

41.9 41.2 41.1
73.1 66.3 66.1
57.5 53.7 71.4 53.6 744 742 399 67.0

BLEMS/SOLUTIONS/COMMENTS

DURING JANUARY MODULES S-1 AND S-2 ENCOUNTERED ELECTRICAL PROBLEMS IN THE
DEWATERING AREA AND PROGRAMMABLE CONTROLLER MALFUNCTIONS.

THE RECYCLE SPRAY NOZZLES ON THE S-1 MODULE PLUGGED CAUSING SOME OUTAGE
TIME.

ADDITIONAL FGD SYSTEM PROBLEMS DURING THE MONTH INCLUDED SLURRY MAKE-UP
LINE PLUGGING, A BROKEN SUPERNATANT LINE, AND AN I.D. FAN EXPANSION JOINT
FAILURE.

55.3 53.6 54.4 53.0
36.9 32.7 37.1 32.3
46.1 43.1 45.8 42.6 672 664 287 71.8

BLEMS/SOLUTIONS/COMMENTS

DURING FEBRUARY MODULE S-1 WAS OFF LINE PART OF THE MONTH DUE TO FAILURE
OF THE EXPANSION JOINT IN THE RECYCLE PUMP DISCHARGE LINE.

MODULE S-2 EXPERIENCED PROBLEMS DUE TO PLUGGING IN THE BALL CAGE, PRESATU-

CITY UTILITIES OF SPRINGFIELD: SOUTHWEST 1 (CONT.)

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

 RATOR AREA, AND THE RECYCLE NOZZLE.

3/81 SYSTEM

744

** PROBLEMS/SOLUTIONS/COMMENTS

INFORMATION FOR THE MONTH OF MARCH IS NOT AVAILABLE AT THIS TIME.

4/81	S-1	47.5	62.1	64.8	46.3				
	S-2	73.5	97.2	97.2	72.4				
	SYSTEM	60.5	79.6	81.3	59.3	720	536	427	59.4

** PROBLEMS/SOLUTIONS/COMMENTS

DURING APRIL A SUPERNATANT PIPE FAILURE CAUSED SOME OUTAGE TIME FOR BOTH MODULES.

A BOILER TRIP ON APRIL 23 CAUSED A HIGH TEMPERATURE CONDITION ON BOTH MODULES. THE MODULES WERE INSPECTED AND S-2 WAS RETURNED TO SERVICE AND S-1 REMAINED OFF LINE DUE TO DAMAGE TO THE SCRUBBER SPHERES.

SOME DOWN TIME RESULTED DUE TO PROGRAMMABLE CONTROLLER PROBLEMS. THE S-1 MODULE'S INTERNALS WERE INSPECTED BY RADIAN CORP.

MODULE S-2 TRIPPED DUE TO AN EQUIPMENT FAILURE WHILE SWITCHING RECYCLE PUMPS AND WENT OFF LINE TWICE DUE TO THE LOSS OF ELECTRICAL POWER IN THE DEWATERING AND SUPERNATANT PUMPS AREA.

5/81	S-1	44.9	86.9	99.3	36.6				
	S-2	42.6	61.3	82.1	25.8				
	SYSTEM	43.7	74.3	91.4	31.2	744	313	232	27.2

** PROBLEMS/SOLUTIONS/COMMENTS

DURING MAY THE BOILER REMAINED OUT OF SERVICE THROUGH MAY 18, FOR A SCHEDULED MAINTENANCE OUTAGE.

MODULE S-1 WAS OUT OF SERVICE APPROXIMATELY 410 HOURS DUE TO PROGRAMMABLE CONTROLLER POWER PROBLEMS.

MODULE S-2 EXPERIENCED 427 HOURS OF OUTAGE TIME DUE TO DEWATERING PROBLEMS

6/81	S-1	76.3	77.9	82.3	62.6				
	S-2	79.2	72.9	84.9	58.5				
	SYSTEM	77.8	75.4	83.5	60.6	720	579	436	58.0

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JUNE THE SYSTEM WAS DOWN PART OF THE TIME DUE TO LIMESTONE CONVEYOR PROBLEMS.

THE UNIT WAS OUT OF SERVICE FOR ABOUT SIX DAYS IN JUNE FOR MAINTENANCE.

BOTH MODULES EXPERIENCED OUTAGES DUE TO ELECTRICAL PROBLEMS CAUSED BY LIGHTNING.

7/81	S-1	94.9	90.9	98.1	90.9				
	S-2	98.3	94.5	94.5	94.5				
	SYSTEM	96.6	92.7	96.3	92.7	744	744	690	78.1

URVEY: JANUARY - DECEMBER 1988

S OF SPRINGFIELD: SOUTHWEST 1 (CONT.)

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

BLEMS/SOLUTIONS/COMMENTS

THE ONLY SIGNIFICANT FGD SYSTEM OUTAGE DURING JULY WAS NECESSARY FOR MODIFICATION OF THE S-1 TRAYS. BOTH MODULES WERE REMOVED FROM SERVICE TO PERMIT ENTRY INTO THE MODULE.

MINOR PUMP AND PIPING PROBLEMS WERE ENCOUNTERED DURING THE MONTH.

100.0	100.0	100.0	100.0				
96.2	74.7	80.5	74.7				
98.1	87.4	90.3	87.4	744	744	650	82.3

BLEMS/SOLUTIONS/COMMENTS

DURING THE MONTH, ONE OF THE CONVEYOR BELTS USED FOR SLUDGE REMOVAL WAS STRUCK BY A TRUCK AND DAMAGED. SOME MINOR PROBLEMS RESULTED.

89.4	79.9	88.6	79.9				
87.6	75.6	81.1	75.6				
88.5	77.8	84.9	75.6	720	720	544	67.4

BLEMS/SOLUTIONS/COMMENTS

THE SLUDGE CONVEYOR REMAINED OUT OF SERVICE DURING THE MONTH AS A RESULT OF DAMAGE FROM A TRUCK ACCIDENT. THIS CAUSED THE MAJORITY OF THE FGD SYSTEM OUTAGE TIME DURING THE MONTH.

SLURRY CARRYOVER IN THE RECYCLED SUPERNATANT WATER CAUSED NOZZLE PLUGGING AND OUTAGE TIME ON BOTH MODULES DURING THE MONTH.

50.9	95.5	99.4	49.3				
43.0	78.0	96.7	40.2				
47.0	86.8	98.1	44.8	744	384	333	32.8

BLEMS/SOLUTIONS/COMMENTS

ON OCTOBER 16 A UNIT MAINTENANCE OUTAGE OCCURRED AND LASTED THROUGH THE END OF THE MONTH.

DURING THE OUTAGE THE MOBILE SPHERES WERE REMOVED FROM S-2 AND REPLACED WITH TRAYS SIMILAR TO THOSE PREVIOUSLY INSTALLED IN S-1.

0.0		0.0		720	0	0	0.0
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BLEMS/SOLUTIONS/COMMENTS

THE UNIT MAINTENANCE OUTAGE LASTED THROUGH NOVEMBER.

80.5	82.6	97.8	65.9				
76.2	82.2	93.3	65.7				
78.4	82.3	95.5	65.8	744	594	489	49.2

BLEMS/SOLUTIONS/COMMENTS

THE UNIT MAINTENANCE OUTAGE ENDED DECEMBER 7 WITH THE BOILER FIRED WITH FUEL OIL AND NATURAL GAS ON DECEMBER 6. A SHORT OUTAGE FOR CONDENSER TUBE LEAK REPAIR OCCURRED ON DECEMBER 30.

THE MODULE OUTAGES OCCURRED DURING THE PERIOD FOR THE FOLLOWING REASONS: HIGH TEMPERATURE TRIPS, LOSS OF D.C. POWER, RECYCLE PUMP PROBLEMS, AND FLUE GAS DAMPER PROBLEMS.

98.6	98.2	98.2	97.9				
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CITY UTILITIES OF SPRINGFIELD: SOUTHWEST 1 (CONT.)

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

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	S-2	88.6	88.5	99.0	88.2					
	SYSTEM	93.6	93.4	98.6	93.0		744	742	692	71.1

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JANUARY MODULE S-2 WAS REMOVED FROM SERVICE FOR MAINTENANCE APPROXIMATELY THREE DAYS DURING A LOW LOAD PERIOD.

2/82	S-1	42.2	43.8	99.8	42.2					
	S-2	84.2	83.3	99.7	80.2					
	SYSTEM	63.2	63.6	99.8	61.2		672	647	411	43.9

** PROBLEMS/SOLUTIONS/COMMENTS

DURING FEBRUARY BOTH MODULES WERE OUT OF SERVICE PART OF THE TIME FOR INTERNAL CLEANING AND GENERAL MAINTENANCE. THIS WORK WAS PERFORMED DURING LOW LOAD PERIODS, PERMITTING SINGLE MODULE OPERATION.

3/82	S-1	66.3	98.5	98.5	66.3					
	S-2	0.0	0.0		0.0					
	SYSTEM	33.2	49.2	98.5	33.2		744	501	247	28.5

** PROBLEMS/SOLUTIONS/COMMENTS

DURING MARCH MODULE S-2 REMAINED OUT OF SERVICE FOR MAINTENANCE. LOW LOADS WERE EXPERIENCED PERMITTING SUCCESSFUL SINGLE MODULE OPERATION WITH S-1.

THE UNIT MAINTENANCE OUTAGE BEGAN ON MARCH 22.

4/82	S-1	0.0			0.0					
	S-2	0.0			0.0					
	SYSTEM	0.0			0.0		720	0	0	0.0

** PROBLEMS/SOLUTIONS/COMMENTS

DURING APRIL THE UNIT AND THE FGD SYSTEM WERE OFF-LINE FOR A SCHEDULED MAINTENANCE OUTAGE.

5/82	S-1	60.6	80.3	95.4	55.8					
	S-2	58.8	51.2	97.9	35.6					
	SYSTEM	59.7	65.7	96.6	45.7		744	517	340	39.1

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT OUTAGE STARTED IN APRIL EXTENDED INTO MAY, DURING WHICH SOME MAJOR REPAIRS WERE ACCOMPLISHED ON THE FGD SYSTEM MODULES. THE REMAINDER OF THE MONTH INCLUDED SEVERAL PERIODS OF LOW UNIT LOAD REQUIRING THE OPERATION OF ONLY ONE MODULE. ADDITIONAL SYSTEM MAINTENANCE WAS ACCOMPLISHED AT THESE TIMES.

6/82	A	82.4	41.6	98.2	40.8					
	B	96.2	98.0	97.6	85.0					
	SYSTEM	89.3	69.8	97.9	62.9		720	706	453	52.6

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JUNE, LOW UNIT LOADS WERE EXPERIENCED DURING MUCH OF THE MONTH, REQUIRING ONLY ONE MODULE TO BE IN SERVICE. ROUTINE CLEANING AND MAINTENANCE WAS ACCOMPLISHED AS REQUIRED.

7/82	S-1	83.9	76.3	96.9	64.1					
	S-2	83.8	85.9	98.9	72.2					
	SYSTEM	83.8	81.1	97.9	68.1		744	625	507	54.5

SURVEY: JANUARY - DECEMBER 1988

S OF SPRINGFIELD: SOUTHWEST 1 (CONT.)

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

BLEMS/SOLUTIONS/COMMENTS

A UNIT OUTAGE OCCURRED DURING THE PERIOD OF JULY 1 THROUGH 6 DUE TO THE REPAIR OF A CONDENSER LEAK. THIS PERIOD WAS CONSIDERED AS UNAVAILABLE TIME FOR THE FGD MODULES AS MINOR MAINTENANCE WAS PERFORMED WHILE THE UNIT WAS OFF LINE.

ALL OTHER FGD SYSTEM OUTAGES DURING JULY OCCURRED AT LOW LOAD PERIODS WITH ONLY ONE MODULE REQUIRED TO OPERATE.

88.0	86.1	95.7	82.4				
93.0	81.8	97.8	78.4				
90.5	83.9	96.7	80.4	744	713	598	66.5

BLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM OUTAGES FOR AUGUST OCCURRED PRIMARILY DURING PERIODS OF LOW UNIT LOAD REQUIRING ONLY SINGLE MODULE OPERATION AND DURING START-UP PERIODS FOLLOWING UNIT TRIPS. TWO INSTANCES OF SHORT DURATION OCCURRED WHEN BOTH MODULES WERE TAKEN OUT OF SERVICE TO PERMIT ACCESS INTO THE MODULE REQUIRING MAINTENANCE.

99.8	69.5	80.9	69.5				
100.0	79.0	91.2	79.0				
99.9	74.2	86.0	74.2	720	720	534	65.2

BLEMS/SOLUTIONS/COMMENTS

THE FGD MODULES WERE REMOVED FROM SERVICE AT VARIOUS TIMES DURING SEPTEMBER DUE IN PART TO LOW UNIT LOADS.

INSTALLATION OF NEW LIMESTONE CLASSIFIER SYSTEMS ALSO CONTRIBUTED TO THE MODULE OUTAGE TIME DURING SEPTEMBER.

ALTHOUGH SOME MAINTENANCE WAS ACCOMPLISHED ON THE MODULES, THEY WERE CONSIDERED AVAILABLE DURING THE OUTAGE PERIODS.

89.2	87.7	98.6	87.8				
96.4	89.6	93.7	89.8				
92.8	88.7	96.1	88.8	744	744	661	68.1

BLEMS/SOLUTIONS/COMMENTS

TWO INSTANCES OF PLUGGING OCCURRED IN THE S-1 MODULE DURING OCTOBER.

THE S-2 MODULE REQUIRED A BRIEF OUTAGE PERIOD IN OCTOBER FOR CLEANING.

97.4	93.1	96.9	93.1				
96.7	95.0	98.3	95.0				
97.1	94.0	97.6	94.0	720	720	677	68.4

BLEMS/SOLUTIONS/COMMENTS

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

7.6	83.7	92.1	6.6				
8.4	91.9	93.4	7.2				
8.0	87.8	92.7	6.9	744	58	51	4.8

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

CITY UTILITIES OF SPRINGFIELD: SOUTHWEST 1 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

A UNIT TRIP OCCURRED ON DECEMBER 2 WHEN LIGHTNING INTERRUPTED THE ELECTRICAL SYSTEM INTERTIE. THIS RESULTED IN A UNIT FORCED OUTAGE OF APPROXIMATELY 4 HOURS.

THE UNIT WAS REMOVED FROM SERVICE ON DECEMBER 3, 1982 FOR AN EXTENSIVE MAINTENANCE OUTAGE. START-UP IS ANTICIPATED FOR MAY, 1983.

1/83	S-1	0.0			0.0				
	S-2	0.0			0.0				
	SYSTEM	0.0			0.0	744	0	0	0.0
2/83	S-1	0.0			0.0				
	S-2	0.0			0.0				
	SYSTEM	0.0			0.0	672	0	0	0.0
3/83	S-1	0.0			0.0				
	S-2	0.0			0.0				
	SYSTEM	0.0			0.0	744	0	0	0.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE DECEMBER 1982 - MAY 1983 MAINTENANCE OUTAGE CONTINUED THROUGHOUT THE MONTH OF MARCH.

4/83	SYSTEM					720	0		0.0
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** PROBLEMS/SOLUTIONS/COMMENTS

A UNIT MAINTENANCE OUTAGE TOOK PLACE DURING THE ENTIRE MONTH OF APRIL.

5/83	S-1	41.4	71.9	92.1	22.3				
	S-2	40.4	40.8	87.3	12.7				
	SYSTEM	40.9	56.4	89.7	17.5	744	231	130	13.7

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT MAINTENANCE OUTAGE WHICH BEGAN IN APRIL, ENDED ON MAY 19, 1983.

6/83	S-1	94.1	56.8	97.6	51.9				
	S-2	99.8	60.8	82.5	55.6				
	SYSTEM	96.9	58.8	90.0	53.7	720	657	387	39.7

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING JUNE.

7/83	S-1	98.6	95.2	99.2	89.7				
	S-2	98.8	68.6	98.8	64.7				
	SYSTEM	98.7	81.9	99.0	77.2	744	701	574	63.2

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING JULY.

8/83	S-1	90.8	84.0	99.2	65.3				
	S-2	93.5	95.5	97.9	74.2				
	SYSTEM	92.2	89.7	98.5	69.8	744	578	519	56.7

IRVEY: JANUARY - DECEMBER 1988

OF SPRINGFIELD: SOUTHWEST 1 (CONT.)

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

BLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT LOW BOILER AVAILABILITY DURING AUGUST WAS DUE TO WATER WALL TUBE LEAKS.

100.0	82.7	99.7	82.7				
100.0	96.5	99.8	96.5				
100.0	89.6	99.8	89.6	720	720	645	59.7

BLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING SEPTEMBER.

22.3	98.6	99.4	22.0				
22.3	94.6	100.0	21.1				
22.3	96.6	99.7	21.5	744	166	160	13.6

BLEMS/SOLUTIONS/COMMENTS

A SCHEDULED UNIT OUTAGE OCCURRED DURING OCTOBER TO REPLACE SECTIONS OF BOILER WATER WALL TUBING.

ABSORBER TRAY REPAIRS AND ALTERATIONS WERE MADE DURING THE UNIT OUTAGE IN OCTOBER.

100.0	40.6	99.6	5.6				
100.0	74.0	99.6	10.3				
100.0	57.3	99.6	8.0	720	100	57	6.3

BLEMS/SOLUTIONS/COMMENTS

THE BOILER WAS OUT OF SERVICE FOR SEVERAL EXTENDED PERIODS DURING NOVEMBER DUE TO WATER WALL TUBE FAILURES AND SUBSEQUENT REPAIRS.

71.2	10.8	89.7	5.0				
98.0	95.3	95.3	43.9				
84.6	53.1	92.5	24.4	744	342	182	20.8

BLEMS/SOLUTIONS/COMMENTS

MODULE S-1 WAS OUT OF SERVICE APPROXIMATELY 9 DAYS DURING DECEMBER DUE TO FROZEN LINES AND VALVES.

99.8	99.0	99.7	90.8				
99.1	96.7	98.8	88.7				
99.4	97.9	99.3	89.7	744	682	668	68.3
100.0	100.0	100.0	100.0				
99.5	89.7	99.5	89.7				
99.8	94.9	99.7	94.9	696	696	660	68.5

BLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD-RELATED PROBLEMS WERE REPORTED DURING JANUARY AND FEBRUARY.

98.0	77.5	96.6	59.5				
93.1	51.2	98.2	39.3				
95.6	64.4	97.4	49.4	744	571	368	49.1

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

CITY UTILITIES OF SPRINGFIELD: SOUTHWEST 1 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

HIGH BACK PRESSURE ON MODULE S-1 WAS REPORTED AND DISCOVERED TO BE CAUSED BY A BROKEN LINKAGE ON A DAMPER BLADE.

THE REPAIR OF A SEAL WATER LINE CONTRIBUTED TO FGD-SYSTEM OUTAGE TIME DURING MARCH.

A SLURRY RECYCLE LINE LEAK ON MODULE S-2 WAS TEMPORARILY REPAIRED DURING MARCH.

4/84	S-1	64.7	75.1	97.3	50.0				
	S-2	66.0	43.1	99.2	28.7				
	SYSTEM	65.4	59.1	98.3	39.4	720	480	284	45.0

** PROBLEMS/SOLUTIONS/COMMENTS

VIBRATION PROBLEMS WERE REPORTED ON THE "A" ID FAN. THE FAN WHEEL WAS CLEANED AND RETURNED TO SERVICE.

5/84	S-1	7.7	0.0		0.0				
	S-2	7.7	87.6	93.5	7.2				
	SYSTEM	7.7	43.8	93.5	3.6	744	61	27	40.7

** PROBLEMS/SOLUTIONS/COMMENTS

A PLANNED UNIT OUTAGE OCCURRED DURING APRIL AND MAY TO REPLACE WATERWALL TUBES.

6/84	S-1	99.5	65.9	97.1	60.9				
	S-2	98.9	89.4	99.1	82.7				
	SYSTEM	99.2	77.7	98.1	71.8	720	665	517	61.9

** PROBLEMS/SOLUTIONS/COMMENTS

MINOR PLUGGING IN THE ABSORBER BOTTOM TRAY AREA WAS REPORTED. HIGH EXCESS OXYGEN REQUIREMENTS AND PH ADJUSTMENTS AT LOW LOADS WERE BELIEVED TO BE THE CAUSE.

CONDENSATE PUMP PROBLEMS DURING JUNE CONTRIBUTED TO FGD SYSTEM DOWN TIME.

7/84	S-1	100.0	72.5	98.2	72.2				
	S-2	98.9	92.6	98.9	92.3				
	SYSTEM	99.4	82.5	98.6	82.3	744	742	612	67.0

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD-RELATED PROBLEMS WERE REPORTED DURING JULY.

8/84	S-1	99.5	83.1	98.2	83.1				
	S-2	98.4	78.9	96.8	78.9				
	SYSTEM	99.0	81.0	97.5	81.0	744	744	603	72.7

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE PERIOD OF AUGUST 26 TO AUGUST 28, THE PROCESS CONTROLLER POWER SUPPLY FAILED CAUSING AN AUTOMATIC SHUT DOWN.

DURING AUGUST, THE SUPERNATE LINE TO THE ABSORBER BROKE AT AN ELBOW AND WAS LATER REPLACED.

9/84	S-1	84.8	72.5	98.5	72.5				
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SRVEY: JANUARY - DECEMBER 1988

5 OF SPRINGFIELD: SOUTHWEST 1 (CONT.)

-----PERFORMANCE DATA-----								
AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
99.1	90.6	98.5	90.6					
91.9	81.6	98.5	81.6		720	720	587	66.7

3LEMS/SOLUTIONS/COMMENTS

UTILITY REPORTED THAT MODULE S-1 HAD SOME BAD SCALE BUILD-UP ON THE TRAY AND ON THE INTERNAL STRUCTURE LOCATED BELOW. THE ABSORBER WAS REMOVED FROM SERVICE SEVERAL DAYS FOR CLEANING. IN ADDITION, THE MODULE WAS OFF A FEW HOURS DUE TO POWER SUPPLY PROBLEMS.

82.9	82.8	98.2	68.7					
82.2	76.8	97.6	63.7					
82.5	79.8	97.9	66.2		744	617	492	58.2

3LEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE CEM EQUIPMENT HAD SEVERAL PERIODS OF DOWN TIME BETWEEN OCTOBER 20 AND OCTOBER 24 DUE TO PLUGGING IN THE STACK FILTER THIS WAS CAUSED BY A CARRYOVER FROM THE S-2 MODULE DEMISTERS DEMISTERS WHICH HAD BECOME PARTIALLY PLUGGED.

THE UNIT CAME OFF-LINE FOR A SCHEDULED MAINTAINENCE OUTAGE ON THE 26TH OF OCTOBER.

40.0	43.6	97.4	16.8					
40.0	86.8	98.6	33.4					
40.0	65.2	98.0	25.1		720	277	180	49.6

3LEMS/SOLUTIONS/COMMENTS

THE UNIT WAS OFF-LINE FROM THE 1ST THRU THE 19TH DUE TO THE SCHEDULED OUTAGE.

66.2	70.1	97.8	50.4					
74.2	76.2	99.9	54.8					
70.2	73.2	98.8	52.6		744	535	391	41.6

3LEMS/SOLUTIONS/COMMENTS

THE UNIT WAS OFF-LINE DECEMBER 11-17 FOR INSPECTION AND MAINTAINENCE FOR A TEST BURN OF A NEW COAL SUPPLY. IN ADDITION THE E.S.P. WAS CLEANED AND SEVERAL BROKEN WIRES WERE REPLACED.

THE UTILITY ALSO CLEANED BOTH MODULES, REPLACED THE DISCHARGE WELL ON S-2 RECYCLE PUMP, AND REPROGRAMMED THE KAYE EMISSION RECORDER(LOSS OF MEMORY HAD CAUSED SEVERAL PERIODS OF DATA TO BE LOST).

26.0	93.6	96.6	25.7					
25.8	40.6	98.5	11.2					
25.9	67.1	97.6	18.4		744	204	137	47.5

3LEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE UNIT WAS OFF LINE FROM THE FIRST THROUGH THE 23RD OF THE MONTH SO THAT AN INDEPENDENT REVIEW OF THE OPERATING/ MAINTENANCE PROCEDURES COULD BE COMPLETED AND A MASTER PLAN TO PREVENT FUTURE COAL PREPARATION SYSTEM EXPLOSIONS COULD BE IMPLEMENTED. THE ORDERING/INSTALLATION OF THE IMMEDIATE AND SHORT TERM RECOMMENDATIONS WERE PUT INTO PRACTICE PRIOR TO THE UNIT START-UP IN ORDER TO MAXIMIZE SAFETY DURING THE INTERIM PERIOD, BEFORE THE INSTALLATION OF A STEAM INERTING SYSTEM.

TRAY PLUGGING CAUSED A FORCED OUTAGE ON MODULE S-1 DURING THE MONTH.

CITY UTILITIES OF SPRINGFIELD: SOUTHWEST 1 (CONT.)

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

2/85	S-1	99.7	98.5	98.8	98.1	672	669	649	56.3
	S-2	100.0	95.3	98.8	95.0				
	SYSTEM	99.8	96.9	98.8	96.5				

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE S-1 WAS TAKEN OUT OF SERVICE DURING THE MONTH TO MAKE TEMPORARY REPAIRS TO THE PRESATURATOR SECTION. A PERMANENT REPAIR WILL BE MADE DURING THE SCHEDULED APRIL OUTAGE.

BOTH ID FANS WERE BALANCED DURING THE MONTH IN RESPONSE TO HIGH VIBRATION PROBLEMS. THE UTILITY EMPLOYED THE SERVICES OF A CONTRACTOR TO PERFORM FAN VIBRATION TESTS TO HELP DETERMINE THE CAUSE OF THE FAN SENSITIVITY TO SMALL WEIGHT CHANGES. THE CONTRACTOR WILL RECOMMEND CHANGES UPON COMPLETING THE ANALYSIS.

3/85	S-1	98.9	56.8	97.8	56.2	744	737	478	46.7
	S-2	99.2	73.0	97.7	72.3				
	SYSTEM	99.0	64.9	97.8	64.2				

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY MADE SEVERAL TEMPORARY REPAIRS TO BOTH THE S-1 AND S-2 PRESATURATORS AS WELL AS TO THE DISCHARGE LINING ON MODULE S-1. PERMANENT REPAIRS WILL BE MADE DURING THE UPCOMING SCHEDULED APRIL OUTAGE.

POWER SUPPLY PROBLEMS ASSOCIATED WITH THE FOUR OPACITY MONITORS WERE REPORTED DURING THE MONTH. THESE WERE TRACED DOWN TO A SHORT IN AN ADJACENT CABLE IN THE CABLE TRAY BURNING THROUGH THEIR SUPPLY CABLE. BOTH CABLES WERE REPAIRED AND THE MONITORS WERE RETURNED TO SERVICE.

4/85	S-1	15.9	99.1	99.3	15.8	720	114	112	56.6
	S-2	15.9	97.3	99.0	15.5				
	SYSTEM	15.9	98.2	99.2	15.6				

5/85	S-1	82.1	96.5	93.9	77.5	744	598	433	54.7
	S-2	47.5	48.4	93.9	38.9				
	SYSTEM	64.8	72.4	93.9	58.2				

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT A SCHEDULED UNIT/FGD SYSTEM OUTAGE BEGAN ON THE FIRST OF APRIL AND EXTENDED THROUGH MAY 6.

ALTHOUGH THE UNIT OUTAGE ENDED ON MAY 6, MODULE S-2 WAS NOT AVAILABLE UNTIL THE 15TH OF THE MONTH. THIS TIME WAS REQUIRED TO COMPLETE THE RELINING WORK IN THE PRESATURATOR WITH HASTELLOY C-276. THE MODULE WAS TAKEN OFF LINE SEVERAL TIMES AFTER THE 15TH TO REPAIR PLUG WELD LEAKS.

6/85	S-1	46.5	97.3	99.7	37.3	720	276	270	73.5
	S-2	46.6	98.5	99.5	37.7				
	SYSTEM	46.6	97.9	99.6	37.5				

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS TAKEN OUT OF SERVICE ON THE 14TH OF THE MONTH FOR INSPECTION AND/OR REMOVAL OF BAD BOILER WATERWALL TUBES. A RANDOM SAMPLE OF TUBES IN ALL AREAS OF THE BOILER WAS TAKEN TO CHECK FOR REDUCTION IN WALL THICKNESS.

7/85	S-1	99.0	94.0	95.3	92.9	744	735	690	71.7
	S-2	99.8	93.8	99.2	92.7				
	SYSTEM	99.4	93.9	97.2	92.8				

SURVEY: JANUARY - DECEMBER 1988

ES OF SPRINGFIELD: SOUTHWEST 1 (CONT.)

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

OBLEMS/SOLUTIONS/COMMENTS

NO FGD SYSTEM-RELATED PROBLEMS WERE REPORTED BY THE UTILITY FOR THE MONTHS OF JUNE OR JULY.

	98.9	98.8	98.8	98.8				
	98.9	98.7	98.7	98.7				
M	98.9	98.8	98.8	98.8	744	744	735	73.9

OBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT BOTH SCRUBBING TRAINS WERE TAKEN OUT OF SERVICE SEVERAL TIMES DURING AUGUST FOR CLEANING.

	99.6	87.5	99.4	87.4				
	99.1	98.9	98.9	98.8				
M	99.3	93.2	99.1	93.1	720	719	670	67.0

OBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED NO FGD SYSTEM-RELATED OUTAGES DURING THE MONTH; HOWEVER, BOILER ID FAN PROBLEMS AND UNIT CONTINUOUS EMISSION MONITOR FAILURES WERE NOTED.

	18.1	15.9	77.2	15.8				
	84.0	80.5	94.5	80.0				
M	51.0	48.2	85.8	47.9	744	739	356	42.5

OBLEMS/SOLUTIONS/COMMENTS

FAN PROBLEMS CONTINUED FROM LAST MONTH. ONE BOILER ID FAN WAS REMOVED AND SENT OUT FOR REWINDING. BECAUSE OF THE FORCED LOAD REDUCTION THAT RESULTED, A PLANNED OUTAGE WAS CANCELLED SINCE MOST REPAIRS COULD BE MADE ON LINE AT THE LOWER LOAD LEVEL. THOSE REPAIRS REQUIRING A UNIT OUTAGE WERE POSTPONED UNTIL THE SPRING, 1986, OUTAGE.

DURING THE LOW LOAD PERIOD SOME SCRUBBER WORK WAS PERFORMED. THE S-2 MODULE WAS REMOVED FROM SERVICE TO MAKE REPAIRS.

	57.9	57.9	99.9	57.8				
	50.8	27.6	65.1	27.6				
M	54.4	42.8	82.5	42.7	720	719	307	44.0

OBLEMS/SOLUTIONS/COMMENTS

THE S-1 MODULE WAS OUT OF SERVICE FROM THE 18TH THROUGH THE 30TH OF THE MONTH FOR MIST ELIMINATOR CLEANING AND PRESATURATOR WORK.

MODULE S-2 WAS OUT OF SERVICE FROM THE 1ST THROUGH THE 18TH OF THE MONTH FOR CLEANING/REPAIR WORK.

OPACITY MONITORS WERE OUT OF SERVICE FROM NOVEMBER 6TH THROUGH THE 14TH. THE MONITORS HAD PROBLEMS HOLDING CALIBRATION AND HIGH MOISTURE LEVELS CAUSED NEGATIVE READINGS. THE OPTICS WERE COMPLETELY CLEANED AND PC BOARDS WERE RESEATED. A COMPLETE MANUAL CALIBRATION WAS PERFORMED ON EACH UNIT BEFORE THE MONITORS WERE RETURNED TO SERVICE.

THE S-1 PRESATURATOR SHELL MATERIAL WAS REPLACED WITH A 1/4 INCH CARBON STEEL PLATE COVERED WITH ALLOY C-276.

	43.0	41.9	98.3	41.9				
	58.8	58.7	99.6	58.7				
M	50.9	50.3	99.0	50.3	744	744	374	43.3

CITY UTILITIES OF SPRINGFIELD: SOUTHWEST 1 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE S-1 WAS OUT OF SERVICE FROM THE 1ST THROUGH THE 18TH OF THE MONTH FOR CLEANING/REPAIR WORK.

THE S-2 MODULE WAS OUT OF SERVICE FROM THE 18TH THROUGH THE 31ST OF THE MONTH FOR UPPER MIST ELIMINATOR CLEANING.

THE S-2 PRESATURATOR UNDERWENT A SHELL REPLACEMENT WITH AN ALLOY C-276 COVERED 1/4 INCH CARBON STEEL PLATE MATERIAL IN DECEMBER.

1/86	S-1	86.4	83.1	98.3	83.1				
	S-2	99.7	49.7	99.7	49.7				
	SYSTEM	93.0	66.4	99.0	66.4	744	744	494	50.3

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE S-1 WAS TAKEN OFF-LINE FOR CLEANING JANUARY 16. THE MODULE CAME BACK ON LINE JANUARY 21. MODULE S-2 WAS OFF-LINE UNTIL JANUARY 16 DUE TO LOW UNIT LOAD.

2/86	S-1	97.1	72.8	99.7	72.8				
	S-2	94.0	89.1	99.9	89.1				
	SYSTEM	95.5	80.9	99.8	80.9	672	672	544	51.8

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE S-1 WAS OFF-LINE FOR CLEANING/REPAIRS ON FEBRUARY 18 THROUGH THE 19TH. THE MODULE WAS OFF AGAIN ON THE 22ND DUE TO LOW LOAD. MODULE S-2 WAS OFF-LINE FOR CLEANING/REPAIRS ON FEBRUARY 19 THROUGH THE 20TH AND AGAIN ON THE 27TH.

3/86	S-1	87.1	1.2	90.0	1.0				
	S-2	84.3	98.4	98.4	84.1				
	SYSTEM	85.7	49.8	94.2	42.5	744	636	317	44.6

4/86	S-1	0.0			0.0				
	S-2	0.0			0.0				
	SYSTEM	0.0			0.0	720	0	0	0.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS TAKEN OFF-LINE MARCH 27 FOR A SCHEDULED ESP/ECONOMIZER OUTAGE. DURING THIS OUTAGE OTHER SCHEDULED BOILER FGD AND COAL HANDLING SYSTEM MAINTENANCE ITEMS WERE ADDRESSED. THE OUTAGE CONTINUED THROUGH APRIL.

5/86	S-1	75.1	75.4	96.8	46.6				
	S-2	78.4	74.6	98.6	46.1				
	SYSTEM	76.7	75.0	97.7	46.3	744	459	345	54.4

** PROBLEMS/SOLUTIONS/COMMENTS

SEVERAL CONTINUOUS EMISSION MONITOR (CEM) PROBLEMS WERE REPORTED IN MAY. THESE WERE AS FOLLOWS- 1) NOX CELL OUT OF CALIBRATION 2) HIGH O2 DUE TO TIMER PROBLEM AND VALVE ACTUATOR HANGING UP 3) CALIBRATION PROBLEM ON OPACITY MONITOR (REPLACED A CONTROL BOARD AND POWER SUPPLY).

A DAMPER PROBLEM CAUSED ROUGHLY 2 DAYS OF DOWNTIME DURING MAY. THIS WAS FOLLOWED BY SEVERAL DAYS OF BOILER-RELATED OUTAGE TIME.

THE SCHEDULED UNIT OUTAGE ENDED MAY 5, 1986.

SRVEY: JANUARY - DECEMBER 1988

3 OF SPRINGFIELD: SOUTHWEST 1 (CONT.)

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

99.8	66.6	98.7	66.6				
98.7	74.2	99.3	74.2				
99.3	70.4	99.0	70.4	720	720	507	54.7

BLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD SYSTEM-RELATED PROBLEMS OCCURRED IN JUNE.

81.8	91.3	98.4	72.0				
81.0	72.2	98.2	56.9				
81.4	81.8	98.3	64.4	744	586	479	71.3

BLEMS/SOLUTIONS/COMMENTS

THERE WERE THREE UNIT TRIPS IN JULY, TWO OF WHICH LASTED FOR AN EXTENDED PERIOD. DURING THIS TIME INSPECTIONS/REPAIRS OF THE MODULES WERE PERFORMED.

89.8	98.9	99.3	87.9				
89.4	95.7	98.8	85.0				
89.6	97.3	99.1	86.4	744	661	643	70.6

BLEMS/SOLUTIONS/COMMENTS

FAN AND SCREEN TUBE PLUGGING PROBLEMS CAUSED THE UNIT TO BE OUT OF SERVICE THE FIRST THREE DAYS OF AUGUST AND PART OF THE FOURTH.

89.6	92.4	99.4	84.9				
91.4	91.9	99.6	84.4				
90.5	92.2	99.5	84.7	720	661	610	62.3

BLEMS/SOLUTIONS/COMMENTS

OPACITY MONITOR PROBLEMS WERE TRACED TO A FAULTY COMMUNICATION CORD. THE CORD WAS REPLACED AS SOON AS THE NEW ONE WAS RECEIVED.

9.7	100.0	100.0	9.6				
9.7	97.5	100.0	9.4				
9.7	98.7	100.0	9.5	744	71	71	52.5

BLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS OFF-LINE FOR A SCHEDULED OUTAGE THROUGH MOST OF OCTOBER.

23.3	86.0	99.5	18.2				
23.3	97.5	99.6	20.6				
23.3	91.8	99.5	19.4	720	153	140	53.2

BLEMS/SOLUTIONS/COMMENTS

AN OPACITY MONITOR HAD TO BE SENT OUT FOR REPAIRS AND TO HAVE THE READ ONLY MEMORY PROGRAMMED IN NOVEMBER.

THE UNIT WAS PLACED BACK IN SERVICE 11/24/86 UPON COMPLETING A SCHEDULED OUTAGE.

99.7	98.9	98.9	98.9				
99.5	98.7	98.7	98.7				
99.6	98.8	98.8	98.8	744	744	735	57.5

CITY UTILITIES OF SPRINGFIELD: SOUTHWEST 1 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

NO FGD SYSTEM-RELATED PROBLEMS WERE REPORTED FOR DECEMBER.

1/87	S-1	99.4	99.4	99.4	99.4				
	S-2	99.3	99.3	99.3	99.3				
	SYSTEM	99.4	99.4	99.4	99.4	744	744	739	57.2

** PROBLEMS/SOLUTIONS/COMMENTS

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

2/87	S-1	100.0	98.3	99.5	75.3				
	S-2	100.0	97.4	99.9	74.7				
	SYSTEM	100.0	97.9	99.7	75.0	672	515	504	56.8

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS OFF-LINE FEBRUARY 26-27 DUE TO PRECIPITATOR PROBLEMS.

THE UNIT WAS OFF-LINE FEBRUARY 3-9 DUE TO A BLOWN REHEATER TUBE.

3/87	S-1	99.9	99.9	99.9	99.9				
	S-2	99.9	99.8	99.8	99.8				
	SYSTEM	99.9	99.8	99.8	99.8	744	744	743	58.3

** PROBLEMS/SOLUTIONS/COMMENTS

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

4/87	S-1	10.1	96.6	100.0	9.8				
	S-2	10.1	99.8	100.0	10.1				
	SYSTEM	10.1	98.2	100.0	9.9	720	73	72	76.3
5/87	S-1	89.4	98.4	99.5	86.1				
	S-2	89.7	97.1	99.8	84.9				
	SYSTEM	89.5	97.8	99.6	85.5	744	651	636	66.6

** PROBLEMS/SOLUTIONS/COMMENTS

UNIT WAS OFF-LINE FOR A SCHEDULED OUTAGE APRIL 4 THROUGH MAY 4.

6/87	S-1	99.7	98.3	98.6	86.4				
	S-2	99.6	98.2	98.8	86.3				
	SYSTEM	99.6	98.2	98.7	86.4	720	633	622	65.4
7/87	S-1	99.8	99.8	99.8	99.8				
	S-2	99.4	99.4	99.4	99.4				
	SYSTEM	99.6	99.6	99.6	99.5	744	744	741	66.3
8/87	S-1	100.0	98.8	99.3	91.0				
	S-2	99.9	98.2	99.9	90.5				
	SYSTEM	100.0	98.5	99.6	90.8	744	685	675	78.3
9/87	S-1	100.0	100.0	100.0	99.7				
	S-2	100.0	100.0	100.0	99.7				
	SYSTEM	100.0	100.0	100.0	99.7	720	716	718	82.6

** PROBLEMS/SOLUTIONS/COMMENTS

NO FGD SYSTEM-RELATED PROBLEMS WERE REPORTED FOR THE PERIOD JUNE THROUGH SEPTEMBER 1987.

SRVEY: JANUARY - DECEMBER 1988

S OF SPRINGFIELD: SOUTHWEST 1 (CONT.)

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

6.1	98.0	100.0	6.0				
6.1	100.0	100.0	6.1				
6.1	99.0	100.0	6.0	744	45	45	72.3

3LEMS/SOLUTIONS/COMMENTS

THE UNIT WAS OFF-LINE FOR A SCHEDULED OUTAGE TO REPLACE BOILER CONTROLS.

26.7	83.4	98.9	21.3				
26.7	96.5	99.8	24.6				
26.7	90.0	99.3	22.9	720	183	165	54.8

3LEMS/SOLUTIONS/COMMENTS

DURING THE SCHEDULED OUTAGE, THE OPACITY MONITOR WAS DAMAGED BY PAINTERS SANDBLASTING. TWO UNITS WERE SENT TO BE REBUILT AND RECALIBRATED.

THE UNIT WAS OFF-LINE UNTIL NOVEMBER 23 FOR A SCHEDULED OUTAGE TO REPLACE BOILER CONTROLS.

99.9	84.2	99.8	81.3				
99.5	85.1	99.5	82.2				
99.7	84.7	99.7	81.7	744	718	608	51.8

3LEMS/SOLUTIONS/COMMENTS

THE UNIT WAS TAKEN OFF-LINE FOR PRECIPITATOR CLEANING AND MAINTENANCE. AIR FILTERS WERE CLEANED AND FAN CONTROL SYSTEMS CHECKED.

100.0	100.0	100.0	100.0				
99.9	99.9	99.9	99.9				
99.9	99.9	99.9	99.9	744	744	743	58.3
99.9	98.7	99.6	98.5				
100.0	100.0	100.2	100.0				
99.9	99.3	99.9	99.2	696	694	691	56.7
99.1	94.6	94.6	94.6				
99.8	99.8	99.8	99.8				
99.4	97.2	97.2	97.2	744	744	723	56.5

3LEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE MONTHS OF JANUARY THROUGH MAY 1988.

23.6	96.1	96.1	23.5				
24.4	99.8	99.8	24.4				
48.0	100.0	100.0	47.9	720	176	345	57.8

3LEMS/SOLUTIONS/COMMENTS

THE UNIT WAS OFF-LINE FOR A SCHEDULED MAINTENANCE OUTAGE FROM APRIL 8 THROUGH APRIL 31.

71.0	98.6	99.7	67.8				
71.0	90.3	99.8	62.1				
71.0	94.5	99.7	64.9	744	511	483	72.3

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

CITY UTILITIES OF SPRINGFIELD: SOUTHWEST 1 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT CONTINUED TO BE OFF-LINE IN MAY DUE TO THE SCHEDULED MAINTENANCE OUTAGE. THE UNIT CAME BACK ON-LINE MAY 10. NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE MONTH.

6/88	S-1	100.0	99.6	99.8	86.1				
	S-2	100.0	98.4	99.9	85.1				
	SYSTEM	100.0	99.0	99.9	85.6	720	623	617	86.3

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS TAKEN OFF-LINE IN JUNE A TOTAL OF 5 DAYS TO MAKE REPAIRS TO RUPTURED WATERWALL TUBES. NO MAJOR FGD-RELATED PROBLEMS WERE REPORTED.

7/88	S-1	94.3	94.3	94.3	94.3				
	S-2	95.3	95.3	95.3	95.3				
	SYSTEM	94.8	94.8	94.8	94.8	744	744	705	81.5

8/88	S-1	93.7	93.7	93.7	93.7				
	S-2	96.2	96.2	96.2	96.2				
	SYSTEM	95.0	95.0	95.0	95.0	744	744	706	87.3

9/88	S-1	98.8	98.7	98.7	97.9				
	S-2	97.9	97.7	97.7	97.0				
	SYSTEM	98.4	98.2	98.2	97.5	720	715	702	82.3

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD-RELATED PROBLEMS WERE REPORTED BY THE UTILITY FOR THE MONTHS OF JULY THROUGH SEPTEMBER.

10/88	S-1	67.7	100.0	100.0	67.7				
	S-2	67.7	98.6	100.0	66.7				
	SYSTEM	67.7	99.3	100.0	67.2	744	504	500	83.2

11/88	S-1	33.3	97.1	97.1	30.2				
	S-2	29.2	90.6	90.6	28.2				
	SYSTEM	31.3	93.8	93.8	29.2	720	224	210	59.9

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS OFF-LINE FOR A SCHEDULED MAINTENANCE OUTAGE OCTOBER 21 THROUGH NOVEMBER 21. NO FGD-SYSTEM RELATED PROBLEMS WERE REPORTED BY THE UTILITY DURING THE PERIOD.

12/88	S-1	99.6	99.2	99.2	98.6				
	S-2	99.5	99.2	99.3	98.6				
	SYSTEM	99.5	99.2	99.3	98.6	744	739	733	73.6

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD-RELATED PROBLEMS WERE REPORTED BY THE UTILITY FOR DECEMBER.

SECTION 13
 DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	COLORADO UTE ELECTRIC	
PLANT NAME	CRAIG	
UNIT NUMBER	1	
CITY	CRAIG	
STATE	COLORADO	
REGULATORY CLASSIFICATION	C	
PARTICULATE EMISSION LIMITATION - NG/J	43.	(0.100 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	172.	(0.400 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	301.	(0.700 LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	900	
GROSS UNIT GENERATING CAPACITY - MW	454	
NET UNIT GENERATING CAPACITY W/FGD - MW	428	
NET UNIT GENERATING CAPACITY WO/FGD - MW	431	
EQUIVALENT SCRUBBED CAPACITY - MW	350	

*** UNIT DATA - BOILER AND STACK

BOILER SUPPLIER	BABCOCK & WILCOX	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	722.29	(1530600 ACFM)
BOILER FLUE GAS TEMPERATURE - C	121.1	(250 F)
STACK HEIGHT - M	183.	(600 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	10.9	(35.8 FT)

*** FUEL DATA

FUEL TYPE	COAL	
FUEL GRADE	SUBBITUMINOUS	
AVERAGE HEAT CONTENT - J/G	23260.	(10000 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		9100-10300
AVERAGE ASH CONTENT - %	8.00	
RANGE ASH CONTENT - %	****	
AVERAGE MOISTURE CONTENT - %	16.00	
RANGE MOISTURE CONTENT - %	****	
AVERAGE SULFUR CONTENT - %	0.45	
RANGE SULFUR CONTENT - %	0.4-0.5	
AVERAGE CHLORIDE CONTENT - %	*****	
RANGE CHLORIDE CONTENT - %	0.00-0.02	

*** PARTICLE CONTROL

*** MECHANICAL COLLECTOR

NUMBER	0
TYPE	NONE

*** ESP

NUMBER	1	
NUMBER OF SPARES	0	
TYPE	HOT SIDE	
SUPPLIER	BELCO	
INLET FLUE GAS CAPACITY - CU.M/S	1392.1	(2950000 ACFM)
INLET FLUE GAS TEMPERATURE - C	398.9	(750 F)
PRESSURE DROP - KPA	0.7	(3. IN-H2O)
PARTICLE REMOVAL EFFICIENCY - %	99.9	

*** 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

SRVEY: JANUARY - DECEMBER 1988

ELECTRIC: CRAIG 1 (CONT.)

ATA		
PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT	
VAL MODE	WET SCRUBBING	
TYPE	LIMESTONE	
ADDITIVES	NONE	
PPPLIER	PEABODY PROCESS SYSTEMS	
	STEARNS-ROGER	
ENT LEVEL	FULL SCALE	
OFIT	NEW	
IGN PARTICLE REMOVAL EFFICIENCY - %	99.80	
IGN SO2 REMOVAL EFFICIENCY - %	85.00	
ONSUMPTION - %	0.7	
STATUS	1	
AL START-UP	12/1980	
START-UP	10/1980	
AWARDED	5/1977	
) OPERATING PARAMETERS		
AL SULFER CONTENT - %	0.96	
AL HEAT CONTENT - J/G	22329.6	(9600 BTU/LB)
AL ASH CONTENT - %	11.60	
ISTURE CONTENT - %	15.30	
HLORIDE CONTENT - %	0.10	
QUIREMENTS - SQ M	12140.2	(130680 SQ FT)
MAINT. REQUIREMENT - MANHR/DAY	264.0	
>RESATURATOR		
	4	
	QUENCH DUCT	
	PEABODY PROCESS SYSTEMS	
S FLOW - CU. M/S	217.07	(460000 ACFM)
S TEMPERATURE - C	121.1	(250 F)
DROP - KPA	0.2	(1.0 IN-H2O)
ECIRCULATION RATE - LITERS/S	32.	(500 GPM)
D - L/CU. M	0.1	(1.1 GAL/1000 ACFM)
ION MATERIAL GENERIC TYPE	HIGH ALLOY	
ION MATERIAL SPECIFIC TYPE	NICKEL BASE/CHROMIUM-IRON-MOLYBDENUM	
	4	
	1	
S SPARES	SPRAY TOWER	
TYPE	OPEN COUNTERCURRENT SPRAY	
TYPE	N/A	
HE/COMMON TYPE	PEABODY PROCESS SYSTEMS	
	32.0 DIA X 52.5	
IS - FT	CARBON STEEL	
IERIC MATERIAL	AISI 1110	
ECIFIC MATERIAL	N/A	
ERIAL TRADE NAME/COMMON TYPE	ORGANIC SPRAY ZONE!; GLASS FLAKE-FILLED POLYEST	
IERIC MATERIAL	NATURAL RUBBER	
ECIFIC MATERIAL	BLACK NATURAL RUBBER	
ERIAL TRADE NAME/COMMON TYPE	NONE	
ACTING DEVICE TYPE	4	
CONTACTING ZONES	1512.	(24000 GPM)
ECIRCULATION RATE - LITER/S	7.0	(52.2 GAL/1000 ACF)
D - L/CU.M	0.4	(1.5 IN-H2O)
PRESSURE DROP - KPA	3.0	(10.0 FT/S)
AL GAS VELOCITY - M/SEC	217.07	(460000 ACFM)
S FLOW - CU. M/S	121.1	(250 F)
S TEMPERATURE - C	85.0	
AL EFFICIENCY - %	50.0	
REMOVAL EFFICENCY - %		
NATOR		
ELIMINATOR/MIST ELIMINATOR	PRIMARY COLLECTOR	
ER SYSTEM	4	
SPARES PER SYSTEM	1	
ER MODULE	1	
TYPE	IMPINGEMENT	
TYPE	BAFFLE	

COLORADO UTE ELECTRIC: CRAIG 1 (CONT.)

TRADE NAME/COMMON TYPE	CLOSED VANE
CONFIGURATION	HORIZONTAL
NUMBER OF STAGES	1
NUMBER OF PASSES PER STAGE	4
FREEBOARD DISTANCE - M	1.52 (5.0 FT)
DISTANCE BETWEEN VANES - CM	3.0 (1.20 IN)
VANE ANGLES - DEGREES	45
PRESSURE DROP - KPA	0.2 (1.0 IN-H2O)
SUPERFICIAL GAS VELOCITY - M/S	3.0 (10.0 FT/S)
CONSTRUCTION MATERIAL GENERIC TYPE	ORGANIC
CONSTRUCTION MATERIAL SPECIFIC TYPE	POLYPHENYLENE
WASH WATER SOURCE	RAW WATER
WASH FREQUENCY	CONTINUOUS
WASH RATE - L/S	6.3 (100 GAL/MIN)
** REHEATER	
NUMBER	4
NUMBER OF SPARES	1
NUMBER PER MODULE	1
GENERIC TYPE	BYPASS
SPECIFIC TYPE	COLD SIDE
TRADE NAME/COMMON TYPE	N/A
LOCATION	OUTLET DUCT BETWEEN ME & OUTLET DAMPER
PERCENT GAS BYPASSED - AVG	23.0
TEMPERATURE INCREASE - C	27.8 (50 F)
INLET FLUE GAS FLOW RATE - CU. M/S	194.89 (413000 ACFM)
INLET FLUE GAS TEMPERATURE - C	43.3 (110 F)
OUTLET FLUE GAS FLOW RATE - CU. M/S	302.02 (640000 ACFM)
OUTLET FLUE GAS TEMPERATURE - C	73.9 (165 F)
CONSTRUCTION MATERIAL GENERIC TYPE	STAINLESS STEEL
CONSTRUCTION MATERIAL SPECIFIC TYPE	AUSTENITIC
** FANS	
NUMBER	4
NUMBER OF SPARES	0
DESIGN	AXIAL
SUPPLIER	BUFFALO FORGE
FUNCTION	INDIRECT REHEAT
APPLICATION	N/A
SERVICE	DRY
FLUE GAS FLOW RATE - CU.M/S	46.03 (97545 ACFM)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL
** FANS	
NUMBER	4
NUMBER OF SPARES	1
DESIGN	AXIAL
SUPPLIER	BUFFALO FORGE
FUNCTION	BOOSTER
APPLICATION	FORCED DRAFT
SERVICE	DRY
FLUE GAS FLOW RATE - CU.M/S	372.80 (790000 ACFM)
FLUE GAS TEMPERATURE - C	121.1 (250 F)
PRESSURE DROP - KPA	3.4 (11.0 IN-H2O)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL
** DAMPERS	
NUMBER	4
GENERIC TYPE	LOUVER
SPECIFIC TYPE	PARALLEL BLADE MULTILOUVER
MANUFACTURER	FORNEY ENGINEERING
MODULATION	OPEN
SEAL AIR FLOW - CU. M/S	3.07 (6500 ACFM)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL/STAINLESS STEEL
CONSTRUCTION MATERIAL SPECIFIC TYPE	ASTM A-285
LINER GENERIC MATERIAL TYPE	NONE
LINER SPECIFIC MATERIAL TYPE	N/A
** DAMPERS	
NUMBER	4
GENERIC TYPE	LOUVER

SURVEY: JANUARY - DECEMBER 1988

E ELECTRIC: CRAIG 1 (CONT.)

IC TYPE
CTURER
TION
R FLOW - CU. M/S
JCTION MATERIAL GENERIC TYPE
JCTION MATERIAL SPECIFIC TYPE
GENERIC MATERIAL TYPE
SPECIFIC MATERIAL TYPE

PARALLEL BLADE MULTILOUVER
FORNEY ENGINEERING
OPEN
3.07 (6500 ACFM)
CARBON STEEL/STAINLESS STEEL
ASTM A-285
NONE
N/A

C TYPE
IC TYPE
CTURER
TION
R FLOW - CU. M/S
JCTION MATERIAL GENERIC TYPE
JCTION MATERIAL SPECIFIC TYPE
GENERIC MATERIAL TYPE
SPECIFIC MATERIAL TYPE

4
LOUVER
PARALLEL BLADE MULTILOUVER
FORNEY ENGINEERING
OPEN
3.07 (6500 ACFM)
CARBON STEEL/STAINLESS STEEL
ASTM A-285
NONE
N/A

: TYPE
C TYPE
TURER
ION
R FLOW - CU. M/S
JCTION MATERIAL GENERIC TYPE
JCTION MATERIAL SPECIFIC TYPE
GENERIC MATERIAL TYPE
SPECIFIC MATERIAL TYPE

4
GUILLOTINE
NR
FORNEY ENGINEERING
OPEN
0.00 (0 ACFM)
CARBON STEEL/HIGH ALLOY
AISI 1110; NR
NONE
N/A

TYPE
C TYPE
TURER
ION
R FLOW - CU. M/S
CTION MATERIAL GENERIC TYPE
CTION MATERIAL SPECIFIC TYPE
ENERIC MATERIAL TYPE
PECIFIC MATERIAL TYPE

2
LOUVER
PARALLEL BLADE MULTILOUVER
FORNEY ENGINEERING
OPEN
0.00 (0 ACFM)
CARBON STEEL/STAINLESS STEEL
ASTM A-285
NONE
N/A

TYPE
C TYPE
TURER
ION
R FLOW - CU. M/S
CTION MATERIAL GENERIC TYPE
CTION MATERIAL SPECIFIC TYPE
ENERIC MATERIAL TYPE
PECIFIC MATERIAL TYPE

1
LOUVER
PARALLEL BLADE MULTILOUVER
FORNEY ENGINEERING
OPEN
0.00 (0 ACFM)
CARBON STEEL/STAINLESS STEEL
ASTM A-285
NONE
N/A

TYPE
C TYPE
TURER
ION
R FLOW - CU. M/S
CTION MATERIAL GENERIC TYPE
CTION MATERIAL SPECIFIC TYPE
ENERIC MATERIAL TYPE
PECIFIC MATERIAL TYPE

2
LOUVER
PARALLEL BLADE MULTILOUVER
FORNEY ENGINEERING
CLOSED
0.00 (0 ACFM)
CARBON STEEL/STAINLESS STEEL
ASTM A-285
NONE
N/A

COLORADO UTE ELECTRIC: CRAIG 1 (CONT.)

** DUCTWORK	
LOCATION	INLET TO QUENCH
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 TO DAMPER
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
SHELL SPECIFIC MATERIAL TYPE	AISI 1110
LINER GENERIC MATERIAL TYPE	ORGANIC
LINER SPECIFIC MATERIAL TYPE	GLASS FLAKE-FILLED POLYESTER
** DUCTWORK	
LOCATION	DAMPER TO STACK
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
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	COMPARTMENTED
DEVICE TYPE	NR
MANUFACTURER	KENNEDY VAN SAUN
NUMBER	1
NUMBER OF SPARES	0
FULL LOAD DRY FEED CAPACITY - M.TONS/HR	9.1 (10 TPH)
PRODUCT QUALITY - % SOLIDS	35.0
** TANKS	
SERVICE	NUMBER
-----	-----
ABSORBER RECYCLE	4
REAGENT PREP PRODUCT	1
THICKENER OVERFLOW	1
CLASSIFIER OVERFLOW	4
FLOCCULANT	1
WASTE SLURRY BLEED	1
** PUMPS	
SERVICE	NUMBER
-----	-----
RAW WATER	2
RECLAIM SUMP	7
POND	1
COOLING TOWER BLOWDOWN BOOSTER	2
ABSORBER RECIRCULATION	8
WASH SLURRY	8
SUPERNATANT	2
THICKENER UNDERFLOW	2
POLYELECTROLYTE	1
WASTE SLURRY	2
MILL RECIRCULATION	2
LIMESTONE SLURRY FEED	2
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	CENTRIFUGE
NUMBER	1
NUMBER OF SPARES	1
DIMENSIONS - FT	3.0 DIA X 6.0
CAPACITY	126 GPM

SURVEY: JANUARY - DECEMBER 1988

E ELECTRIC: CRAIG 1 (CONT.)

GENERIC MATERIAL TYPE	HIGH ALLOY
SPECIFIC MATERIAL TYPE	NICKEL BASE/CHROMIUM-IRON-MOLYBDENUM
GENERIC MATERIAL TYPE	NONE
SPECIFIC MATERIAL TYPE	N/A
ENERIC MATERIAL TYPE	N/A
PECIFIC MATERIAL TYPE	N/A
TREAM SOURCE	THICKENER UNDERFLOW
TREAM CHARACTERISTICS	35% SOLIDS
STREAM CHARACTERISTICS	60% SOLIDS
W STREAM CHARACTERISTICS	60 GPM
STREAM DISPOSITION	LANDFILL
W STREAM DISPOSITION	TO WASTE SUMP & THEN TO THICKENER

CONCENTRATING/DEWATERING

	THICKENER
	1
OF SPARES	0
JRATION	CENTER DRAW
IONS - FT	75.0 DIA X 15.0
GENERIC MATERIAL TYPE	CARBON STEEL
SPECIFIC MATERIAL TYPE	AISI 1110
GENERIC MATERIAL TYPE	ORGANIC
SPECIFIC MATERIAL TYPE	GLASS FLAKE-FILLED POLYESTER 'WALLS!'; MAT-REINFO
TREAM SOURCE	ABSORBER BLEED
TREAM CHARACTERISTICS	5% SOLIDS
STREAM CHARACTERISTICS	35% SOLIDS
W STREAM CHARACTERISTICS	100 GPM, <1% SUSPENDED SOLIDS
STREAM DISPOSITION	TO CENTRIFUGES
W STREAM DISPOSITION	RECYCLED TO PROCESS

BYPRODUCTS

AD SLUDGE QUANTITY - M.TONS/HR (DRY)	10.5	(11.6 TPH)
E CONTENT - % TOTAL FREE WATER	40.0	
- DRY	22.6	
- DRY	70.7	
- DRY	0.0	
- DRY	2.9	
DRY	0.3	
COMPOUNDS - DRY	3.9	

T

UNSTABILIZED

N

ANSPORTATION METHOD

FINAL
LANDFILL
OFF-SITE
TRUCK

CONTROL AND INSTRUMENTATION

L PARAMETERS	PH, SO2 CONCENTRATION
L VARIABLES	DENSITY, GAS FLOW, LIQUID FLOW
LEVELS	PH 5.4, SOLIDS 12-15%
TYPE	UNILOK-PH, OHMART-DENSITY, BROOKS-FLOW, DYNASCIE
LOCATION	AT MODULE RECYCLE TANK
CONTROL MANNER	AUTOMATIC
CHEMISTRY MODE	FEEDBACK

LANCE

DOF TYPE	CLOSED
TION WATER LOSS - LITER/S	17.8 (282 GPM)
HYDRATION WATER LOSS - LITER/S	0.6 (9 GPM)
INTERSTITIAL WATER LOSS - LITERS/S	2.1 (33 GPM)
EPAGE/RUNOFF WATER LOSS - LITERS/S	0
T WATER LOSS - LITERS/S	0.0 (0 GPM)

COLORADO UTE ELECTRIC: CRAIG 1 (CONT.)

RECEIVING WATER STREAM	N/A
MAKEUP WATER ADDITION - LITERS/S	20.2 (321 GPM)
SOURCE OF MAKEUP WATER	COOLING TOWER BLOWDOWN
** CHEMICALS AND CONSUMPTION	
FUNCTION	ABSORBENT
NAME	LIMESTONE
PRINCIPAL CONSTITUENT	CACO3
CONSUMPTION	7000 LB/HR
UTILIZATION - %	75.0
POINT OF ADDITION	BALL MILL
** FGD SPARE CAPACITY INDICES	
ABSORBER - %	33.3
MIST ELIMINATOR - %	33.3
REHEATER - %	33.3
BALL MILL - %	0.0
EFFLUENT HOLD TANK - %	33.3
THICKENER - %	0.0
CENTRIFUGE - %	50.0
** FGD SPARE COMPONENT INDICES	
ABSORBER	1.0

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

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

744

** PROBLEMS/SOLUTIONS/COMMENTS

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

11/80 D
SYSTEM

48.6

44.7

46.2

38.5

720 619

47.3

** PROBLEMS/SOLUTIONS/COMMENTS

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

12/80 A
B
C
D
SYSTEM0.0
53.8
73.9
60.5
62.70.0
44.3
70.4
56.0
56.870.4
84.0
80.2
78.70.0
42.6
67.7
53.9
54.7

744 716 407 63.0

** PROBLEMS/SOLUTIONS/COMMENTS

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

1/81 A
B
C
D
SYSTEM0.0
59.7
48.9
11.3
39.90.0
70.2
59.8
12.6
47.50.0
71.0
60.5
12.7
48.10.0
55.4
47.2
9.9
37.5

744 587 279 62.0

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JANUARY THE FGD SYSTEM EQUIPMENT CHECKOUT CONTINUED. MODULE A REMAINED OUT OF SERVICE BECAUSE THE MECHANICAL PARTS NEEDED FOR REPAIR WORK WERE NOT AVAILABLE.

JRVEY: JANUARY - DECEMBER 1988

ELECTRIC: CRAIG 1 (CONT.)

-----PERFORMANCE DATA-----				% REMOVAL	PER	BOILER	FGD	CAP.
AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	SO2	PART.	HOURS	HOURS	HOURS FACTOR
0.0	0.0	0.0	0.0					
12.2	12.4	12.9	10.7					
13.6	12.4	12.9	10.7					
0.0	0.0	0.0	0.0					
8.6	8.3	8.6	7.1			672	580	36 64.2

BLEMS/SOLUTIONS/COMMENTS

THE CHECKOUT OF THE FGD SYSTEM EQUIPMENT CONTINUED DURING FEBRUARY. MODULE A NEEDED MECHANICAL PARTS FOR REPAIR. THREE OF THE FOUR MODULES WERE TO BE OPERATING BY THE END OF THE MONTH.

MODULES B AND C ENCOUNTERED PROBLEMS WITH THE INLET AND OUTLET DAMPERS DURING FEBRUARY.

0.0	0.0	0.0	0.0				
0.0	0.0	0.0	0.0				
0.0	0.0	0.0	0.0				
35.5	35.5	35.7	35.5				
11.8	11.8	11.9	11.8			744	744 88 88.6

BLEMS/SOLUTIONS/COMMENTS

DURING MARCH MODULES A, B, AND C EXPERIENCED OPERATING PROBLEMS WITH THE DAMPERS.

ADDITIONAL OUTAGE TIME WAS DUE TO THE READJUSTMENT OF THE FAN BLADE PITCHES.

0.0	0.0	0.0	0.0				
36.1	59.9	60.9	35.6				
2.8	4.2	4.3	2.5				
25.0	40.5	41.2	23.9				
21.3	34.9	26.6	20.7			720	427 149 52.9

BLEMS/SOLUTIONS/COMMENTS

DURING THE FIRST HALF OF APRIL THE SYSTEM EXPERIENCED PROBLEMS WITH THE DAMPERS AND CONTROLS MALFUNCTIONING. MODULE A NEEDED PARTS AND THE OTHER MODULES WERE REPAIRED.

ON APRIL 18 THE UNIT WAS SHUT DOWN FOR A SCHEDULED FIVE WEEK MAINTENANCE OUTAGE.

0.0	0.0	0.0	0.0			744	101 0
0.0	0.0	0.0	0.0			720	699 0 97.1

BLEMS/SOLUTIONS/COMMENTS

DURING MAY AND JUNE THE SYSTEM WAS OUT OF SERVICE DUE TO DAMAGED MIST ELIMINATOR PADS AND PLUGGING OF THE MIST ELIMINATOR.

THICKENER REPAIRS WERE PERFORMED DURING JUNE.

0.0	0.0	0.0	0.0			744	724 0 58.9
-----	-----	-----	-----	--	--	-----	------------

BLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM REMAINED OFF LINE THROUGH JULY AS A RESULT OF THE BROKEN MIST ELIMINATOR TRAYS.

0.0	0.0	0.0	0.0			744	709 0 90.0
-----	-----	-----	-----	--	--	-----	------------

COLORADO UTE ELECTRIC: CRAIG 1 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

AS OF THE END OF AUGUST, MODULES A AND C WERE READY FOR OPERATION; HOWEVER MODULE B NEEDED MORE MIST ELIMINATOR TRAYS.

DURING THE MONTH, THE THICKENER WAS DRAINED FOR REPAIRS THAT WERE EXPECTED TO BE COMPLETED BY THE MIDDLE OF SEPTEMBER.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL	PER BOILER	FGD	CAP.
						SO2 PART.	HOURS	HOURS	HOURS FACTOR
9/81	SYSTEM	0.0	0.0	0.0	0.0		720	677	0 85.4

** PROBLEMS/SOLUTIONS/COMMENTS

MIST ELIMINATOR INSTALLATION WAS COMPLETED ON MODULES A,C, AND D BUT WAS CONTINUING ON MODULE B.

THE THICKENER WAS REFILLED AFTER WORK WAS COMPLETED TO REPAIR LEAKS IN THE BASE. AFTER REFILLING, MORE LEAKS WERE FOUND SO THE THICKENER WAS DRAINED AGAIN.

10/81	A	15.4	15.4	15.5	15.3				
	B	0.0	0.0	0.0	0.0				
	C	14.1	13.8	13.9	13.7				
	D	12.8	12.2	12.2	12.1				
	SYSTEM	14.1	13.8	13.9	13.7		744	739	102 81.9

** PROBLEMS/SOLUTIONS/COMMENTS

DURING OCTOBER INSTRUMENTATION PROBLEMS WITH MODULES A, C AND D WERE ENCOUNTERED.

11/81	A	91.9	91.9	91.9	91.9				
	B	0.0	0.0	0.0	0.0				
	C	68.5	68.4	68.4	68.4				
	D	78.8	78.6	78.6	78.6				
	SYSTEM	79.6	79.5	79.6	79.6		720	720	573 90.8

12/81	A	79.5	79.4	79.4	79.4				
	B	0.0	0.0	0.0	0.0				
	C	89.6	89.4	89.4	89.4				
	D	83.6	83.5	83.5	83.5				
	SYSTEM	84.2	84.1	84.1	84.1		744	744	626 88.5

** PROBLEMS/SOLUTIONS/COMMENTS

REPLACEMENT PARTS NEEDED FOR MODULE B KEPT THE MODULE OFF-LINE THROUGH THE FOURTH QUARTER.

DURING NOVEMBER AND DECEMBER PLUGGING IN THE LIMESTONE BALL MILL WAS A MINOR PROBLEM.

1/82	A	82.0	82.5	82.8	81.8				
	B	0.0	0.0	0.0	0.0				
	C	87.4	87.5	87.8	86.7				
	D	89.8	90.3	90.6	89.5				
	SYSTEM	86.4	86.8	87.1	86.0		744	737	640 84.2

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JANUARY THE MIST ELIMINATORS WERE CLEANED WEEKLY.

ROCKS IN THE LIMESTONE HAS CAUSED PLUGGING OF THE BALL MILL. THE SUPPLIER IS WORKING ON THE PROBLEM.

SRVEY: JANUARY - DECEMBER 1988

ELECTRIC: CRAIG 1 (CONT.)

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

THE UTILITY IS WAITING FOR PARTS TO MAKE THE NECESSARY REPAIRS TO MODULE B

72.9	73.1	73.9	72.8				
2.2	2.1	2.1	2.1				
88.8	89.1	90.0	88.7				
65.3	65.5	66.2	65.2				
76.5	76.6	76.3	76.3	672	669	513	83.6

BLEMS/SOLUTIONS/COMMENTS

MODULE B WAS REPAIRED DURING THE MONTH AND IS IN THE PROCESS OF BEING STARTED UP.

DURING FEBRUARY PROBLEMS WERE ENCOUNTERED WITH THE LIMESTONE BALL MILL LUBRICATION SYSTEM.

40.9	40.9	41.5	40.9				
85.4	85.4	86.5	85.2				
85.1	85.1	86.2	84.9				
79.7	79.7	80.7	79.5				
96.9	97.1	98.3	96.8	744	742	720	80.2

BLEMS/SOLUTIONS/COMMENTS

DURING MARCH MODULE A WAS DOWN 428 HOURS FOR CLEANING.

46.9	47.1	49.2	46.8				
70.7	71.0	74.2	70.6				
76.1	76.3	79.7	75.8				
20.8	20.8	21.8	20.7				
71.5	71.7	75.0	71.3	720	715	513	82.7

BLEMS/SOLUTIONS/COMMENTS

DURING APRIL PROBLEMS WERE ENCOUNTERED WITH THE SUPERNATE PUMPS.

22.7	56.4	64.9	22.6				
29.2	72.6	83.6	29.1				
29.2	72.5	83.4	29.0				
0.0	0.0	0.0	0.0				
27.0	67.2	77.3	26.9	744	298	200	25.6

BLEMS/SOLUTIONS/COMMENTS

DURING MAY THE UNIT WAS OFF-LINE FOR THREE WEEKS FOR A SCHEDULED OUTAGE. THE FGD SYSTEM WAS IN COMPLIANCE PRIOR TO THE SHUT DOWN.

0.0	0.0	0.0	0.0				
58.2	58.1	58.1	58.1				
58.5	58.2	58.2	58.2				
0.0	0.0	0.0	0.0				
38.9	38.8	38.8	38.8	720	720	279	77.3

BLEMS/SOLUTIONS/COMMENTS

AT THE BEGINNING OF JUNE, ALL MODULES WERE DOWN DUE TO FAULTY PIPING ON THE SUPERNATE SYSTEM, WHICH WAS REPAIRED BY THE 10TH.

MODULES A AND D WERE OFF-LINE THE REST OF THE MONTH DUE TO LINER PROBLEMS.

0.0	0.0	0.0	0.0
7.9	8.2	9.4	7.9
41.1	42.4	48.5	41.0

COLORADO UTE ELECTRIC: CRAIG 1 (CONT.)

-----PERFORMANCE DATA-----										
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	D	0.0	0.0	0.0	0.0					
	SYSTEM	16.4	16.9	19.3	16.3		744	720	121	62.8

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JULY ABSORBER LINER REPAIRS CONTRIBUTED TO MODULAR OUTAGES.

MAJOR DEMISTER REPAIRS ALSO RESULTED IN DOWN TIME DURING JULY.

8/82	A	68.1	69.7	77.1	68.0					
	B	5.1	5.2	5.7	5.0					
	C	0.0	0.0	0.0	0.0					
	D	0.0	0.0	0.0	0.0					
	SYSTEM	24.4	25.0	27.6	24.3		744	725	181	64.0

** PROBLEMS/SOLUTIONS/COMMENTS

MODULES C AND D WERE DOWN DURING AUGUST FOR LINING REPAIRS. A BOILERMAKER STRIKE PREVENTED COMPLETION OF THESE REPAIRS DURING THE MONTH, AND THUS ALSO CONTRIBUTED TO DOWN TIME.

MODULE B EXPERIENCED BOOSTER FAN PROBLEMS DURING AUGUST. THEY WERE CORRECTED, HOWEVER BY THE END OF THE MONTH.

9/82	A	3.5	3.7	3.6	3.5					
	B	84.2	89.2	88.2	84.0					
	C	0.0	0.0	0.0	0.0					
	D	0.0	0.0	0.0	0.0					
	SYSTEM	29.2	31.0	30.6	29.2		720	678	210	68.5

** PROBLEMS/SOLUTIONS/COMMENTS

DURING SEPTEMBER MODULES C AND D WERE DOWN AWAITING COMPLETION OF THE ABSORBER LINER REPAIRS.

MODULE A WAS DOWN DURING THE MONTH FOR DEMISTER WASH MODIFICATIONS.

10/82	A	61.8	61.7	61.7	61.7					
	B	61.8	61.6	61.6	61.6					
	C	0.0	0.0	0.0	0.0					
	D	0.0	0.0	0.0	0.0					
	SYSTEM	41.2	41.1	41.1	41.1		744	744	306	78.1

** PROBLEMS/SOLUTIONS/COMMENTS

MODULES A AND B WERE DOWN DURING OCTOBER FOR DEMISTER REPAIRS AND CLEANING

MODULES C AND D REMAINED OUT OF SERVICE DURING OCTOBER AWAITING REPAIRS ON THE ABSORBER LINER.

11/82	A	63.2	77.1	90.1	63.1					
	B	55.4	67.6	79.0	55.3					
	C	0.0	0.0	0.0	0.0					
	D	0.0	0.0	0.0	0.0					
	SYSTEM	39.5	48.2	56.3	39.4		720	589	284	41.8

** PROBLEMS/SOLUTIONS/COMMENTS

MODULES C AND D REMAINED OUT OF SERVICE DURING NOVEMBER AWAITING ABSORBER LINER REPAIRS.

THE UNIT WAS DOWN FOR PART OF THE MONTH DUE TO A SCHEDULED OUTAGE.

12/82	A	100.0	100.0	100.0	100.0					
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SURVEY: JANUARY - DECEMBER 1988

ELECTRIC: CRAIG 1 (CONT.)

-----PERFORMANCE DATA-----									
AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PER PART.	BOILER HOURS	FGD HOURS	CAP. HOURS	FACTOR
7.7	7.5	7.5	7.5						
0.0	0.0	0.0	0.0						
0.0	0.0	0.0	0.0						
35.9	35.8	35.8	35.8			744	744	266	71.3

BLEMS/SOLUTIONS/COMMENTS

MODULES C AND D WERE DOWN THE ENTIRE MONTH FOR ABSORBER LINER REPAIRS.
MODULE B WAS DOWN SHORTLY AFTER THE FIRST OF THE MONTH, ALSO FOR LINER REPAIRS.

95.8	95.8	98.1	95.7						
0.0	0.0	0.0	0.0						
0.0	0.0	0.0	0.0						
0.0	0.0	0.0	0.0						
31.9	31.9	32.7	31.9			744	743	237	68.5

BLEMS/SOLUTIONS/COMMENTS

MODULES B, C AND D WERE DOWN DURING JANUARY FOR ABSORBER LINER REPAIRS.

57.2	57.5	59.1	57.2						
0.0	0.0	0.0	0.0						
0.0	0.0	0.0	0.0						
88.1	45.5	46.7	45.2						
48.4	34.3	35.3	34.2			672	668	230	63.0

BLEMS/SOLUTIONS/COMMENTS

MODULE A WAS DOWN DURING FEBRUARY FOR PREVENTIVE MAINTENANCE.
MODULE B WAS DOWN DURING FEBRUARY FOR ABSORBER LINER REPAIRS.
MODULE C WAS DOWN DURING THE MONTH FOR REPAIRS ON THE BOOSTER FAN LUBE SET
MODULE D WAS AVAILABLE DURING FEBRUARY BUT NOT IN SERVICE. THE UTILITY WAS ONLY OPERATING ONE MODULE.

0.0	0.0	0.0	0.0						
67.1	76.7	79.5	67.1						
0.0	0.0	0.0	0.0						
71.0	81.1	84.2	71.0						
46.1	52.6	54.6	46.1			744	652	343	61.7

BLEMS/SOLUTIONS/COMMENTS

MODULE A WAS DOWN DURING MARCH DUE TO PROBLEMS WITH SCALE BUILD-UP ON THE INLET DUCTWORK.
RECYCLE PUMP PROBLEMS ALSO CONTRIBUTED TO DOWN TIME FOR MODULE A DURING THE MONTH.
MODULE C AWAITED COMPLETION OF WORK ON THE INTERFACE WASH SPRAY HEADER DURING MARCH.

0.0	0.0	0.0	0.0						
10.3	9.3	9.7	9.3						
0.0	0.0	0.0	0.0						
92.4	89.4	93.4	89.2						
33.8	32.9	34.3	32.8			720	718	236	73.6

COLORADO UTE ELECTRIC: CRAIG 1 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE A WAS DOWN DURING THE MONTH TO ALLOW FOR WORK ON A RECYCLE PUMP.

A CLEANING OF THE INLET DUCTWORK ALSO CAUSED DOWN TIME FOR MODULE A DURING APRIL.

MODULE B WAS OUT OF SERVICE FOR MIST ELIMINATOR CLEANING.

MODULE C WAS DOWN SO THAT REPAIRS COULD BE MADE TO A SECTION OF A WASH SPRAY HEADER.

5/83	A	0.0	0.0	0.0	0.0				
	B	64.8	66.9	70.8	64.8				
	C	0.0	0.0	0.0	0.0				
	D	32.8	33.7	40.2	32.7				
	SYSTEM	32.5	33.5	40.0	32.5	744	721	242	70.7

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE A WAS DOWN DURING THE MONTH FOR RECYCLE PUMP REPAIRS.

MODULE C WAS OUT OF SERVICE SO THAT REPAIRS COULD BE MADE ON A WASH SPRAY HEADER.

6/83	A	31.1	4.6	5.1	4.4				
	B	57.0	31.1	34.5	30.3				
	C	0.0	0.0	0.0	0.0				
	D	66.7	68.4	75.8	66.7				
	SYSTEM	51.6	34.7	38.5	33.8	720	701	243	68.4

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE A WAS DOWN DURING THE FIRST PART OF JUNE DUE TO PROBLEMS WITH RECYCLE PUMP BEARINGS.

MODULE C WAS DOWN FOR THE ENTIRE MONTH OF JUNE DUE TO PROBLEMS WITH THE BOOSTER FAN BLADE PITCH CONTROL.

7/83	A	82.9	82.9	100.0	82.9				
	B	85.3	56.3	71.5	56.3				
	C	50.5	34.4	43.7	34.4				
	D	0.0	0.0		0.0				
	SYSTEM	72.9	57.9	73.5	57.8	744	743	430	74.7

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE C WAS OUT OF SERVICE DURING THE FIRST 12 DAYS OF JULY DUE TO MIST ELIMINATOR HEADER PROBLEMS.

MODULE D WAS OUT OF SERVICE UNTIL JULY 25 DUE TO RECYCLE PUMP PROBLEMS.

8/83	A	96.0	96.1	96.5	96.0				
	B	0.0	0.0		0.0				
	C	100.0	100.0	100.0	100.0				
	D	91.0	8.5	8.5	8.5				
	SYSTEM	95.7	68.2	68.5	68.1	744	743	507	
9/83	A	94.5	94.8	96.3	94.5				
	B	48.4	51.7	52.6	51.6				
	C	56.5	43.6	44.3	43.5				
	D	0.0	0.0		0.0				
	SYSTEM	66.5	63.4	64.4	63.2	720	718	455	75.6

URVEY: JANUARY - DECEMBER 1988

ELECTRIC: CRAIG 1 (CONT.)

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

BLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD-RELATED OUTAGES WERE ENCOUNTERED DURING AUGUST AND SEPTEMBER.

67.7	100.0	100.0	67.7				
22.3	65.2	65.1	44.1				
0.0	0.0		0.0				
53.0	21.9	21.8	14.8				
47.7	62.4	62.3	42.2	744	503	314	82.0

BLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS OUT OF SERVICE FROM OCTOBER 21 THROUGH THE END OF THE MONTH FOR AN ANNUAL MAINTENANCE OUTAGE.

0.0		0.0	0.0				
46.7		96.0	46.7				
39.3		80.9	39.3				
0.0			0.0				
28.7		59.0	28.7	720		206	

BLEMS/SOLUTIONS/COMMENTS

THE ANNUAL MAINTENANCE OUTAGE WHICH BEGAN IN OCTOBER CONTINUED THROUGH NOVEMBER 12.

THE UTILITY REPORTED PROBLEMS WITH A CIRCULATING WATER PUMP FROM NOVEMBER 13 TO NOVEMBER 15, 1983. THE UNIT WAS BROUGHT DOWN DURING THIS PERIOD.

MODULES A AND C WERE DOWN DURING PART OF NOVEMBER DUE TO ABSORBER GAS AND LIQUID SIDE EQUIPMENT PROBLEMS.

THE UNIT WAS PLACED BACK IN SERVICE ON NOVEMBER 16.

0.0	0.0		0.0				
99.2	100.0	100.0	99.2				
99.2	100.0	100.0	99.2				
15.7	15.9	100.0	15.7				
71.4	72.0	100.0	71.4	744	736	531	98.9

BLEMS/SOLUTIONS/COMMENTS

MODULES A AND D EXPERIENCED PROBLEMS WITH ABSORBER LIQUID SIDE EQUIPMENT DURING DECEMBER.

0.0	0.0		0.0				
100.0	100.0	100.0	100.0				
32.5	32.5	32.5	32.5				
96.2	96.2	96.2	96.2				
76.3	76.3	76.3	76.3	744	744	567	

BLEMS/SOLUTIONS/COMMENTS

MODULE A WAS DOWN FOR LIQUID SIDE EQUIPMENT PROBLEMS DURING JANUARY.

MODULE C WAS DOWN FOR LIQUID AND GAS SIDE EQUIPMENT PROBLEMS.

696

744

720

COLORADO UTE ELECTRIC: CRAIG 1 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

INFORMATION WAS UNAVAILABLE FOR THE PERIOD OF FEBRUARY THROUGH APRIL 1984.

5/84	A	99.2	83.7	99.9	83.1			
	B	0.0	0.0		0.0			
	C	99.3	100.0	100.0	99.3			
	D	98.6	99.2	99.2	98.6			
	SYSTEM	99.0	94.3	99.7	93.7	744	739	697
6/84	A	100.0	100.0	100.0	100.0			
	B	28.3	0.0	0.0	0.0			
	C	100.0	76.5	100.0	76.5			
	D	100.0	89.0	100.0	89.0			
	SYSTEM	100.0	88.5	100.0	88.5	720	720	637
7/84	A	100.0	78.8	100.0	100.0			
	B	41.9	21.3	93.1	27.0			
	C	91.5	53.7	100.0	68.1			
	D	99.9	78.7	100.0	99.9			
	SYSTEM	100.0	77.5	100.0	98.3	744	744	732
8/84	A	84.3	80.1	100.0	80.1			
	B	68.4	67.5	100.0	67.5			
	C	100.0	95.6	95.6	95.6			
	D	29.0	19.4		19.4			
	SYSTEM	93.9	87.5	100.0	87.5	744	744	651

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD-RELATED PROBLEMS WERE REPORTED DURING THE PERIOD OF MAY THROUGH AUGUST 1984.

9/84	A	100.0	91.3	100.0	90.7			
	B	100.0	78.9	100.0	78.4			
	C	100.0	75.7	100.0	75.1			
	D	0.0	0.0		0.0			
	SYSTEM	100.0	82.0	100.0	81.4	720	715	586

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE MONTH OF SEPTEMBER.

10/84	A	60.9	100.0	100.0	60.9			
	B	60.9	100.0	100.0	60.9			
	C	60.3	96.9	100.0	59.0			
	D	0.0	0.0		0.0			
	SYSTEM	60.7	99.0	100.0	60.3	744	453	448

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE UNIT WAS DOWN FOR AN ANNUAL MAINTENANCE OUTAGE. THE UNIT WAS OFF LINE FOR APPROXIMATELY 2 WEEKS.

11/84	A	78.0	94.9	100.0	75.9			
	B	78.0	87.4	100.0	69.9			
	C	0.0	0.0	0.0	0.0			
	D	34.8	41.8	100.0	33.4			
	SYSTEM	63.6	74.7	100.0	59.8	720	576	430

SURVEY: JANUARY - DECEMBER 1988

E ELECTRIC: CRAIG 1 (CONT.)

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

PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE UNIT CAME BACK ON-LINE NOVEMBER 7, 1984.
 THE UTILITY EXPERIENCED FGD SYSTEM INLET DAMPER AND MODICON CONTROL
 PROBLEMS DURING THE MONTH OF NOVEMBER FOLLOWING UNIT STARTUP.

	98.8	100.0	100.0	98.8			
	96.8	98.0	100.0	96.8			
	0.0	0.0		0.0			
	95.4	63.6	100.0	62.8			
EM	97.0	87.2	100.0	86.1	744	735	641

PROBLEMS/SOLUTIONS/COMMENTS

MODULE C WAS UNAVAILABLE ALL OF DECEMBER DUE TO LIQUID HANDLING
 EQUIPMENT PROBLEMS. NO OTHER MAJOR FGD-RELATED PROBLEMS WERE REPORTED.

	56.5	60.8	100.0	56.5			
	87.6	89.1	94.5	82.8			
	39.5	42.5	100.0	39.5			
	91.4	94.5	96.7	87.8			
EM	91.7	95.7	100.0	88.8	744	691	661

PROBLEMS/SOLUTIONS/COMMENTS

NO FGD SYSTEM PROBLEMS WERE REPORTED BY THE UTILITY FOR THE MONTH OF
 JANUARY.

EM					672		
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PROBLEMS/SOLUTIONS/COMMENTS

NO INFORMATION WAS AVAILABLE FROM THE UTILITY FOR THE MONTH OF FEBRUARY.

	59.5	40.3	100.0	36.0			
	100.0	94.9	99.9	84.6			
	99.4	85.3	99.9	76.0			
	70.7	65.9	100.0	58.7			
EM	100.0	95.5	100.0	85.1	744	663	633

PROBLEMS/SOLUTIONS/COMMENTS

NO FGD SYSTEM PROBLEMS WERE REPORTED FOR THE MONTH OF MARCH.

	96.7	3.8	54.7	3.7			
	96.9	96.9	100.0	95.6			
	99.7	97.9	99.9	96.6			
	99.9	97.1	100.0	95.8			
EM	100.0	98.6	100.0	97.2	720	710	700

PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED C-MODULE OUTAGES TOTALING FEWER THAN 3 HOURS RELATED
 TO BOOSTER FAN AND RECYCLE PUMP MAINTENANCE.

EXCEPT WHERE OTHERWISE REPORTED THE BALANCE OF THE MODULAR OUTAGE HOURS
 WERE ATTRIBUTED TO STANDBY PERIODS WHERE MODULARS WERE AVAILABLE BUT NOT
 CALLED TO OPERATE.

MODULE B WAS DOWN 22 HOURS FOR RECYCLE PUMP PROBLEMS/MAINTENANCE.

MODULE D WAS ONLY UNAVAILABLE FOR 1 HOUR. THE DOWNTIME WAS ATTRIBUTED TO
 WORK PERFORMED ON A RECYCLE PUMP.

COLORADO UTE ELECTRIC: CRAIG 1 (CONT.)

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

MODULE A WAS OUT OF SERVICE FOR 24 HOURS DURING APRIL. MOST OF THE
 OUTAGE TIME WAS ATTRIBUTED TO BOOSTER FAN PROBLEMS/MAINTENANCE.

5/85	A	85.2	37.4	99.8	36.9			
	B	84.8	54.5	99.9	53.7			
	C	50.0	50.7	99.9	49.9			
	D	99.4	98.8	100.0	97.4			
	SYSTEM	100.0	80.5	100.0	79.3	744	733	590

** PROBLEMS/SOLUTIONS/COMMENTS

EXCEPT WHERE OTHERWISE NOTED THE MODULAR OUTAGE TIMES WERE OUTAGE
 PERIODS THE MODULES WERE AVAILABLE BUT NOT CALLED TO OPERATE.

THE UTILITY REPORTED THAT MODULE A WAS DOWN FOR BOOSTER FAN WORK FOR
 APPROXIMATELY 110 HOURS IN MAY.

MODULE B WAS OUT OF SERVICE FOR 113 HOURS TO MAKE REPAIRS TO A RECYCLE
 PUMP.

THE UTILITY REPORTED THAT MODULE C WAS DOWN FOR 372 HOURS. THE OUTAGE
 TIME WAS REQUIRED TO PERFORM MIST ELIMINATOR WORK.

RECYCLE/WASH PUMP PROBLEMS CAUSED 4 HOURS OF OUTAGE TIME ON MODULE D.

6/85	A	100.0	100.0	99.9	92.8			
	B	100.0	98.8	99.9	91.7			
	C	0.0	0.0		0.0			
	D	100.0	93.9	100.0	87.2			
	SYSTEM	100.0	97.6	100.0	90.6	720	668	652

** PROBLEMS/SOLUTIONS/COMMENTS

NO FGD SYSTEM-RELATED PROBLEMS WERE REPORTED BY THE UTILITY FOR JUNE. ALL
 OUTAGE TIME ASSOCIATED WITH THE SCRUBBER MODULES WAS ATTRIBUTED TO PERIODS
 THE INDIVIDUAL MODULES WERE NOT CALLED TO OPERATE.

7/85	A	82.2	77.8	100.0	76.3			
	B	40.0	39.5	99.8	38.8			
	C	96.9	69.2	100.0	67.9			
	D	100.0	99.6	100.0	97.7			
	SYSTEM	100.0	95.4	100.0	93.6	744	730	696

** PROBLEMS/SOLUTIONS/COMMENTS

APPROXIMATELY 447 HOURS OF DOWNTIME WERE ATTRIBUTED TO ABSORBER LINER
 REPAIR WORK ON MODULE B.

98 HOURS OF DOWNTIME WERE ATTRIBUTED TO RECYCLE/WASH PUMP PROBLEMS AND
 RELATED LIQUID SIDE EQUIPMENT REPAIR/MAINTENANCE WORK ON MODULE A.

MODULES A AND C LOGGED APPROXIMATELY 11 AND 6 HOURS OF DOWNTIME
 RESPECTIVELY FOR BOOSTER FAN WORK.

MIST ELIMINATOR PROBLEMS CAUSED OUTAGES OF ROUGHLY 24 AND 18 HOURS
 RESPECTIVELY FOR MODULES A AND C.

EXCEPT WHERE OTHERWISE NOTED ALL OTHER MODULAR OUTAGE HOURS INCLUDED
 PERIODS WHERE MODULES WERE AVAILABLE BUT NOT CALLED TO OPERATE.

8/85	A	100.0	85.1	100.0	85.1			
	B	0.0	0.0		0.0			
	C	79.1	44.0	100.0	44.0			

SURVEY: JANUARY - DECEMBER 1988

E ELECTRIC: CRAIG 1 (CONT.)

-----PERFORMANCE DATA-----									
	LE AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	100.0	96.2	99.9	96.2					
EM	93.0	75.1	100.0	75.1		744	744	559	

ROBLEMS/SOLUTIONS/COMMENTS

EXCEPT WHERE OTHERWISE INDICATED MODULAR OUTAGE HOURS WERE HOURS WHERE MODULES WERE AVAILABLE BUT NOT CALLED INTO SERVICE.

MODULE C WAS OUT OF SERVICE FOR APPROXIMATELY 156 HOURS FOR MIST ELIMINATOR REPAIR/MAINTENANCE.

ABSORBER LINER REPAIR/REPLACEMENT CAUSED MODULE B TO BE OUT OF SERVICE FOR THE ENTIRE 744 HOUR PERIOD.

	98.6	98.3	97.6	97.9					
	0.0	0.0		0.0					
	95.3	79.5	97.3	79.2					
	76.5	69.0	96.5	68.8					
EM	90.1	82.3	97.1	81.9		720	717	590	

ROBLEMS/SOLUTIONS/COMMENTS

MODULAR DOWNTIME EXCEPT WHERE OTHERWISE NOTED WAS ATTRIBUTED TO AVAILABLE MODULAR HOURS WHEN INDIVIDUAL MODULES WERE NOT REQUIRED FOR SCRUBBING SERVICE.

THE UTILITY REPORTED REAGENT PREPARATION PROBLEMS OCCURRED THAT RESULTED IN 10 AND 34 HOURS OF DOWNTIME FOR MODULES A AND D RESPECTIVELY.

MODULE B WAS DOWN THE ENTIRE 720 HOUR PERIOD FOR ABSORBER LINER REPAIRS.

MIST ELIMINATOR REPAIR/MAINTENANCE RESULTED IN 169 HOURS OF OUTAGE TIME ON MODULE D.

	80.6	97.4	95.6	76.7					
	31.3	29.0	87.2	22.8					
	79.4	92.2	95.6	72.6					
	43.3	49.1	92.0	38.7					
EM	78.2	89.2	100.0	70.3		744	586	523	

ROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD SYSTEM-RELATED PROBLEMS WERE REPORTED BY THE UTILITY FOR THE MONTHS OF APRIL THROUGH OCTOBER.

MIST ELIMINATOR MAINTENANCE/REPAIR ACCOUNTED FOR 204 AND APPROXIMATELY 14 HOURS OF DOWNTIME ON MODULES B AND D RESPECTIVELY.

MODULE B WAS OUT OF SERVICE FOR 162 HOURS DUE TO UNSPECIFIED LIQUID SIDE SCRUBBER EQUIPMENT REPAIR/MAINTENANCE.

A SCHEDULED UNIT OUTAGE BEGAN ON OCTOBER 26 AND EXTENDED THROUGH THE END OF THE MONTH. EXCEPT WHERE OTHERWISE REPORTED MODULAR OUTAGE HOURS WERE HOURS THE MODULES WERE AVAILABLE BUT NOT CALLED TO OPERATE.

PUMP PROBLEMS ACCOUNTED FOR APPROXIMATELY 10 HOURS OF THE MODULE C DOWNTIME REPORTED BY THE UTILITY.

GAS SIDE EQUIPMENT PROBLEMS CAUSED 48 HOURS OF DOWNTIME ON MODULE D DURING OCTOBER.

0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0

COLORADO UTE ELECTRIC: CRAIG 1 (CONT.)

-----PERFORMANCE DATA-----									
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER BOILER HOURS	FGD CAP. HOURS FACTOR
	C	0.0	0.0	0.0	0.0				
	D	0.0	0.0	0.0	0.0				
	SYSTEM	0.0	0.0	0.0	0.0			720 431	0

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS OUT OF SERVICE FROM NOVEMBER 13 THROUGH THE END OF THE MONTH FOR ABSORBER OUTLET DAMPER INSTALLATION WORK.

THE ANNUAL OUTAGE WHICH BEGAN IN OCTOBER CONTINUED THROUGH NOVEMBER 12.

12/85	A	88.6	75.5	83.3	73.8				
	B	0.0	0.0		0.0				
	C	88.3	76.7	84.9	74.9				
	D	89.0	88.6	99.6	86.6				
	SYSTEM	88.6	80.3	89.3	78.4			744 727	584

** PROBLEMS/SOLUTIONS/COMMENTS

EXCEPT WHERE OTHERWISE NOTED SCRUBBER MODULE DOWNTIME WAS ATTRIBUTED TO AVAILABLE HOURS WHERE MODULES WERE NOT CALLED TO OPERATE.

THE FGD SYSTEM WAS OUT OF SERVICE FROM DECEMBER 1 THROUGH 4 FOR INSTALLATION OF MODULE OUTLET ISOLATION DAMPERS.

MODULE B WAS OUT OF SERVICE FOR 672 HOURS DURING DECEMBER WITH BOOSTER FAN PROBLEM/REPAIRS.

1/86	A	97.0	90.5	98.8	90.5				
	B	0.0	0.0		0.0				
	C	99.9	77.6	84.6	77.6				
	D	100.0	94.8	100.0	94.8				
	SYSTEM	99.0	87.6	94.5	87.6			744 744	652

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED BOOSTER FAN PROBLEMS ON MODULES A, B, AND C IN JANUARY.

2/86	A	85.8	57.9	96.8	57.6				
	B	0.0	0.0		0.0				
	C	48.1	46.7	99.1	46.4				
	D	100.0	100.0	100.0	99.4				
	SYSTEM	78.0	68.2	98.6	67.8			672 668	456 0.0

** PROBLEMS/SOLUTIONS/COMMENTS

BOOSTER FAN PROBLEMS WERE REPORTED ON MODULE C AND CONTRIBUTED TO THE MONTH LONG SHUT DOWN OF MODULE B.

MODULES A AND B EXPERIENCED MIST ELIMINATOR PROBLEMS DURING THE MONTH OF FEBRUARY 1986. THIS AND OTHER PROBLEMS CAUSED MODULE B TO BE DOWN ALL MONTH.

3/86	A	88.4	93.1	100.0	87.8				
	B	0.0	0.0		0.0				
	C	99.1	94.4	100.0	89.0				
	D	97.4	91.5	100.0	86.2				
	SYSTEM	95.0	93.0	100.0	87.6			744 701	652 0.0

D SURVEY: JANUARY - DECEMBER 1988

TE ELECTRIC: CRAIG 1 (CONT.)

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

PROBLEMS/SOLUTIONS/COMMENTS

BOOSTER FAN PROBLEMS ON MODULE B CONTINUED TO CONTRIBUTE TO THE MONTH LONG SHUT-DOWN.

THE MIST ELIMINATOR PROBLEMS ON MODULES A AND B CONTINUED INTO MARCH. MODULE B REMAINED DOWN ALL MONTH.

THE UTILITY REPORTED MINOR GAS DAMPER PROBLEMS ON MODULES A, C, AND D DURING FEBRUARY.

	98.8	76.7	100.0	76.3				
	0.0	0.0		0.0				
	100.0	100.0	100.0	99.4				
	67.9	44.8	100.0	44.6				
TEM	88.9	73.8	100.0	73.4	720	716	529	0.0

PROBLEMS/SOLUTIONS/COMMENTS

MODULE B REMAINED DOWN THE ENTIRE MONTH OF APRIL DUE TO BOOSTER FAN PROBLEMS. MODULE A ALSO EXPERIENCED MINOR FAN PROBLEMS EARLY IN THE MONTH.

THE UTILITY REPORTED MIST ELIMINATOR PROBLEMS DURING THE MIDDLE OF APRIL ON MODULE D.

	98.0	97.9	100.0	92.7				
	0.0	0.0		0.0				
	96.2	65.5	100.0	62.1				
	96.4	49.9	100.0	47.3				
TEM	96.9	71.1	100.0	67.4	744	705	501	

PROBLEMS/SOLUTIONS/COMMENTS

UNSPECIFIED GAS-SIDE EQUIPMENT PROBLEMS SHUT DOWN MODULES A, C, AND D FOR PART OF ONE DAY IN MAY.

A PROBLEM WITH LIMESTONE PREPARATION EQUIPMENT KEPT MODULES C AND D OUT OF SERVICE FOR A SHORT TIME.

BOOSTER FAN PROBLEMS AGAIN KEPT MODULE B DOWN FOR THE ENTIRE MONTH OF MAY.

	100.0	48.6	100.0	48.6				
	0.0	0.0		0.0				
	100.0	60.9	100.0	60.9				
	100.0	100.0	100.0	100.0				
TEM	100.0	69.8	100.0	69.8	720	720	503	

PROBLEMS/SOLUTIONS/COMMENTS

MODULE B REMAINED DOWN THE ENTIRE MONTH OF APRIL BECAUSE OF BOOSTER FAN PROBLEMS.

	100.0	49.8	100.0	49.6				
	0.0	0.0		0.0				
	99.7	98.1	100.0	97.8				
	100.0	100.0	100.0	99.7				
EM	99.9	82.6	100.0	82.4	744	742	613	

COLORADO UTE ELECTRIC: CRAIG 1 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

BOOSTER FAN PROBLEMS CONTINUED TO PLAGUE MODULE B, CAUSING IT TO REMAIN DOWN ALL MONTH.

MODULE C REMAINED ALMOST TROUBLE-FREE DURING JULY, SHUTTING DOWN ONLY 2 HOURS FOR GAS-SIDE ABSORBER EQUIPMENT PROBLEMS.

8/86	A	98.7	86.8	100.0	86.8			
	B	30.9	28.1	100.0	28.1			
	C	100.0	97.3	100.0	97.3			
	D	97.3	72.3	100.0	72.3			
	SYSTEM	100.0	94.8	100.0	94.8	744	744	706
9/86	A	100.0	85.6	100.0	81.5			
	B	90.2	85.8	100.0	81.6			
	C	100.0	100.0	100.0	95.1			
	D	30.0	9.8	100.0	9.3			
	SYSTEM	100.0	93.7	100.0	89.2	720	685	642

** PROBLEMS/SOLUTIONS/COMMENTS

DAMPER PROBLEMS ON MODULE D CAUSED A SHUTDOWN FOR MOST OF THE MONTH OF SEPTEMBER.

LIQUID-SIDE ABSORBER EQUIPMENT TROUBLE CONTRIBUTED TO THE NEARLY MONTH SHUTDOWN OF MODULE D.

THE UTILITY REPORTED PROBLEMS WITH THE RECYCLE/WASH PUMP EQUIPMENT ON MODULE B EARLY IN SEPTEMBER.

MINOR BOOSTER FAN PROBLEMS SHUT DOWN MODULE B FOR A FEW HOURS.

10/86	A	9.3	44.9	100.0	4.2			
	B	9.3	100.0	100.0	9.3			
	C	9.3	100.0	100.0	9.3			
	D	5.0	0.0		0.0			
	SYSTEM	10.9	81.6	100.0	7.6	744	69	56

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT'S ANNUAL OUTAGE BEGAN OCTOBER 3RD AND CONTINUED THROUGHOUT THE REMAINDER OF THE MONTH. MODULE D HAD GAS SIDE ABSORBER EQUIPMENT PROBLEMS, THE FIRST FEW DAYS, BUT IT WAS CORRECTED BEFORE THE OUTAGE.

11/86	A	0.0			0.0			
	B	0.0			0.0			
	C	0.0			0.0			
	D	0.0			0.0			
	SYSTEM	0.0			0.0	720	0	0

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT'S ANNUAL OUTAGE CONTINUED THROUGHOUT THE MONTH OF NOVEMBER

12/86	A	100.0	79.8	100.0	65.6			
	B	100.0	85.1	100.0	70.0			
	C	0.0	0.0		0.0			
	D	0.0	0.0		0.0			
	SYSTEM	66.7	55.0	100.0	45.2	744	612	336

1 SURVEY: JANUARY - DECEMBER 1988

2 E ELECTRIC: CRAIG 1 (CONT.)

-----PERFORMANCE DATA-----
 3 LE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION % REMOVAL PER BOILER FGD CAP.
 4 SO2 PART. HOURS HOURS HOURS HOURS FACTOR

5 PROBLEMS/SOLUTIONS/COMMENTS

6 THE UTILITY REPORTED MODULES C AND D WERE DOWN ALL MONTH BECAUSE OF
 7 LIQUID-SIDE ABSORBER EQUIPMENT PROBLEMS.

	83.6	84.2	100.0	83.6			
	97.1	86.8	100.0	86.3			
	24.5	24.2	100.0	24.1			
	0.0	0.0		0.0			
8 EM	68.4	65.1	100.0	64.6	744	739	481

9 PROBLEMS/SOLUTIONS/COMMENTS

10 UNSPECIFIED MODULE LIQUID SIDE EQUIPMENT PROBLEMS CAUSED 3 HOURS OF
 11 DOWNTIME ON MODULES A AND B, 562 HOURS ON MODULE C, AND THE ENTIRE MONTH
 12 ON MODULE D.

13 BOOSTER FAN PROBLEMS WERE REPORTED ON MODULE B DURING JANUARY.

14 UNSPECIFIED GAS-SIDE EQUIPMENT PROBLEMS SHUT DOWN MODULES A AND B FOR PART
 15 OF ONE DAY IN JANUARY.

16 THE UTILITY REPORTED 116 HOURS OF DOWNTIME FOR MODULE A DUE TO MIST
 17 ELIMINATOR PROBLEMS.

18 RECYCLE PUMP PROBLEMS WERE ENCOUNTERED ON MODULE B DURING JANUARY.

	99.9	82.4	100.0	82.4			
	58.3	43.2	100.0	43.2			
	96.4	96.4	100.0	96.4			
	0.0	0.0		0.0			
19 EM	84.8	74.0	100.0	74.0	672	672	497

20 PROBLEMS/SOLUTIONS/COMMENTS

21 UNSPECIFIED GAS-SIDE PROBLEMS SHUT DOWN MODULE C FOR 3 DAYS IN FEBRUARY.

22 RECYCLE PUMP PROBLEMS WERE THE CAUSE OF 635 HOURS OF DOWNTIME ON MODULE B.

23 THE UTILITY REPORTED 9 DAYS OF DOWNTIME ON MODULE B DUE TO MIST
 24 ELIMINATOR PROBLEMS.

25 UNSPECIFIED LIQUID EQUIPMENT PROBLEMS CAUSED MODULES A, B, AND C TO BE
 26 SHUT DOWN FOR ONE HOUR AND FORCED MODULE D DOWN FOR THE ENTIRE MONTH.

	60.1	84.5	100.0	60.1			
	74.2	84.7	100.0	60.3			
	61.3	84.6	100.0	60.2			
	0.0	0.0		0.0			
27 EM	65.2	84.6	100.0	60.2	744	530	448

28 PROBLEMS/SOLUTIONS/COMMENTS

29 UNSPECIFIED LIQUID-SIDE EQUIPMENT PROBLEMS FORCED MODULE D OUT OF
 30 SERVICE FOR THE ENTIRE MONTH.

31 THE UTILITY REPORTED THAT MODULES A AND C WERE OUT OF SERVICE FOR 4 DAYS
 32 IN MARCH DUE TO MIST ELIMINATOR PROBLEMS.

33 THE UNIT WAS DOWN FOR A SCHEDULED OUTAGE MARCH 14-22.

100.0	100.0	100.0	100.0
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COLORADO UTE ELECTRIC: CRAIG 1 (CONT.)

-----PERFORMANCE DATA-----									
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART. HOURS	BOILER HOURS	FGD CAP. HOURS FACTOR
	B	100.0	100.0	100.0	100.0				
	C	100.0	100.0	100.0	100.0				
	D	0.0	0.0	0.0	0.0				
	SYSTEM	100.0	100.0	100.0	100.0		720	720	720

** PROBLEMS/SOLUTIONS/COMMENTS

BOOSTER FAN PROBLEMS FORCED MODULE D OUT OF SERVICE FOR THE ENTIRE MONTH OF APRIL.

5/87	A	88.3	86.4	94.7	83.5				
	B	84.4	80.8	92.5	78.1				
	C	33.3	34.5	61.8	33.3				
	D	26.8	23.7	42.5	22.9				
	SYSTEM	77.6	75.1	97.2	72.6		744	719	540

** PROBLEMS/SOLUTIONS/COMMENTS

BOOSTER FAN PROBLEMS AGAIN FORCED MODULE D OUT OF SERVICE FOR MOST OF MAY.

THE UTILITY REPORTED THAT MODULE A ENCOUNTERED RECYCLE PUMP PROBLEMS FOR A SHORT TIME IN MAY.

THE FGD SYSTEM WAS OUT OF SERVICE FOR PART OF MAY DUE TO ABSORBER LINING REPAIRS.

6/87	A	77.2	73.4	97.7	67.8				
	B	97.4	96.1	98.3	88.8				
	C	0.0	0.0		0.0				
	D	99.8	98.9	96.9	91.4				
	SYSTEM	91.5	89.5	97.6	82.6		720	665	595

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE D EXPERIENCED BOOSTER FAN PROBLEMS FOR 2 DAYS IN JUNE.

RECYCLE PUMP PROBLEMS CAUSED MODULE B TO BE DOWN FOR PART OF ONE DAY IN JUNE.

MIST ELIMINATOR PROBLEMS FORCED MODULE A OUT OF SERVICE FOR 7 DAYS AND MODULE C OUT OF SERVICE FOR THE ENTIRE MONTH.

7/87	A	93.5	92.0	100.0	90.7				
	B	100.0	93.0	100.0	91.7				
	C	8.3	8.4	100.0	8.3				
	D	91.4	90.7	100.0	89.5				
	SYSTEM	97.8	94.7	100.0	93.4		744	734	695

** PROBLEMS/SOLUTIONS/COMMENTS

MIST ELIMINATOR PROBLEMS FORCED MODULES A AND D OUT OF SERVICE FOR A FEW DAYS AND MODULE C OUT OF SERVICE FOR MOST OF THE MONTH.

MODULE D WAS OUT OF SERVICE FOR PART OF ONE DAY DUE TO DAMPER PROBLEMS.

8/87	A	100.0	89.8	100.0	89.8				
	B	99.6	99.6	100.0	99.6				
	C	100.0	100.0	100.0	100.0				
	D	0.0	0.0		0.0				
	SYSTEM	99.9	96.5	100.0	96.5		744	744	718

SURVEY: JANUARY - DECEMBER 1988

ELECTRIC: CRAIG 1 (CONT.)

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

PROBLEMS/SOLUTIONS/COMMENTS

MIST ELIMINATOR PROBLEMS FORCED MODULE D OUT OF SERVICE FOR 7 DAYS DURING AUGUST.

BOOSTER FAN PROBLEMS CONTINUED TO PLAGUE MODULE D, KEEPING IT OUT OF SERVICE FOR 24 DAYS IN AUGUST.

RECYCLE PUMP PROBLEMS CAUSED MODULE B TO BE DOWN FOR PART OF ONE DAY IN AUGUST.

720

PROBLEMS/SOLUTIONS/COMMENTS

NO INFORMATION WAS AVAILABLE ON THIS UNIT FOR THE MONTH OF SEPTEMBER.

100.0	100.0	100.0	100.0			
100.0	100.0	100.0	100.0			
0.0	0.0		0.0			
0.0	0.0		0.0			
66.7	66.7	100.0	66.7	744	744	496

PROBLEMS/SOLUTIONS/COMMENTS

GAS-SIDE ABSORBER EQUIPMENT TROUBLE CAUSED MODULE C TO BE OUT OF SERVICE FOR 19 DAYS IN OCTOBER AND MODULE D TO BE DOWN THE ENTIRE MONTH.

LIQUID-SIDE ABSORBER EQUIPMENT TROUBLE WAS THE CAUSE OF MODULE C BEING OUT OF SERVICE FOR 12 DAYS IN OCTOBER.

98.8	98.8	99.4	98.8			
22.5	22.5	76.4	22.5			
94.6	94.6	95.2	94.6			
0.0	0.0		0.0			
71.9	71.9	90.4	71.9	720	720	518

PROBLEMS/SOLUTIONS/COMMENTS

MIST ELIMINATOR PROBLEMS CAUSED MODULE A TO BE OUT OF SERVICE FOR 9 HOURS IN NOVEMBER.

BOOSTER FAN TROUBLE FORCED MODULE D OUT OF SERVICE FOR MOST NOVEMBER, AND MODULE D FOR ALL OF THE MONTH.

UNSPECIFIED GAS-SIDE EQUIPMENT FORCED MODULE C OUT OF SERVICE FOR A SHORT TIME IN NOVEMBER.

86.6	86.6	100.0	86.6			
98.7	96.0	100.0	96.0			
100.0	100.0	100.0	100.0			
0.0	0.0		0.0			
95.1	94.2	100.0	94.2	744	744	701

PROBLEMS/SOLUTIONS/COMMENTS

BOOSTER FAN PROBLEMS CAUSED THE MODULE D FORCED OUTAGE TO CONTINUE FOR ANOTHER COMPLETE MONTH.

LIQUID-SIDE AND GAS-SIDE EQUIPMENT PROBLEMS FORCED MODULE B OUT OF SERVICE FOR A FEW HOURS IN DECEMBER.

MIST ELIMINATOR PROBLEMS FORCED MODULE A OUT OF SERVICE FOR 100

COLORADO UTE ELECTRIC: CRAIG 1 (CONT.)

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

HOURS IN DECEMBER.

1/88	A	57.0	54.3	100.0	51.8			
	B	100.0	98.7	100.0	94.2			
	C	64.5	67.6	100.0	64.5			
	D	0.0	0.0		0.0			
	SYSTEM	73.8	73.6	100.0	70.2	744	710	522

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED 320 HOURS AND 264 HOURS OF DOWNTIME FOR MODULES A AND C, RESPECTIVELY, DUE TO MIST ELIMINATOR PROBLEMS.

MODULE D WAS OFF-LINE ALL OF JANUARY DUE TO PROBLEMS WITH THE BOOSTER FAN.

2/88	A	100.0	100.0	96.9	93.8			
	B	100.0	80.9	73.4	75.9			
	C	35.3	37.7	100.0	35.3			
	D	0.0	0.0		0.0			
	SYSTEM	78.4	72.8	91.8	68.4	696	653	476

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT MODULE D WAS OFF-LINE ALL OF FEBRUARY DUE TO BOOSTER FAN PROBLEMS.

THE UTILITY REPORTED 450 HOURS OF DOWNTIME FOR MODULE C DUE TO MIST ELIMINATOR PROBLEMS.

3/88	A	6.4	6.4	91.1	6.4			
	B	100.0	95.4	95.4	95.2			
	C	99.2	99.2	99.2	98.9			
	D	0.0	0.0		0.0			
	SYSTEM	68.5	67.0	95.3	66.8	744	742	497

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT BOOSTER FAN PROBLEMS SHUT DOWN MODULE D THE ENTIRE MONTH OF MARCH.

THE UTILITY REPORTED THAT UNSPECIFIED GAS-SIDE EQUIPMENT PROBLEMS SHUT DOWN MODULE C FOR 5 HOURS IN MARCH.

THE UTILITY REPORTED 697 HOURS OF DOWNTIME FOR MODULE A DUE TO MIST ELIMINATOR PROBLEMS.

4/88	SYSTEM					720		
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5/88	A	0.0	0.0		0.0			
	B	0.0	0.0		0.0			
	C	93.5	96.3	100.0	90.0			
	D	84.8	90.8	100.0	84.8			
	SYSTEM	59.4	62.3	100.0	58.3	744	695	433 77.5

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT MODULES A AND B WERE OFF-LINE THE ENTIRE MONTH OF MAY.

6/88	A	0.0	0.0		0.0			
	B	0.0	0.0		0.0			
	C	100.0	84.1	100.0	84.1			
	D	100.0	100.0	100.0	100.0			
	SYSTEM	66.7	61.4	100.0	61.4	720	720	442

URVEY: JANUARY - DECEMBER 1988

ELECTRIC: CRAIG 1 (CONT.)

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

BLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT MODULE A WAS OFF-LINE THE ENTIRE MONTH OF JUNE
 DUE TO MIST ELIMINATOR PROBLEMS.

THE UTILITY REPORTED THAT MODULE B WAS OFF-LINE THE ENTIRE MONTH OF JUNE
 DUE TO RELINING WORK.

0.0	0.0		0.0			
0.0	0.0		0.0			
96.0	68.3	100.0	65.6			
65.1	66.8	100.0	64.1			
53.7	45.1	100.0	43.2	744	714	322

BLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED 30 HOURS OF DOWNTIME FOR MODULE C DUE TO MIST
 ELIMINATOR PROBLEMS.

UNSPECIFIED GAS-SIDE EQUIPMENT PROBLEMS SHUT DOWN MODULE B THE ENTIRE
 MONTH OF JULY.

THE UTILITY REPORTED 256 HOURS OF DOWNTIME FOR MODULE D DUE TO BOOSTER FAN
 PROBLEMS. IN ADDITION, FOUR HOURS OF UNSPECIFIED DOWNTIME WERE ALSO
 REPORTED FOR MODULE D DURING THE MONTH OF JULY.

THE UTILITY REPORTED THAT MODULE A WAS OFF-LINE THE ENTIRE MONTH OF JULY
 DUE TO MIST ELIMINATOR PROBLEMS.

774

93.3	44.7	100.0	44.7			
0.0	0.0		0.0			
100.0	56.0	100.0	56.0			
100.0	100.0	100.0	100.0			
97.8	66.9	100.0	66.9	720	720	482

BLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT UNSPECIFIED MODULE LIQUID SIDE EQUIPMENT
 PROBLEMS SHUT DOWN MODULE B THE ENTIRE MONTH OF SEPTEMBER.

THE UTILITY REPORTED 48 HOURS OF DOWNTIME FOR MODULE A DUE TO MIST
 ELIMINATOR PROBLEMS.

93.5	88.5	100.0	78.5			
0.0	0.0		0.0			
93.5	58.1	100.0	51.5			
95.7	40.5	100.0	35.9			
94.3	62.3	100.0	55.3	744	660	411

BLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED 48 HOURS OF DOWNTIME FOR MODULE A DUE TO MIST
 ELIMINATOR PROBLEMS.

THE UTILITY REPORTED 32 HOURS OF DOWNTIME FOR MODULE D DUE TO MIST
 ELIMINATOR PROBLEMS.

THE UTILITY REPORTED THAT UNSPECIFIED MODULE LIQUID SIDE EQUIPMENT
 PROBLEMS SHUT DOWN MODULE B THE ENTIRE MONTH OF OCTOBER AND SHUT DOWN

96.7	37.4	100.0	37.4			
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COLORADO UTE ELECTRIC: CRAIG 1 (CONT.)

-----PERFORMANCE DATA-----									
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER BOILER HOURS	FGD CAP. HOURS FACTOR
	B	0.0	0.0		0.0				
	C	100.0	67.9	100.0	67.9				
	D	100.0	23.5	100.0	23.5				
	SYSTEM	98.9	42.9	100.0	42.9			720	309

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT MODULE A WAS OFF-LINE IN NOVEMBER FOR 24 HOURS DUE TO RECYCLE PUMP PROBLEMS.

THE UTILITY REPORTED THAT UNSPECIFIED MODULE GAS SIDE EQUIPMENT PROBLEMS SHUT DOWN MODULE B THE ENTIRE MONTH OF NOVEMBER.

12/88	A	36.5	0.0		0.0				
	B	74.2	46.0	100.0	45.4				
	C	100.0	54.2	100.0	53.5				
	D	100.0	85.0	100.0	83.8				
	SYSTEM	100.0	61.8	100.0	60.9			744	453

** PROBLEMS/SOLUTIONS/COMMENTS

UNSPECIFIED MODULE GAS SIDE EQUIPMENT PROBLEMS SHUT DOWN MODULES A AND B FOR 456 HOURS AND 192 HOURS, RESPECTIVELY.

THE UTILITY REPORTED 16 HOURS OF DOWNTIME FOR MODULE A DUE TO MIST ELIMINATOR PROBLEMS.

SECTION 13
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	COLORADO UTE ELECTRIC	
PLANT NAME	CRAIG	
UNIT NUMBER	2	
CITY	CRAIG	
STATE	COLORADO	
REGULATORY CLASSIFICATION	C	
PARTICULATE EMISSION LIMITATION - NG/J	43.	(0.100 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	172.	(0.400 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	301.	(0.700 LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	900	
GROSS UNIT GENERATING CAPACITY - MW	454	
NET UNIT GENERATING CAPACITY W/FGD - MW	428	
NET UNIT GENERATING CAPACITY WO/FGD - MW	431	
EQUIVALENT SCRUBBED CAPACITY - MW	350	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	BABCOCK & WILCOX	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	722.29	(1530600 ACFM)
BOILER FLUE GAS TEMPERATURE - C	121.1	(250 F)
STACK HEIGHT - M	183.	(600 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	10.9	(35.8 FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	SUBBITUMINOUS	
AVERAGE HEAT CONTENT - J/G	23260.	(10000 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		9100-10300
AVERAGE ASH CONTENT - %	8.00	
RANGE ASH CONTENT - %	****	
AVERAGE MOISTURE CONTENT - %	16.00	
RANGE MOISTURE CONTENT - %	****	
AVERAGE SULFUR CONTENT - %	0.45	
RANGE SULFUR CONTENT - %	0.4-0.5	
AVERAGE CHLORIDE CONTENT - %	*****	
RANGE CHLORIDE CONTENT - %	0.00-0.02	
*** PARTICLE CONTROL		
** MECHANICAL COLLECTOR		
NUMBER	0	
TYPE	NONE	
** ESP		
NUMBER	1	
NUMBER OF SPARES	0	
TYPE	HOT SIDE	
SUPPLIER	BELCO	
INLET FLUE GAS CAPACITY - CU.M/S	1392.1	(2950000 ACFM)
INLET FLUE GAS TEMPERATURE - C	398.9	(750 F)
PRESSURE DROP - KPA	0.7	(3. IN-H2O)
PARTICLE REMOVAL EFFICIENCY - %	99.9	
** 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		

SURVEY: JANUARY - DECEMBER 1988

ELECTRIC: CRAIG 2 (CONT.)

ATA		
PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT	
VAL MODE	WET SCRUBBING	
TYPE	LIMESTONE	
ADDITIVES	NONE	
UPPLIER	PEABODY PROCESS SYSTEMS	
	STEARNS-ROGER	
ENT LEVEL	FULL SCALE	
OFIT	NEW	
IGN PARTICLE REMOVAL EFFICIENCY - %	99.80	
IGN SO2 REMOVAL EFFICIENCY - %	85.00	
CONSUMPTION - %	0.7	
STATUS	1	
AL START-UP	5/1980	
START-UP	12/1979	
AWARDED	5/1977	
D OPERATING PARAMETERS		
OAL SULFUR CONTENT - %	0.96	
OAL HEAT CONTENT - J/G	22329.6	(9600 BTU/LB)
OAL ASH CONTENT - %	11.60	
OISTURE CONTENT - %	15.30	
HLORIDE CONTENT - %	0.10	
QUIREMENTS - SQ M	12140.2	(130680 SQ FT)
MAINT. REQUIREMENT - MANHR/DAY	264.0	
PRESATURATOR		
	4	
	QUENCH DUCT	
	PEABODY PROCESS SYSTEMS	
S FLOW - CU. M/S	217.07	(460000 ACFM)
S TEMPERATURE - C	121.1	(250 F)
DROP - KPA	0.2	(1.0 IN-H2O)
ECIRCULATION RATE - LITERS/S	32.	(500 GPM)
O - L/CU. M	0.1	(1.1 GAL/1000 ACFM)
TION MATERIAL GENERIC TYPE	HIGH ALLOY	
TION MATERIAL SPECIFIC TYPE	NICKEL BASE/CHROMIUM-IRON-MOLYBDENUM	
	4	
F SPARES	1	
TYPE	SPRAY TOWER	
TYPE	OPEN COUNTERCURRENT SPRAY	
ME/COMMON TYPE	N/A	
	PEABODY PROCESS SYSTEMS	
NS - FT	32.0 DIA X 52.5	
NERIC MATERIAL	CARBON STEEL	
ECIFIC MATERIAL	AISI 1110	
TIERIAL TRADE NAME/COMMON TYPE	N/A	
NERIC MATERIAL	ORGANIC SPRAY ZONE!; GLASS FLAKE-FILLED POLYEST	
ECIFIC MATERIAL	NATURAL RUBBER	
TIERIAL TRADE NAME/COMMON TYPE	BLACK NATURAL RUBBER	
ACTING DEVICE TYPE	NONE	
F CONTACTING ZONES	4	
ECIRCULATION RATE - LITER/S	1512.	(24000 GPM)
O - L/CU.M	7.0	(52.2 GAL/1000 ACF)
PRESSURE DROP - KPA	0.4	(1.5 IN-H2O)
AL GAS VELOCITY - M/SEC	3.0	(10.0 FT/S)
S FLOW - CU. M/S	217.07	(460000 ACFM)
S TEMPERATURE - C	121.1	(250 F)
VAL EFFICIENCY - %	85.0	
REMOVAL EFFICIENCY - %	50.0	
INATOR		
ELIMINATOR/MIST ELIMINATOR	PRIMARY COLLECTOR	
ER SYSTEM	4	
F SPARES PER SYSTEM	1	
ER MODULE	1	
TYPE	IMPINGEMENT	
TYPE	BAFFLE	

COLORADO UTE ELECTRIC: CRAIG 2 (CONT.)

TRADE NAME/COMMON TYPE	CLOSED VANE	
CONFIGURATION	HORIZONTAL	
NUMBER OF STAGES	1	
NUMBER OF PASSES PER STAGE	4	
FREEBOARD DISTANCE - M	1.52	(5.0 FT)
DISTANCE BETWEEN VANES - CM	3.0	(1.20 IN)
VANE ANGLES - DEGREES	45	
PRESSURE DROP - KPA	0.2	(1.0 IN-H ₂ O)
SUPERFICIAL GAS VELOCITY - M/S	3.0	(10.0 FT/S)
CONSTRUCTION MATERIAL GENERIC TYPE	ORGANIC	
CONSTRUCTION MATERIAL SPECIFIC TYPE	POLYPHENYLENE	
WASH WATER SOURCE	RAW WATER	
WASH FREQUENCY	CONTINUOUS	
WASH RATE - L/S	6.3	(100 GAL/MIN)
** REHEATER		
NUMBER	4	
NUMBER OF SPARES	1	
NUMBER PER MODULE	1	
GENERIC TYPE	BYPASS	
SPECIFIC TYPE	COLD SIDE	
TRADE NAME/COMMON TYPE	N/A	
LOCATION	OUTLET DUCT BETWEEN ME & OUTLET DAMPER	
PERCENT GAS BYPASSED - AVG	23.0	
TEMPERATURE INCREASE - C	27.8	(50 F)
INLET FLUE GAS FLOW RATE - CU. M/S	194.89	(413000 ACFM)
INLET FLUE GAS TEMPERATURE - C	43.3	(110 F)
OUTLET FLUE GAS FLOW RATE - CU. M/S	302.02	(640000 ACFM)
OUTLET FLUE GAS TEMPERATURE - C	73.9	(165 F)
CONSTRUCTION MATERIAL GENERIC TYPE	STAINLESS STEEL	
CONSTRUCTION MATERIAL SPECIFIC TYPE	AUSTENITIC	
** FANS		
NUMBER	4	
NUMBER OF SPARES	0	
DESIGN	AXIAL	
SUPPLIER	BUFFALO FORGE	
FUNCTION	INDIRECT REHEAT	
APPLICATION	N/A	
SERVICE	DRY	
FLUE GAS FLOW RATE - CU.M/S	46.03	(97545 ACFM)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	
** FANS		
NUMBER	4	
NUMBER OF SPARES	1	
DESIGN	AXIAL	
SUPPLIER	BUFFALO FORGE	
FUNCTION	BOOSTER	
APPLICATION	FORCED DRAFT	
SERVICE	DRY	
FLUE GAS FLOW RATE - CU.M/S	372.80	(790000 ACFM)
FLUE GAS TEMPERATURE - C	121.1	(250 F)
PRESSURE DROP - KPA	3.4	(11.0 IN-H ₂ O)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	
** DAMPERS		
NUMBER	4	
GENERIC TYPE	LOUVER	
SPECIFIC TYPE	PARALLEL BLADE MULTILOUVER	
MANUFACTURER	FORNEY ENGINEERING	
MODULATION	OPEN	
SEAL AIR FLOW - CU. M/S	3.07	(6500 ACFM)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL/STAINLESS STEEL	
CONSTRUCTION MATERIAL SPECIFIC TYPE	ASTM A-285	
LINER GENERIC MATERIAL TYPE	NONE	
LINER SPECIFIC MATERIAL TYPE	N/A	
** DAMPERS		
NUMBER	4	
GENERIC TYPE	LOUVER	

SURVEY: JANUARY - DECEMBER 1988

ELECTRIC: CRAIG 2 (CONT.)

TYPE
C TYPE
TURER
ION
R FLOW - CU. M/S
CTION MATERIAL GENERIC TYPE
CTION MATERIAL SPECIFIC TYPE
ENERIC MATERIAL TYPE
PECIFIC MATERIAL TYPE

PARALLEL BLADE MULTILOUVER
FORNEY ENGINEERING
OPEN
3.07 (6500 ACFM)
CARBON STEEL/STAINLESS STEEL
ASTM A-285
NONE
N/A

TYPE
C TYPE
TURER
ION
R FLOW - CU. M/S
CTION MATERIAL GENERIC TYPE
CTION MATERIAL SPECIFIC TYPE
ENERIC MATERIAL TYPE
PECIFIC MATERIAL TYPE

4
LOUVER
PARALLEL BLADE MULTILOUVER
FORNEY ENGINEERING
OPEN
3.07 (6500 ACFM)
CARBON STEEL/STAINLESS STEEL
ASTM A-285
NONE
N/A

TYPE
C TYPE
TURER
ION
R FLOW - CU. M/S
CTION MATERIAL GENERIC TYPE
CTION MATERIAL SPECIFIC TYPE
ENERIC MATERIAL TYPE
PECIFIC MATERIAL TYPE

4
GUILLotine
NR
FORNEY ENGINEERING
OPEN
0.00 (0 ACFM)
CARBON STEEL/HIGH ALLOY
AISI 1110; NR
NONE
N/A

TYPE
C TYPE
TURER
ION
R FLOW - CU. M/S
CTION MATERIAL GENERIC TYPE
CTION MATERIAL SPECIFIC TYPE
ENERIC MATERIAL TYPE
PECIFIC MATERIAL TYPE

2
LOUVER
PARALLEL BLADE MULTILOUVER
FORNEY ENGINEERING
OPEN
0.00 (0 ACFM)
CARBON STEEL/STAINLESS STEEL
ASTM A-285
NONE
N/A

TYPE
C TYPE
TURER
ION
R FLOW - CU. M/S
CTION MATERIAL GENERIC TYPE
CTION MATERIAL SPECIFIC TYPE
ENERIC MATERIAL TYPE
PECIFIC MATERIAL TYPE

1
LOUVER
PARALLEL BLADE MULTILOUVER
FORNEY ENGINEERING
OPEN
0.00 (0 ACFM)
CARBON STEEL/STAINLESS STEEL
ASTM A-285
NONE
N/A

TYPE
C TYPE
TURER
ION
R FLOW - CU. M/S
CTION MATERIAL GENERIC TYPE
CTION MATERIAL SPECIFIC TYPE
ENERIC MATERIAL TYPE
PECIFIC MATERIAL TYPE

2
LOUVER
PARALLEL BLADE MULTILOUVER
FORNEY ENGINEERING
CLOSED
0.00 (0 ACFM)
CARBON STEEL/STAINLESS STEEL
ASTM A-285
NONE
N/A

COLORADO UTE ELECTRIC: CRAIG 2 (CONT.)

** DUCTWORK	
LOCATION	INLET TO QUENCH
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 TO DAMPER
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
SHELL SPECIFIC MATERIAL TYPE	AISI 1110
LINER GENERIC MATERIAL TYPE	ORGANIC
LINER SPECIFIC MATERIAL TYPE	GLASS FLAKE-FILLED POLYESTER
** DUCTWORK	
LOCATION	DAMPER TO STACK
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
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	COMPARTMENTED
DEVICE TYPE	NR
MANUFACTURER	KENNEDY VAN SAUN
NUMBER	1
NUMBER OF SPARES	0
FULL LOAD DRY FEED CAPACITY - M.TONS/HR	9.1 (10 TPH)
PRODUCT QUALITY - % SOLIDS	35.0
** TANKS	
SERVICE	NUMBER
-----	-----
ABSORBER RECYCLE	4
REAGENT PREP PRODUCT	1
THICKENER OVERFLOW	1
CLASSIFIER OVERFLOW	4
FLOCCULANT	1
WASTE SLURRY BLEED	1
** PUMPS	
SERVICE	NUMBER
-----	-----
RAW WATER	2
RECLAIM SUMP	7
POND	1
COOLING TOWER BLOWDOWN BOOSTER	2
ABSORBER RECIRCULATION	8
WASH SLURRY	8
SUPERNATANT	2
THICKENER UNDERFLOW	2
POLYELECTROLYTE	1
WASTE SLURRY	2
MILL RECIRCULATION	2
LIMESTONE SLURRY FEED	2
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	CENTRIFUGE
NUMBER	1
NUMBER OF SPARES	1
DIMENSIONS - FT	3.0 DIA X 6.0
CAPACITY	126 GPM

SURVEY: JANUARY - DECEMBER 1988

E ELECTRIC: CRAIG 2 (CONT.)

GENERIC MATERIAL TYPE	HIGH ALLOY
SPECIFIC MATERIAL TYPE	NICKEL BASE/CHROMIUM-IRON-MOLYBDENUM
GENERIC MATERIAL TYPE	NONE
SPECIFIC MATERIAL TYPE	N/A
ENERIC MATERIAL TYPE	N/A
PECIFIC MATERIAL TYPE	N/A
TREAM SOURCE	THICKENER UNDERFLOW
TREAM CHARACTERISTICS	35% SOLIDS
STREAM CHARACTERISTICS	60% SOLIDS
OW STREAM CHARACTERISTICS	60 GPM
STREAM DISPOSITION	LANDFILL
OW STREAM DISPOSITION	TO WASTE SUMP & THEN TO THICKENER

CONCENTRATING/DEWATERING

	THICKENER
	1
OF SPARES	0
URATION	CENTER DRAW
IONS - FT	75.0 DIA X 15.0
GENERIC MATERIAL TYPE	CARBON STEEL
SPECIFIC MATERIAL TYPE	AISI 1110
GENERIC MATERIAL TYPE	ORGANIC
SPECIFIC MATERIAL TYPE	GLASS FLAKE-FILLED POLYESTER 'WALLS!; MAT-REINFO
TREAM SOURCE	ABSORBER BLEED
TREAM CHARACTERISTICS	5% SOLIDS
STREAM CHARACTERISTICS	35% SOLIDS
OW STREAM CHARACTERISTICS	100 GPM, <1% SUSPENDED SOLIDS
STREAM DISPOSITION	TO CENTRIFUGES
OW STREAM DISPOSITION	RECYCLED TO PROCESS

E BYPRODUCTS

	NONE
ITION	N/A

OAD SLUDGE QUANTITY - M.TONS/HR (DRY)	10.5	(11.6 TPH)
RE CONTENT - % TOTAL FREE WATER	40.0	
3 - DRY	22.6	
4 - DRY	70.2	
2 - DRY	0.0	
3 - DRY	2.9	
- DRY	0.3	
R COMPOUNDS - DRY	3.9	

NT

UNSTABILIZED

L

FINAL
LANDFILL
OFF-SITE
TRUCK

ON
RANSPORTATION METHOD

CONTROL AND INSTRUMENTATION

AL PARAMETERS	PH, SO2 CONCENTRATION
AL VARIABLES	DENSITY, GAS FLOW, LIQUID FLOW
L LEVELS	PH 5.4, SOLIDS 12-15%
R TYPE	UNILOK-PH, OHMART-DENSITY, BROOKS-FLOW, DYNASCIE
R LOCATION	AT MODULE RECYCLE TANK
S CONTROL MANNER	AUTOMATIC
S CHEMISTRY MODE	FEEDBACK

ALANCE

LOOP TYPE	CLOSED	
ATION WATER LOSS - LITER/S	17.8	(282 GPM)
HYDRATION WATER LOSS - LITER/S	0.6	(9 GPM)
INTERSTITIAL WATER LOSS - LITERS/S	2.1	(33 GPM)

COLORADO UTE ELECTRIC: CRAIG 2 (CONT.)

POND SEEPAGE/RUNOFF WATER LOSS - LITERS/S	0	
EFFLUENT WATER LOSS - LITERS/S	0.0	(0 GPM)
RECEIVING WATER STREAM	N/A	
MAKEUP WATER ADDITION - LITERS/S	20.2	(321 GPM)
SOURCE OF MAKEUP WATER	COOLING TOWER BLOWDOWN	

** CHEMICALS AND CONSUMPTION

FUNCTION	ABSORBENT
NAME	LIMESTONE
PRINCIPAL CONSTITUENT	CACO3
CONSUMPTION	7000 LB/HR
UTILIZATION - %	75.0
POINT OF ADDITION	BALL MILL

** FGD SPARE CAPACITY INDICES

ABSORBER - %	33.3
MIST ELIMINATOR - %	33.3
REHEATER - %	33.3
BALL MILL - %	0.0
EFFLUENT HOLD TANK - %	33.3
THICKENER - %	0.0
CENTRIFUGE - %	50.0

** FGD SPARE COMPONENT INDICES

ABSORBER	1.0
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-----PERFORMANCE DATA-----

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

7/79	SYSTEM							744		
8/79	SYSTEM							744		
9/79	SYSTEM							720		

** PROBLEMS/SOLUTIONS/COMMENTS

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

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

** PROBLEMS/SOLUTIONS/COMMENTS

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

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

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

SURVEY: JANUARY - DECEMBER 1988

ELECTRIC: CRAIG 2 (CONT.)

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

BLEMS/SOLUTIONS/COMMENTS

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

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

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

720

BLEMS/SOLUTIONS/COMMENTS

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

38.4	27.5	28.4	24.5				
42.5	32.1	33.1	28.5				
47.0	37.2	38.4	33.1				
30.0	18.0	18.6	16.0				
52.6	38.3	39.5	34.0	640	661	253	76.8

BLEMS/SOLUTIONS/COMMENTS

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

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

47.6	41.2	42.0	37.9				
53.9	48.0	48.9	44.2				
61.1	55.8	56.9	51.4				
34.6	27.0	27.5	24.9				
65.7	57.3	58.4	52.8	720	663	380	68.5

BLEMS/SOLUTIONS/COMMENTS

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

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

THE SCRUBBING SYSTEM IS STILL UNDERGOING SHAKEDOWN OPERATIONS.

59.1	51.0	51.7	43.8				
61.8	54.1	54.9	46.5				
37.6	26.0	26.3	22.3				
43.7	33.0	33.5	28.4				
67.4	54.7	55.5	47.0	744	640	350	65.8

COLORADO UTE ELECTRIC: CRAIG 2 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

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

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

** PROBLEMS/SOLUTIONS/COMMENTS

DURING AUGUST THE FGD SYSTEM EXPERIENCED ASSORTED MECHANICAL PROBLEMS.

SPRAY NOZZLE PLUGGING OCCURRED, CAUSING ADDITIONAL OUTAGE TIME WHICH ADDED TO THE LOW AVAILABILITY FACTOR DURING THE MONTH.

9/80	A	48.6	47.5	48.4	47.1				
	B	58.2	58.8	59.9	58.2				
	C	61.1	59.6	60.7	59.0				
	D	67.4	66.2	67.4	65.6				
	SYSTEM	78.4	77.4	78.8	76.6	720	713	552	85.2

** PROBLEMS/SOLUTIONS/COMMENTS

THE SPRAY NOZZLES IN THE ABSORBER MODULE CONTINUED TO PLUG UP DURING SEPTEMBER.

10/80	A	99.5	89.4	93.7	11.9				
	B	99.5	91.5	95.8	12.2				
	C	99.5	88.4	92.6	11.8				
	D	99.5	92.5	96.8	12.4				
	SYSTEM	99.5	90.5	94.7	12.1	744	99	90	12.2

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER WAS TAKEN OFF LINE ON OCTOBER 5 FOR A FIVE WEEK SCHEDULED OUTAGE.

AN IN-LINE SPOT CHECK PERFORMED ON OCTOBER 4 INDICATED THAT THE FGD SYSTEM WAS ACHIEVING A 66.2% SO2 REMOVAL EFFICIENCY. THE STACK OPACITY WAS MEASURED AT 5.7%.

11/80	A	69.4	61.7	66.0	27.5				
	B	0.0	0.0	0.0	0.0				
	C	70.8	71.0	76.0	31.6				
	D	72.2	89.7	96.0	40.0				
	SYSTEM	70.8	74.1	79.3	33.0	720	321		38.8

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS RETURNED TO SERVICE ON NOVEMBER 10 AFTER A FIVE WEEK SCHEDULED MAINTENANCE OUTAGE.

MODULE B WAS TAKEN OFF LINE DURING NOVEMBER DUE TO BOOSTER FAN PROBLEMS.

12/80	A	43.0	57.5	58.7	42.6				
	B	0.0	0.0		0.0				
	C	53.8	69.3	70.7	51.3				
	D	60.5	78.4	80.0	58.1				
	SYSTEM	52.4	68.4	69.8	50.7	744	551	377	54.6

SURVEY: JANUARY - DECEMBER 1988

E ELECTRIC: CRAIG 2 (CONT.)

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

ROBLEMS/SOLUTIONS/COMMENTS

MODULE B REMAINED OFF LINE DURING DECEMBER DUE TO BOOSTER FAN BLADE
 PITCH PROBLEMS.

	67.2	66.0	66.2	65.9				
	0.0	0.0	0.0	0.0				
	79.8	78.2	78.4	77.9				
	89.2	88.9	89.2	88.7				
EM	78.7	77.7	77.9	77.5	744	742	414	85.5

ROBLEMS/SOLUTIONS/COMMENTS

DURING JANUARY MODULE B REMAINED OUT OF SERVICE DUE TO BOOSTER FAN BLADE
 PITCH PROBLEMS AND PROBLEMS WITH THE SYSTEM INTERLOCKS.

	32.7	32.1	32.2	32.1				
	65.5	64.3	64.5	64.3				
	0.0	0.0	0.0	0.0				
	100.0	100.0	99.8	100.0				
EM	66.1	65.5	65.5	65.5	672	672		90.1

ROBLEMS/SOLUTIONS/COMMENTS

PROBLEMS WERE ENCOUNTERED DURING THE MONTH WITH OPENING THE MODULE A, B,
 AND C DAMPERS.

DURING FEBRUARY MODULE A ALSO ENCOUNTERED PLUGGAGE IN THE MOISTURE SEPARA-
 TOR.

	68.5	69.8	70.1	67.9				
	80.6	82.3	82.8	80.1				
	0.0	0.0	0.0	0.0				
	7.5	7.7	7.8	7.5				
EM	52.2	53.3	53.6	51.8	744	724	385	85.6

ROBLEMS/SOLUTIONS/COMMENTS

DURING MARCH MODULES C AND D EXPERIENCED PROBLEMS WITH THE MIST ELIMINATOR
 PLUGGING.

ADDITIONAL OUTAGE TIME OF MODULE C WAS DUE TO OPERATIONAL PROBLEMS OF THE
 DAMPERS.

EM	0.0	0.0	0.0	0.0	720	596	0	59.3
----	-----	-----	-----	-----	-----	-----	---	------

ROBLEMS/SOLUTIONS/COMMENTS

THE SYSTEM DID NOT OPERATE DURING APRIL BECAUSE OF PLUGGED MIST
 ELIMINATORS. THE MIST ELIMINATORS ARE BEING CLEANED.

EM	0.0	0.0	0.0	0.0	744	744	0	
EM	0.0	0.0	0.0	0.0	720	717	0	78.7

ROBLEMS/SOLUTIONS/COMMENTS

DURING MAY AND JUNE THE SYSTEM WAS OUT OF SERVICE DUE TO DAMAGED MIST
 ELIMINATOR PADS AND PLUGGING OF THE MIST ELIMINATOR.

EM	0.0	0.0	0.0	0.0	744	686	0	61.6
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COLORADO UTE ELECTRIC: CRAIG 2 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

ALL MODULES REMAINED OUT OF SERVICE DURING JULY AS A RESULT OF THE BROKEN MIST ELIMINATOR TRAYS.

8/81	A	0.0	0.0	0.0	0.0				
	B	0.0	0.0	0.0	0.0				
	C	59.7	61.0	61.8	59.4				
	D	39.5	40.5	41.0	39.4				
	SYSTEM	33.1	33.8	34.3	32.9	744	724	245	73.2

** PROBLEMS/SOLUTIONS/COMMENTS

MODULES A AND B REMAINED DOWN DURING AUGUST AS THE UTILITY WAS WAITING FOR NEW MIST ELIMINATOR TRAYS.

MODULE D WAS UNAVAILABLE FOR PART OF THE MONTH AS A RESULT OF PROBLEMS WITH DAMPERS.

9/81	A	18.1	18.4	18.6	17.8				
	B	40.3	40.9	41.4	39.6				
	C	81.9	83.6	84.5	80.8				
	D	13.9	13.4	13.5	12.9				
	SYSTEM	51.4	52.1	52.7	50.4	720	696	363	81.5

** PROBLEMS/SOLUTIONS/COMMENTS

ALL FOUR MODULES BECAME OPERABLE TOWARD THE END OF THE MONTH. MODULE D HAD BEEN OUT OF SERVICE AS A RESULT OF OUTLET DAMPER PROBLEMS. MODULE A WAS PUT IN SERVICE THE THIRD WEEK OF THE MONTH AFTER HAVING THE MIST ELIMINATORS REPLACED. THE MODULES ARE NOW BEING SHUT DOWN ON A REGULAR BASIS TO CLEAN THE MIST ELIMINATORS.

10/81	A	83.9	83.7	83.8	83.7				
	B	44.6	44.3	44.4	44.3				
	C	85.2	84.9	85.1	84.9				
	D	85.3	84.9	85.1	84.9				
	SYSTEM	99.7	99.3	99.5	99.3	744	744	739	85.7

** PROBLEMS/SOLUTIONS/COMMENTS

DURING OCTOBER MODULE B EXPERIENCED BOOSTER FAN BEARING PROBLEMS.

PROBLEMS WITH INSTRUMENTATION HINDERED ALL FOUR MODULES DURING THE MONTH.

11/81	A	19.3	43.8	48.4	19.2				
	B	1.9	4.1	4.6	1.8				
	C	11.8	26.7	29.5	11.7				
	D	29.6	67.3	74.4	29.4				
	SYSTEM	20.8	47.3	52.3	20.7	720	315	149	32.9

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS SHUT DOWN FROM NOVEMBER 8 THRU NOVEMBER 23 FOR SCHEDULED MAINTENANCE.

A PROBLEM WITH MANY OF THE VALVES STICKING AT STARTUP WAS RESOLVED BY FLUSHING.

LIMESTONE BALL MILL PLUGGING PROBLEMS WERE ENCOUNTERED DURING DECEMBER.

12/81	A	33.2	33.3	33.8	32.9				
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SURVEY: JANUARY - DECEMBER 1988

ELECTRIC: CRAIG 2 (CONT.)

-----PERFORMANCE DATA-----									
	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	32.9	33.1	33.6	32.7					
	88.0	88.7	89.9	87.6					
	51.6	51.9	52.6	51.3					
M	68.5	69.0	70.0	68.1		744	735	507	82.1

PROBLEMS/SOLUTIONS/COMMENTS

DURING DECEMBER PROBLEMS WERE ENCOUNTERED WITH THE BOOSTER FAN BEARING.

MODULE D EXPERIENCED PROBLEMS WITH A BINDING OUTLET DAMPER.

	81.3	83.9	84.9	81.0					
	75.0	77.5	78.4	74.8					
	77.1	79.8	80.7	77.0					
	83.3	86.1	87.1	83.1					
M	100.0	100.0	100.0	100.0		744	718	744	88.5

PROBLEMS/SOLUTIONS/COMMENTS

DURING JANUARY THE MIST ELIMINATORS WERE CLEANED WEEKLY.

ROCKS IN THE LIMESTONE HAS CAUSED PLUGGING OF THE BALL MILL. THE SUPPLIER IS WORKING ON THE PROBLEM.

	86.0	86.8	87.5	85.9					
	86.5	87.2	87.9	86.3					
	54.3	54.7	55.1	54.2					
	30.9	31.1	31.4	30.8					
M	86.0	86.7	85.9	85.9		672	665	577	85.3

PROBLEMS/SOLUTIONS/COMMENTS

DURING FEBRUARY MODULE D WAS OFF-LINE FOR 464 HOURS DUE TO A BROKEN RECYCLE PUMP SHAFT.

PROBLEMS WITH THE THICKENER UNDERFLOW PUMP CONTROLLERS WAS ALSO ENCOUNTERED DURING FEBRUARY.

	62.6	62.5	62.5	62.5					
	68.5	68.3	68.3	68.3					
	69.9	69.7	69.7	69.7					
	41.5	41.3	41.3	41.3					
EM	80.9	80.6	80.6	80.6		744	744	600	80.9

PROBLEMS/SOLUTIONS/COMMENTS

DURING MARCH THE RECYCLE PUMP SHAFT ON THE D MODULE WAS REPAIRED AND THE MODULE RETURNED TO SERVICE.

	60.7	64.6	68.9	60.6					
	56.5	60.3	64.2	56.5					
	56.0	59.6	63.5	55.8					
	34.2	36.4	38.8	34.1					
EM	69.1	73.6	78.5	69.0		720	674	497	69.8

PROBLEMS/SOLUTIONS/COMMENTS

MODULE D EXPERIENCED SOME OUTLET DAMPER PROBLEMS DURING APRIL.

	1.8	1.7	2.0	1.7					
	4.6	4.5	5.4	4.5					
	0.0	0.0	0.0	0.0					
	14.1	14.0	16.7	14.0					
EM	6.8	6.7	8.0	6.7		744	744	50	60.8

COLORADO UTE ELECTRIC: CRAIG 2 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

DURING MAY THE SYSTEM WAS DOWN MOST OF THE TIME DUE TO THICKENER REPAIRS.

6/82	A	48.1	50.4	51.8	47.9				
	B	0.0	0.0	0.0	0.0				
	C	54.6	57.5	59.0	54.6				
	D	84.0	88.4	90.7	84.0				
	SYSTEM	62.2	65.4	67.2	62.2	720	684	447	59.5

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE B WAS OFF-LINE DURING JUNE DUE TO DAMAGED TURNING VANES.

MODULES A, C, AND D WERE TAKEN DOWN FOR CLEANING AND REPAIR OF THE MIST ELIMINATOR DURING PART OF THE MONTH.

7/82	A	67.9	67.7	69.4	67.7				
	B	47.2	47.2	48.3	47.2				
	C	74.1	74.0	75.8	74.0				
	D	43.8	43.7	44.8	43.7				
	SYSTEM	77.6	77.5	79.4	77.5	744	744	577	79.6

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JULY THE UNIT EXPERIENCED NUMEROUS INSTRUMENT FAILURES AS A RESULT OF EXCESSIVE MOISTURE IN THE INSTRUMENT AIR SUPPLY.

8/82	A	56.3	57.3	63.2	56.2				
	B	0.0	0.0	0.0	0.0				
	C	85.5	87.1	96.1	85.4				
	D	29.5	29.9	33.0	29.4				
	SYSTEM	57.1	58.1	64.1	57.0	744	730	424	68.8

** PROBLEMS/SOLUTIONS/COMMENTS

DURING AUGUST MODULES B AND D WERE DOWN DUE TO INOPERABLE OUTLET DAMPERS. MODULE D WAS REPAIRED BY THE END OF THE MONTH, HOWEVER REPAIRS CONTINUED ON MODULE B.

9/82	A	0.0	0.0	0.0	0.0				
	B	0.0	0.0	0.0	0.0				
	C	36.7	65.3	79.5	36.5				
	D	27.6	49.1	59.8	27.5				
	SYSTEM	21.4	38.1	46.4	21.3	720	403	153	36.9

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE A WAS OUT OF SERVICE DURING SEPTEMBER DUE TO ABSORBER LINER DAMAGE.

MODULE B WAS DOWN DURING SEPTEMBER DUE TO OUTLET DAMPER PROBLEMS.

DUCTWORK PROBLEMS WERE ALSO EXPERIENCED BY MODULE B DURING THE MONTH.

THE UNIT WAS TAKEN OUT OF SERVICE ON SEPTEMBER 18 FOR AN ANNUAL OUTAGE LASTING THE REMAINDER OF THE MONTH.

10/82	A	0.0	0.0	0.0	0.0				
	B	0.0	0.0	0.0	0.0				
	C	50.9	57.3	94.0	50.8				
	D	25.0	28.1	46.1	24.9				
	SYSTEM	25.3	28.5	46.7	25.2	744	659	187	65.1

RVEY: JANUARY - DECEMBER 1988

ELECTRIC: CRAIG 2 (CONT.)

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

LEMS/SOLUTIONS/COMMENTS

MODULES A AND B WERE DOWN DURING OCTOBER AWAITING ABSORBER LINER REPAIRS.

MODULE D DEVELOPED A BOOSTER FAN OIL LEAK DURING THE MONTH. THE PROBLEM OCCURRED FOLLOWING THE UNIT OUTAGE AND FORCED THE MODULE OUT OF SERVICE FOR REPAIRS.

0.0	0.0	0.0	0.0				
0.0	0.0	0.0	0.0				
63.6	63.5	63.7	63.5				
93.8	93.6	94.0	93.6				
52.5	52.4	52.6	52.4	720	720	377	71.3

LEMS/SOLUTIONS/COMMENTS

MODULES A AND B REMAINED OUT OF SERVICE DURING NOVEMBER AWAITING ABSORBER LINER REPAIRS.

0.0	0.0	0.0	0.0				
0.0	0.0	0.0	0.0				
93.8	93.7	93.7	93.7				
18.5	18.5	18.5	18.5				
37.5	37.4	37.4	37.4	744	744	278	69.6

LEMS/SOLUTIONS/COMMENTS

MODULES A AND B REMAINED OUT OF SERVICE DURING DECEMBER AWAITING ABSORBER LINER REPAIRS.

MODULE D DEVELOPED A BOOSTER FAN LUBE OIL LEAK DURING DECEMBER.

0.0	0.0	0.0	0.0				
45.8	46.0	46.6	45.7				
62.2	62.5	63.4	62.1				
0.0	0.0	0.0	0.0				
36.0	36.1	36.7	35.9	744	740	267	64.1

LEMS/SOLUTIONS/COMMENTS

MODULE A WAS DOWN THE ENTIRE MONTH FOR ABSORBER LINER REPAIRS.

MODULE D WAS DOWN DURING JANUARY DUE TO A BOOSTER FAN OVERHAUL. MODULES B AND C ALSO EXPERIENCED FAN PROBLEMS DURING THE MONTH.

MODULES B AND C EXPERIENCED DAMPER PROBLEMS IN JANUARY.

0.0	0.0	0.0	0.0				
40.7	40.9	41.3	40.7				
57.5	57.8	58.3	57.5				
0.0	0.0	0.0	0.0				
32.7	32.9	33.2	32.7	672	668	220	67.5

LEMS/SOLUTIONS/COMMENTS

MODULES A AND C WERE DOWN DURING FEBRUARY FOR ABSORBER LINER REPAIRS.

MODULE B WAS DOWN DURING THE MONTH FOR REPAIRS ON THE INLET DAMPER.

MODULES B AND D WERE DOWN DURING FEBRUARY FOR BOOSTER FAN REPAIRS.

34.8	36.2	37.8	34.8
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COLORADO UTE ELECTRIC: CRAIG 2 (CONT.)

-----PERFORMANCE DATA-----									
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER BOILER HOURS	FGD HOURS	CAP. FACTOR
	B	49.4	51.4	53.6	49.4				
	C	0.0	0.0	0.0	0.0				
	D	0.0	0.0	0.0	0.0				
	SYSTEM	28.1	29.2	30.5	28.1		744	715	209 68.0

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE C WAS DOWN DURING MARCH FOR ABSORBER LINER REPAIRS.

4/83	A	42.2	85.0	97.4	42.2				
	B	0.0	0.0	0.0	0.0				
	C	0.0	0.0	0.0	0.0				
	D	0.0	0.0	0.0	0.0				
	SYSTEM	14.0	28.3	24.3	14.0		720	357	102 34.3

** PROBLEMS/SOLUTIONS/COMMENTS

ON APRIL 15, THE UNIT WAS TAKEN DOWN FOR AN ANNUAL OUTAGE.

MODULES B AND C WERE UNDERGOING LINER REPAIR WORK DURING THE MONTH.

MODULE D WAS DOWN IN APRIL AWAITING THE RETURN OF A BOOSTER FAN FROM THE MANUFACTURER.

5/83	A	35.1	48.0	54.4	35.1				
	B	0.0	0.0	0.0	0.0				
	C	0.0	0.0	0.0	0.0				
	D	0.0	0.0	0.0	0.0				
	SYSTEM	11.7	16.0	18.1	11.7		744	544	87 49.5

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS DOWN MOST OF MAY FOR AN ANNUAL OUTAGE.

6/83	A	70.1	70.6	72.7	70.1				
	B	9.0	7.9	8.2	7.9				
	C	65.8	66.3	68.3	65.8				
	D	0.0	0.0	0.0	0.0				
	SYSTEM	48.3	48.3	49.7	47.9		720	715	345 69.6

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE B WAS DOWN DURING MOST OF JUNE DUE TO PROBLEMS WITH A BOOSTER FAN BLADE PITCH CONTROL.

DAMPER PROBLEMS ALSO ACCOUNTED FOR THE MODULE B OUTAGE IN JUNE.

MODULE D WAS DOWN DURING JUNE AWAITING THE RETURN OF A BOOSTER FAN FROM THE MANUFACTURER.

7/83	A	72.6	72.7	73.2	72.6				
	B	92.2	37.4	37.7	37.4				
	C	49.9	52.7	53.1	52.6				
	D	0.0	0.0	0.0	0.0				
	SYSTEM	71.6	54.3	54.7	54.2		744	742	403 73.7

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE A WAS DOWN DURING PART OF JULY FOR MIST ELIMINATOR CLEANING.

MODULE C WAS DOWN DURING PART OF THE MONTH FOR RECYCLE PUMP REPAIRS.

MODULE D WAS OUT OF SERVICE DURING JULY AWAITING DELIVERY OF A BOOSTER FAN

JRVEY: JANUARY - DECEMBER 1988

ELECTRIC: CRAIG 2 (CONT.)

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

75.8	75.8	75.8	75.8				
12.0	88.1	88.0	88.0				
74.2	25.8	25.8	25.8				
0.0	0.0		0.0				
54.0	63.3	63.2	63.2		744	744	470

BLEMS/SOLUTIONS/COMMENTS

MODULE D WAS DOWN DURING AUGUST DUE TO BOOSTER FAN REPAIRS.

95.3	95.6	100.0	95.3				
43.1	57.1	59.9	56.9				
32.8	67.4	70.7	67.2				
0.0	0.0		0.0				
57.1	73.4	76.9	73.2		720	718	527 75.8

BLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD-RELATED OUTAGES WERE ENCOUNTERED DURING SEPTEMBER.

96.8	100.0	100.0	96.8				
94.4	0.8	0.8	0.8				
0.0	0.0		0.0				
0.0	0.0		0.0				
63.7	33.6	50.4	32.5		744	718	242 81.3
99.9		99.9	99.9				
89.9		89.9	89.9				
0.0		0.0	0.0				
0.0			0.0				
63.3		63.3	63.3		720		456

BLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING OCTOBER AND NOVEMBER 1983.

64.0	68.5	67.1	64.0				
72.2	77.3	75.7	72.2				
78.2	83.7	82.0	78.2				
0.0	0.0		0.0				
71.4	76.5	75.0	71.4		744	695	532 98.0

BLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED A UNIT TRIP ON DECEMBER 14 AND 15, 1983.

86.0	89.6	94.8	86.0				
72.8	75.9	80.3	72.8				
50.3	52.4	55.4	50.3				
0.0	0.0		0.0				
69.7	72.6	76.8	69.7		744	714	519

BLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE UNIT SUFFERED A UNIT-TRIP AND SPENT 10 HOURS OUT OF SERVICE.

THE UNIT LOST HOURS ON JUNE 27-29 DUE TO REPAIRS TO THE THICKENER.

696

744

COLORADO UTE ELECTRIC: CRAIG 2 (CONT.)

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

4/84 SYSTEM

720

** PROBLEMS/SOLUTIONS/COMMENTS

INFORMATION WAS UNAVAILABLE FOR THE PERIOD OF FEBRUARY THROUGH APRIL 1984.

5/84	A	50.7	77.6	77.6	41.0			
	B	51.8	98.1	98.1	51.8			
	C	0.0	0.0		0.0			
	D	0.0	0.0	0.0	0.0			
	SYSTEM	34.2	58.6	58.6	30.9	744	393	230

** PROBLEMS/SOLUTIONS/COMMENTS

THE RECYCLE TANK AGITATOR WAS OUT OF SERVICE DURING MAY.

THE MIST ELIMINATOR PAD ON MODULE C WAS CLEANED DURING MAY.

6/84	A	86.2	87.0	96.3	86.2			
	B	87.1	62.3	69.0	61.7			
	C	0.0	0.0		0.0			
	D	75.6	74.4	82.3	73.7			
	SYSTEM	83.0	74.6	82.5	73.8	720	713	532

7/84	A	91.7	98.4	100.0	90.5			
	B	86.7	94.3	100.0	86.7			
	C	0.0	0.0	0.0	0.0			
	D	91.8	99.9	100.0	91.8			
	SYSTEM	90.1	97.5	100.0	89.7	744	684	667

8/84	A	100.0	86.3	100.0	86.3			
	B	100.0	100.0	100.0	100.0			
	C	0.0	0.0		0.0			
	D	100.0	86.0	100.0	86.0			
	SYSTEM	100.0	90.8	100.0	90.8	744	744	675

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD-RELATED PROBLEMS WERE REPORTED DURING THE PERIOD OF JUNE THROUGH AUGUST.

9/84	A	93.3	89.0	100.0	89.0			
	B	98.6	98.6	100.0	98.6			
	C	0.0	0.0		0.0			
	D	95.3	91.1	100.0	91.1			
	SYSTEM	95.7	92.9	100.0	92.9	720	720	669

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED MODULE C WAS DOWN ALMOST ALL OF SEPTEMBER FOR MIST ELIMINATOR CLEANING AND THAT MODULE A REQUIRED SOME MINOR PIPING/PUMP REPAIRS

10/84	A	99.2	99.7	100.0	98.9			
	B	99.1	99.8	100.0	99.0			
	C	0.0	0.0		0.0			
	D	87.3	87.5	100.0	86.8			
	SYSTEM	95.2	95.7	100.0	94.9	744	738	706

SRVEY: JANUARY - DECEMBER 1988

ELECTRIC: CRAIG 2 (CONT.)

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

BLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT MODULE C REMAINED OUT OF SERVICE ALL OF OCTOBER FOR GENERAL CLEANING AND MAINTENANCE.

61.0	68.6	100.0	60.8			
87.9	88.6	100.0	78.5			
0.0	0.0	0.0	0.0			
88.3	88.6	100.0	78.5			
79.1	81.9	100.0	72.6	720	638	523

BLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE UNIT WAS DOWN FOR APPROXIMATELY 3 DAYS FOR AN UNSCHEDULED OUTAGE. THE UTILITY ALSO MENTIONED HAVING MECHANICAL AND ELECTRICAL PROBLEMS WITH SCRUBBER BOOSTER FAN, LUBE SET AND CAVITY BLOWERS PROBLEMS, AND WASH PUMP FAILURES.

95.2	96.7	100.0	95.2			
95.8	97.4	100.0	95.8			
0.0	0.0		0.0			
98.1	98.6	100.0	97.0			
96.4	97.6	100.0	96.0	744	732	714

BLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT MODULE C WAS UNAVAILABLE DUE TO GENERAL CLEANING AND MAINTENANCE OF MIST ELIMINATOR AND SLURRY HANDLING EQUIPMENT.

54.8	55.4	76.0	54.8			
89.9	90.8	100.0	89.9			
20.4	20.6	24.5	20.4			
89.9	90.8	100.0	89.9			
85.0	85.8	100.0	85.0	744	737	633

BLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT PLUGGED MIST ELIMINATOR PADS ON ALL FOUR MODULES ACCOUNTED FOR THE LOWER JANUARY DEPENDABILITY.

672

BLEMS/SOLUTIONS/COMMENTS

NO INFORMATION WAS AVAILABLE FROM THE UTILITY FOR THE MONTH OF FEBRUARY.

70.8	100.0	100.0	70.8			
0.0	0.0		0.0			
69.8	98.5	100.0	69.8			
25.6	36.1	99.0	25.6			
55.4	78.2	99.7	55.4	744	527	412

BLEMS/SOLUTIONS/COMMENTS

THE MAIN PLANT OUTAGE BEGAN ON MARCH 22ND AND EXTENDED THROUGH THE END OF THE MONTH.

0.0		0.0				
0.0		0.0				
0.0		0.0				
0.0		0.0				
0.0		0.0		720	0	0

COLORADO UTE ELECTRIC: CRAIG 2 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE FGD SYSTEM WAS OUT OF SERVICE FOR A SCHEDULED UNIT OUTAGE. NO FGD SYSTEM PROBLEMS WERE REPORTED.

5/85	A	71.5	88.3	99.9	68.5			
	B	33.5	43.1	100.0	33.4			
	C	0.0	0.0		0.0			
	D	78.2	57.2	99.8	44.4			
	SYSTEM	61.1	62.9	100.0	48.8	744	577	363

** PROBLEMS/SOLUTIONS/COMMENTS

A UNIT OUTAGE CONTINUED THROUGH THE MAY 1 TO MAY 6 PERIOD. EXCEPT WHERE OTHERWISE REPORTED THE MODULES WERE AVAILABLE BUT WERE NOT CALLED TO OPERATE DURING MODULAR OUTAGE PERIODS.

MUCH OF THE DOWNTIME ASSOCIATED WITH THE FGD SYSTEM MODULES WAS ATTRIBUTED TO BOOSTER FAN WORK BY THE UTILITY. DOWNTIMES RECORDED FOR MODULES A THROUGH C RESPECTIVELY WERE APPROXIMATELY 55, 351, AND 600 HOURS. NO FAN WORK WAS REPORTED FOR MODULE D.

OUTAGES REPORTED FOR MODULES A AND D ATTRIBUTED TO LIQUID SIDE EQUIPMENT INCLUDED ABOUT 14 HOURS FOR PUMP WORK ON MODULE A AND 16 HOURS ON MODULE D FOR PUMP AND OTHER RELATED REPAIR WORK.

6/85	A	97.2	90.6	99.9	87.3			
	B	97.2	95.7	99.9	92.3			
	C	0.0	0.0	0.0	0.0			
	D	91.5	68.1	99.9	65.6			
	SYSTEM	95.3	84.8	99.9	81.7	720	694	589

** PROBLEMS/SOLUTIONS/COMMENTS

ALL MODULE DOWNTIME, EXCEPT WHERE OTHERWISE REPORTED, WAS REPORTED AS AVAILABLE HOURS THE MODULES WERE NOT CALLED INTO SERVICE.

APPROXIMATELY 20 HOURS OF OUTAGE TIME REPORTED FOR MODULE A WERE ATTRIBUTED TO DAMPER PROBLEMS. NO OTHER PROBLEMS WERE REPORTED FOR MODULE A.

MODULE D LOGGED 61 HOURS OF DOWNTIME ATTRIBUTED TO RECYCLE/WASH PUMP MAINTENANCE/REPAIRS.

PROBLEMS ASSOCIATED WITH MODULE B INCLUDED COOLING TOWER BLOWDOWN MAKE UP WATER SYSTEM AND OTHER LIQUID SIDE EQUIPMENT TALLING 10 HOURS OF OUTAGE TIME.

MODULE C WAS OUT OF SERVICE THROUGH THE ENTIRE 720 HOUR PERIOD WITH BOOSTER FAN PROBLEMS.

7/85	A	100.0	100.0	100.0	99.5			
	B	100.0	100.0	100.0	99.5			
	C	0.0	0.0		0.0			
	D	98.7	88.0	100.0	87.5			
	SYSTEM	99.6	96.0	100.0	95.5	744	740	710

** PROBLEMS/SOLUTIONS/COMMENTS

MODULAR DOWNTIME EXCEPT WHERE OTHERWISE NOTED WAS ATTRIBUTED TO PERIODS THE ABSORBERS WERE AVAILABLE BUT NOT CALLED INTO SERVICE.

MODULE D WAS OUT OF SERVICE 10 HOURS FOR RECYCLE PUMP REPAIR/MAINTENANCE

URVEY: JANUARY - DECEMBER 1988

ELECTRIC: CRAIG 2 (CONT.)

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

WORK.

THE UTILITY REPORTED THAT MODULE C WAS OUT OF SERVICE FOR THE ENTIRE 744 HOUR PERIOD FOR BOOSTER FAN REPAIRS.

97.2	93.6	99.9	85.9			
96.6	71.6	71.7	65.8			
0.0	0.0		0.0			
88.0	85.4	99.9	78.4			
94.0	83.5	90.5	76.7	744	683	571

BLEMS/SOLUTIONS/COMMENTS

RECYCLE/WASH PUMP REPAIR/MAINTENANCE CAUSED 16 HOURS OF OUTAGE TIME ON MODULE D DURING THE MONTH.

ONE OF FOUR MODULES WAS UNAVAILABLE THE ENTIRE MONTH. THE UTILITY REPORTED THAT SO2 READINGS INDICATED THAT FOUR MODULES WERE REQUIRED ON NINE DAYS. EXCEPT WHERE OTHERWISE NOTED, MODULAR OUTAGE HOURS OCCURRED DURING PERIODS WHEN MODULES WERE AVAILABLE BUT NOT CALLED TO OPERATE.

THE UTILITY REPORTED THAT MODULE B WAS DOWN FOR 2 HOURS WITH DAMPER PROBLEMS.

BOOSTER FAN PROBLEMS FORCED MODULE C OUT OF SERVICE FOR THE ENTIRE 744 HOUR PERIOD.

MIST ELIMINATOR REPAIR/MAINTENANCE REQUIRED OUTAGE TIMES OF 21, 23 AND 73 HOURS RESPECTIVELY FOR MODULES A, B AND D.

98.3	97.6	97.6	96.9			
89.2	81.0	89.2	80.4			
0.0	0.0		0.0			
94.4	94.4	98.1	93.8			
94.0	91.0	95.0	90.4	720	715	651

BLEMS/SOLUTIONS/COMMENTS

MODULES A, B AND D EXPERIENCED REAGENT PREPARATION PROBLEMS RESULTING IN DOWNTIME OF 8, 32 AND 30 HOURS RESPECTIVELY.

THE UTILITY REPORTED RECYCLE PUMP PROBLEMS ON MODULES A AND C DURING THE MONTH. MODULE A WAS DOWN FOR 2 HOURS AND MODULE C WAS OUT OF SERVICE FOR 46 HOURS.

BOTH MODULES A AND C HAD BOOSTER FAN PROBLEMS. MODULE A WAS DOWN FOR 2 HOURS. HOWEVER, MODULE C WAS OUT OF SERVICE THE ENTIRE 720 HOUR PERIOD.

MIST ELIMINATOR REPAIR/MAINTENANCE CAUSED MODULE D TO BE TAKEN OUT OF SERVICE FOR 10 HOURS DURING THE MONTH.

MODULAR OUTAGE HOURS WHERE NOT OTHERWISE NOTED WERE ATTRIBUTED TO PERIODS WHERE MODULES WERE AVAILABLE BUT NOT CALLED TO OPERATE.

94.1	93.5	96.8	92.2			
96.8	84.7	86.4	83.6			
0.0	0.0		0.0			
100.0	100.0	98.7	98.7			
97.0	92.7	93.9	91.5	744	734	681

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

COLORADO UTE ELECTRIC: CRAIG 2 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE C WAS OUT OF SERVICE THE ENTIRE 744 HOUR PERIOD FOR BOOSTER FAN REPAIR WORK.

EXCEPT WHERE OTHERWISE REPORTED MODULAR OUTAGE HOURS FOR OCTOBER WERE HOURS THE MODULES WERE AVAILABLE BUT NOT CALLED TO OPERATE.

MODULES A AND B EXPERIENCED RECYCLE/WASH PUMP PROBLEMS/MAINTENANCE ACCOUNTING FOR 44 AND 8 HOURS OF DOWNTIME RESPECTIVELY.

REAGENT PREPARATION PROBLEMS CAUSED 16 HOURS OF DOWNTIME ON MODULE B.

11/85	A	29.5	31.7	35.4	29.5			
	B	79.7	78.5	87.6	73.0			
	C	0.0	0.0	0.0	0.0			
	D	79.7	77.6	86.7	72.2			
	SYSTEM	63.0	62.6	69.9	58.3	720	670	419

** PROBLEMS/SOLUTIONS/COMMENTS

BOOSTER FAN WORK WAS UNDERTAKEN ON MODULES B, C AND D DURING THE ABSORBER OUTLET DAMPER INSTALLATION WORK. MODULE C WAS OUT OF SERVICE FOR MOST OF THE MONTH FOR FAN PROBLEMS.

THE UTILITY REPORTED THAT THE FGD SYSTEM WAS REMOVED FROM SERVICE BEGINNING NOVEMBER 26 AND EXTENDING THROUGH THE END OF THE MONTH FOR ABSORBER OUTLET DAMPER INSTALLATION WORK.

RECYCLE/WASH PUMP PROBLEMS CAUSED 385 HOURS OF OUTAGE TIME ON MODULE A.

REAGENT PREPARATION SYSTEM PROBLEM ACCOUNTED FOR ROUGHLY 3, 5 AND 3 HOURS OF DOWNTIME FOR MODULES A, B AND D RESPECTIVELY.

ROUGHLY 21 AND 8 HOURS OF DOWNTIME RESPECTIVELY FOR MODULES B AND D WERE ATTRIBUTED TO GAS SIDE EQUIPMENT REPAIR WORK NOT SPECIFIED BY THE UTILITY.

12/85	A	31.9	28.4	31.7	28.4			
	B	37.0	25.6	28.6	25.6			
	C	0.0	0.0		0.0			
	D	29.8	29.8	33.2	29.8			
	SYSTEM	32.9	27.9	31.2	27.9	744	744	208

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT 288 HOURS OF OUTAGE TIME OCCURRED ON MODULE C FOR UNSPECIFIED GAS SIDE EQUIPMENT REPAIR WORK.

MODULE D WAS DOWN FOR ROUGHLY 65 HOURS WITH RECYCLE/WASH PUMP REPAIR/MAINTENANCE.

THE UTILITY REPORTED THAT THE FGD SYSTEM WAS OUT OF SERVICE FROM DECEMBER 1 THROUGH 20 FOR INSTALLATION OF MODULE OUTLET ISOLATION DAMPERS.

MODULE A EXPERIENCED 39 HOURS OF OUTAGE TIME ATTRIBUTED TO THE LIQUID SIDE EQUIPMENT BY THE UTILITY DURING DECEMBER.

EXCEPT WHERE OTHERWISE INDICATED MODULE OUTAGE HOURS LOGGED WERE HOURS MODULES WERE AVAILABLE BUT NOT CALLED TO OPERATE DURING THE MONTH.

1/86	A	39.8	41.4	48.9	39.7			
	B	87.8	83.0	98.0	79.5			

ILITY FGD SURVEY: JANUARY - DECEMBER 1988

ORADO UTE ELECTRIC: CRAIG 2 (CONT.)

-----PERFORMANCE DATA-----									
MOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER BOILER HOURS	FGD CAP. HOURS FACTOR
	C	0.0	0.0		0.0				
	D	75.3	73.4	86.7	70.3				
	SYSTEM	67.6	65.9	77.9	63.2			744 713	470

** PROBLEMS/SOLUTIONS/COMMENTS

THE LOWER AVAILABILITY DURING THE MONTH RESULTED FROM AN EXTENDED 2-MODULE MAINTENANCE OUTAGE.

/86	A	0.0	0.0		0.0				
	B	100.0	100.0	100.0	100.0				
	C	52.6	51.8	100.0	51.8				
	D	83.2	50.6	93.4	50.6				
	SYSTEM	78.6	67.5	97.8	67.5			672 672	454 0.0

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE A WAS OUT OF SERVICE THE ENTIRE MONTH OF FEBRUARY AS A RESULT OF LIQUID-SIDE ABSORBER EQUIPMENT PROBLEMS.

RECYCLE PUMP/WASH PUMP PROBLEMS SHUT DOWN MODULE C FOR 12 DAYS AND WERE ALSO A PROBLEM ON MODULE D.

MINOR BOOSTER FAN PROBLEMS WERE REPORTED ON MODULE C AND WERE A CHRONIC PROBLEM FOR MODULE D.

/86	A	0.0	0.0		0.0				
	B	22.6	43.5	100.0	22.6				
	C	54.8	100.0	100.0	51.9				
	D	30.0	4.1	16.8	2.2				
	SYSTEM	35.8	49.2	72.3	25.6			744 386	190 0.0

** PROBLEMS/SOLUTIONS/COMMENTS

EXCEPT FOR A 13-DAY UNIT OUTAGE, MODULE A WAS OUT OF SERVICE THE ENTIRE MONTH OF MARCH FOR LIQUID SIDE ABSORBER EQUIPMENT PROBLEMS. MODULE B EXPERIENCED SIMILAR PROBLEMS LATE IN THE MONTH.

MODULE D EXPERIENCED BOOSTER FAN PROBLEMS EARLY IN THE MONTH OF MARCH.

/86	A	65.4	61.7	100.0	61.0				
	B	0.0	0.0		0.0				
	C	77.3	77.1	100.0	76.2				
	D	100.0	62.4	100.0	61.7				
	SYSTEM	80.9	67.0	100.0	66.3			720 712	477

** PROBLEMS/SOLUTIONS/COMMENTS

LIQUID SIDE ABSORBER EQUIPMENT PROBLEMS SHUT DOWN MODULE B FOR THE ENTIRE

MONTH OF APRIL. MODULE C ALSO HAD ABSORBER OPERATIONAL TROUBLE.

/86	A	100.0	95.9	100.0	95.9				
	B	0.0	0.0		0.0				
	C	93.7	53.8	100.0	53.8				
	D	98.1	57.7	100.0	57.7				
	SYSTEM	97.3	69.1	100.0	69.1			744 744	514

** PROBLEMS/SOLUTIONS/COMMENTS

A PROBLEM WITH LIMESTONE PREPARATION EQUIPMENT KEPT MODULES C AND D DOWN FOR A SHORT TIME.

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

COLORADO UTE ELECTRIC: CRAIG 2 (CONT.)

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

MODULE B REMAINED DOWN THE ENTIRE MONTH OF MAY, THIS TIME EXPERIENCING
 ABSORBER LIQUID-SIDE PIPING PROBLEMS, AS DID MODULE C EARLY IN THE MONTH.

THE UTILITY REPORTED MIST ELIMINATOR PLUGGING PROBLEMS ON MODULE C DURING
 THE MIDDLE OF JUNE.

PIPING PROBLEMS CONTINUED TO KEEP MODULE B OUT OF SERVICE ALL MONTH.

MODULE A WAS AVAILABLE THE ENTIRE MONTH OF JUNE EXCEPT FOR A BRIEF
 PROBLEM WITH ABSORBER GAS SIDE EQUIPMENT.

6/86	A	99.7	99.2	100.0	93.9			
	B	0.0	0.0		0.0			
	C	74.0	70.9	100.0	67.1			
	D	100.0	30.5	100.0	28.9			
	SYSTEM	91.2	66.8	100.0	63.3	720	682	456

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE B REMAINED DOWN DURING THE MONTH OF JULY BECAUSE OF
 CONTINUING PROBLEMS WITH THE LIQUID-SIDE ABSORBER EQUIPMENT.

WITH THE EXCEPTION OF 2 HOURS FOR BOOSTER FAN PROBLEMS, MODULE A WAS
 TROUBLE-FREE ALL MONTH.

THE UTILITY REPORTED MODULE C WAS SHUT DOWN MUCH OF THE MONTH FOR RECYCLE
 /WASH PUMP TROUBLE.

7/86	A	99.7	99.7	100.0	99.7			
	B	0.0	0.0		0.0			
	C	41.5	36.4	100.0	36.4			
	D	100.0	76.2	100.0	76.2			
	SYSTEM	80.4	70.8	100.0	70.8	744	744	527

8/86	A	53.8	43.5	100.0	35.6			
	B	0.0	0.0		0.0			
	C	77.3	88.0	100.0	72.0			
	D	99.5	73.7	100.0	60.3			
	SYSTEM	76.9	68.4	100.0	55.9	744	609	416

** PROBLEMS/SOLUTIONS/COMMENTS

MIST ELIMINATOR PLUGGING CONTRIBUTED TO THE SHUT-DOWN OF MODULE A AND
 ALSO CAUSED PROBLEMS ON MODULE B LATER IN AUGUST.

MODULES C AND D EXPERIENCED SCATTERED BOOSTER FAN PROBLEMS DURING
 THE MONTH.

BOTH MODULES A AND D EXPERIENCED MINOR RECYCLE/WASH PUMP TROUBLE DURING
 AUGUST.

MODULE B WAS OPERATING THE LAST FEW DAYS IN AUGUST AFTER EXPERIENCING
 BOOSTER FAN TROUBLE ALL YEAR.

LIQUID SIDE ABSORBER EQUIPMENT PROBLEMS CAUSED SHUTDOWNS AT MODULES A, B,
 AND C DURING THE MONTH OF AUGUST. MODULE B REMAINED DOWN ALL MONTH;
 MODULE A WAS DOWN NEARLY HALF THE MONTH.

9/86	A	99.1	88.6	100.0	66.3			
	B	0.0	0.0		0.0			
	C	83.7	66.7	100.0	49.9			
	D	100.0	69.2	100.0	51.8			
	SYSTEM	94.3	74.9	100.0	56.0	720	539	404

ORADO UTE ELECTRIC: CRAIG 2 (CONT.)

★★ PROBLEMS/SOLUTIONS/COMMENTS

MODULE B CONTINUED TO REMAIN DOWN, THE ENTIRE MONTH OF SEPTEMBER, NOW EXPERIENCING TROUBLE WITH THE GAS-SIDE ABSORBER EQUIPMENT. MODULE A WAS DOWN FOR A FEW HOURS ONE DAY WITH LIQUID-SIDE ABSORBER EQUIPMENT.

★★ PROBLEMS/SOLUTIONS/COMMENTS

MODULE A WAS DOWN FOR MOST OF THE MONTH WITH BOOSTER FAN TROUBLE; MODULE B WAS OUT A FEW HOURS WITH THE SAME PROBLEM.

★★ PROBLEMS/SOLUTIONS/COMMENTS

MODULE A WAS DOWN ALL MONTH WITH A CONTINUING BOOSTER FAN PROBLEM.

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UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

COLORADO UTE ELECTRIC: CRAIG 2 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE D EXPERIENCED BOTH GAS-SIDE AND LIQUID-SIDE ABSORBER EQUIPMENT TROUBLE BRIEFLY IN DECEMBER.

PLUGGING IN THE MIST ELIMINATOR KEPT MODULES B, C, AND D OUT OF SERVICE FOR A FEW DAYS EACH DURING THE MONTH OF DECEMBER.

MODULE A CONTINUED TO HAVE BOOSTER FAN PROBLEMS AND WAS OUT OF SERVICE THE ENTIRE MONTH OF DECEMBER.

1/87	A	38.7	38.7	100.0	38.7			
	B	100.0	93.5	100.0	93.5			
	C	100.0	100.0	100.0	100.0			
	D	100.0	57.0	100.0	57.0			
	SYSTEM	100.0	96.4	100.0	96.4	744	744	717

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE A WAS OUT OF SERVICE FOR 456 HOURS IN JANUARY DUE TO BOOSTER FAN PROBLEMS.

2/87	A	94.6	76.5	98.9	76.5			
	B	100.0	71.1	99.5	71.1			
	C	53.1	51.0	97.9	51.0			
	D	100.0	15.1	65.2	15.1			
	SYSTEM	100.0	71.2	100.0	71.2	672	672	479

** PROBLEMS/SOLUTIONS/COMMENTS

RECYCLE/WASH PUMP PROBLEMS FORCED MODULE A OUT OF SERVICE FOR 36.5 HOURS AND MODULE C FOR 6.1 HOURS.

MIST ELIMINATOR PROBLEMS FORCED MODULE C OUT OF SERVICE FOR 10 DAYS IN FEBRUARY.

MODULE C EXPERIENCED DAMPER PROBLEMS AT THE END OF FEBRUARY, FORCING IT OUT OF SERVICE FOR 3 DAYS.

3/87	A	99.8	99.8	100.0	99.8			
	B	99.2	62.0	83.1	62.0			
	C	93.2	90.6	100.0	90.6			
	D	0.0	0.0		0.0			
	SYSTEM	97.4	84.1	94.4	84.1	744	744	626

** PROBLEMS/SOLUTIONS/COMMENTS

RECYCLE/WASH PUMP PROBLEMS CAUSED MODULES A, B, AND C TO BE OUT OF SERVICE FOR A FEW HOURS DURING THE MONTH.

MODULE D ENCOUNTERED MIST ELIMINATOR PROBLEMS AND WAS OUT OF SERVICE THE ENTIRE MONTH.

MODULE C CONTINUED TO EXPERIENCE DAMPER PROBLEMS FOR 2 MORE DAYS IN MARCH.

4/87	A	33.3	100.0	100.0	32.9			
	B	33.3	100.0	100.0	32.9			
	C	1.9	5.9	6.2	1.9			
	D	0.0	0.0		0.0			
	SYSTEM	22.9	68.6	68.7	22.6	720	237	163

ILITY FGD SURVEY: JANUARY - DECEMBER 1988

ORADO UTE ELECTRIC: CRAIG 2 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

UNSPECIFIED LIQUID-SIDE EQUIPMENT PROBLEMS FORCED MODULE C OUT OF SERVICE FOR THE FIRST 10 DAYS OF THE MONTH.

UNSPECIFIED GAS-SIDE EQUIPMENT PROBLEMS FORCED MODULE D OUT OF SERVICE FOR 10 DAYS IN APRIL.

THE UNIT WAS DOWN FOR A SCHEDULED OUTAGE BEGINNING APRIL 10, AND CONTINUING THROUGH THE MONTH.

/87	A	76.7	84.9	100.0	60.2			
	B	77.4	61.8	100.0	43.8			
	C	0.0	0.0		0.0			
	D	77.4	12.5	100.0	8.8			
	SYSTEM	77.2	53.0	100.0	37.6	744	528	280

** PROBLEMS/SOLUTIONS/COMMENTS

UNSPECIFIED GAS-SIDE EQUIPMENT PROBLEMS CAUSED MODULE A TO BE DOWN FOR A FEW HOURS IN MAY.

THE ANNUAL SCHEDULED OUTAGE CONTINUED THROUGH MAY 7, 1987.

UNSPECIFIED LIQUID-SIDE EQUIPMENT PROBLEMS FORCED MODULE C OUT OF SERVICE AFTER THE SCHEDULED OUTAGE TO THE END OF THE MONTH.

RECYCLE/WASH PUMP PROBLEMS CAUSED MODULE B TO BE DOWN FOR PART OF ONE DAY IN MAY.

/87	A	100.0	68.0	100.0	55.3			
	B	100.0	94.7	100.0	77.0			
	C	0.0	0.0		0.0			
	D	100.0	78.1	100.0	63.5			
	SYSTEM	100.0	80.3	100.0	65.3	720	586	470

** PROBLEMS/SOLUTIONS/COMMENTS

UNSPECIFIED LIQUID-SIDE EQUIPMENT PROBLEMS CONTINUED TO KEEP MODULE C OUT OF SERVICE THROUGHOUT JUNE.

'/87	A	100.0	82.5	100.0	67.7			
	B	98.6	87.3	100.0	71.7			
	C	0.0	0.0		0.0			
	D	100.0	76.1	100.0	62.5			
	SYSTEM	99.5	81.9	100.0	67.3	744	611	501

** PROBLEMS/SOLUTIONS/COMMENTS

RECYCLE/WASH PUMP PROBLEMS FORCED MODULE B OUT OF SERVICE FOR A FEW HOURS IN JULY.

MODULE C WAS OUT OF SERVICE THE ENTIRE MONTH DUE TO GAS-SIDE ABSORBER EQUIPMENT PROBLEMS.

3/87	A	76.7	76.7	100.0	76.7			
	B	100.0	84.5	100.0	84.5			
	C	0.0	0.0		0.0			
	D	56.3	55.8	100.0	55.8			
	SYSTEM	77.7	72.3	100.0	72.3	744	744	538

COLORADO UTE ELECTRIC: CRAIG 2 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE D WAS SHUT DOWN FOR 328.8 HOURS DURING AUGUST DUE TO MIST
 ELIMINATOR PROBLEMS.

BOOSTER FAN PROBLEMS CAUSED MODULE A TO BE SHUT DOWN FOR A FEW HOURS.

LIQUID-SIDE ABSORBER PROBLEMS FORCED MODULE A TO BE OUT OF SERVICE
 FOR 8 DAYS AND CAUSED MODULE C TO BE DOWN THE ENTIRE MONTH.

9/87 SYSTEM

720

** PROBLEMS/SOLUTIONS/COMMENTS

NO INFORMATION WAS AVAILABLE ON THIS UNIT FOR SEPTEMBER 1987.

10/87	A	100.0	100.0	100.0	93.1			
	B	41.9	0.0		0.0			
	C	61.3	0.0		0.0			
	D	100.0	99.9	100.0	93.0			
	SYSTEM	100.0	66.6	100.0	62.1	744	693	462

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE C WAS SHUT DOWN IN OCTOBER DUE TO LIQUID-SIDE ABSORBER EQUIPMENT
 PROBLEMS.

MODULE B WAS OUT OF SERVICE FOR 15 DAYS IN OCTOBER DUE TO MIST ELIMINATOR
 TROUBLE.

11/87	A	54.7	54.7	100.0	54.7			
	B	0.0	0.0		0.0			
	C	100.0	68.9	100.0	68.9			
	D	77.9	77.9	100.0	77.9			
	SYSTEM	77.5	67.2	100.0	67.2	720	720	484

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE B WAS OFF-LINE FOR 1 DAY IN NOVEMBER DUE TO DAMPER PROBLEMS.

MIST ELIMINATOR TROUBLE CAUSED MODULE A TO BE OUT OF SERVICE FOR 14 DAYS,
 MODULE B FOR 11 DAYS, AND MODULE D FOR 7 DAYS DURING THE MONTH.

UNSPECIFIED GAS-SIDE EQUIPMENT PROBLEMS CAUSED MODULE B TO BE OUT OF
 SERVICE FOR 2 DAYS.

INFORMATION WAS UNAVAILABLE FOR THE MONTHS OF SEPTEMBER
 TO NOVEMBER 1987.

12/87	A	97.8	91.1	100.0	75.7			
	B	0.0	0.0		0.0			
	C	98.8	83.2	100.0	69.1			
	D	100.0	89.7	100.0	74.5			
	SYSTEM	98.9	88.0	100.0	73.1	744	618	544

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE B WAS SHUT DOWN THE ENTIRE MONTH DUE TO GAS DAMPER PROBLEM

UNSPECIFIED GAS-SIDE ABSORBER EQUIPMENT CAUSED MODULES A AND C TO BE SHUT
 DOWN FOR A FEW HOURS IN DECEMBER.

1/88	A	100.0	96.1	96.1	96.1			
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UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

COLORADO UTE ELECTRIC: CRAIG 2 (CONT.)

-----PERFORMANCE DATA-----									
MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
B	0.0	0.0		0.0					
C	94.2	94.2	97.6	94.2					
D	97.4	94.0	96.5	94.0					
SYSTEM	97.2	94.8	96.7	94.8		744	744	705	

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT MODULE B WAS SHUT DOWN FOR THE ENTIRE MONTH DUE TO GAS DAMPER PROBLEMS.

MODULE D WAS OFF-LINE 19 HOURS DUE TO VARIOUS PROBLEMS WITH GAS HANDLING EQUIPMENT.

MODULE C WAS OFF-LINE FOR 43 HOURS DUE TO MIST ELIMINATOR REPAIRS.

/88	A	41.1	39.4	100.0	39.4				
	B	62.1	60.3	100.0	60.3				
	C	100.0	100.0	100.0	100.0				
	D	100.0	11.7	100.0	11.7				
	SYSTEM	100.0	70.5	100.0	70.5	696	696	491	

** PROBLEMS/SOLUTIONS/COMMENTS

UNSPECIFIED GAS-SIDE EQUIPMENT PROBLEMS SHUT DOWN MODULE B FOR 264 HOURS IN FEBRUARY.

THE UTILITY REPORTED 410 HOURS OF DOWNTIME FOR MODULE A DUE TO MIST ELIMINATOR AND BOOSTER FAN PROBLEMS.

/88	A	0.0	0.0		0.0				
	B	33.7	60.9	100.0	27.0				
	C	45.2	99.7	100.0	44.2				
	D	45.2	42.6	100.0	18.9				
	SYSTEM	41.4	67.7	100.0	30.0	744	330	223	

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED 312 HOURS OF DOWNTIME FOR MODULE A DUE TO MIST ELIMINATOR PROBLEMS.

MODULE B WAS OFF-LINE FOR 61 HOURS DURING THE MONTH OF MARCH DUE TO RECYCLE PUMP PROBLEMS.

THE UTILITY REPORTED THAT THE UNIT WAS SHUT DOWN FROM MARCH 11 THROUGH MARCH 28 FOR AN ANNUAL OUTAGE.

/88	SYSTEM					720			
-----	--------	--	--	--	--	-----	--	--	--

/88	A	0.7	0.0		0.0				
	B	80.0	52.1	71.9	47.1				
	C	89.1	77.5	100.0	70.0				
	D	97.6	93.0	100.0	84.0				
	SYSTEM	89.2	74.2	90.6	67.0	744	672	499	75.0

** PROBLEMS/SOLUTIONS/COMMENTS

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

5/88	A	98.9	68.6	100.0	61.0				
	B	100.0	31.3	100.0	27.8				
	C	63.1	59.9	100.0	53.2				
	D	100.0	66.2	100.0	58.9				
	SYSTEM	100.0	75.3	100.0	67.0	720	640	482	

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

COLORADO UTE ELECTRIC: CRAIG 2 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE C WAS OFF-LINE 266 HOURS IN JUNE DUE TO MIST ELIMINATOR PROBLEMS.

MODULE A WAS OFF-LINE 8 HOURS IN JUNE DUE TO BOOSTER FAN PROBLEMS.

7/88	A	96.6	95.5	100.0	88.6			
	B	84.5	7.0	100.0	6.5			
	C	78.4	81.7	100.0	75.8			
	D	97.4	55.3	100.0	51.3			
	SYSTEM	100.0	79.8	100.0	74.1	744	690	551

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED 96 HOURS OF DOWNTIME FOR MODULE B AND 144 HOURS FOR MODULE C DUE TO MIST ELIMINATOR PROBLEMS.

MODULES A,B AND D WERE OFF-LINE 25,38 AND 19 HOURS RESPECTIVELY, IN JULY DUE TO BOOSTER FAN PROBLEMS.

8/88	SYSTEM					774		
9/88	A	0.0	0.0		0.0			
	B	63.8	48.8	100.0	48.0			
	C	100.0	100.0	100.0	98.3			
	D	100.0	100.0	100.0	98.3			
	SYSTEM	87.9	82.9	100.0	81.6	720	708	587

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE B WAS OFF-LINE FOR 261 HOURS IN SEPTEMBER DUE TO MIST ELIMINATOR AND SLURRY PIPING PROBLEMS.

THE UTILITY REPORTED THAT MODULE A WAS OFF-LINE THE ENTIRE MONTH OF SEPTEMBER DUE TO BOOSTER FAN REPAIRS.

10/88	A	0.0	0.0		0.0			
	B	79.2	76.4	100.0	66.7			
	C	85.0	71.7	100.0	62.6			
	D	51.0	58.4	100.0	50.9			
	SYSTEM	71.8	68.8	100.0	60.1	744	649	447

** PROBLEMS/SOLUTIONS/COMMENTS

MODULES B,C AND D WERE OFF-LINE FOR 144,39 AND 364 HOURS RESPECTIVELY, IN OCTOBER DUE TO MIST ELIMINATOR PROBLEMS.

THE UTILITY REPORTED THAT MODULE A WAS OFF-LINE THE ENTIRE MONTH OF OCTOBER DUE TO BOOSTER FAN REPAIRS.

THE UTILITY REPORTED 11 HOURS OF DOWNTIME FOR MODULE B AND 72 HOURS FOR MODULE C DUE TO MIST ELIMINATOR PROBLEMS.

11/88	A	0.0	0.0		0.0			
	B	100.0	100.0	100.0	100.0			
	C	100.0	69.2	100.0	69.2			
	D	53.3	39.3	100.0	39.3			
	SYSTEM	84.4	69.5	100.0	69.5	720	720	500

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

COLORADO UTE ELECTRIC: CRAIG 2 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT MODULE A WAS OFF-LINE THE ENTIRE MONTH OF NOVEMBER DUE TO BOOSTER FAN REPAIRS.

MODULE D WAS OFF-LINE FOR 96 HOURS IN NOVEMBER DUE TO MIST ELIMINATOR PROBLEMS.

MODULE D WAS OFF-LINE FOR 240 HOURS IN NOVEMBER DUE TO SLURRY PIPING PROBLEMS.

/88	A	0.0	0.0		0.0			
	B	96.5	94.8	100.0	94.8			
	C	36.2	16.5	100.0	16.5			
	D	85.0	83.8	100.0	83.8			
	SYSTEM	72.5	65.0	100.0	65.0	744	744	484

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT MODULE A WAS OFF-LINE THE ENTIRE MONTH OF DECEMBER DUE TO ID BOOSTER FAN PROBLEMS.

MODULE B WAS OFF-LINE 26 HOURS IN DECEMBER DUE TO MIST ELIMINATOR PROBLEMS.

MODULE D WAS OFF-LINE 112 HOURS IN DECEMBER DUE TO BOOSTER FAN REPAIRS.

MODULE C WAS SHUT DOWN IN DECEMBER FOR 410 HOURS FOR UNSPECIFIED GAS-SIDE EQUIPMENT PROBLEMS AND 144 HOURS DUE TO MIST ELIMINATOR REPAIRS.

SECTION 13
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

MPANY NAME	COLORADO UTE ELECTRIC	
ANT NAME	CRAIG	
IT NUMBER	3	
TY	CRAIG	
ATE	COLORADO	
GULATORY CLASSIFICATION	C	
RTICULATE EMISSION LIMITATION - NG/J	13.	(0.030 LB/MMBTU)
2 EMISSION LIMITATION - NG/J	86.	(0.200 LB/MMBTU)
X EMISSION LIMITATION - NG/J	*****	(***** LB/MMBTU)
T PLANT GENERATING CAPACITY - MW	900	
OSS UNIT GENERATING CAPACITY - MW	427	
T UNIT GENERATING CAPACITY W/FGD - MW	408	
T UNIT GENERATING CAPACITY WO/FGD - MW	409	
UIVALENT SCRUBBED CAPACITY - MW	427	
* UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	BABCOCK & WILCOX	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	722.29	(1530600 ACFM)
BOILER FLUE GAS TEMPERATURE - C	*****	(**** F)
STACK HEIGHT - M	183.	(600 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	*****	(***** FT)
* FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	SUBBITUMINOUS	
AVERAGE HEAT CONTENT - J/G	23260.	(10000 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		9100-10300
AVERAGE ASH CONTENT - %	8.00	
RANGE ASH CONTENT - %	10.0-12.0	
AVERAGE MOISTURE CONTENT - %	14.00	
RANGE MOISTURE CONTENT - %	10.0-12.0	
AVERAGE SULFUR CONTENT - %	0.45	
RANGE SULFUR CONTENT - %	0.4-0.5	
AVERAGE CHLORIDE CONTENT - %	0.10	
RANGE CHLORIDE CONTENT - %	0.05-0.10	
* PARTICLE CONTROL		
* FABRIC FILTER		
NUMBER	1	
PRESSURE DROP - KPA	1.5	(6.0 IN-H2O)
TYPICAL GAS/CLOTH RATIO - M/MIN	0.7	(2.3 FT/MIN)
** 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	SPRAY DRYING	
PROCESS TYPE	LIME/SPRAY DRYING	
SYSTEM SUPPLIER	BABCOCK & WILCOX	
A-E FIRM	STANLEY CONSULTANTS	
DEVELOPMENT LEVEL	FULL SCALE	
NEW/RETROFIT	NEW	
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.80	
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	85.00	

COLORADO UTE ELECTRIC: CRAIG 3 (CONT.)

ENERGY CONSUMPTION - %	0.2	
CURRENT STATUS	1	
COMMERCIAL START-UP	2/1985	
INITIAL START-UP	6/1984	
CONTRACT AWARDED	4/1980	
** DESIGN AND OPERATING PARAMETERS		
DESIGN COAL SULFUR CONTENT - %	0.96	
DESIGN CHLORIDE CONTENT - %	*****	
** QUENCHER/PRESATURATOR		
CONSTRUCTION MATERIAL GENERIC TYPE	NR	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR	
** ABSORBER		
NUMBER	4	
GENERIC TYPE	SPRAY DRYER	
SPECIFIC TYPE	NR	
TRADE NAME/COMMON TYPE	HYDRAULIC PRESSURE NOZZLE	
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	
NUMBER OF CONTACTING ZONES	2	
INLET GAS FLOW - CU. M/S	528.29	(1119490 ACFM)
INLET GAS TEMPERATURE - C	83.3	(182 F)
SO2 REMOVAL EFFICIENCY - %	90.0	
PARTICLE REMOVAL EFFICIENCY - %	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		
NUMBER	4	
NUMBER OF SPARES	1	
GENERIC TYPE	INDIRECT HOT AIR	
SPECIFIC TYPE	STEAM	
TRADE NAME/COMMON TYPE	NR	
PERCENT GAS BYPASSED - AVG	0.0	
CONSTRUCTION MATERIAL GENERIC TYPE	NR	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR	
** FANS		
DESIGN	NR	
FUNCTION	NR	
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	

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

COLORADO UTE ELECTRIC: CRAIG 3 (CONT.)

* REAGENT PREPARATION EQUIPMENT
 FUNCTION SLAKER
 DEVICE NR
 DEVICE TYPE NR

* TANKS
 SERVICE NUMBER

 NR *****

* PUMPS
 SERVICE NUMBER

 NR *****

* SOLIDS CONCENTRATING/DEWATERING
 DEVICE N/A

* SALEABLE BYPRODUCTS
 NATURE NONE
 DISPOSITION N/A

* SLUDGE

* TREATMENT
 METHOD UNSTABILIZED
 DEVICE N/A
 PROPRIETARY PROCESS N/A

* DISPOSAL
 NATURE FINAL
 TYPE LANDFILL
 SITE TREATMENT NONE

* WATER BALANCE

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

1/84	SYSTEM	720
1/84	SYSTEM	744
1/84	SYSTEM	744
1/84	SYSTEM	720

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT INITIAL START UP COMMENCED IN JUNE 1984.
 COMMERCIAL START UP IS SCHEDULED FOR FEBRUARY 1985.

THE SPRAY DRYER SYSTEM AT CRAIG 3 IS THE SECOND BABCOCK AND WILCOX
 LIME/SPRAY DRYING PROCESS IN OPERATION TO DATE. THE UTILITY REPORTED
 THAT MODIFICATIONS ARE BEING MADE BASED ON PROBLEMS EXPERIENCED AT THE
 FIRST BABCOCK AND WILCOX INSTALLATION (LARAMIE RIVER 3).

1/84	SYSTEM	744
1/84	SYSTEM	720
2/84	SYSTEM	744

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

COLORADO UTE ELECTRIC: CRAIG 3 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

INFORMATION WAS UNAVAILABLE FOR THE FOURTH QUARTER OF 1984.

1/85	SYSTEM	744
2/85	SYSTEM	672
3/85	SYSTEM	744
4/85	SYSTEM	720
5/85	SYSTEM	744

** PROBLEMS/SOLUTIONS/COMMENTS

A ONE-WEEK OUTAGE WAS NECESSARY DURING THE MONTH OF MAY IN ORDER TO MAKE THE NECESSARY DESIGN MODIFICATIONS TO INCREASE THE RECYCLE ASH SLURRY PIPE DIAMETER FROM 4 INCHES TO 6 INCHES. THIS WAS DONE IN ORDER TO HANDLE THE INCREASED PUMPING CAPACITY WHICH WAS ADDED TO THE SYSTEM.

6/85	SYSTEM	720
7/85	SYSTEM	744
8/85	SYSTEM	744

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT AND FGD SYSTEM WERE DOWN 1 WEEK DURING THE MONTH OF AUGUST FOR A SCHEDULED MAINTENANCE OUTAGE.

9/85	SYSTEM	720
10/85	SYSTEM	744
11/85	SYSTEM	720
12/85	SYSTEM	744

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE FGD SYSTEM WAS VERY RELIABLE DURING THE PERIOD JULY THROUGH DECEMBER, 1985. THE ONLY FGD-RELATED PROBLEM ENCOUNTERED DURING THIS PERIOD WAS THE DEPOSITION OF DRIED MATERIAL IN THE PNEUMATIC CONVEYOR LINES AT THE ELBOWS. THE UTILITY PLANS TO INSTALL RUBBER HOSE CONNECTIONS WITH WIDE SWEEPING TURNS TO REDUCE PLUGGING.

THE UTILITY REPORTED CHANGING ATOMIZER NOZZLES TO INCREASE SLURRY CAPACITY. NO DOWNTIME WAS NEEDED TO MAKE THIS CHANGE. THE SYSTEM SUPPLIER, B&W, HAS HAD TO INCREASE PUMP, SPRAY NOZZLE, AND SLURRY PIPE CAPACITY IN ORDER TO MEET 0.7% SULFUR COAL SO2 REMOVAL GUARANTEE.

1/86	SYSTEM	774
2/86	SYSTEM	672
3/86	SYSTEM	774
4/86	SYSTEM	720
5/86	SYSTEM	774
6/86	SYSTEM	720

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

COLORADO UTE ELECTRIC: CRAIG 3 (CONT.)

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

/86	SYSTEM					774
/86	SYSTEM					774
/86	SYSTEM					720
/86	SYSTEM					774
/86	SYSTEM					720
/86	SYSTEM					774

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD-RELATED OUTAGES WERE REPORTED FOR THE YEAR 1986 WITH THE EXCEPTION OF A PLANNED TWO WEEK OUTAGE IN AUGUST. THE UTILITY REPORTS HAVING ONLY MINOR FGD-RELATED PROBLEMS SUCH AS SCALING, PLUGGED SLAKERS, AND PLUGGED PNEUMATIC LINES.

/87	SYSTEM					744
/87	SYSTEM					672
/87	SYSTEM					744
/87	SYSTEM					720
/87	SYSTEM					744
/87	SYSTEM					720
/87	SYSTEM					744
/87	SYSTEM					744
/87	SYSTEM					720
/87	SYSTEM					744
/87	SYSTEM					720
/87	SYSTEM					744

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED OUTAGES WERE ENCOUNTERED DURING THE YEAR 1987. THE UNIT WAS OFF-LINE FOR A SCHEDULED UNIT OUTAGE IN THE FALL WHICH LASTED APPROXIMATELY 6 WEEKS.

/88	SYSTEM					774
/88	SYSTEM					672
/88	SYSTEM					774
/88	SYSTEM					720
/88	SYSTEM					774
/88	SYSTEM					720
/88	SYSTEM					774
/88	SYSTEM					774

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

COLORADO UTE ELECTRIC: CRAIG 3 (CONT.)

-----PERFORMANCE DATA-----									
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER BOILER HOURS	FGD CAP. HOURS FACTOR
9/88	SYSTEM							720	
10/88	SYSTEM							774	
11/88	SYSTEM							720	
12/88	SYSTEM							774	

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED OUTAGES WERE ENCOUNTERED DURING THE YEAR. A SCHEDULED 6 WEEK MAINTENANCE OUTAGE TOOK PLACE DURING THE MONTHS OF SEPTEMBER AND OCTOBER.

SECTION 13
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	COLUMBUS & SOUTHERN OHIO ELEC
PLANT NAME	CONESVILLE
UNIT NUMBER	5
CITY	CONESVILLE
STATE	OHIO
REGULATORY CLASSIFICATION	D
PARTICULATE EMISSION LIMITATION - NG/J	43. (0.100 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	516. (1.200 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	301. (0.700 LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	1885
GROSS UNIT GENERATING CAPACITY - MW	405
NET UNIT GENERATING CAPACITY W/FGD - MW	375
NET UNIT GENERATING CAPACITY WO/FGD - MW	382
EQUIVALENT SCRUBBED CAPACITY - MW	350

** 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	596.95 (1265000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	146.7 (296 F)
STACK HEIGHT - M	244. (800 FT)
STACK SHELL	CONCRETE
STACK TOP DIAMETER - M	7.9 (26.0 FT)

** FUEL DATA

FUEL TYPE	COAL
FUEL GRADE	BITUMINOUS
AVERAGE HEAT CONTENT - J/G	25237. (10850 BTU/LB)
RANGE HEAT CONTENT - BTU/LB	10000-12000
AVERAGE ASH CONTENT - %	14.90
RANGE ASH CONTENT - %	10.0-24.0
AVERAGE MOISTURE CONTENT - %	7.50
RANGE MOISTURE CONTENT - %	5.0-18.0
AVERAGE SULFUR CONTENT - %	4.50
RANGE SULFUR CONTENT - %	4.2-5.1
AVERAGE CHLORIDE CONTENT - %	0.01
RANGE CHLORIDE CONTENT - %	0.01-0.11

*** 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	657.8 (1393893 ACFM)
INLET FLUE GAS TEMPERATURE - C	146.7 (296 F)
PRESSURE DROP - KPA	0.5 (2. IN-H2O)
PARTICLE REMOVAL EFFICIENCY - %	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

ILITY FGD SURVEY: JANUARY - DECEMBER 1988

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

* GENERAL DATA

SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT
SO2 REMOVAL MODE	WET SCRUBBING
PROCESS TYPE	LIME
PROCESS ADDITIVES	MAGNESIUM OXIDE
SYSTEM SUPPLIER	AIR CORRECTION DIVISION, UOP
A-E FIRM	BLACK & VEATCH
DEVELOPMENT LEVEL	FULL SCALE
NEW/RETROFIT	NEW
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.65
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	89.50
ENERGY CONSUMPTION - %	1.7
CURRENT STATUS	1
COMMERCIAL START-UP	2/1977
INITIAL START-UP	1/1977
CONTRACT AWARDED	10/1974

* DESIGN AND OPERATING PARAMETERS

DESIGN COAL SULFUR CONTENT - %	4.50
DESIGN CHLORIDE CONTENT - %	*****
OPER. & MAINT. REQUIREMENT - MANHR/DAY	280.0

* QUENCHER/PRESATURATOR

NUMBER	2
TYPE	SPRAY CHAMBER
SUPPLIER	AIR CORRECTION DIVISION, UOP
INLET GAS TEMPERATURE - C	141.1 (286 F)
L/G RATIO - L/CU. M	0.1 (0.6 GAL/1000 ACFM)
CONSTRUCTION MATERIAL GENERIC TYPE	HIGH ALLOY
CONSTRUCTION MATERIAL SPECIFIC TYPE	IRON BASE/NICKEL-CHROMIUM-COPPER-MOLYBDENUM

* ABSORBER

NUMBER	2
NUMBER OF SPARES	0
GENERIC TYPE	PACKED TOWER
SPECIFIC TYPE	MOBILE BED PACKING
TRADE NAME/COMMON TYPE	TURBULENT CONTACT ABSORBER
SUPPLIER	AIR CORRECTION DIVISION, UOP
DIMENSIONS - FT	45.0 X 17.5 X 79.5
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	GRID CAGES
NUMBER OF CONTACTING ZONES	1
LIQUID RECIRCULATION RATE - LITER/S	1988. (31560 GPM)
L/G RATIO - L/CU.M	6.6 (49.3 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	2.0 (8.1 IN-H2O)
SUPERFICAL GAS VELOCITY - M/SEC	4.0 (13.1 FT/S)
INLET GAS FLOW - CU. M/S	301.81 (639568 ACFM)
INLET GAS TEMPERATURE - C	51.7 (125 F)
SO2 REMOVAL EFFICIENCY - %	92.0
PARTICLE REMOVAL EFFICIENCY - %	99.6

* 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
CONFIGURATION	HORIZONTAL
NUMBER OF STAGES	2
NUMBER OF PASSES PER ST. GE	4
FREEBOARD DISTANCE - M	3.05 (10.0 FT)
DISTANCE BETWEEN STAGES - CM	11.43 (4.5 IN)
DISTANCE BETWEEN VANES - CM	5.1 (2.00 IN)

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

VANE ANGLES - DEGREES	90	
PRESSURE DROP - KPA	0.5	(1.9 IN-H2O)
SUPERFICIAL GAS VELOCITY - M/S	3.0	(10.0 FT/S)
CONSTRUCTION MATERIAL GENERIC TYPE	ORGANIC	
CONSTRUCTION MATERIAL SPECIFIC TYPE	FIBER-REINFORCED POLYESTER	
WASH WATER SOURCE	RECLAIMED	
WASH FREQUENCY	CONTINUOUS	
WASH RATE - L/S	63.1	(1000 GAL/MIN)
** REHEATER		
GENERIC TYPE	NONE	
SPECIFIC TYPE	N/A	
TRADE NAME/COMMON TYPE	N/A	
CONSTRUCTION MATERIAL GENERIC TYPE	N/A	
CONSTRUCTION MATERIAL SPECIFIC TYPE	N/A	
** FANS		
NUMBER	2	
NUMBER OF SPARES	0	
DESIGN	CENTRIFUGAL	
SUPPLIER	GREEN FAN	
FUNCTION	UNIT	
APPLICATION	FORCED DRAFT	
SERVICE	DRY	
FLUE GAS FLOW RATE - CU.M/S	401.11	(850000 ACFM)
FLUE GAS TEMPERATURE - C	146.7	(296 F)
PRESSURE DROP - KPA	0.6	(2.0 IN-H2O)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	
** DAMPERS		
NUMBER	2	
FUNCTION	SHUT-OFF	
GENERIC TYPE	GUILLOTINE	
CONSTRUCTION MATERIAL GENERIC TYPE	HIGH ALLOY	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NICKEL BASE/CHROMIUM-IRON-MOLYBDENUM	
LINER GENERIC MATERIAL TYPE	NONE	
LINER SPECIFIC MATERIAL TYPE	N/A	
** DAMPERS		
NUMBER	2	
FUNCTION	SHUT-OFF	
GENERIC TYPE	GUILLOTINE	
CONSTRUCTION MATERIAL GENERIC TYPE	HIGH ALLOY	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NICKEL BASE/CHROMIUM-IRON-MOLYBDENUM	
LINER GENERIC MATERIAL TYPE	NONE	
LINER SPECIFIC MATERIAL TYPE	N/A	
** DAMPERS		
NUMBER	2	
FUNCTION	CONTROL	
GENERIC TYPE	GUILLOTINE & LOUVER	
CONSTRUCTION MATERIAL GENERIC TYPE	HIGH ALLOY	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NICKEL BASE/CHROMIUM-IRON-MOLYBDENUM	
LINER GENERIC MATERIAL TYPE	NONE	
LINER SPECIFIC MATERIAL TYPE	N/A	
** DUCTWORK		
LOCATION	INLET	
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	
** DUCTWORK		
LOCATION	OUTLET TO DAMPER	
SHELL GENERIC MATERIAL TYPE	CARBON STEEL	
SHELL SPECIFIC MATERIAL TYPE	HIGH STRENGTH LOW ALLOY 'HSLA'	
LINER GENERIC MATERIAL TYPE	ORGANIC	
LINER SPECIFIC MATERIAL TYPE	GLASS FLAKE-FILLED POLYESTER	

DUCTWORK

LOCATION

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

OUTLET BEYOND DAMPER

CARBON STEEL
HIGH STRENGTH LOW ALLOY 'HSLA'
INORGANIC
CHEMICALLY-BONDED CONCRETE

DUCTWORK

LOCATION

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

BYPASS

CARBON STEEL
HIGH STRENGTH LOW ALLOY 'HSLA'
NONE
N/A

REAGENT PREPARATION EQUIPMENT

FUNCTION

DEVICE

DEVICE TYPE

MANUFACTURER

NUMBER

SLAKER

PASTE

N/A

WALLACE & TIERNAN

5

TANKS

SERVICE

ABSORBER RECYCLE
RECLAIMED WATER
REAGENT PREP PRODUCT
MIST ELIMINATOR WASH

NUMBER

2
1
2
2

PUMPS

SERVICE

ABSORBER RECIRCULATION
LIME SLURRY TRANSFER
SLURRY MAKEUP
RECYCLE TANK DRAWOFF
MIST ELIMINATOR WASH
RECLAIM WATER
THICKENER UNDERFLOW

NUMBER

10
2
3
4
4
2

* SOLIDS CONCENTRATING/DEWATERING

DEVICE

NUMBER

NUMBER OF SPARES

SHELL GENERIC MATERIAL TYPE
SHELL SPECIFIC MATERIAL TYPE
BELT GENERIC MATERIAL TYPE
BELT SPECIFIC MATERIAL TYPE
FEED STREAM SOURCE
FEED STREAM CHARACTERISTICS
OUTLET STREAM CHARACTERISTICS
OUTLET STREAM DISPOSITION
OVERFLOW STREAM DISPOSITION

VACUUM FILTER

3

1

CARBON STEEL

AISI 1110

ORGANIC

POLYPROPYLENE

THICKENER UNDERFLOW

30% SOLIDS

50% SOLIDS

TO IUCS PROCESS

TO RECLAIMED WATER TANK

* SOLIDS CONCENTRATING/DEWATERING

DEVICE

NUMBER

NUMBER OF SPARES

DIMENSIONS - FT

SHELL GENERIC MATERIAL TYPE
SHELL SPECIFIC MATERIAL TYPE
LINER GENERIC MATERIAL TYPE
LINER SPECIFIC MATERIAL TYPE
FEED STREAM SOURCE
FEED STREAM CHARACTERISTICS
OUTLET STREAM CHARACTERISTICS
OUTLET STREAM DISPOSITION
OVERFLOW STREAM DISPOSITION

THICKENER

2

0

145.0 DIA X 16.0

CARBON STEEL

AISI 1110

ORGANIC

EPOXY

ABSORBER BLEED

7-12% SOLIDS

30% SOLIDS

TO IUCS THICKENER & THEN TO VACUUM FILTER

TO RECLAIMED WATER TANK

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

*** SALEABLE BYPRODUCTS	
NATURE	NONE
DISPOSITION	N/A
*** SLUDGE	
** TREATMENT	
METHOD	FIXATION
DEVICE	PUG MILL
PROPRIETARY PROCESS	CONVERSION SYSTEMS 'POZ-O-TEC'
INLET QUALITY - %	50.0
** DISPOSAL	
NATURE	FINAL
TYPE	LANDFILL
LOCATION	ON-SITE
SITE TRANSPORTATION METHOD	PIPELINE/CONVEYED
SITE TREATMENT	NONE
SITE DIMENSIONS	80 ACRES/50 FT
** PROCESS CONTROL AND INSTRUMENTATION	
CHEMICAL PARAMETERS	PH
PHYSICAL VARIABLES	RECYCLE TANK LEVEL
CONTROL LEVELS	OUTLET PH 5.5-6.3; RECYCLE PH 7.0-7.5
MONITOR LOCATION	SLURRY DISCHARGE FROM MODULE
PROCESS CONTROL MANNER	AUTOMATIC
PROCESS CHEMISTRY MODE	FEEDBACK
** WATER BALANCE	
WATER LOOP TYPE	CLOSED
MAKEUP WATER ADDITION - LITERS/S	31.5 (500 GPM)
** CHEMICALS AND CONSUMPTION	
FUNCTION	ABSORBENT
NAME	LIME
PRINCIPAL CONSTITUENT	90-95% CAO, 3-8% MGO
SOURCE/SUPPLIER	DRAVO
CONSUMPTION	16 TPH
UTILIZATION - %	90.0
POINT OF ADDITION	SLAKER
** FGD SPARE CAPACITY INDICES	
ABSORBER - %	0.0
** FGD SPARE COMPONENT INDICES	
ABSORBER	0.0

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

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

12/76 SYSTEM

744

** PROBLEMS/SOLUTIONS/COMMENTS

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

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

1/77 SYSTEM

744

ILITY FGD SURVEY: JANUARY - DECEMBER 1988

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

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

** PROBLEMS/SOLUTIONS/COMMENTS

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

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

1/77	B		43.0		43.0		
	SYSTEM					672	668

** PROBLEMS/SOLUTIONS/COMMENTS

COMMERCIAL START-UP OF MODULE B OCCURRED ON FEBRUARY 13, 1977. THE LONG-
 EST PERIOD OF CONTINUOUS OPERATION WAS 132 HOURS.

THE UTILITY REPORTED THAT THE ESP OPERATED SATISFACTORILY.

PRESSURE SURGES OCCURRED IN THE PRESATURATOR PIPING.

THE CONTINUOUS SO2 ANALYZERS OPERATED UNSATISFACTORILY.

MODULE B EXPERIENCED POOR VELOCITY DISTRIBUTION THROUGH THE TCA BEDS.

SCRUBBING LIQUOR WAS CARRYING OVER INTO THE MIST ELIMINATOR SECTION.

1/77	B		72.9		50.9		
	SYSTEM					744	520

1/77	B	41.8	40.0	40.5	37.4		
	SYSTEM					720	685

** PROBLEMS/SOLUTIONS/COMMENTS

A STACK OUTLET TEMPERATURE OF 200 F IS BEING MAINTAINED IN ORDER TO MIN-
 IMIZE ACID RAINOUT AND STACK CORROSION PROBLEMS.

THE 316 SS PRESATURATOR AREA HAS EXPERIENCED CORROSION.

THE RUBBER LINER IN THE RECYCLE TANK HAS BEEN PEELING AWAY. THE PROBLEM
 APPEARED TO BE APPLICATION-RELATED.

SOME PLUGGING HAS OCCURRED IN THE TUBE THICKENERS.

THE QUALITY OF THE LIME SLURRY HAS BEEN A PROBLEM AREA. ROCKS UP TO FIVE
 INCHES IN DIAMETER HAVE BEEN DETECTED. THIS HAS PROMPTED DRAVO TO INSTAL
 MECHANICAL SEPARATORS AND METAL DETECTORS AT THE LIME SHIPMENT FACILITY.

5/77	B	58.0	50.0	51.0	48.0		
	SYSTEM					744	712

5/77	B	66.0	59.0	60.0	58.0		
	SYSTEM					720	713

7/77	B	0.0	0.0	0.0	0.0		
	SYSTEM					744	744

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

**** PROBLEMS/SOLUTIONS/COMMENTS**

THE REPLACEMENT A-SIDE TCA MODULE REPLACING THE ORIGINAL MODULE DESTROYED BY FIRE IN DECEMBER 1976 IS EXPECTED TO BE AVAILABLE FOR COMMERCIAL SERVICE IN JANUARY 1978.

★★ PROBLEMS/SOLUTIONS/COMMENTS

THE SCRUBBER WAS NOT OPERATED THE ENTIRE MONTH OF AUGUST. REPAIRS AND MODIFICATIONS CONTINUED UNTIL SEPTEMBER 13. THERE WERE SOME WEATHER-RELATED DELAYS.

**** PROBLEMS/SOLUTIONS/COMMENTS**

THE SCRUBBER WAS DOWN FROM OCTOBER 10 TO NOVEMBER 10 FOR RELINING WITH NEOPRENE RUBBER.

★★ PROBLEMS/SOLUTIONS/COMMENTS

13-467

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

MID-MARCH BUT THIS MAY BE PUSHED BACK TO APRIL 1.

DURING THE DECEMBER TO MARCH 1978 SHUTDOWN THE CARBON STEEL FLUE WILL BE REPLACED WITH AN ACID-BRICK LINING.

'78	SYSTEM	0.0			0.0	744	0	0	0.0
'78	SYSTEM	0.0			0.0	672	0	0	0.0
'78	A	20.0	19.0	64.0	10.0				
	B	20.0	15.8	54.0	8.0				
	SYSTEM	20.0	17.4	59.0	9.0	744	379	66	

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT STARTED UP AGAIN ON MARCH 16.

PH CONTROLS AND SO2 ANALYZERS HAVE EXPERIENCED OPERATIONAL PROBLEMS.

IMPURITIES IN THE LIME HAVE CAUSED PLUGGING PROBLEMS.

'78	A	67.0	58.0	61.0	58.0				
	B	65.0	59.0	63.0	59.0				
	SYSTEM	66.0	58.5	62.0	58.5	720	716	421	

** PROBLEMS/SOLUTIONS/COMMENTS

THE SYSTEM WAS DOWN DUE TO AN EXCESS OF FLOCCULANT IN THE THICKENER.

EXCESS FLOCCULANT IN THE THICKENER YIELDED A HIGH SOLIDS LEVEL IN THE OVERFLOW AND RESULTED IN PLUGGING PROBLEMS IN THE ABSORBER MODULES.

'78	A	52.0	45.0	45.0	44.0				
	B	54.0	50.0	51.0	69.0				
	SYSTEM	53.0	47.5	48.0	56.5	744	720	420	

** PROBLEMS/SOLUTIONS/COMMENTS

THE SYSTEM WAS TAKEN OUT OF SERVICE BECAUSE OF CONTINUED PROBLEMS WITH THE FLOCCULANT FEED SYSTEM. THE THICKENER WAS EMPTIED TO RESTORE PROPER FLOCCULANT BALANCE.

'78	A	48.0	37.0	37.0	37.0				
	B	30.0	30.0	30.0	30.0				
	SYSTEM	39.0	33.5	33.5	33.5	720	720	243	

** PROBLEMS/SOLUTIONS/COMMENTS

AN FRP PIPING FAILURE IN THE MIST ELIMINATOR WASH SYSTEM OCCURRED.

'78	A	66.0	66.0	66.0	64.0				
	B	43.0	33.0	33.0	32.0				
	SYSTEM	54.5	49.5	49.5	49.0	744	727	359	

** PROBLEMS/SOLUTIONS/COMMENTS

OUTAGE TIME WAS DUE TO PLUGGING IN THE MIST ELIMINATOR AND SCRUBBER BALL REGIONS.

'78	A	18.0	20.0	20.0	18.0				
	B	18.0	21.0	21.0	18.0				
	SYSTEM	18.0	20.5	20.5	18.0	744	667	135	

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

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

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

** PROBLEMS/SOLUTIONS/COMMENTS

THE FORCED OUTAGE TIME WAS DUE, IN PART, TO TIME REQUIRED TO REMOVE SCALE FROM THE MIST ELIMINATOR.

THE FORCED OUTAGE TIME WAS DUE, IN PART, TO TIME REQUIRED TO REPLACE SOME OF THE PING PONG BALLS IN THE MODULES.

THE UTILITY EXPERIENCED BYPASS DAMPER PROBLEMS DURING THE PERIOD.

PROBLEMS OCCURRED RELATED TO BROKEN SLUDGE LINES AND PLUGGING IN THE LIME SLURRY FEED LINES.

9/78	A	61.0	46.0	55.0	45.0			
	B	54.0	44.0	53.0	43.0			
	SYSTEM	57.5	45.0	54.0	44.0	720	707	316
10/78	A	72.0	37.0	38.0	36.0			
	B	82.0	46.0	47.0	45.0			
	SYSTEM	77.0	41.5	42.5	40.5	744	713	301

** PROBLEMS/SOLUTIONS/COMMENTS

DAMPER DRIVE PROBLEMS WERE REPORTED BY THE UTILITY.

MINIMAL RUBBER LINER FAILURE WAS OBSERVED AT THE TOP OF ONE OF THE SCRUBBER MODULES AND JUST AFTER THE PRESATURATOR.

11/78	A	43.0	29.0	29.0	25.0			
	B	84.0	74.0	75.0	66.0			
	SYSTEM	63.5	51.5	52.0	45.5	720	642	331
12/78	A	6.6	0.3	0.3	0.3			
	B	33.1	36.3	36.6	30.0			
	SYSTEM	19.8	18.3	18.4	15.1	744	609	112

** PROBLEMS/SOLUTIONS/COMMENTS

THE LOW HOURS FOR THIS PERIOD ARE ATTRIBUTED TO FREEZE UPS.

1/79	SYSTEM	0.0	0.0	0.0	0.0	744	602	0
2/79	SYSTEM	0.0	0.0	0.0	0.0	672	629	0

** PROBLEMS/SOLUTIONS/COMMENTS

THE SYSTEM WAS UNAVAILABLE DURING JANUARY AND FEBRUARY BECAUSE OF SEVERE WINTER WEATHER.

3/79	A	50.0	49.0	50.0	43.0			
	B	0.0	0.0	0.0	0.0			
	SYSTEM	25.0	24.5	25.0	21.5	744	652	160
4/79	A	17.0	58.0	73.0	12.0			
	B	0.0	0.0	0.0	0.0			
	SYSTEM	8.5	29.0	36.5	6.0	720	149	43

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE B DID NOT OPERATE DURING MARCH AND APRIL BECAUSE OF SEVERE CORROSION AT THE PRESATURATOR INLET DUCT WHICH IS BEING REPAIRED BY UOP.

5/79	SYSTEM	0.0	0.0	0.0	0.0	744	744	0
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-----PERFORMANCE DATA-----
 100 MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION % REMOVAL PER BOILER FGD CAP.
 SO2 PART. HOURS HOURS HOURS HOURS FACTOR

** PROBLEMS/SOLUTIONS/COMMENTS

REPAIRS WERE MADE TO THE SEAL BETWEEN THE THICKENER BASE AND SIDEWALL.

THE FGD SYSTEM WAS DOWN DURING MAY FOR AN ANNUAL OUTAGE.

79	A	69.0	35.0	36.0	33.0			
	B	50.0	21.0	22.0	20.0			
	SYSTEM	59.5	28.0	29.0	26.5	720	670	191

** PROBLEMS/SOLUTIONS/COMMENTS

PLUGGED PH LINES WERE A PROBLEM DURING MAY AND JUNE.

FLYASH CONVEYING PROBLEMS RESULTED IN ABOUT A TWO DAY OUTAGE.

OUTLET DAMPER PROBLEMS WERE REPORTED BY THE UTILITY.

79	A	75.3	76.3	77.6	69.0			
	B	93.4	89.8	90.8	80.6			
	SYSTEM	84.4	82.8	84.2	74.8	744	672	557
79	A	86.6	24.7	25.0	10.1			
	B	85.6	22.7	23.0	9.3			
	SYSTEM	86.1	23.7	24.0	9.7	744	305	72
79	A	89.3	52.6	59.5	27.9			
	B	95.9	51.3	58.0	27.2			
	SYSTEM	92.6	51.9	58.8	27.6	720	383	199
79	A	53.2	76.3	77.0	45.4			
	B	47.8	77.4	78.1	46.1			
	SYSTEM	50.5	76.9	77.6	45.8	744	443	341
79	A	74.0	90.0	91.0	52.0			
	B	70.0	88.0	89.0	51.0			
	SYSTEM	72.0	89.0	90.0	51.2	720	414	369
79	SYSTEM	0.0		0.0		744	0	0 0.0

** PROBLEMS/SOLUTIONS/COMMENTS

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

CAVITATION WAS SITED IN THE SLUDGE PUMP.

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

PLUGGING IN THE REAGENT CIRCULATION SYSTEMS WAS ENCOUNTERED.

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

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

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

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

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

** PROBLEMS/SOLUTIONS/COMMENTS

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

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

** PROBLEMS/SOLUTIONS/COMMENTS

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

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

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

** PROBLEMS/SOLUTIONS/COMMENTS

DURING MARCH PROBLEMS WERE EXPERIENCED WITH THE IUCS SLUDGE STABILIZATION PROCESS AND SOME OUTAGE TIME RESULTED. ALSO DURING MARCH SOME GRID ROOS REQUIRED REPLACING AND SOME RUBBER LINER FAILURES OCCURRED.

THE MAJORITY OF THE MARCH FGD SYSTEM OUTAGE TIME WAS DUE TO CONTINUING PROBLEMS WITH THE MIST ELIMINATOR NOZZLES.

4/80	A	94.6	84.4	87.7	78.9				
	B	74.9	65.8	68.4	61.5				
	SYSTEM	84.7	75.2	78.0	70.3	720	673	506	63.1

** PROBLEMS/SOLUTIONS/COMMENTS

CONTINUAL PROBLEMS WITH THE DAMPERS, PRESATURATOR HOSES, AND NOZZLES WERE THE CAUSES OF FGD SYSTEM OUTAGE TIME IN APRIL.

5/80	A	92.1	86.2	86.2	86.2				
	B	90.3	84.3	84.3	84.3				
	SYSTEM	91.3	85.2	85.2	85.2	744	744	634	69.5

** PROBLEMS/SOLUTIONS/COMMENTS

IN MAY, CONTROLS AND INSTRUMENTATION DEVELOPED PROBLEMS THAT CAUSED SOME OUTAGE TIME.

6/80	A	89.6	71.0	71.0	70.7				
	B	94.3	74.8	74.8	74.4				
	SYSTEM	91.9	72.9	72.9	72.6	720	717	523	65.1

** PROBLEMS/SOLUTIONS/COMMENTS

EXTERNAL CAUSES (IUCS DISPOSAL FACILITY, LOW UNIT DEMAND, SERVICE WATER PROBLEMS, ETC.) WERE RESPONSIBLE FOR THE MAJORITY OF THE JUNE OUTAGES.

7/80	A	90.6	70.7	72.4	43.8				
	B	88.8	82.0	84.0	50.8				
	SYSTEM	89.7	76.4	78.2	47.3	744	461	352	36.6

LITY FGD SURVEY: JANUARY - DECEMBER 1988

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

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

** PROBLEMS/SOLUTIONS/COMMENTS

THE PRESATURATOR HOSES AND NOZZLES PLUGGED CAUSING THE UNIT TO SHUT DOWN FOR PART OF JULY.

80	A	98.0	83.5	84.9	48.5				
	B	95.4	88.8	90.4	51.6				
	SYSTEM	96.7	86.2	87.6	50.1	744	432	373	40.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT PROBLEMS WITH THE RECLAIM WATER SYSTEM OCCURRED IN AUGUST CAUSING SOME OUTAGE TIME.

80	A	87.6	73.4	74.4	73.1				
	B	88.8	85.1	86.3	82.0				
	SYSTEM	88.2	79.2	80.3	78.9	720	717	568	71.5

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE JULY-SEPTEMBER PERIOD INLET DAMPER SEAL LEAKING WAS A MAJOR PROBLEM.

THE PRESATURATOR PROBLEMS CONTINUED IN SEPTEMBER CAUSING ADDITIONAL OUTAGE TIME FOR THE FGD SYSTEM.

80	A	92.7	77.8	80.8	75.7				
	B	89.2	80.0	82.9	77.7				
	SYSTEM	91.0	78.9	81.9	76.7	744	723	571	59.7

** PROBLEMS/SOLUTIONS/COMMENTS

DURING OCTOBER MINOR OUTAGES WERE THE RESULT OF DAMPER AND AGITATOR MOTOR PROBLEMS.

'80	A	79.0	35.7	36.9	31.3				
	B	86.1	64.6	66.8	56.5				
	SYSTEM	82.6	50.1	51.9	43.9	720	630	316	35.9

** PROBLEMS/SOLUTIONS/COMMENTS

THE LOW SYSTEM AVAILABILITY DURING THE MONTH OF NOVEMBER WAS A DIRECT RESULT OF A 28 HOUR OUTAGE ATTRIBUTED TO LIME SLURRY TRANSFER TANK AND AGITATOR MOTOR PROBLEMS.

ADDITIONAL MINOR PROBLEMS WERE ENCOUNTERED WITH THE PRESATURATOR HOSES, TEMPERATURE PROBES, THICKENERS AND SERVICE WATER DURING THE MONTH OF NOVEMBER.

'80	A	93.1	88.8	89.2	82.2				
	B	90.9	86.6	85.3	80.2				
	SYSTEM	92.0	87.7	87.2	81.2	744	689	604	72.6

** PROBLEMS/SOLUTIONS/COMMENTS

DURING DECEMBER THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED.

'81	A	90.6	85.7	87.4	77.4				
	B	90.5	86.0	84.9	77.2				
	SYSTEM	90.5	86.0	84.9	77.2	744	672	575	71.0

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

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

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

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JANUARY THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED.

2/81	A	93.2	89.9	91.2	83.4				
	B	95.4	94.9	93.6	88.1				
	SYSTEM	94.2	92.3	92.4	85.7	672	624	576	100.0

** PROBLEMS/SOLUTIONS/COMMENTS

DURING FEBRUARY THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED.

3/81	A	3.7	15.7	21.0	0.5				
	B	4.0	23.5	31.0	0.9				
	SYSTEM	3.9	19.6	26.0	0.7	744	26	5	1.6

** PROBLEMS/SOLUTIONS/COMMENTS

DURING MOST OF MARCH THE BOILER AND FGD SYSTEM WERE OFF LINE FOR SCHEDULED MAINTENANCE.

4/81	A	98.9	83.7	90.1	64.5				
	B	94.3	78.6	84.5	60.6				
	SYSTEM	96.6	81.1	87.3	63.8	720	555	450	

5/81	A	99.7	100.0	100.0	95.0				
	B	99.7	100.0	100.0	95.0				
	SYSTEM	99.7	100.0	100.0	95.0	744	707	707	

6/81	A	99.4	100.0	100.0	96.4				
	B	98.5	100.0	100.0	96.9				
	SYSTEM	99.0	100.0	100.0	96.9	720	698	698	

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR OPERATIONAL PROBLEMS WERE ENCOUNTERED DURING THE SECOND QUARTER 1981.

7/81	A	99.8	100.0	100.0	55.4				
	B	100.0	100.0	100.0	55.4				
	SYSTEM	99.9	100.0	100.0	55.4	744	412	412	

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JULY, THE BOILER ONLY OPERATED 412 HOURS AS A RESULT OF FAILURE OF BOILER FEED PUMP.

8/81	A	99.0	76.0	95.0	43.0				
	B	99.0	30.0	88.0	39.0				
	SYSTEM	99.0	53.0	91.5	41.0	744	422	305	

9/81	A	100.0	59.0	100.0	6.0				
	B	87.0	48.0	81.0	5.0				
	SYSTEM	93.5	53.5	90.5	5.5	720	69	41	

** PROBLEMS/SOLUTIONS/COMMENTS

SEVERE OUTLET DUCT CORROSION HAS OCCURRED ON UNIT 5. THE GUNITE LINER HAS FAILED DUE TO INADEQUATE STRENGTH OF THE SUPPORTING MESH. THE UTILITY IS LOOKING INTO INCONEL OR FRP AS A REPLACEMENT LINER.

ILITY FGD SURVEY: JANUARY - DECEMBER 1988

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

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

UNIT 5 WAS REMOVED FROM SERVICE ON SEPTEMBER 19 AS A RESULT OF LOW DEMAND.
 THE UNIT IS NOT EXPECTED TO BE BROUGHT BACK ON LINE UNTIL DECEMBER.
 THIS OUTAGE PERIOD WILL BE UTILIZED FOR OUTLET DUCTWORK REPAIRS.

		100.0	0.0	0.0	0.0			
/81	A	100.0	0.0	0.0	0.0			
	B	100.0	0.0	0.0	0.0			
	SYSTEM	100.0	0.0	0.0	0.0	744		0

** PROBLEMS/SOLUTIONS/COMMENTS

DURING OCTOBER MAJOR MODIFICATIONS WERE BEING PERFORMED ON THE BOILER
 DUCTWORK. THIS INCLUDED REPAIRING THE CORRODED INNER SUPPORTS AND REPLAC-
 ING THE GUNITE.

		27.0	0.0	0.0	0.0			
/81	A	27.0	0.0	0.0	0.0			
	B	27.0	0.0	0.0	0.0			
	SYSTEM	27.0	0.0	0.0	0.0	720		0

** PROBLEMS/SOLUTIONS/COMMENTS

DURING NOVEMBER MAJOR MODIFICATION TO THE FGD SYSTEM DUCTWORK WAS PERFORM-
 ED. THIS WORK INCLUDED REPAIRING THE CORRODED SUPPORTS AND RECOATING
 WITH GUNITE.

ADDITIONAL OUTAGE TIME DURING THE MONTH WAS DUE TO GENERAL FGD MAINTENANCE

		84.0	82.0	86.0	77.0			
2/81	A	84.0	82.0	86.0	77.0			
	B	84.0	82.0	86.0	77.0			
	SYSTEM	84.0	82.0	86.0	77.0	744	699	573

** PROBLEMS/SOLUTIONS/COMMENTS

DURING DECEMBER TEST WERE CONDUCTED ON THE ESP.

ADDITIONAL OUTAGE TIME DURING THE MONTH WAS DUE TO HIGH THICKENER SOLIDS
 AND PROBLEMS WITH THE FLYASH HANDLING SYSTEM.

		97.0	83.0	87.0	69.0			
1/82	A	97.0	83.0	87.0	69.0			
	B	88.0	81.0	85.0	67.0			
	SYSTEM	92.5	82.0	86.0	68.0	744	617	506
2/82	A	99.0	80.0	89.0	64.0			
	B	98.0	76.0	84.0	60.0			
	SYSTEM	98.5	78.0	86.5	62.0	672	535	417
3/82	A	100.0	89.0	95.0	76.0			
	B	93.0	90.0	96.0	77.0			
	SYSTEM	96.5	89.5	95.5	76.5	744	636	569

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED
 DURING THE FIRST QUARTER OF 1982.

		98.0	81.0	89.0	50.0			
4/82	A	98.0	81.0	89.0	50.0			
	B	67.0	62.0	67.0	38.0			
	SYSTEM	82.5	71.5	78.0	44.0	720	443	317
5/82	A	100.0	83.0	98.0	48.0			
	B	100.0	78.0	92.0	46.0			
	SYSTEM	100.0	80.5	95.0	47.0	744	434	350
6/82	A	100.0	77.0	93.0	17.0			

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

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

-----PERFORMANCE DATA-----										
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	B	98.0	64.0	77.0	14.0					
	SYSTEM	99.0	70.5	85.0	15.5		720	158	112	

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE SECOND QUARTER 1982.

7/82	5A	94.6	93.7	96.5	58.1					
	5B	94.3	85.6	88.2	53.1					
	SYSTEM	94.4	89.6	92.3	55.6		744	461	414	43.9
8/82	5A	99.2	89.4	87.5	66.9					
	5B	99.5	99.1	97.0	74.1					
	SYSTEM	99.4	94.2	92.3	70.5		744	557	524	56.2
9/82	5A	96.4	89.7	92.3	55.5					
	5B	97.0	83.5	85.9	51.6					
	SYSTEM	96.7	86.6	89.1	53.5		720	445	386	47.5
10/82	5A	86.4	88.0	89.1	64.2					
	5B	86.3	86.5	87.6	63.1					
	SYSTEM	86.3	87.3	88.4	63.7		744	543	474	55.1

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE PERIOD OF JULY THROUGH OCTOBER, 1982.

11/82	5A	0.0			0.0					
	5B	0.0			0.0					
	SYSTEM	0.0			0.0		720	0		0.0

** PROBLEMS/SOLUTIONS/COMMENTS

UNIT 5 WAS OUT OF SERVICE DURING NOVEMBER FOR AN ANNUAL OUTAGE.

12/82	5A	23.7			0.0					
	5B	23.7			0.0					
	SYSTEM	23.7			0.0		744	0		0.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE ANNUAL OUTAGE CONTINUED FOR UNIT 5 THROUGHOUT THE MONTH OF DECEMBER.

1/83	5A	88.5	58.7	62.9	19.5					
	5B	92.4	70.7	75.8	23.5					
	SYSTEM	90.5	64.7	69.4	21.5		744	248	160	24.0

** PROBLEMS/SOLUTIONS/COMMENTS

UNIT 5 WAS PLACED BACK IN SERVICE DURING JANUARY FOLLOWING THE ANNUAL OUTAGE.

2/83	5A	91.8	89.3	89.7	87.2					
	5B	88.3	86.6	87.0	84.5					
	SYSTEM	90.0	88.0	88.3	85.8		672	656	577	60.7

** PROBLEMS/SOLUTIONS/COMMENTS

PRIOR TO FEBRUARY 16, 1983, THE UTILITY WAS CONSIDERING FGD SYSTEM AVAILABLE TIME TO INCLUDE PERIODS WHEN SCRUBBER MAINTENANCE WAS PERFORMED DURING A UNIT OUTAGE. THE UTILITY NOW CONFORMS TO THE CORRECT DEFINITION OF AVAILABILITY AND CONSIDERS THE SCRUBBER UNAVAILABLE DURING THESE

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

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

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

PERIODS.

/83	5A	92.3	93.5	94.5	78.8				
	5B	90.5	87.6	88.5	73.8				
	SYSTEM	91.4	90.5	91.5	76.3	744	627	568	55.4

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING MARCH.

/83	5A	92.6	90.2	92.4	89.9				
	5B	95.3	93.0	95.3	92.6				
	SYSTEM	94.0	91.6	93.9	91.3	720	717	657	66.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY ATTRIBUTED THE VERY GOOD PERFORMANCE OF MODULES A AND B DURING APRIL TO PROPER MAINTENANCE PERFORMED AND THE COMPLETION OF ESSENTIAL CHANGES IN THE SCRUBBING SYSTEM DESIGN.

/83	5A	82.3	78.1	78.7	60.6				
	5B	74.6	77.6	78.2	60.2				
	SYSTEM	78.4	77.8	78.4	60.4	744	578	450	49.3

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT OUTAGE TIME WAS ATTRIBUTED TO THE CLEANING OF MIST ELIMINATORS DURING MAY.

MAINTENANCE WORK ON MIST ELIMINATOR PUMPS ALSO CAUSED OUTAGE TIME IN MAY.

A 72 HOUR OUTAGE OCCURRED DUE TO A CHEMICAL IMBALANCE OF THE MAKEUP WATER POND. AIR HEATER DRAINAGE DURING A CLEANING OPERATION PRODUCED ACIDIC CONDITIONS IN THE POND.

/83	5A	88.2	75.5	77.6	39.0				
	5B	96.5	90.9	93.4	46.9				
	SYSTEM	92.4	83.2	85.5	43.0	720	372	310	37.1

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING JUNE.

/83	5A	87.9	83.3	84.2	63.6				
	5B	90.2	81.9	82.7	62.5				
	SYSTEM	89.0	82.6	83.5	63.0	744	568	469	54.0

/83	5A	94.1	83.8	88.0	67.3				
	5B	91.3	84.1	88.4	67.6				
	SYSTEM	92.7	83.9	88.2	67.5	744	598	502	46.0

/83	5A	99.0	97.2	98.0	47.8				
	5B	93.8	86.7	87.5	42.6				
	SYSTEM	96.4	91.9	92.7	45.2	720	354	326	34.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE PERIOD OF JULY THROUGH SEPTEMBER 1983.

/83	5A	99.1	98.0	98.0	46.9				
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UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

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

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

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	5B	98.1	94.7	94.7	45.3					
	SYSTEM	98.6	96.3	96.3	46.1		744	356	343	33.5

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD-RELATED OUTAGES WERE ENCOUNTERED DURING OCTOBER.

11/83	5A	58.6	98.2	98.2	54.4					
	5B	57.1	94.7	94.7	52.5					
	SYSTEM	57.8	96.5	96.5	53.5		720	399	385	38.7

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT ANNUAL OUTAGES OCCURRED DURING NOVEMBER FOR UNIT 5 AND 6.

12/83	A	30.2	59.2	67.1	19.5					
	B	31.3	60.8	69.0	20.0					
	SYSTEM	30.8	60.0	68.1	19.8		744	245	147	17.9

** PROBLEMS/SOLUTIONS/COMMENTS

FGD SYSTEM OUTAGE TIME DURING DECEMBER WAS DUE IN PART TO THE LOSS OF A LIME FEED LINE AND FROZEN WATER LINES ON THE SLAKERS.

THE UNAVAILABILITY OF THE SLUDGE TREATMENT FACILITY CONTRIBUTED TO FGD SYSTEM DOWN TIME DURING THE MONTH.

A LOCALIZED ABSORBER RUBBER LINER FAILURE ALSO CONTRIBUTED TO FGD SYSTEM OUTAGE TIME DURING DECEMBER.

1/84	A	94.1	87.8	89.7	46.6					
	B	98.1	95.4	97.4	50.7					
	SYSTEM	96.1	91.6	93.5	48.7		744	395	362	35.0

** PROBLEMS/SOLUTIONS/COMMENTS

ABSORBER RUBBER LININGS WERE REPAIRED DURING THE MONTH.

MIST ELIMINATOR AND RECYCLE SPRAY NOZZLES WERE CLEANED DURING JANUARY.

A POWER SUPPLY FAILURE AND COMPUTER-RELATED PROBLEMS ACCOUNTED FOR OUTAGE TIME IN JANUARY.

2/84	5A	98.9	70.4	81.3	20.5					
	5B	96.0	68.5	79.0	20.0					
	SYSTEM	97.4	69.5	80.1	20.3		696	203	141	17.5

** PROBLEMS/SOLUTIONS/COMMENTS

POOR LIME QUALITY ACCOUNTED FOR OUTAGE TIME DURING FEBRUARY.

A POWER FAILURE AT THE SLUDGE TREATMENT PLANT CONTRIBUTED TO DOWN TIME.

ABSORBER LINER FAILURE ACCOUNTED FOR ADDITIONAL OUTAGE TIME IN FEBRUARY.

3/84	A	98.3	96.4	98.0	85.8					
	B	99.6	97.9	99.5	87.1					
	SYSTEM	98.9	97.1	98.8	86.4		744	662	643	64.4

ILITY FGD SURVEY: JANUARY - DECEMBER 1988

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

-----PERFORMANCE DATA-----
 R100 MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION % REMOVAL PER BOILER FGD CAP.
 SO2 PART. HOURS HOURS HOURS FACTOR

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE UNIT WAS OUT OF SERVICE 14 HOURS DUE TO FAULTY DAMPERS.

RECYCLE TANK AGITATOR PROBLEMS WERE REPORTED DURING MARCH.

/84	5A	100.0	99.0	100.0	72.4				
	5B	98.5	97.0	97.9	70.8				
	SYSTEM	99.2	98.0	98.9	71.6	720	526	516	51.0
/84	5A	99.9	99.7	99.7	79.6				
	5B	99.6	99.5	99.5	79.4				
	SYSTEM	99.7	99.6	99.6	79.5	744	594	592	58.0
/84	5A	98.3	96.6	97.9	81.8				
	5B	99.3	97.9	99.3	82.9				
	SYSTEM	98.8	97.3	98.6	82.3	720	609	593	55.5
/84	5A	93.5	96.7	99.3	36.4				
	5B	93.5	96.7	99.3	36.4				
	SYSTEM	93.5	96.7	99.3	36.4	744	280	271	24.5

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD RELATED PROBLEMS WERE ENCOUNTERED DURING THE PERIOD OF APRIL THROUGH JULY, 1984.

/84	A	99.5	97.9	99.3	75.9				
	B	100.0	98.6	100.0	76.5				
	SYSTEM	99.7	98.3	99.6	76.2	744	577	567	53.0
/84	A	96.1	99.0	99.2	54.4				
	B	100.0	99.7	100.0	54.9				
	SYSTEM	98.1	99.4	99.6	54.7	720	396	394	36.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE MONTH OF AUGUST AND SEPTEMBER.

/84	A	46.2	95.2	100.0	29.4				
	B	46.2	95.2	100.0	29.4				
	SYSTEM	46.2	95.2	100.0	29.4	744	230	219	19.0
/84	A	33.8	100.0	100.0	6.3				
	B	32.2	100.0	100.0	6.3				
	SYSTEM	33.0	100.0	100.0	6.3	720	45	45	3.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE UNIT WAS DOWN MOST OF OCTOBER AND NOVEMBER FOR AN ANNUAL MAINTENANCE OUTAGE.

/84	A	100.0	100.0	100.0	49.3				
	B	98.8	99.2	95.9	47.3				
	SYSTEM	99.4	99.6	98.0	48.3	744	355	350	

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE MONTH OF DECEMBER.

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

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

-----PERFORMANCE DATA-----										
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART. HOURS	PER BOILER HOURS	FGD HOURS	CAP. FACTOR
1/85	5A	100.0	100.0	100.0	70.4					
	5B	100.0	100.0	100.0	70.4					
	SYSTEM	100.0	100.0	100.0	70.4		744	514	524	52.0
2/85	5A	100.0	100.0	100.0	100.0					
	5B	100.0	100.0	100.0	100.0					
	SYSTEM	100.0	100.0	100.0	100.0		672	672	672	66.0
3/85	5A	99.9	100.0	99.8	81.6					
	5B	97.8	98.2	97.5	79.7					
	SYSTEM	98.9	99.1	98.7	80.6		744	604	600	54.0
4/85	5A	99.7	98.9	99.7	91.1					
	5B	99.9	98.6	99.4	90.8					
	SYSTEM	99.8	98.8	99.5	91.0		720	663	655	65.0
5/85	5A	99.9	100.0	98.3	63.7					
	5B	100.0	100.0	93.4	60.5					
	SYSTEM	99.9	100.0	95.9	62.1		744	422	462	39.0
** PROBLEMS/SOLUTIONS/COMMENTS										
NO FGD SYSTEM-RELATED PROBLEMS WERE REPORTED BY THE UTILITY FOR THE MONTHS OF JANUARY THROUGH MAY.										
6/85	5A	100.0	100.0	100.0	29.3					
	5B	86.5	100.0	100.0	29.3					
	SYSTEM	93.3	100.0	100.0	29.3		720	211	211	21.3
** PROBLEMS/SOLUTIONS/COMMENTS										
MODULE 5B WAS OUT OF SERVICE FOR A SHORT TIME DURING THE MONTH AS A RESULT OF A PIPING RUBBER LINING FAILURE.										
7/85	5A	100.0	98.0	100.0	59.7					
	5B	100.0	98.0	100.0	59.7					
	SYSTEM	100.0	98.0	100.0	59.7		744	453	444	38.2
8/85	5A	99.1	98.7	99.0	92.3					
	5B	99.1	98.7	99.0	92.3					
	SYSTEM	99.1	98.7	99.0	92.3		744	696	687	63.9
9/85	5A	99.6	99.8	100.0	72.9					
	5B	99.6	98.5	98.7	71.9					
	SYSTEM	99.6	99.1	99.3	72.4		720	526	522	43.1
10/85	5A	100.0	98.4	100.0	65.2					
	5B	99.7	97.4	99.0	64.5					
	SYSTEM	99.9	97.9	99.5	64.9		744	493	482	44.1
11/85	5A	100.0	100.0	100.0	90.1					
	5B	100.0	100.0	100.0	90.1					
	SYSTEM	100.0	100.0	100.0	90.1		720	649	649	56.7
12/85	5A	94.5	98.4	99.8	64.7					
	5B	94.5	98.2	99.6	64.5					
	SYSTEM	94.5	98.3	99.7	64.6		744	489	480	40.1

** PROBLEMS/SOLUTIONS/COMMENTS

NO FGD SYSTEM-RELATED PROBLEMS WERE REPORTED BY THE UTILITY FOR THE MONTHS OF JULY THROUGH DECEMBER.

LITY FGD SURVEY: JANUARY - DECEMBER 1988

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

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

86	5A	100.0	100.0	99.7	16.1				
	5B	90.9	100.0	99.7	16.1				
	SYSTEM	95.4	100.0	99.7	16.1	744	107	120	9.0
86	5A	100.0	100.0	99.6	86.1				
	5B	100.0	100.0	99.9	86.4				
	SYSTEM	100.0	100.0	99.8	86.2	672	574	580	56.7

** PROBLEMS/SOLUTIONS/COMMENTS

NO FGD SYSTEM-RELATED PROBLEMS WERE REPORTED FOR THE MONTHS OF JANUARY
OR FEBRUARY.

86	5A	97.8	100.0	100.0	81.7				
	5B	88.7	90.1	89.1	72.5				
	SYSTEM	93.3	95.0	94.7	77.1	744	599	574	15.1

** PROBLEMS/SOLUTIONS/COMMENTS

A 5B-MODULE DAMPER FAILURE CAUSED A 68 HOUR SCRUBBER OUTAGE IN MARCH.

'86	5A	0.0			0.0				
	5B	0.0			0.0				
	SYSTEM	0.0			0.0	720	0	0	0.0
'86	5A	9.7			0.0				
	5B	9.7			0.0				
	SYSTEM	9.7			0.0	744	0	0	0.0

** PROBLEMS/SOLUTIONS/COMMENTS

A SCHEDULED UNIT 5 OUTAGE BEGAN ON MARCH 31 AND CONTINUED THROUGH
MAY 29, 1986.

'86	5A	97.9	100.0	97.7	76.4				
	5B	99.4	100.0	98.0	76.6				
	SYSTEM	98.7	100.0	97.9	76.5	720	526	551	45.4

** PROBLEMS/SOLUTIONS/COMMENTS

MODULES 5A AND 5B WERE REMOVED FROM SERVICE 12 HOURS FOR ESP TESTS.

/86	5A	98.5	98.8	98.4	90.7				
	5B	95.7	95.8	95.4	88.0				
	SYSTEM	97.1	97.3	96.9	89.3	744	683	665	49.6
/86	5A	98.9	100.0	100.0	71.3				
	5B	98.7	100.0	99.7	71.0				
	SYSTEM	98.8	100.0	99.9	71.2	744	518	530	36.0
/86	5A	100.0	99.0	98.1	83.6				
	5B	98.4	97.1	96.2	82.0				
	SYSTEM	99.2	98.1	97.1	82.8	720	608	596	45.8
/86	5A	99.9	100.0	99.8	47.6				
	5B	99.9	100.0	99.7	47.5				
	SYSTEM	99.9	100.0	99.7	47.5	744	345	354	26.3

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD SYSTEM-RELATED PROBLEMS WERE REPORTED FOR THE MONTHS OF
APRIL THROUGH OCTOBER 1986.

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

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

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

11/86	5A	100.0	100.0	100.0	8.4	720	36	55	3.2
	5B	98.4	100.0	82.2	6.8				
	SYSTEM	99.2	100.0	91.8	7.6				

** PROBLEMS/SOLUTIONS/COMMENTS

A DAMPER FAILURE ON MODULE 5B FORCED THE FGD SYSTEM OUT OF SERVICE FOR 12 HOURS IN NOVEMBER.

12/86	5A	100.0	95.8	100.0	27.8	744	216	207	17.7
	5B	100.0	95.7	99.9	27.8				
	SYSTEM	100.0	95.7	100.0	27.8				

** PROBLEMS/SOLUTIONS/COMMENTS

NO FGD SYSTEM-RELATED PROBLEMS WERE REPORTED FOR DECEMBER.

1/87	5A	100.0	97.9	100.0	15.1	744	115	113	8.9
	5B	100.0	97.9	100.0	15.1				
	SYSTEM	100.0	97.9	100.0	15.1				

2/87	5A	100.0	99.4	100.0	61.0	672	412	410	36.0
	5B	100.0	99.4	100.0	61.0				
	SYSTEM	100.0	99.4	100.0	61.0				

3/87	5A	100.0	97.8	99.9	67.8	744	516	505	41.6
	5B	100.0	97.8	99.9	67.9				
	SYSTEM	100.0	97.8	99.9	67.9				

4/87	5A	99.5	97.5	99.1	56.2	720	415	406	34.8
	5B	100.0	98.3	100.0	56.7				
	SYSTEM	99.8	97.9	99.6	56.4				

5/87	5A	97.7	96.9	98.3	54.8	744	421	411	33.5
	5B	100.0	98.4	99.9	55.6				
	SYSTEM	98.9	97.6	99.1	55.2				

6/87	5A	100.0	95.1	99.9	57.7	720	437	415	34.4
	5B	100.0	95.1	99.9	57.7				
	SYSTEM	100.0	95.1	99.9	57.7				

7/87	5A	100.0	97.0	100.0	45.3	744	347	337	28.9
	5B	100.0	97.0	100.0	45.3				
	SYSTEM	100.0	97.0	100.0	45.3				

8/87	5A	99.7	98.3	99.6	68.1	744	515	503	45.1
	5B	98.6	96.8	98.1	67.0				
	SYSTEM	99.2	97.5	98.8	67.5				

9/87	5A	100.0	98.3	100.0	32.4	720	238	234	21.3
	5B	100.0	98.5	100.0	32.5				
	SYSTEM	100.0	98.4	100.0	32.5				

10/87	5A	96.3	99.1	99.4	82.4	744	619	614	53.9
	5B	96.5	99.4	99.7	82.6				
	SYSTEM	96.4	99.3	99.5	82.5				

** PROBLEMS/SOLUTIONS/COMMENTS

NO FGD SYSTEM-RELATED PROBLEMS WERE REPORTED FOR THE PERIOD JANUARY THROUGH OCTOBER 1987.

11/87	5A	0.0			0.0				
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LITY FGD SURVEY: JANUARY - DECEMBER 1988

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

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

	5B	0.0			0.0				
	SYSTEM	0.0			0.0	720	0	0	0.0
87	5A	58.1	98.8	100.0	25.4				
	5B	58.1	98.8	100.0	25.4				
	SYSTEM	58.1	98.8	100.0	25.4	744	191	189	10.9

** PROBLEMS/SOLUTIONS/COMMENTS

A SCHEDULED UNIT 5 OUTAGE BEGAN IN NOVEMBER AND EXTENDED THROUGH DECEMBER.

88	5A	92.9	84.9	86.5	45.5				
	5B	92.4	86.5	88.1	46.3				
	SYSTEM	92.7	85.7	87.3	45.9	744	399	342	29.0
88	5A	100.0	99.5	100.0	86.5				
	5B	100.0	99.5	100.0	86.5				
	SYSTEM	100.0	99.5	100.0	86.5	696	605	602	44.1

** PROBLEMS/SOLUTIONS/COMMENTS

NO FGD SYSTEM-RELATED PROBLEMS WERE REPORTED BY THE UTILITY FOR THE MONTHS OF JANUARY AND FEBRUARY 1989.

'88	5A	75.0	73.1	73.3	68.4				
	5B	66.3	63.8	63.9	59.7				
	SYSTEM	70.7	68.5	68.6	64.1	744	696	477	48.1

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD-SYSTEM WAS FORCED OFF-LINE IN MARCH DUE TO INCREASED SCALING CAUSED BY A CHANGE IN FUEL CHARACTERISTICS. MANUAL CLEANING WAS REQUIRED TO CLEAN THE ABSORBER VESSELS. THE SYSTEM OPERATING PH WAS REVISED TO DECREASE SCALE BUILDUP.

'88	5A	99.9	99.7	100.0	93.6				
	5B	95.0	94.4	94.8	88.6				
	SYSTEM	97.5	97.1	97.5	91.1	720	676	656	84.5
'88	5A	99.8	99.4	100.0	83.6				
	5B	94.4	93.0	93.7	78.2				
	SYSTEM	97.1	96.2	96.9	80.9	744	626	602	72.6
'88	5A	100.0	99.6	99.9	93.9				
	5B	100.0	99.6	99.9	93.9				
	SYSTEM	100.0	99.6	99.9	93.9	720	679	676	84.7
'88	5A	99.4	96.5	99.4	49.5				
	5B	99.4	96.5	99.4	49.5				
	SYSTEM	99.4	96.5	99.4	49.5	744	382	369	40.1
'88	5A	98.8	97.3	97.9	58.1				
	5B	98.8	97.3	97.9	58.1				
	SYSTEM	98.8	97.3	97.9	58.1	744	444	432	39.7
'88	5A	100.0	99.7	100.0	70.2				
	5B	100.0	99.7	100.0	70.2				
	SYSTEM	100.0	99.7	100.0	70.2	720	507	505	41.4
'88	5A	100.0	98.6	100.0	76.5				
	5B	100.0	98.6	100.0	76.5				
	SYSTEM	100.0	98.6	100.0	76.5	744	577	569	44.2
'88	5A	99.4	98.3	99.2	72.7				

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

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

-----PERFORMANCE DATA-----										
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART. HOURS	PER BOILER HOURS	FGD HOURS	CAP. FACTOR
	5B	99.4	98.3	99.2	72.7					
	SYSTEM	99.4	98.3	99.2	72.7			720	533	523 42.8
12/88	5A	98.5	96.5	97.8	59.1					
	5B	100.0	98.9	100.0	60.6					
	SYSTEM	99.2	97.7	99.0	59.9			744	456	445 34.8

** PROBLEMS/SOLUTIONS/COMMENTS

NO FGD SYSTEM-RELATED PROBLEMS WERE REPORTED FOR THE PERIOD APRIL THROUGH DECEMBER 1988.

SECTION 13
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	COLUMBUS & SOUTHERN OHIO ELEC
PLANT NAME	CONESVILLE
UNIT NUMBER	6
CITY	CONESVILLE
STATE	OHIO
REGULATORY CLASSIFICATION	D
PARTICULATE EMISSION LIMITATION - NG/J	43. (0.100 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	516. (1.200 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	301. (0.700 LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	1885
GROSS UNIT GENERATING CAPACITY - MW	405
NET UNIT GENERATING CAPACITY W/FGD - MW	375
NET UNIT GENERATING CAPACITY WO/FGD - MW	382
EQUIVALENT SCRUBBED CAPACITY - MW	350

** 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	596.95 (1265000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	146.7 (296 F)
STACK HEIGHT - M	244. (800 FT)
STACK SHELL	CONCRETE
STACK TOP DIAMETER - M	7.9 (26.0 FT)

** FUEL DATA

FUEL TYPE	COAL
FUEL GRADE	BITUMINOUS
AVERAGE HEAT CONTENT - J/G	25237. (10850 BTU/LB)
RANGE HEAT CONTENT - BTU/LB	10000-12000
AVERAGE ASH CONTENT - %	14.90
RANGE ASH CONTENT - %	10.0-24.0
AVERAGE MOISTURE CONTENT - %	7.50
RANGE MOISTURE CONTENT - %	5.0-18.0
AVERAGE SULFUR CONTENT - %	4.50
RANGE SULFUR CONTENT - %	4.2-5.1
AVERAGE CHLORIDE CONTENT - %	0.01
RANGE CHLORIDE CONTENT - %	0.01-0.11

*** 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	657.8 (1393893 ACFM)
INLET FLUE GAS TEMPERATURE - C	146.7 (296 F)
PRESSURE DROP - KPA	0.5 (2. IN-H2O)
PARTICLE REMOVAL EFFICIENCY - %	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

LITY FGD SURVEY: JANUARY - DECEMBER 1988

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

GENERAL DATA	
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT
SO2 REMOVAL MODE	WET SCRUBBING
PROCESS TYPE	LIME
PROCESS ADDITIVES	MAGNESIUM OXIDE
SYSTEM SUPPLIER	AIR CORRECTION DIVISION, UOP
A-E FIRM	BLACK & VEATCH
DEVELOPMENT LEVEL	FULL SCALE
NEW/RETROFIT	NEW
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.65
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	89.50
ENERGY CONSUMPTION - %	1.7
CURRENT STATUS	1
COMMERCIAL START-UP	7/1978
INITIAL START-UP	6/1978
CONTRACT AWARDED	10/1974
DESIGN AND OPERATING PARAMETERS	
DESIGN COAL SULFUR CONTENT - %	4.50
DESIGN CHLORIDE CONTENT - %	*****
OPER. & MAINT. REQUIREMENT - MANHR/DAY	280.0
QUENCHER/PRESATURATOR	
NUMBER	2
TYPE	SPRAY CHAMBER
SUPPLIER	AIR CORRECTION DIVISION, UOP
INLET GAS TEMPERATURE - C	141.1 (286 F)
L/G RATIO - L/CU. M	0.1 (0.6 GAL/1000 ACFM)
CONSTRUCTION MATERIAL GENERIC TYPE	HIGH ALLOY
CONSTRUCTION MATERIAL SPECIFIC TYPE	IRON BASE/NICKEL-CHROMIUM-COPPER-MOLYBDENUM
* ABSORBER	
NUMBER	2
NUMBER OF SPARES	0
GENERIC TYPE	PACKED TOWER
SPECIFIC TYPE	MOBILE BED PACKING
TRADE NAME/COMMON TYPE	TURBULENT CONTACT ABSORBER
SUPPLIER	AIR CORRECTION DIVISION, UOP
DIMENSIONS - FT	45.0 X 17.5 X 79.5
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	GRID CAGES
NUMBER OF CONTACTING ZONES	1
LIQUID RECIRCULATION RATE - LITER/S	1988. (31560 GPM)
L/G RATIO - L/CU.M	6.6 (49.3 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	2.0 (8.1 IN-H2O)
SUPERFICAL GAS VELOCITY - M/SEC	4.0 (13.1 FT/S)
INLET GAS FLOW - CU. M/S	301.81 (639568 ACFM)
INLET GAS TEMPERATURE - C	51.7 (125 F)
SO2 REMOVAL EFFICIENCY - %	92.0
PARTICLE REMOVAL EFFICIENCY - %	99.6
* 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
CONFIGURATION	HORIZONTAL
NUMBER OF STAGES	2
NUMBER OF PASSES PER STAGE	4
FREEBOARD DISTANCE - M	3.05 (10.0 FT)
DISTANCE BETWEEN STAGES - CM	11.43 (4.5 IN)
DISTANCE BETWEEN VANES - CM	5.1 (2.00 IN)

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

VANE ANGLES - DEGREES	90	
PRESSURE DROP - KPA	0.5	(1.9 IN-H2O)
SUPERFICIAL GAS VELOCITY - M/S	3.0	(10.0 FT/S)
CONSTRUCTION MATERIAL GENERIC TYPE	ORGANIC	
CONSTRUCTION MATERIAL SPECIFIC TYPE	FIBER-REINFORCED POLYESTER	
WASH WATER SOURCE	RECLAIMED	
WASH FREQUENCY	CONTINUOUS	
WASH RATE - L/S	63.1	(1000 GAL/MIN)
** REHEATER		
GENERIC TYPE	NONE	
SPECIFIC TYPE	N/A	
TRADE NAME/COMMON TYPE	N/A	
CONSTRUCTION MATERIAL GENERIC TYPE	N/A	
CONSTRUCTION MATERIAL SPECIFIC TYPE	N/A	
** FANS		
NUMBER	2	
NUMBER OF SPARES	0	
DESIGN	CENTRIFUGAL	
SUPPLIER	GREEN FAN	
FUNCTION	UNIT	
APPLICATION	FORCED DRAFT	
SERVICE	DRY	
FLUE GAS FLOW RATE - CU.M/S	401.11	(850000 ACFM)
FLUE GAS TEMPERATURE - C	146.7	(296 F)
PRESSURE DROP - KPA	0.6	(2.0 IN-H2O)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	
** DAMPERS		
NUMBER	2	
FUNCTION	SHUT-OFF	
GENERIC TYPE	GUILLOTINE	
CONSTRUCTION MATERIAL GENERIC TYPE	HIGH ALLOY	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NICKEL BASE/CHROMIUM-IRON-MOLYBDENUM	
LINER GENERIC MATERIAL TYPE	NONE	
LINER SPECIFIC MATERIAL TYPE	N/A	
** DAMPERS		
NUMBER	2	
FUNCTION	SHUT-OFF	
GENERIC TYPE	GUILLOTINE	
CONSTRUCTION MATERIAL GENERIC TYPE	HIGH ALLOY	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NICKEL BASE/CHROMIUM-IRON-MOLYBDENUM	
LINER GENERIC MATERIAL TYPE	NONE	
LINER SPECIFIC MATERIAL TYPE	N/A	
** DAMPERS		
NUMBER	2	
FUNCTION	CONTROL	
GENERIC TYPE	GUILLOTINE & LOUVER	
CONSTRUCTION MATERIAL GENERIC TYPE	HIGH ALLOY	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NICKEL BASE/CHROMIUM-IRON-MOLYBDENUM	
LINER GENERIC MATERIAL TYPE	NONE	
LINER SPECIFIC MATERIAL TYPE	N/A	
** DUCTWORK		
LOCATION	INLET	
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	
** DUCTWORK		
LOCATION	OUTLET TO DAMPER	
SHELL GENERIC MATERIAL TYPE	CARBON STEEL	
SHELL SPECIFIC MATERIAL TYPE	HIGH STRENGTH LOW ALLOY 'HSLA'	
LINER GENERIC MATERIAL TYPE	ORGANIC	
LINER SPECIFIC MATERIAL TYPE	GLASS FLAKE-FILLED POLYESTER	

LITY FGD SURVEY: JANUARY - DECEMBER 1988

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

DUCTWORK

LOCATION

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

OUTLET BEYOND DAMPER

CARBON STEEL
HIGH STRENGTH LOW ALLOY 'HSLA'
INORGANIC
CHEMICALLY-BONDED CONCRETE

DUCTWORK

LOCATION

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

BYPASS

CARBON STEEL
HIGH STRENGTH LOW ALLOY 'HSLA'
NONE
N/A

REAGENT PREPARATION EQUIPMENT

FUNCTION

DEVICE
DEVICE TYPE
MANUFACTURER
NUMBER

SLAKER

PASTE
N/A
WALLACE & TIERNAN
5

TANKS

SERVICE

ABSORBER RECYCLE
RECLAIMED WATER
REAGENT PREP PRODUCT
MIST ELIMINATOR WASH

NUMBER

2
1
2
2

PUMPS

SERVICE

ABSORBER RECIRCULATION
LIME SLURRY TRANSFER
SLURRY MAKEUP
RECYCLE TANK DRAWOFF
MIST ELIMINATOR WASH
RECLAIM WATER
THICKENER UNDERFLOW

NUMBER

10
2
3
4
4
2

* SOLIDS CONCENTRATING/DEWATERING

DEVICE

NUMBER
NUMBER OF SPARES
SHELL GENERIC MATERIAL TYPE
SHELL SPECIFIC MATERIAL TYPE
BELT GENERIC MATERIAL TYPE
BELT SPECIFIC MATERIAL TYPE
FEED STREAM SOURCE
FEED STREAM CHARACTERISTICS
OUTLET STREAM CHARACTERISTICS
OUTLET STREAM DISPOSITION
OVERFLOW STREAM DISPOSITION

VACUUM FILTER

3
1
CARBON STEEL
AISI 1110
ORGANIC
POLYPROPYLENE
THICKENER UNDERFLOW
30% SOLIDS
50% SOLIDS
TO IUCS PROCESS
TO RECLAIMED WATER TANK

* SOLIDS CONCENTRATING/DEWATERING

DEVICE

NUMBER
NUMBER OF SPARES
DIMENSIONS - FT
SHELL GENERIC MATERIAL TYPE
SHELL SPECIFIC MATERIAL TYPE
LINER GENERIC MATERIAL TYPE
LINER SPECIFIC MATERIAL TYPE
FEED STREAM SOURCE
FEED STREAM CHARACTERISTICS
OUTLET STREAM CHARACTERISTICS
OUTLET STREAM DISPOSITION
OVERFLOW STREAM DISPOSITION

THICKENER

2
0
145.0 DIA X 16.0
CARBON STEEL
AISI 1110
ORGANIC
EPOXY
ABSORBER BLEED
7-12% SOLIDS
30% SOLIDS
TO IUCS THICKENER & THEN TO VACUUM FILTER
TO RECLAIMED WATER TANK

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

*** SALEABLE BYPRODUCTS
 NATURE NONE
 DISPOSITION N/A

*** SLUDGE

** TREATMENT
 METHOD FIXATION
 DEVICE PUG MILL
 PROPRIETARY PROCESS CONVERSION SYSTEMS 'POZ-O-TEC!
 INLET QUALITY - % 50.0

** DISPOSAL
 NATURE FINAL
 TYPE LANDFILL
 LOCATION ON-SITE
 SITE TRANSPORTATION METHOD PIPELINE/CONVEYED
 SITE TREATMENT NONE
 SITE DIMENSIONS 80 ACRES/50 FT

** PROCESS CONTROL AND INSTRUMENTATION
 CHEMICAL PARAMETERS PH
 PHYSICAL VARIABLES RECYCLE TANK LEVEL
 CONTROL LEVELS OUTLET PH 5.5-6.3; RECYCLE PH 7.0-7.5
 MONITOR LOCATION SLURRY DISCHARGE FROM MODULE
 PROCESS CONTROL MANNER AUTOMATIC
 PROCESS CHEMISTRY MODE FEEDBACK

** WATER BALANCE
 WATER LOOP TYPE CLOSED
 MAKEUP WATER ADDITION - LITERS/S 31.5 (500 GPM)

** CHEMICALS AND CONSUMPTION
 FUNCTION ABSORBENT
 NAME LIME
 PRINCIPAL CONSTITUENT 90-95% CAO, 3-8% MGO
 SOURCE/SUPPLIER DRAVO
 CONSUMPTION 16 TPH
 UTILIZATION - % 90.0
 POINT OF ADDITION SLAKER

** FGD SPARE CAPACITY INDICES
 ABSORBER - % 0.0

** FGD SPARE COMPONENT INDICES
 ABSORBER 0.0

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

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

** PROBLEMS/SOLUTIONS/COMMENTS

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

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

SCRUBBER CONTROLS WERE NOT OPERATING PROPERLY AND NEEDED ADJUSTMENT.

LITY FGD SURVEY: JANUARY - DECEMBER 1988

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

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

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

** PROBLEMS/SOLUTIONS/COMMENTS

THE LOUVERED DAMPER PROBLEM CONTINUED.

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

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

** PROBLEMS/SOLUTIONS/COMMENTS

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

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

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

** PROBLEMS/SOLUTIONS/COMMENTS

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

BYPASS DAMPER CONTROL PROBLEMS CONTINUED THROUGH SEPTEMBER.

78	A	98.0	29.0	30.0	24.0			
	B	37.0	35.0	36.0	29.0			
	SYSTEM	67.5	32.0	33.0	26.5	744	603	199

** PROBLEMS/SOLUTIONS/COMMENTS

PROBLEMS WITH DAMPER SEALS AND GUIDE BARS WERE ENCOUNTERED. THE UTILITY PLANS TO REPLACE THEM DURING THE NEXT BOILER OUTAGE.

78	A	26.0	3.0	3.0	2.0			
	B	26.0	9.0	9.0	8.0			
	SYSTEM	26.0	6.0	6.0	5.0	720	600	36

** PROBLEMS/SOLUTIONS/COMMENTS

LIME TRANSFER BAGHOUSE SHAKER PROBLEMS WERE EXPERIENCED.

THE THICKENER RAKE MOTOR BURNED OUT AND HAD TO BE REWOUND.

78	A	34.8	26.3	26.8	24.2			
	B	26.6	19.0	19.3	17.5			
	SYSTEM	30.7	22.6	23.0	20.8	744	672	155

79	A	5.0	2.0	2.0	2.0			
	B	0.0	0.0	0.0	0.0			
	SYSTEM	2.5	1.0	1.0	1.0	744	730	8

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

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

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

** PROBLEMS/SOLUTIONS/COMMENTS

FREEZE UPS WERE A SERIOUS PROBLEM DURING THE DECEMBER-JANUARY PERIOD.

2/79	SYSTEM	0.0	0.0	0.0	0.0	672	629	0
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** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM DID NOT OPERATE DURING FEBRUARY DUE TO SEVERE WINTER WEATHER CAUSING SYSTEM FREEZE UPS.

3/79	A	43.0	37.0	39.0	33.0			
	B	32.0	28.0	29.0	25.0			
	SYSTEM	37.5	32.5	34.0	29.0	744	664	216
4/79	A	82.0	79.0	79.0	78.0			
	B	72.0	59.0	59.0	58.0			
	SYSTEM	77.0	69.0	69.0	68.0	720	711	489
5/79	SYSTEM	100.0			0.0	744	0	0 0.0

** PROBLEMS/SOLUTIONS/COMMENTS

REPAIRS WERE MADE TO THE SEAL BETWEEN THE THICKENER BASE AND SIDEWALL.

THE BOILER DID NOT OPERATE DURING MAY DUE TO A SCHEDULED ANNUAL OUTAGE.

6/79	A	43.0	37.0	39.0	27.0			
	B	49.0	49.0	52.0	31.0			
	SYSTEM	46.0	43.0	45.5	29.0	720	433	209

** PROBLEMS/SOLUTIONS/COMMENTS

FLYASH CONVEYING PROBLEMS RESULTED IN ABOUT A TWO DAY OUTAGE.

PLUGGED PH LINES WERE A PROBLEM DURING THIS PERIOD.

7/79	A	83.9	29.5	29.7	22.0			
	B	88.7	41.2	41.4	30.8			
	SYSTEM	86.3	35.4	35.6	26.4	744	554	196
8/79	A	76.2	40.8	40.8	40.8			
	B	77.6	42.6	42.6	42.6			
	SYSTEM	76.9	41.7	41.7	41.7	744	744	310
9/79	A	87.6	58.5	57.4	54.4			
	B	86.5	55.5	56.2	53.3			
	SYSTEM	87.0	57.0	56.8	53.9	720	681	388
10/79	A	75.9	66.2	66.5	63.3			
	B	43.1	23.6	23.7	22.6			
	SYSTEM	59.5	44.9	45.1	43.0	744	713	320
11/79	A	67.0	58.0	58.0	48.0			
	B	52.0	49.0	49.0	41.0			
	SYSTEM	59.5	53.5	53.5	44.5	720	599	320
12/79	A	84.0	76.0	76.0	76.0			
	B	91.0	87.0	87.0	87.0			
	SYSTEM	87.5	81.5	81.5	81.5	744	744	606

LITY FGD SURVEY: JANUARY - DECEMBER 1988

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

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

** PROBLEMS/SOLUTIONS/COMMENTS

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

CAVITATION WAS SITED IN THE SLUDGE PUMP.

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

PLUGGING IN THE REAGENT CIRCULATION SYSTEMS WAS ENCOUNTERED.

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

30	A	88.0	74.0	74.0	74.0				
	B	89.0	78.0	78.0	78.0				
	SYSTEM	89.0	76.0	76.0	76.0	744	744	566	73.9

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD SYSTEM RELATED PROBLEMS WERE REPORTED FOR JANUARY.

80	A	87.0	75.0	78.0	69.0				
	B	92.0	81.0	85.0	75.0				
	SYSTEM	90.0	78.0	82.0	72.0	696	648	503	70.8

** PROBLEMS/SOLUTIONS/COMMENTS

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

80	A	93.0	69.0	69.0	15.0				
	B	94.0	76.0	76.0	16.0				
	SYSTEM	94.0	73.0	73.0	16.0	744	160	117	17.6

** PROBLEMS/SOLUTIONS/COMMENTS

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

80	A	98.8	25.6	29.4	11.1				
	B	98.9	54.2	62.1	23.5				
	SYSTEM	98.9	40.1	45.8	17.4	720	312	125	19.8

** PROBLEMS/SOLUTIONS/COMMENTS

CONTINUOUS PROBLEMS WITH DAMPERS, PRESATURATOR HOSES, AND NOZZLES ACCOUNTED FOR MOST OF THE APRIL FGD SYSTEM OUTAGES.

80	A	96.9	58.3	63.8	55.0				
	B	96.1	33.8	37.0	31.9				
	SYSTEM	96.5	46.1	50.4	43.4	744	701	323	39.1

** PROBLEMS/SOLUTIONS/COMMENTS

CONTROL AND INSTRUMENTATION PROBLEMS THAT DEVELOPED IN MAY WERE RESPONSIBLE FOR SOME FGD SYSTEM OUTAGE TIME.

'80	A	97.1	73.6	73.4	73.1				
	B	97.1	50.5	50.3	50.1				
	SYSTEM	97.1	62.1	61.9	61.7	720	715	444	52.5

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

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

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

** PROBLEMS/SOLUTIONS/COMMENTS

THE MAJORITY OF THE JUNE FGD SYSTEM OUTAGES WERE A RESULT OF EXTERNAL CAUSES (IUCS DISPOSAL SYSTEM, LOW UNIT DEMAND, SERVICE WATER, ETC.).

7/80	A	96.0	85.1	85.9	82.7				
	B	99.1	89.1	89.9	86.6				
	SYSTEM	97.5	87.1	87.9	84.6	744	722	630	61.7

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM EXPERIENCED PROCESS CONTROL PROBLEMS DURING JULY.

PROBLEMS WITH LEAKING INLET DAMPER SEALS ALSO OCCURRED DURING JULY.

8/80	A	90.2	65.4	67.3	30.1				
	B	97.4	85.5	88.0	39.4				
	SYSTEM	93.8	75.5	77.6	34.7	744	343	259	28.3

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT PROBLEMS WERE ENCOUNTERED WITH THE RECLAIM WATER AND THE RECYCLE SLURRY SYSTEMS DURING AUGUST.

9/80	A	93.6	88.2	88.5	87.8				
	B	94.2	90.7	91.0	90.3				
	SYSTEM	93.9	89.5	89.8	89.0	720	716	641	72.6

** PROBLEMS/SOLUTIONS/COMMENTS

THE INLET DAMPER SEAL PROBLEM CONTINUED THROUGH AUGUST AND SEPTEMBER.

EXTERNAL PROBLEMS WERE EXPERIENCED WITH THE IUCS SYSTEM.

10/80	A	89.2	72.0	72.6	64.9				
	B	94.1	87.6	88.3	78.9				
	SYSTEM	91.7	79.8	80.5	71.9	744	670	535	57.2

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

** PROBLEMS/SOLUTIONS/COMMENTS

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

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

** PROBLEMS/SOLUTIONS/COMMENTS

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

1/81	A	97.6	92.7	92.7	92.7				
	B	98.4	90.5	90.4	90.4				
	SYSTEM	97.9	92.0	91.5	91.5	744	744	681	79.0

2/81	A	89.7	81.0	81.3	74.7				
	B	95.2	89.2	89.6	82.3				
	SYSTEM	92.4	85.0	85.4	78.4	672	620	528	75.4

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

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

-----PERFORMANCE DATA-----
 R100 MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION % REMOVAL PER BOILER FGD CAP.
 SO2 PART. HOURS HOURS HOURS HOURS FACTOR

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JANUARY AND FEBRUARY THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED.

/81	A	74.7	96.6	98.0	58.9			
	B	75.0	97.5	99.0	59.4			
	SYSTEM	74.9	97.0	98.5	59.1	744	453	440 57.7

** PROBLEMS/SOLUTIONS/COMMENTS

THE MAJORITY OF OUTAGE TIME DURING MARCH WAS THE RESULT OF LOW BOILER LOAD OR A LACK OF POWER DEMAND.

DURING THE MONTH SOME MINOR PROBLEMS WERE ENCOUNTERED WITH VARIOUS PIECES OF AUXILIARY EQUIPMENT. NO PROBLEMS WERE EXPERIENCED WITH EITHER MODULE.

/81	A	53.3	95.0	99.1	31.9			
	B	49.4	100.0	100.0	33.6			
	SYSTEM	51.4	97.5	99.5	32.8	720	242	236

** PROBLEMS/SOLUTIONS/COMMENTS

ON MAY 1, THE UNIT WAS OUT OF SERVICE FOR A SCHEDULED OUTAGE. THE UNIT REMAINED OFF LINE THROUGH MAY 14.

/81	A	99.6	100.0	100.0	83.3			
	B	99.6	100.0	100.0	83.3			
	SYSTEM	99.6	100.0	100.0	83.3	744	620	620

/81	A	99.2	100.0	100.0	90.0			
	B	99.2	100.0	100.0	90.0			
	SYSTEM	99.2	100.0	100.0	90.0	720	648	648

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR OPERATIONAL PROBLEMS WERE ENCOUNTERED DURING MAY AND JUNE.

7/81	A	99.6	100.0	100.0	73.9			
	B	99.2	100.0	100.0	73.9			
	SYSTEM	99.4	100.0	100.0	73.9	744	550	550

3/81	A	99.0	90.0	94.0	74.0			
	B	98.0	89.0	92.0	73.0			
	SYSTEM	98.5	89.5	93.0	73.5	744	607	547

9/81	A	100.0	85.0	94.0	35.0			
	B	89.0	87.0	97.0	36.0			
	SYSTEM	94.5	86.0	95.5	35.5	720	297	256

** PROBLEMS/SOLUTIONS/COMMENTS

SEVERE OUTLET DUCT CORROSION HAS OCCURRED ON UNIT 6. THE GUNITE LINER HAS FAILED DUE TO INADEQUATE STRENGTH OF THE SUPPORTING MESH. THE UTILITY IS LOOKING INTO INCONEL OR FRP AS A REPLACEMENT LINER.

UNIT 6 WAS REMOVED FROM SERVICE ON SEPTEMBER 19 AS A RESULT OF LOW DEMAND. THE UNIT IS NOT EXPECTED TO BE BROUGHT BACK ON LINE UNTIL DECEMBER. THIS OUTAGE PERIOD WILL BE UTILIZED FOR OUTLET DUCTWORK REPAIRS.

12/81	A	100.0	0.0	0.0	0.0			
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UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

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

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

B	100.0	0.0	0.0	0.0				
SYSTEM	100.0	0.0	0.0	0.0	744		0	

** PROBLEMS/SOLUTIONS/COMMENTS

DURING OCTOBER MAJOR MODIFICATIONS WERE BEING PERFORMED ON THE BOILER DUCTWORK. THIS INCLUDED REPAIRING THE CORRODED INNER SUPPORTS AND REPLACING THE GUNITE.

11/81	A	27.0	0.0	0.0	0.0			
	B	27.0	0.0	0.0	0.0			
	SYSTEM	27.0	0.0	0.0	0.0	720		0

** PROBLEMS/SOLUTIONS/COMMENTS

DURING NOVEMBER MAJOR MODIFICATION TO THE FGD SYSTEM DUCTWORK WAS PERFORMED. THIS WORK INCLUDED REPAIRING THE CORRODED SUPPORTS AND RECOATING WITH GUNITE.

DURING THE MONTH ADDITIONAL OUTAGE TIME WAS DUE TO GENERAL FGD MAINTENANCE

12/81	A	88.0	83.0	93.0	66.0			
	B	88.0	83.0	93.0	66.0			
	SYSTEM	88.0	83.0	93.0	66.0	744	592	491

** PROBLEMS/SOLUTIONS/COMMENTS

DURING DECEMBER MISCELLANEOUS EQUIPMENT PROBLEMS WERE ENCOUNTERED.

ALSO DURING THE MONTH OPACITY MONITORS WERE INSTALLED AND TESTED.

1/82	A	100.0	88.0	95.0	70.0			
	B	100.0	88.0	95.0	70.0			
	SYSTEM	100.0	88.0	95.0	70.0	744	592	521

2/82	A	98.0	87.0	92.0	60.0			
	B	99.0	90.0	90.0	62.0			
	SYSTEM	98.5	88.5	94.0	61.0	672	463	410

3/82	A	99.0	88.0	91.0	80.0			
	B	99.0	92.0	95.0	83.0			
	SYSTEM	99.0	90.0	93.0	81.5	744	673	606

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE FIRST QUARTER OF 1982.

4/82	A	100.0	89.0	96.0	63.0			
	B	100.0	88.0	94.0	62.0			
	SYSTEM	100.0	88.5	95.0	62.5	720	509	450

5/82	A	100.0	66.0	97.0	23.0			
	B	100.0	66.0	97.0	23.0			
	SYSTEM	100.0	66.0	97.0	23.0	744	259	171

6/82	A	100.0	86.0	96.0	46.0			
	B	100.0	89.0	99.0	47.0			
	SYSTEM	100.0	87.5	97.5	46.5	720	383	335

LITY FGD SURVEY: JANUARY - DECEMBER 1988

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

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

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE SECOND QUARTER 1982.

'82	6A	99.7	92.9	93.7	62.0				
	6B	99.9	95.9	96.8	64.7				
	SYSTEM	99.8	94.4	95.2	63.7	744	502	474	50.2
'82	6A	99.8	93.9	97.7	72.1				
	6B	100.0	91.9	95.5	70.5				
	SYSTEM	99.9	92.9	96.6	71.3	744	571	530	56.7
'82	6A	97.2	90.4	91.3	75.3				
	6B	96.5	91.0	91.9	75.8				
	SYSTEM	96.8	90.7	91.6	75.6	720	600	544	64.9

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE PERIOD OF JULY THROUGH SEPTEMBER, 1982.

'82	6A	33.3	98.4	100.0	24.7				
	6B	33.0	93.2	94.6	23.4				
	SYSTEM	33.2	95.8	97.3	24.1	744	187	179	17.8

** PROBLEMS/SOLUTIONS/COMMENTS

UNIT 6 WAS OUT OF SERVICE DURING PART OF OCTOBER FOR AN ANNUAL OUTAGE.

'82	6A	46.3	81.5	78.3	35.7				
	6B	46.5	76.1	73.0	33.3				
	SYSTEM	46.4	78.8	75.6	34.5	720	315	248	31.9

** PROBLEMS/SOLUTIONS/COMMENTS

UNIT 6 WAS OUT OF SERVICE DURING PART OF NOVEMBER FOR THE ANNUAL OUTAGE.

'82	6A	98.0	87.9	88.0	64.5				
	6B	96.9	87.1	87.2	63.9				
	SYSTEM	97.5	87.5	87.6	64.2	744	546	478	58.3
'83	6A	96.7	88.5	90.6	55.6				
	6B	96.8	88.4	90.5	55.6				
	SYSTEM	96.7	88.4	90.5	55.6	744	468	414	45.1

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING DECEMBER, 1982 THROUGH JANUARY, 1983.

'83	6A	90.9	82.4	85.2	61.5				
	6B	91.4	84.1	87.0	62.8				
	SYSTEM	91.2	83.3	86.1	62.1	672	501	418	45.0

** PROBLEMS/SOLUTIONS/COMMENTS

PRIOR TO FEBRUARY 16, 1983, THE UTILITY WAS CONSIDERING FGD SYSTEM AVAILABLE TIME TO INCLUDE PERIODS WHEN SCRUBBER MAINTENANCE WAS PERFORMED DURING A UNIT OUTAGE. THE UTILITY NOW CONFORMS TO THE CORRECT DEFINITION OF AVAILABILITY AND CONSIDERS THE SCRUBBER UNAVAILABLE DURING THESE PERIODS.

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

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

-----PERFORMANCE DATA-----										
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
3/83	6A	88.8	86.6	87.5	80.2					
	6B	90.2	89.6	90.5	82.9					
	SYSTEM	89.5	88.1	89.0	81.6		744	689	607	61.7
** PROBLEMS/SOLUTIONS/COMMENTS										
THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING MARCH.										
4/83	6A	80.4	79.6	80.3	79.6					
	6B	96.3	95.4	96.2	95.4					
	SYSTEM	88.3	87.5	88.2	87.5		720	720	630	67.1
** PROBLEMS/SOLUTIONS/COMMENTS										
THE UTILITY ATTRIBUTED THE VERY GOOD PERFORMANCE OF MODULE 6B DURING APRIL TO PROPER MAINTENANCE PERFORMED AND THE COMPLETION OF ESSENTIAL CHANGES IN THE SCRUBBING SYSTEM DESIGN.										
5/83	6A	94.5	80.0	82.4	22.6					
	6B	96.0	85.2	87.7	24.1					
	SYSTEM	95.2	82.6	85.0	23.3		744	210	174	17.7
** PROBLEMS/SOLUTIONS/COMMENTS										
THE UTILITY REPORTED THAT OUTAGE TIME WAS ATTRIBUTED TO THE CLEANING OF MIST ELIMINATORS DURING MAY.										
MAINTENANCE WORK ON MIST ELIMINATOR PUMPS ALSO CAUSED OUTAGE TIME IN MAY.										
A 72 HOUR OUTAGE OCCURRED DUE TO A CHEMICAL IMBALANCE OF THE MAKEUP WATER POND. DRAINAGE FROM THE CLEANING OF AN AIR HEATER PRODUCED ACIDIC CONDITIONS IN THE POND.										
6/83	6A	95.0	84.0	89.2	28.8					
	6B	96.8	86.9	92.2	29.7					
	SYSTEM	95.9	85.4	90.7	29.2		720	246	211	24.1
** PROBLEMS/SOLUTIONS/COMMENTS										
THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING JUNE.										
7/83	6A	94.9	86.8	88.9	39.8					
	6B	95.6	88.3	90.4	40.5					
	SYSTEM	95.2	87.5	89.6	40.1		744	341	299	32.0
8/83	6A	87.0	92.4	93.5	73.7					
	6B	91.1	95.1	96.2	75.8					
	SYSTEM	89.0	93.8	94.9	74.7		744	593	556	47.0
9/83	6A	93.3	91.3	92.0	49.6					
	6B	93.2	90.8	91.5	49.3					
	SYSTEM	93.3	91.0	91.8	49.4		720	391	356	33.3
** PROBLEMS/SOLUTIONS/COMMENTS										
THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE PERIOD OF JULY THROUGH SEPTEMBER, 1983.										
10/83	6A	98.9	98.9	98.9	61.7					
	6B	99.6	99.8	99.8	62.2					
	SYSTEM	99.3	99.4	99.4	62.0		744	464	461	44.4

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

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

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

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD-RELATED OUTAGES WERE ENCOUNTERED DURING OCTOBER.

33	6A	76.7	96.1	96.1	51.4				
	6B	76.1	95.1	95.1	50.8				
	SYSTEM	76.4	95.6	95.6	51.1	720	385	368	33.7

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT ANNUAL OUTAGES OCCURRED DURING NOVEMBER FOR UNIT 5 AND 6.

33	A	38.6	69.8	75.4	31.3				
	B	41.3	75.7	81.9	34.0				
	SYSTEM	39.9	72.8	78.6	32.7	744	334	243	26.1

** PROBLEMS/SOLUTIONS/COMMENTS

LOSS OF LINE FEED DUE TO FROZEN WATER LINES ON THE SLAKERS CONTRIBUTED TO FGD SYSTEM DOWN TIME DURING DECEMBER.

A MODULE OUTAGE WAS REQUIRED TO CLEAN PLUGGED ABSORBER & MIST ELIMINATOR SPRAY NOZZLES.

THE UNAVAILABILITY OF THE SLUDGE TREATMENT FACILITY DURING DECEMBER CONTRIBUTED TO FGD SYSTEM DOWN TIME.

84	A	96.2	93.9	95.2	73.9				
	B	96.8	94.5	95.8	74.5				
	SYSTEM	96.5	94.2	95.5	74.2	744	586	552	54.0

** PROBLEMS/SOLUTIONS/COMMENTS

PLUGGED RECYCLE, MIST ELIMINATOR AND PRESATURATOR SPRAY NOZZLES CONTRIBUTE TO DOWN TIME IN JANUARY.

DAMPER OPERATION FAILURE OCCURRED DURING THE MONTH.

COMPUTER-RELATED PROBLEMS WERE ENCOUNTERED DURING JANUARY.

84	6A	95.8	73.8	84.9	23.4				
	6B	79.3	81.0	93.2	25.7				
	SYSTEM	87.6	77.4	89.1	24.6	696	221	171	18.6

** PROBLEMS/SOLUTIONS/COMMENTS

PROBLEMS WITH PLUGGED SPRAY NOZZLES WERE REPORTED IN THE MIST ELIMINATOR, RECYCLE SYSTEM AND PRESATURATOR.

A POWER FAILURE AT THE SLUDGE TREATMENT PLANT OCCURRED DURING THE MONTH.

ABSORBER LINER FAILURE WAS REPORTED DURING FEBRUARY.

84	A	99.9	98.1	100.0	57.0				
	B	75.4	93.1	94.8	54.0				
	SYSTEM	87.6	95.6	97.4	55.5	744	432	413	40.7

** PROBLEMS/SOLUTIONS/COMMENTS

PRESATURATOR PLUGGAGE ACCOUNTED FOR 8 HOURS OF OUTAGE TIME IN MARCH.

COMPUTER-RELATED PROBLEMS WERE REPORTED DURING MARCH.

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

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

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

ABSORBER LINER FAILURE RESULTED IN 5 HRS. OF DOWN TIME IN MARCH.

THE UTILITY REPORTED THAT MODULE B WAS UNAVAILABLE 160 HOURS DUE TO DAMPER FAILURE.

4/84	6A	100.0	99.8	100.0	59.0				
	6B	100.0	99.8	100.0	59.0				
	SYSTEM	100.0	99.8	100.0	59.0	720	426	425	40.5
5/84	6A	100.0	99.0	100.0	41.9				
	6B	99.9	99.0	100.0	41.9				
	SYSTEM	99.9	99.0	100.0	41.9	744	315	312	32.0
6/84	6A	100.0	97.6	100.0	60.6				
	6B	100.0	97.6	100.0	60.6				
	SYSTEM	100.0	97.6	100.0	60.6	720	447	436	44.5
7/84	6A	99.7	97.1	99.4	57.2				
	6B	99.7	97.1	99.4	57.2				
	SYSTEM	99.7	97.1	99.4	57.2	744	438	426	

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD RELATED PROBLEMS WERE ENCOUNTERED DURING THE PERIOD OF APRIL THROUGH JULY, 1984.

8/84	A	100.0	95.2	100.0	80.5				
	B	100.0	95.2	100.0	80.5				
	SYSTEM	100.0	95.2	100.0	80.5	744	629	599	56.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE MONTH OF AUGUST.

9/84	A	73.3	100.0	100.0	62.1				
	B	73.1	100.0	100.0	62.1				
	SYSTEM	73.2	100.0	100.0	62.1	720	447	447	40.0
10/84	A	12.9	100.0	100.0	11.2				
	B	12.9	100.0	100.0	11.2				
	SYSTEM	12.9	100.0	100.0	11.2	744	83	83	8.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE UNIT WAS DOWN MOST OF SEPTEMBER AND OCTOBER FOR AN ANNUAL MAINTAINENCE OUTAGE.

11/84	A	100.0	99.8	99.8	56.5				
	B	99.9	99.5	99.5	56.4				
	SYSTEM	99.9	99.6	99.6	56.5	720	408	406	41.0
12/84	A	99.7	100.0	99.5	53.2				
	B	99.7	100.0	99.5	53.2				
	SYSTEM	99.7	100.0	99.5	53.2	744	388	396	

** PROBLEMS/SOLUTIONS/COMMENTS

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

1/85	6A	100.0	100.0	100.0	97.7				
	6B	100.0	100.0	100.0	97.7				
	SYSTEM	100.0	100.0	100.0	97.7	744	717	727	72.0

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

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

-----PERFORMANCE DATA-----											
MOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART. HOURS	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
'85	6A	100.0	100.0	100.0	65.2						
	6B	99.4	100.0	99.1	64.6						
	SYSTEM	99.7	100.0	99.5	64.9			672	423	436	43.0
'85	6A	99.9	100.0	99.9	90.6						
	6B	100.0	100.0	100.0	90.7						
	SYSTEM	99.9	100.0	99.9	90.7			744	667	675	63.0
'85	6A	100.0	99.3	99.8	92.1						
	6B	100.0	99.1	99.7	91.9						
	SYSTEM	100.0	99.2	99.8	92.0			720	668	662	67.0
'85	6A	100.0	100.0	100.0	91.3						
	6B	100.0	100.0	99.9	91.1						
	SYSTEM	100.0	100.0	99.9	91.2			744	668	678	66.0
'85	6A	99.2	97.1	98.4	60.0						
	6B	100.0	98.7	100.0	61.0						
	SYSTEM	99.6	97.9	99.2	60.5			720	445	436	41.3
'85	6A	99.9	99.4	99.8	62.6						
	6B	100.0	99.4	99.8	62.6						
	SYSTEM	99.9	99.4	99.8	62.6			744	469	466	41.9
'85	6A	98.9	97.8	98.6	76.6						
	6B	98.9	97.8	98.6	76.6						
	SYSTEM	98.9	97.8	98.6	76.6			744	583	570	51.6
'85	6A	100.0	99.2	100.0	70.4						
	6B	100.0	99.2	100.0	70.4						
	SYSTEM	100.0	99.2	100.0	70.4			720	511	507	42.7
'85	6A	100.0	99.5	100.0	57.3						
	6B	100.0	99.5	100.0	57.3						
	SYSTEM	100.0	99.5	100.0	57.3			744	428	426	38.9
'85	6A	100.0	99.5	100.0	85.8						
	6B	100.0	99.4	99.8	85.7						
	SYSTEM	100.0	99.4	99.9	85.8			720	621	617	55.5
'85	6A	98.7	99.4	100.0	68.0						
	6B	98.7	99.4	100.0	68.0						
	SYSTEM	98.7	99.4	100.0	68.0			744	509	506	44.0

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD SYSTEM-RELATED PROBLEMS WERE REPORTED BY THE UTILITY DURING THE MONTHS OF JANUARY THROUGH DECEMBER.

'86	6A		78.0	79.8	100.0	32.8					
	6B		100.0	100.0	100.0	44.8					
	SYSTEM		89.0	89.9	86.7	38.8		744	306	289	24.3
'86	6A		92.9	95.8	92.1	56.9					
	6B		95.3	95.7	92.0	56.9					
	SYSTEM		94.1	95.8	92.0	56.9		672	399	382	38.3

** PROBLEMS/SOLUTIONS/COMMENTS

PIPING PROBLEMS FORCED THE FGD SYSTEM OUT OF SERVICE 16 HOURS DURING THE MONTH.

THE FGD SYSTEM WAS FORCED OUT OF SERVICE 164 HOURS IN JANUARY AND 16 HOURS

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

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

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

IN EARLY FEBRUARY FOR MODULE 6A DAMPER PROBLEMS.

3/86	6A	30.1	100.0	100.0	22.6				
	6B	30.1	100.0	99.9	22.6				
	SYSTEM	30.1	100.0	99.9	22.6	744	167	168	49.2
4/86	6A	46.3	100.0	100.0	22.8				
	6B	46.1	100.0	100.0	22.7				
	SYSTEM	46.2	100.0	100.0	22.8	720	145	164	7.7

** PROBLEMS/SOLUTIONS/COMMENTS

MODULES 6A AND 6B WERE OUT OF SERVICE WITH THE UNIT FOR A SCHEDULED UNIT
 ANNUAL OUTAGE OVER THE MARCH 10 THROUGH APRIL 17 PERIOD.

5/86	6A	100.0	100.0	100.0	40.6				
	6B	100.0	100.0	100.0	40.5				
	SYSTEM	100.0	100.0	100.0	40.5	744	266	302	14.8
6/86	6A	99.9	100.0	100.0	80.2				
	6B	99.9	100.0	100.0	80.2				
	SYSTEM	99.9	100.0	100.0	80.2	720	561	577	37.3
7/86	6A	99.9	100.0	99.9	83.3				
	6B	99.9	100.0	99.9	83.3				
	SYSTEM	99.9	100.0	99.9	83.3	744	614	620	48.2
8/86	6A	100.0	100.0	100.0	61.7				
	6B	100.0	100.0	100.0	61.8				
	SYSTEM	100.0	100.0	100.0	61.8	744	442	460	30.7

** PROBLEMS/SOLUTIONS/COMMENTS

NO FGD SYSTEM-RELATED PROBLEMS WERE REPORTED FOR THE MONTHS OF MAY
 THROUGH AUGUST 1986.

9/86	6A	100.0	100.0	99.1	91.2				
	6B	100.0	97.2	96.4	88.7				
	SYSTEM	100.0	98.6	97.8	90.0	720	657	648	48.8

** PROBLEMS/SOLUTIONS/COMMENTS

A MODULE 6B DAMPER FAILURE CAUSED AN 11-HOUR FGD SYSTEM OUTAGE.

MODULES 6A AND 6B WERE REMOVED FROM SERVICE 63 HOURS FOR ESP TESTS.

10/86	6A	100.0	100.0	100.0	51.2				
	6B	98.8	100.0	97.8	50.0				
	SYSTEM	99.4	100.0	98.9	50.6	744	326	377	25.5
11/86	6A	100.0	99.5	98.8	76.1				
	6B	100.0	99.5	98.8	76.1				
	SYSTEM	100.0	99.5	98.8	76.1	720	551	548	43.1

** PROBLEMS/SOLUTIONS/COMMENTS

MODULES 6A AND 6B WERE REMOVED FROM SERVICE 7.2 HOURS FOR ESP TESTS.
 NO FGD SYSTEM-RELATED PROBLEMS WERE REPORTED FOR THE OCTOBER THROUGH
 NOVEMBER PERIOD.

12/86	6A	100.0	100.0	100.0	75.0				
	6B	99.8	100.0	99.7	74.7				
	SYSTEM	99.9	100.0	100.0	74.8	744	541	557	41.6

PLITY FGD SURVEY: JANUARY - DECEMBER 1988

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

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

** PROBLEMS/SOLUTIONS/COMMENTS

NO FGD SYSTEM-RELATED PROBLEMS WERE REPORTED FOR DECEMBER.

'87	6A	100.0	99.2	99.9	71.5				
	6B	100.0	99.2	99.9	71.5				
	SYSTEM	100.0	99.2	99.9	71.5	744	536	532	47.9
'87	6A	100.0	95.0	99.8	28.4				
	6B	100.0	95.2	100.0	28.5				
	SYSTEM	100.0	95.1	99.9	28.5	672	201	191	14.1
'87	6A	100.0	99.1	100.0	87.8				
	6B	100.0	99.1	100.0	87.8				
	SYSTEM	100.0	99.1	100.0	87.8	744	660	653	54.5
'87	6A	100.0	98.9	99.9	83.5				
	6B	100.0	98.9	99.9	83.5				
	SYSTEM	100.0	98.9	99.9	83.5	720	608	601	56.8
'87	6A	100.0	98.0	99.8	55.1				
	6B	100.0	98.0	99.8	55.1				
	SYSTEM	100.0	98.0	99.8	55.1	744	418	410	36.2
'87	6A	99.8	97.4	99.4	59.1				
	6B	100.0	97.7	99.7	59.3				
	SYSTEM	99.9	97.6	99.6	59.2	720	437	426	36.4
'87	6A	97.6	100.0	99.9	40.2				
	6B	97.6	100.0	99.9	40.2				
	SYSTEM	97.6	100.0	99.9	40.2	744	298	299	24.2
'87	6A	99.9	99.4	99.4	57.9				
	6B	99.9	99.4	99.4	57.9				
	SYSTEM	99.9	99.4	99.4	57.9	744	433	431	28.9

** PROBLEMS/SOLUTIONS/COMMENTS

NO FGD SYSTEM-RELATED PROBLEMS WERE REPORTED FOR THE PERIOD JANUARY THROUGH AUGUST 1987.

'87	6A	56.6	99.0	99.8	33.2				
	6B	56.6	98.9	99.7	33.2				
	SYSTEM	56.6	98.9	99.8	33.2	720	242	239	20.4
'87	6A	0.0			0.0				
	6B	0.0			0.0				
	SYSTEM	0.0			0.0	744	0	0	0.0
'87	6A	30.6	74.1	82.8	13.0				
	6B	24.8	62.9	70.3	11.0				
	SYSTEM	27.7	68.5	76.6	12.0	720	126	86	6.0
'87	6A	99.5	92.9	96.5	14.1				
	6B	99.8	95.8	99.5	14.6				
	SYSTEM	99.6	94.4	98.0	14.4	744	113	107	7.0

** PROBLEMS/SOLUTIONS/COMMENTS

A SCHEDULED UNIT 6 OUTAGE BEGAN IN SEPTEMBER AND CONTINUED THROUGH DECEMBER.

'88	6A	94.2	96.1	97.8	57.2				
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UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

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

-----PERFORMANCE DATA-----											
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART. HOURS	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
2/88	6B	98.3	97.4	99.1	58.0						
	SYSTEM	96.2	96.8	98.4	57.6			744	443	429	33.5
	6A	100.0	98.5	99.8	51.5						
3/88	6B	99.9	98.5	99.9	51.5						
	SYSTEM	100.0	98.5	99.8	51.5			696	364	358	25.1
	6A	100.0	99.5	99.9	90.7						
4/88	6B	99.9	99.6	100.0	90.8						
	SYSTEM	99.9	99.5	100.0	90.8			744	679	675	49.7
	6A	97.1	96.7	97.2	90.2						
5/88	6B	97.9	97.6	98.0	90.9						
	SYSTEM	97.5	97.1	97.6	90.5			720	671	652	87.2
	6A	96.7	95.3	96.2	81.2						
6/88	6B	95.5	93.9	94.8	80.0						
	SYSTEM	96.1	94.6	95.5	80.6			744	634	600	75.4
	6A	100.0	99.0	100.0	78.3						
7/88	6B	97.9	96.4	97.3	76.3						
	SYSTEM	99.0	97.7	98.7	77.3			720	570	557	69.5
	6A	100.0	98.9	100.0	79.0						
8/88	6B	100.0	98.9	100.0	79.0						
	SYSTEM	100.0	98.9	100.0	79.0			744	594	588	68.5
	6A	99.8	99.0	99.8	75.7						
9/88	6B	99.9	99.2	100.0	75.8						
	SYSTEM	99.9	99.1	99.9	75.8			744	569	564	49.2
	6A	100.0	99.4	100.0	86.5						
10/88	6B	100.0	99.4	99.9	86.5						
	SYSTEM	100.0	99.4	99.9	86.5			720	627	623	51.9
	6A	100.0	99.4	100.0	82.7						
11/88	6B	100.0	99.4	100.0	82.7						
	SYSTEM	100.0	99.4	100.0	82.7			744	619	615	48.2
	6A	100.0	97.9	100.0	71.4						
12/88	6B	100.0	97.9	100.0	71.4						
	SYSTEM	100.0	97.9	100.0	71.4			720	525	514	40.8
	6A	100.0	99.2	100.0	70.6						
	6B	100.0	99.2	100.0	70.6						
	SYSTEM	100.0	99.2	100.0	70.6			744	530	525	41.6

** PROBLEMS/SOLUTIONS/COMMENTS

NO FGD SYSTEM-RELATED PROBLEMS WERE REPORTED FOR THE YEAR 1988.

SECTION 13
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	COOPERATIVE POWER ASSOCIATION	
PLANT NAME	COAL CREEK	
UNIT NUMBER	1	
CITY	UNDERWOOD	
STATE	NORTH DAKOTA	
REGULATORY CLASSIFICATION	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	1100	
GROSS UNIT GENERATING CAPACITY - MW	550	
NET UNIT GENERATING CAPACITY W/FGD - MW	500	
NET UNIT GENERATING CAPACITY WO/FGD - MW	501	
EQUIVALENT SCRUBBED CAPACITY - MW	327	
** UNIT DATA - BOILER AND STACK	COMBUSTION ENGINEERING	
BOILER SUPPLIER	PULVERIZED COAL	
BOILER TYPE	BASE	
BOILER SERVICE LOAD		
DESIGN BOILER FLUE GAS FLOW - CU.M/S	1038.18	(2200000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	160.0	(320 F)
STACK HEIGHT - M	201.	(658 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	6.7	(22.0 FT)
** FUEL DATA	COAL	
FUEL TYPE	LIGNITE	
FUEL GRADE	14556.	(6258 BTU/LB)
AVERAGE HEAT CONTENT - J/G		3068-7660
RANGE HEAT CONTENT - BTU/LB	7.14	
AVERAGE ASH CONTENT - %	3.9-16.0	
RANGE ASH CONTENT - %	39.83	
AVERAGE MOISTURE CONTENT - %	27.8-52.6	
RANGE MOISTURE CONTENT - %	0.63	
AVERAGE SULFUR CONTENT - %	0.2-1.4	
RANGE SULFUR CONTENT - %	0.02	
AVERAGE CHLORIDE CONTENT - %	0.00-0.08	
RANGE CHLORIDE CONTENT - %		
*** PARTICLE CONTROL		
** MECHANICAL COLLECTOR		
NUMBER	0	
TYPE	NONE	
** ESP		
NUMBER	1	
NUMBER OF SPARES	0	
TYPE	COLD SIDE	
SUPPLIER	WHEELABRATOR-FRYE	
INLET FLUE GAS CAPACITY - CU.M/S	1090.1	(2310000 ACFM)
INLET FLUE GAS TEMPERATURE - C	160.6	(321 F)
PRESSURE DROP - KPA	0.6	(3. IN-H2O)
PARTICLE REMOVAL EFFICIENCY - %	99.5	
** 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	THROWAWAY PRODUCT	
SO2 REMOVAL MODE	WET SCRUBBING	
PROCESS TYPE	LIME/ALKALINE FLYASH	
PROCESS ADDITIVES	NONE	

LITY FGD SURVEY: JANUARY - DECEMBER 1988

PERATIVE POWER ASSOCIATION: COAL CREEK 1 (CONT.)

SYSTEM SUPPLIER	COMBUSTION ENGINEERING	
A-E FIRM	BLACK & VEATCH	
DEVELOPMENT LEVEL	FULL SCALE	
NEW/RETROFIT	NEW	
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.50	
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	54.00	
ENERGY CONSUMPTION - %	0.2	
CURRENT STATUS	1	
COMMERCIAL START-UP	8/1979	
INITIAL START-UP	7/1979	
CONTRACT AWARDED	5/1976	
DESIGN AND OPERATING PARAMETERS		
DESIGN COAL SULFUR CONTENT - %	0.63	
DESIGN CHLORIDE CONTENT - %	*****	
SPACE REQUIREMENTS - SQ M	8091.6	(87100 SQ FT)
OPER. & MAINT. REQUIREMENT - MANHR/DAY	72.0	
QUENCHER/PRESATURATOR		
NUMBER	0	
ABSORBER		
NUMBER	4	
NUMBER OF SPARES	0	
GENERIC TYPE	SPRAY TOWER	
SPECIFIC TYPE	OPEN COUNTERCURRENT SPRAY	
TRADE NAME/COMMON TYPE	N/A	
SUPPLIER	COMBUSTION ENGINEERING	
DIMENSIONS - FT	21.5 WIDE X 20 DEEP X 55 HIGH	
SHELL GENERIC MATERIAL	STAINLESS STEEL	
SHELL SPECIFIC MATERIAL	AUSTENITIC	
SHELL MATERIAL TRADE NAME/COMMON TYPE	TYPE 316L	
LINER GENERIC MATERIAL	NONE	
LINER SPECIFIC MATERIAL	N/A	
LINER MATERIAL TRADE NAME/COMMON TYPE	N/A	
GAS CONTACTING DEVICE TYPE	NONE	
NUMBER OF CONTACTING ZONES	1	
LIQUID RECIRCULATION RATE - LITER/S	1310.	(20790 GPM)
L/G RATIO - L/CU.M	8.0	(60.0 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	0.7	(3.0 IN-H2O)
SUPERFICAL GAS VELOCITY - M/SEC	3.2	(10.6 FT/S)
INLET GAS FLOW - CU. M/S	163.51	(346500 ACFM)
INLET GAS TEMPERATURE - C	160.6	(321 F)
SO2 REMOVAL EFFICIENCY - %	90.0	
* MIST ELIMINATOR		
PRE-MIST ELIMINATOR/MIST ELIMINATOR	PRIMARY COLLECTOR	
NUMBER PER SYSTEM	4	
NUMBER OF SPARES PER SYSTEM	0	
NUMBER PER MODULE	1	
GENERIC TYPE	IMPINGEMENT	
SPECIFIC TYPE	BAFFLE	
TRADE NAME/COMMON TYPE	CLOSED VANE	
CONFIGURATION	HORIZONTAL	
NUMBER OF STAGES	2	
NUMBER OF PASSES PER STAGE	2	
FREEBOARD DISTANCE - M	2.44	(8.0 FT)
DISTANCE BETWEEN STAGES - CM	76.20	(30.0 IN)
DISTANCE BETWEEN VANES - CM	7.6	(3.00 IN)
PRESSURE DROP - KPA	0.1	(0.5 IN-H2O)
SUPERFICAL GAS VELOCITY - M/S	2.7	(8.9 FT/S)
CONSTRUCTION MATERIAL GENERIC TYPE	ORGANIC	
CONSTRUCTION MATERIAL SPECIFIC TYPE	FIBER-REINFORCED POLYESTER	
WASH WATER SOURCE	COOLING TOWER BLOWDOWN	
WASH FREQUENCY	INTERMITTENT	
WASH RATE - L/S	37.8	(600 GAL/MIN)
* REHEATER		
NUMBER	1	
NUMBER OF SPARES	0	
GENERIC TYPE	BYPASS	

COOPERATIVE POWER ASSOCIATION: COAL CREEK 1 (CONT.)

SPECIFIC TYPE	COLD SIDE
TRADE NAME/COMMON TYPE	N/A
PERCENT GAS BYPASSED - AVG	40.0
TEMPERATURE INCREASE - C	47.2 (85 F)
INLET FLUE GAS TEMPERATURE - C	57.2 (135 F)
OUTLET FLUE GAS TEMPERATURE - C	98.9 (210 F)
CONSTRUCTION MATERIAL GENERIC TYPE	NR
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR
** FANS	
NUMBER	4
NUMBER OF SPARES	0
DESIGN	CENTRIFUGAL
SUPPLIER	GREEN FAN
FUNCTION	BALANCED DRAFT
APPLICATION	FORCED DRAFT
SERVICE	DRY
FLUE GAS FLOW RATE - CU.M/S	163.51 (346500 ACFM)
FLUE GAS TEMPERATURE - C	160.6 (321 F)
PRESSURE DROP - KPA	12.8 (42.0 IN-H2O)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL
** DAMPERS	
NUMBER	8
FUNCTION	ISOLATION
GENERIC TYPE	LOUVER
SPECIFIC TYPE	NR
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	8
FUNCTION	ISOLATION
GENERIC TYPE	LOUVER
SPECIFIC TYPE	NR
CONSTRUCTION MATERIAL GENERIC TYPE	STAINLESS STEEL
CONSTRUCTION MATERIAL SPECIFIC TYPE	AUSTENITIC
LINER GENERIC MATERIAL TYPE	NONE
LINER SPECIFIC MATERIAL TYPE	N/A
** DAMPERS	
NUMBER	4
FUNCTION	CONTROL
GENERIC TYPE	LOUVER
SPECIFIC TYPE	NR
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	8
FUNCTION	ISOLATION
GENERIC TYPE	LOUVER
SPECIFIC TYPE	NR
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
** DUCTWORK	
LOCATION	OUTLET
SHELL GENERIC MATERIAL TYPE	STAINLESS STEEL
SHELL SPECIFIC MATERIAL TYPE	AUSTENITIC
LINER GENERIC MATERIAL TYPE	NONE
LINER SPECIFIC MATERIAL TYPE	N/A

ILITY FGD SURVEY: JANUARY - DECEMBER 1988

PERATIVE POWER ASSOCIATION: COAL CREEK 1 (CONT.)

DUCTWORK	
LOCATION	INLET
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
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	PLENUM TO STACK
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
SHELL SPECIFIC MATERIAL TYPE	AISI 1110
LINER GENERIC MATERIAL TYPE	INORGANIC
LINER SPECIFIC MATERIAL TYPE	HYDRAULICALLY-BONDED MORTAR
REAGENT PREPARATION EQUIPMENT	
FUNCTION	SLAKER
DEVICE	NR
DEVICE TYPE	NR
MANUFACTURER	WALLACE & TIEMAN
NUMBER	2
PRODUCT QUALITY - % SOLIDS	10.0
TANKS	
SERVICE	NUMBER
-----	-----
ABSORBER RECYCLE	2
FLYASH	****
REAGENT PREP PRODUCT	****
PUMPS	
SERVICE	NUMBER
-----	-----
BLEED STREAM	3
SLURRY FEED	2
REACTION TANK TRANSFER	6
SOLIDS CONCENTRATING/DEWATERING	
DEVICE	NONE
SALEABLE BYPRODUCTS	
NATURE	NONE
DISPOSITION	N/A
SLUDGE	
TREATMENT	
METHOD	BLEED
DEVICE	NR
PROPRIETARY PROCESS	N/A
DISPOSAL	
NATURE	FINAL
TYPE	POND
LOCATION	ON-SITE
SITE TRANSPORTATION METHOD	PIPELINE
SITE TREATMENT	CLAY LINING
SITE DIMENSIONS	400 ACRES
SITE SERVICE LIFE - YRS	35

COOPERATIVE POWER ASSOCIATION: COAL CREEK 1 (CONT.)

** PROCESS CONTROL AND INSTRUMENTATION	
CHEMICAL PARAMETERS	PH, SO2
PHYSICAL VARIABLES	SOLIDS, LIQUID LEVEL
MONITOR TYPE	UNILOC FOR PH, LEAR-SIEGLER FOR SO2, MOORE FOR S
MONITOR LOCATION	REACTION TANK FOR PH
** WATER BALANCE	
WATER LOOP TYPE	OPEN
** CHEMICALS AND CONSUMPTION	
FUNCTION	ABSORBENT
NAME	LIME
PRINCIPAL CONSTITUENT	CAO
SOURCE/SUPPLIER	PETE LIEN & SONS, INC.
CONSUMPTION	RAPID CITY, SOUTH DAKOTA
POINT OF ADDITION	SLAKER
** FGD SPARE CAPACITY INDICES	
ABSORBER - %	0.0
** FGD SPARE COMPONENT INDICES	
ABSORBER	0.0

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

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

744

** PROBLEMS/SOLUTIONS/COMMENTS

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

8/79 SYSTEM

744

9/79 SYSTEM

720

** PROBLEMS/SOLUTIONS/COMMENTS

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

10/79 SYSTEM

744 711

11/79 SYSTEM

720 703

12/79 SYSTEM

744 719

** PROBLEMS/SOLUTIONS/COMMENTS

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

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

1/80 SYSTEM

100.0

96.1

744 715 715

LITY FGD SURVEY: JANUARY - DECEMBER 1988

PERATIVE POWER ASSOCIATION: COAL CREEK 1 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

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

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

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

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

80 SYSTEM 99.9 696 695

** PROBLEMS/SOLUTIONS/COMMENTS

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

80 SYSTEM 100.0 96.1 744 715 715

** PROBLEMS/SOLUTIONS/COMMENTS

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

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

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

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

** PROBLEMS/SOLUTIONS/COMMENTS

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

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

** PROBLEMS/SOLUTIONS/COMMENTS

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

'80	11	92.9	49.3	100.0	49.2
	12	98.5	47.6	100.0	47.5

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

COOPERATIVE POWER ASSOCIATION: COAL CREEK 1 (CONT.)

-----PERFORMANCE DATA-----										
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	13	74.7	42.2	100.0	42.1					
	14	93.5	73.0	100.0	72.8					
	SYSTEM	89.9	53.0	100.0	52.9		720	718	381	58.5
** PROBLEMS/SOLUTIONS/COMMENTS										
THERE WERE NO MAJOR PROBLEMS REPORTED DURING JUNE. ROUTINE MAINTENANCE AND REPAIRS WERE DONE THROUGHOUT THE MONTH.										
7/80	SYSTEM	100.0	100.0	100.0	87.1		744	648	648	47.1
** PROBLEMS/SOLUTIONS/COMMENTS										
IN JULY, NO PROBLEMS WERE ENCOUNTERED WITH THE FGD SYSTEM.										
8/80	11		24.8		17.5					
	12		43.5		30.6					
	13		42.7		30.1					
	14		78.9		55.6					
	SYSTEM		47.5		33.5		744	525	249	31.8
** PROBLEMS/SOLUTIONS/COMMENTS										
THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING AUGUST.										
9/80	SYSTEM		0.0		0.0		720	0	0	0.0
** PROBLEMS/SOLUTIONS/COMMENTS										
THE UNIT DID NOT OPERATE DURING SEPTEMBER DUE TO A TURBINE BEARING FAILURE										
10/80	11		65.6		13.2					
	12		80.3		16.1					
	13		2.7		0.0					
	14		36.1		7.3					
	SYSTEM		46.2		9.3		744	149	69	12.1
** PROBLEMS/SOLUTIONS/COMMENTS										
DURING MOST OF OCTOBER THE UNIT DID NOT OPERATE DUE TO THE REPAIRS BEING PERFORMED ON THE TURBINE BEARINGS. THE UNIT OPERATED APPROXIMATELY 150 HOURS DURING THE MONTH.										
11/80	11		46.7		45.8					
	12		48.1		47.2					
	13		33.7		33.1					
	14		45.0		44.2					
	SYSTEM		43.4		42.6		720	707	307	30.8
12/80	11		60.6		60.2					
	12		30.3		30.1					
	13		85.0		84.4					
	14		10.0		9.9					
	SYSTEM		46.6		46.2		744	739	344	72.2
** PROBLEMS/SOLUTIONS/COMMENTS										
NO MAJOR PROBLEMS WERE ENCOUNTERED DURING NOVEMBER AND DECEMBER.										
1/81	11	100.0	45.2		45.2					
	12	100.0	46.8		46.8					
	13	100.0	38.7		38.7					

LITY FGD SURVEY: JANUARY - DECEMBER 1988

OPERATIVE POWER ASSOCIATION: COAL CREEK 1 (CONT.)

-----PERFORMANCE DATA-----									
MOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER BOILER HOURS	FGD CAP. HOURS FACTOR
	14	100.0	44.6		44.6				
	SYSTEM	100.0	43.8		43.8			744	744 326 58.3
'81	11	82.5	57.4		47.5				
	12	82.5	79.1		65.2				
	13	82.5	71.8		59.2				
	14	82.5	1.8		1.5				
	SYSTEM	82.5	52.5		43.3			672	554 291 45.6
'81	11	47.4	50.4		23.9				
	12	47.4	73.7		34.9				
	13	47.4	57.8		27.4				
	14	47.4	58.4		29.0				
	SYSTEM	47.4	60.9		28.8			744	353 215 30.7

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE FIRST QUARTER 1981 VIBRATION PROBLEMS WERE EXPERIENCED CAUSING FAILURE OF THE REACTION TANK BLADES.

'81	11	100.0	64.7	100.0	64.7				
	12	100.0	94.7	100.0	94.7				
	13	100.0	36.7	100.0	36.7				
	14	100.0	87.2	100.0	87.2				
	SYSTEM	100.0	70.8	100.0	70.8			720	720 510 68.6
'81	11	100.0	62.9	100.0	62.9				
	12	100.0	65.6	100.0	65.6				
	13	100.0	31.5	100.0	31.5				
	14	100.0	39.0	100.0	39.0				
	SYSTEM	100.0	49.7	100.0	49.7			744	744 370 68.3
'81	11	100.0	51.3	100.0	47.2				
	12	100.0	76.9	100.0	70.8				
	13	100.0	15.7	100.0	14.4				
	14	100.0	10.6	100.0	9.7				
	SYSTEM	100.0	38.6	100.0	35.6			720	663 256 57.0

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE SECOND QUARTER 1981 THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED.

'81	11		34.3		34.1				
	12		49.9		49.7				
	13		8.9		8.9				
	14		54.8		54.6				
	SYSTEM		37.0		36.8			744	741 274 55.3
'81	11		41.5		33.3				
	12		46.6		37.4				
	13		8.0		6.5				
	14		84.4		67.7				
	SYSTEM		45.2		36.3			744	597 270 62.9
'81	SYSTEM				0.0			720	0 0 0.0

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR OPERATIONAL PROBLEMS WERE REPORTED FOR THE MONTHS OF JULY AND AUGUST. THE UNIT WAS TAKEN OFF LINE IN SEPTEMBER FOR AN ANNUAL OUTAGE.

'81	11		64.7		17.5				
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UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

COOPERATIVE POWER ASSOCIATION: COAL CREEK 1 (CONT.)

-----PERFORMANCE DATA-----										
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	12		20.9		5.6					
	13		79.6		21.5					
	14		49.8		13.4					
	SYSTEM		53.7		14.5		744	201	108	18.4
11/81	11		42.0		34.2					
	12		59.4		48.3					
	13		52.2		42.5					
	14		76.2		61.9					
	SYSTEM		57.4		46.7		720	586	336	52.6
** PROBLEMS/SOLUTIONS/COMMENTS										
DURING OCTOBER THE UNIT WAS SHUTDOWN UNTIL THE 24TH FOR AN ANNUAL INSPECTION.										
12/81	11		72.4		54.3					
	12		67.4		50.5					
	13		49.1		36.8					
	14		49.4		37.1					
	SYSTEM		59.5		44.7		744	558	332	48.8
** PROBLEMS/SOLUTIONS/COMMENTS										
GENERAL MAINTENANCE WAS PERFORMED ON THE FGD SYSTEM DURING THE FOURTH QUARTER. NO FGD FORCED OUTAGES WERE ENCOUNTERED.										
1/82	11	100.0	66.1	100.0	65.9					
	12	100.0	58.3	100.0	58.1					
	13	100.0	73.1	100.0	72.8					
	14	100.0	92.2	100.0	91.9					
	SYSTEM	100.0	72.4	100.0	72.2		744	741	537	81.8
2/82	11	100.0	65.8	100.0	65.8					
	12	100.0	71.3	100.0	71.3					
	13	100.0	82.9	100.0	82.9					
	14	100.0	58.9	100.0	58.9					
	SYSTEM	100.0	69.7	100.0	69.7		672	672	469	76.7
3/82	11	100.0	37.9	100.0	37.9					
	12	100.0	50.0	100.0	50.0					
	13	100.0	39.9	100.0	39.9					
	14	100.0	30.6	100.0	30.6					
	SYSTEM	100.0	39.6	100.0	39.6		744	744	295	71.5
** PROBLEMS/SOLUTIONS/COMMENTS										
NO MAJOR PROBLEMS OR FORCED OUTAGES WERE ENCOUNTERED DURING THE FIRST QUARTER OF 1982.										
4/82	11	100.0	17.0	100.0	16.9					
	12	100.0	15.6	100.0	15.5					
	13	88.0	88.3	100.0	74.0					
	14	72.4	64.7	100.0	64.5					
	SYSTEM	90.1	46.4	100.0	42.7		720	718	308	75.1
5/82	11	100.0	3.7	100.0	3.2					
	12	100.0	13.6	100.0	11.9					
	13	100.0	52.7	100.0	46.2					
	14	100.0	54.4	100.0	47.7					
	SYSTEM	100.0	31.1	100.0	27.2		744	653	203	55.9
6/82	11	74.2	40.6	100.0	37.4					

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

OPERATIVE POWER ASSOCIATION: COAL CREEK 1 (CONT.)

-----PERFORMANCE DATA-----									
MOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER BOILER HOURS	FGD CAP. HOURS FACTOR
12		69.6	22.0	100.0	20.3				
13		73.3	0.0	100.0	54.3				
14		76.4	52.8	100.0	48.6				
SYSTEM		73.4	43.6	100.0	40.1			720 663	289 92.1

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE SECOND QUARTER 1982 GENERAL MAINTENANCE AND CLEANING OF THE FGD SYSTEM ACCOUNTED FOR ANY UNAVAILABLE TIME.

32 SYSTEM 744
 32 SYSTEM 744
 32 SYSTEM 720
 32 SYSTEM 744
 32 SYSTEM 720
 32 SYSTEM 744
 33 SYSTEM 744
 33 SYSTEM 672
 33 SYSTEM 744

** PROBLEMS/SOLUTIONS/COMMENTS

INFORMATION WAS UNAVAILABLE FOR THE PERIOD OF JULY 1982 THROUGH MARCH 1983

83 SYSTEM 720
 83 SYSTEM 744
 83 SYSTEM 720

** PROBLEMS/SOLUTIONS/COMMENTS

INFORMATION WAS UNAVAILABLE FOR THE PERIOD OF JULY 1982 THROUGH JUNE 1983.

83 SYSTEM 744
 83 SYSTEM 744
 83 SYSTEM 720

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE THIRD QUARTER OF 1983.

83 SYSTEM 744
 83 SYSTEM 720
 83 SYSTEM 744

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE FGD SYSTEM AT COAL CREEK 1 WAS 100 PERCENT AVAILABLE THROUGHOUT THE FOURTH QUARTER OF 1983.

84 SYSTEM 744

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

COOPERATIVE POWER ASSOCIATION: COAL CREEK 1 (CONT.)

-----PERFORMANCE DATA-----									
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART. HOURS	PER BOILER HOURS	FGD CAP. HOURS FACTOR
2/84	SYSTEM							696	
3/84	SYSTEM							744	
4/84	SYSTEM							720	
5/84	SYSTEM							744	
6/84	SYSTEM							720	
7/84	SYSTEM							744	
** PROBLEMS/SOLUTIONS/COMMENTS									
FGD SYSTEM AVAILABILITY FOR THE PERIOD OF JANUARY THROUGH JULY 1984 WAS REPORTED AS 100%.									
8/84	SYSTEM							744	
** PROBLEMS/SOLUTIONS/COMMENTS									
DURING THE SCHEDULED OUTAGE IN AUGUST, CORRODING REHEAT DUCTWORK WAS REPLACED WITH 316L STAINLESS STEEL.									
9/84	SYSTEM							720	
** PROBLEMS/SOLUTIONS/COMMENTS									
THE UTILITY REPORTED REPLACING DETERIORATING MIST ELIMINATOR FIBERGLASS LININGS DURING THE FIRST THREE QUARTERS OF 1984.									
10/84	SYSTEM							744	
11/84	SYSTEM							720	
12/84	SYSTEM							744	
** PROBLEMS/SOLUTIONS/COMMENTS									
THE UTILITY REPORTED THAT BOILER LOAD WAS REDUCED DUE TO PLUGGED MIST ELIMINATORS AND SPRAY HEADERS. THE PROBLEM DEPOSITS ARE HARD IN NATURE AND ARE BELIEVED TO BE CAUSED BY ALKALINE FLYASH WHICH IS USED AS A SCRUBBING ADDITIVE. THE UTILITY IS PRESENTING TESTING A CRYSTAL GROWTH MODIFIER TO SEE IF THE SCALE CAN BE SOFTENED TO FACILITATE REMOVAL.									
1/85	SYSTEM							744	
2/85	SYSTEM							672	
3/85	SYSTEM							744	
4/85	SYSTEM							720	
5/85	SYSTEM							744	
6/85	SYSTEM							720	
7/85	SYSTEM							744	
8/85	SYSTEM							744	
9/85	SYSTEM							720	
10/85	SYSTEM							744	

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

OPERATIVE POWER ASSOCIATION: COAL CREEK 1 (CONT.)

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

'85	SYSTEM						720			
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'85	SYSTEM						744			
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** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THERE WERE NO UNIT/FGD SCHEDULED OR FORCED OUT-AGES DURING 1985.

THE UTILITY STATED THAT THEY ARE STILL HAVING MIST ELIMINATOR PLUGGING PROBLEMS. THE HARD SCALE DEPOSITION SEEMS TO BE INDUCED BY THEIR FLYASH WHICH IS USED AS A SCRUBBING ADDITIVE. ONGOING SCALE MODIFIER TESTS HAVE PRODUCED MIXED RESULTS. MORE TESTING IS SCHEDULED FOR MAY OF NEXT YEAR. A SINGLE REACTION TANK ON ONE MODULE WILL BE TESTED WITH THE MODIFIER.

'86	SYSTEM						774			
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'86	SYSTEM						672			
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'86	SYSTEM						774			
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** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THERE WERE NO UNIT/FGD SCHEDULED OR FORCED OUTAGES DURING THE FIRST QUARTER 1986.

'86	SYSTEM						720			
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'86	SYSTEM						774			
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** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS OFF-LINE DURING THE MONTHS OF APRIL AND MAY FOR A SCHEDULED TURBINE/BOILER OUTAGE. IN ADDITION, THE FRP MIST ELIMINATOR IN A SINGLE MODULE WAS REPLACED BY ONE CONSTRUCTED OF 316L STAINLESS STEEL. THE FRP CONSTRUCTED MIST ELIMINATOR CRACK DURING SCALE REMOVAL

'86	SYSTEM						720			
-----	--------	--	--	--	--	--	-----	--	--	--

'86	SYSTEM						774			
-----	--------	--	--	--	--	--	-----	--	--	--

'86	SYSTEM						774			
-----	--------	--	--	--	--	--	-----	--	--	--

'86	SYSTEM						720			
-----	--------	--	--	--	--	--	-----	--	--	--

'86	SYSTEM						774			
-----	--------	--	--	--	--	--	-----	--	--	--

'86	SYSTEM						720			
-----	--------	--	--	--	--	--	-----	--	--	--

'86	SYSTEM						774			
-----	--------	--	--	--	--	--	-----	--	--	--

** PROBLEMS/SOLUTIONS/COMMENTS

NO UNIT/FGD OUTAGES WERE ENCOUNTERED DURING THE SECOND HALF OF THE YEAR. THE NOZZLES INSTALLED DURING THE EARLIER PART OF THE YEAR WERE REPORTED TO BE WORKING SUCCESSFULLY. THERE IS LESS MIST ELIMINATOR SCALE WITH THESE NOZZLES AND LESS NOZZLE PLUGGING.

'87	SYSTEM						744			
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'87	SYSTEM						672			
-----	--------	--	--	--	--	--	-----	--	--	--

'87	SYSTEM						744			
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UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

COOPERATIVE POWER ASSOCIATION: COAL CREEK 1 (CONT.)

-----PERFORMANCE DATA-----										
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PER PART.	BOILER HOURS	FGD HOURS	CAP. FACTOR
4/87	SYSTEM							720		
5/87	SYSTEM							744		
6/87	SYSTEM							720		
7/87	SYSTEM							744		
8/87	SYSTEM							744		
9/87	SYSTEM							720		
10/87	SYSTEM							744		
11/87	SYSTEM							720		
12/87	SYSTEM							744		

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE UNIT OPERATED ALL OF 1987. THE UNIT IS SCHEDULED FOR A 2 TO 3 WEEK OUTAGE IN APRIL 1988. NO PROBLEMS WERE REPORTED REGARDING THE FGD SYSTEM EXCEPT FOR HARD SCALE BUILDUP CAUSED BY THE ADDITION OF FLYASH. THE REMAINING BULK ENTRAINMENT SEPARATORS CONSTRUCTED OF 316L STAINLESS STEEL HAVE BEEN INSTALLED.

1/88	SYSTEM							774		
2/88	SYSTEM							672		
3/88	SYSTEM							774		
4/88	SYSTEM							720		
5/88	SYSTEM							774		
6/88	SYSTEM							720		
7/88	SYSTEM							774		
8/88	SYSTEM							774		
9/88	SYSTEM							720		
10/88	SYSTEM							774		
11/88	SYSTEM							720		
12/88	SYSTEM							774		

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FDG-RELATED OUTAGES WERE ENCOUNTERED DURING THE YEAR. THE UNIT WAS OFF-LINE FOR A SCHEDULED THREE WEEK MAINTENANCE OUTAGE IN APRIL. THE UNIT WAS ALSO OFF-LINE TWICE FOR APPROXIMATELY ONE WEEK DURING THE YEAR DUE TO BOILER TUBE LEAKS AND SOOT BLOWER RELATED PROBLEMS. THE UTILITY STILL REPORTS ONGOING SCALING PROBLEMS. THE USE OF A SCALE INHIBITOR HAS HAD LIMITED RESULTS.

SECTION 13
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	COOPERATIVE POWER ASSOCIATION	
PLANT NAME	COAL CREEK	
UNIT NUMBER	2	
CITY	UNDERWOOD	
STATE	NORTH DAKOTA	
REGULATORY CLASSIFICATION	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	1100	
GROSS UNIT GENERATING CAPACITY - MW	550	
NET UNIT GENERATING CAPACITY W/FGD - MW	500	
NET UNIT GENERATING CAPACITY WO/FGD - MW	501	
EQUIVALENT SCRUBBED CAPACITY - MW	327	
*** 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	1038.18	(2200000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	160.0	(320 F)
STACK HEIGHT - M	201.	(658 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	6.7	(22.0 FT)
*** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	LIGNITE	
AVERAGE HEAT CONTENT - J/G	14556.	(6258 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		3068-7660
AVERAGE ASH CONTENT - %	7.14	
RANGE ASH CONTENT - %	3.9-16.0	
AVERAGE MOISTURE CONTENT - %	39.83	
RANGE MOISTURE CONTENT - %	27.8-52.6	
AVERAGE SULFUR CONTENT - %	0.63	
RANGE SULFUR CONTENT - %	0.2-1.4	
AVERAGE CHLORIDE CONTENT - %	0.02	
RANGE CHLORIDE CONTENT - %	0.00-0.08	
*** PARTICLE CONTROL		
** MECHANICAL COLLECTOR		
NUMBER	0	
TYPE	NONE	
** ESP		
NUMBER	1	
NUMBER OF SPARES	0	
TYPE	COLD SIDE	
SUPPLIER	WHEELABRATOR-FRYE	
INLET FLUE GAS CAPACITY - CU.M/S	1090.1	(2310000 ACFM)
INLET FLUE GAS TEMPERATURE - C	160.6	(321 F)
PRESSURE DROP - KPA	0.6	(3. IN-H2O)
PARTICLE REMOVAL EFFICIENCY - %	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		

ILITY FGD SURVEY: JANUARY - DECEMBER 1988

OPERATIVE POWER ASSOCIATION: COAL CREEK 2 (CONT.)

* GENERAL DATA		
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT	
SO2 REMOVAL MODE	WET SCRUBBING	
PROCESS TYPE	LIME/ALKALINE FLYASH	
PROCESS ADDITIVES	NONE	
SYSTEM SUPPLIER	COMBUSTION ENGINEERING	
A-E FIRM	BLACK & VEATCH	
DEVELOPMENT LEVEL	FULL SCALE	
NEW/RETROFIT	NEW	
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.50	
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	54.00	
ENERGY CONSUMPTION - %	0.2	
CURRENT STATUS	1	
COMMERCIAL START-UP	9/1980	
INITIAL START-UP	7/1980	
CONTRACT AWARDED	5/1976	
* DESIGN AND OPERATING PARAMETERS		
DESIGN COAL SULFUR CONTENT - %	0.63	
DESIGN CHLORIDE CONTENT - %	*****	
SPACE REQUIREMENTS - SQ M	8091.6	(87100 SQ FT)
OPER. & MAINT. REQUIREMENT - MANHR/DAY	72.0	
* QUENCHER/PRESATURATOR		
NUMBER	0	
* ABSORBER		
NUMBER	4	
NUMBER OF SPARES	0	
GENERIC TYPE	SPRAY TOWER	
SPECIFIC TYPE	OPEN COUNTERCURRENT SPRAY	
TRADE NAME/COMMON TYPE	N/A	
SUPPLIER	COMBUSTION ENGINEERING	
DIMENSIONS - FT	21.5 WIDE X 20 DEEP X 55 HIGH	
SHELL GENERIC MATERIAL	STAINLESS STEEL	
SHELL SPECIFIC MATERIAL	AUSTENITIC	
SHELL MATERIAL TRADE NAME/COMMON TYPE	TYPE 316L	
LINER GENERIC MATERIAL	NONE	
LINER SPECIFIC MATERIAL	N/A	
LINER MATERIAL TRADE NAME/COMMON TYPE	N/A	
GAS CONTACTING DEVICE TYPE	NONE	
NUMBER OF CONTACTING ZONES	1	
LIQUID RECIRCULATION RATE - LITER/S	1310.	(20790 GPM)
L/G RATIO - L/CU.M	8.0	(60.0 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	0.7	(3.0 IN-H2O)
SUPERFICAL GAS VELOCITY - M/SEC	3.2	(10.6 FT/S)
INLET GAS FLOW - CU. M/S	163.51	(346500 ACFM)
INLET GAS TEMPERATURE - C	160.6	(321 F)
SO2 REMOVAL EFFICIENCY - %	90.0	
* MIST ELIMINATOR		
PRE-MIST ELIMINATOR/MIST ELIMINATOR	PRIMARY COLLECTOR	
NUMBER PER SYSTEM	4	
NUMBER OF SPARES PER SYSTEM	0	
NUMBER PER MODULE	1	
GENERIC TYPE	IMPINGEMENT	
SPECIFIC TYPE	BAFFLE	
TRADE NAME/COMMON TYPE	CLOSED VANE	
CONFIGURATION	HORIZONTAL	
NUMBER OF STAGES	2	
NUMBER OF PASSES PER STAGE	2	
FREEBOARD DISTANCE - M	2.44	(8.0 FT)
DISTANCE BETWEEN STAGES - CM	76.20	(30.0 IN)
DISTANCE BETWEEN VANES - CM	7.6	(3.00 IN)
PRESSURE DROP - KPA	0.1	(0.5 IN-H2O)
SUPERFICAL GAS VELOCITY - M/S	2.7	(8.9 FT/S)
CONSTRUCTION MATERIAL GENERIC TYPE	ORGANIC	
CONSTRUCTION MATERIAL SPECIFIC TYPE	FIBER-REINFORCED POLYESTER	
WASH WATER SOURCE	COOLING TOWER BLOWDOWN	
WASH FREQUENCY	INTERMITTENT	

COOPERATIVE POWER ASSOCIATION: COAL CREEK 2 (CONT.)

WASH RATE - L/S	37.8	(600 GAL/MIN)
** REHEATER		
NUMBER	1	
NUMBER OF SPARES	0	
GENERIC TYPE	BYPASS	
SPECIFIC TYPE	COLD SIDE	
TRADE NAME/COMMON TYPE	N/A	
PERCENT GAS BYPASSED - AVG	40.0	
TEMPERATURE INCREASE - C	47.2	(85 F)
INLET FLUE GAS TEMPERATURE - C	57.2	(135 F)
OUTLET FLUE GAS TEMPERATURE - C	98.9	(210 F)
CONSTRUCTION MATERIAL GENERIC TYPE	NR	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR	
** FANS		
NUMBER	4	
DESIGN	CENTRIFUGAL	
SUPPLIER	GREEN FAN	
FUNCTION	BALANCED DRAFT	
APPLICATION	FORCED DRAFT	
SERVICE	DRY	
FLUE GAS FLOW RATE - CU.M/S	163.51	(346500 ACFM)
FLUE GAS TEMPERATURE - C	160.6	(321 F)
PRESSURE DROP - KPA	12.8	(42.0 IN-H2O)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	
** DAMPERS		
NUMBER	8	
FUNCTION	ISOLATION	
GENERIC TYPE	LOUVER	
SPECIFIC TYPE	NR	
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	8	
FUNCTION	ISOLATION	
GENERIC TYPE	LOUVER	
SPECIFIC TYPE	NR	
CONSTRUCTION MATERIAL GENERIC TYPE	STAINLESS STEEL	
CONSTRUCTION MATERIAL SPECIFIC TYPE	AUSTENITIC	
LINER GENERIC MATERIAL TYPE	NONE	
LINER SPECIFIC MATERIAL TYPE	N/A	
** DAMPERS		
NUMBER	4	
FUNCTION	CONTROL	
GENERIC TYPE	LOUVER	
SPECIFIC TYPE	NR	
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	8	
FUNCTION	ISOLATION	
GENERIC TYPE	LOUVER	
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	
** DUCTWORK		
LOCATION	OUTLET	
SHELL GENERIC MATERIAL TYPE	STAINLESS STEEL	
SHELL SPECIFIC MATERIAL TYPE	AUSTENITIC	
LINER GENERIC MATERIAL TYPE	NONE	

ILITY FGD SURVEY: JANUARY - DECEMBER 1988

OPERATIVE POWER ASSOCIATION: COAL CREEK 2 (CONT.)

LINER SPECIFIC MATERIAL TYPE	N/A
* DUCTWORK	
LOCATION	INLET
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
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	PLENUM TO STACK
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
SHELL SPECIFIC MATERIAL TYPE	AISI 1110
LINER GENERIC MATERIAL TYPE	INORGANIC
LINER SPECIFIC MATERIAL TYPE	HYDRAULICALLY-BONDED MORTAR
* REAGENT PREPARATION EQUIPMENT	
FUNCTION	SLAKER
DEVICE	NR
DEVICE TYPE	NR
MANUFACTURER	WALLACE & TIEMAN
NUMBER	2
PRODUCT QUALITY - % SOLIDS	10.0
* TANKS	
SERVICE	NUMBER
-----	-----
ABSORBER RECYCLE	2
FLYASH	****
REAGENT PREP PRODUCT	****
* PUMPS	
SERVICE	NUMBER
-----	-----
BLEED STREAM	3
SLURRY FEED	2
REACTION TANK TRANSFER	6
* SOLIDS CONCENTRATING/DEWATERING	
DEVICE	NONE
* SALEABLE BYPRODUCTS	
NATURE	NONE
DISPOSITION	N/A
* SLUDGE	
* TREATMENT	
METHOD	BLEED
DEVICE	NR
PROPRIETARY PROCESS	N/A
* DISPOSAL	
NATURE	FINAL
TYPE	POND
LOCATION	ON-SITE
SITE TRANSPORTATION METHOD	PIPELINE
SITE TREATMENT	CLAY LINING
SITE DIMENSIONS	400 ACRES
SITE SERVICE LIFE - YRS	35

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

COOPERATIVE POWER ASSOCIATION: COAL CREEK 2 (CONT.)

** PROCESS CONTROL AND INSTRUMENTATION
 CHEMICAL PARAMETERS PH, SO2
 PHYSICAL VARIABLES SOLIDS, LIQUID LEVEL
 MONITOR TYPE UNILOC FOR PH, LEAR-SIEGLER FOR SO2, MOORE FOR S
 MONITOR LOCATION REACTION TANK FOR PH

** WATER BALANCE
 WATER LOOP TYPE OPEN

** CHEMICALS AND CONSUMPTION
 FUNCTION ABSORBENT
 NAME LIME
 PRINCIPAL CONSTITUENT CAO
 SOURCE/SUPPLIER PETE LIEN & SONS, INC.
 CONSUMPTION RAPID CITY, SOUTH DAKOTA
 POINT OF ADDITION SLAKER

** FGD SPARE CAPACITY INDICES
 ABSORBER - % 0.0

** FGD SPARE COMPONENT INDICES
 ABSORBER 0.0

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

7/80	21	61.8	52.4	744	631	250	34.5
	22	18.7	15.9				
	23	25.0	21.2				
	24	52.9	44.9				
	SYSTEM	39.6	33.6				

** PROBLEMS/SOLUTIONS/COMMENTS

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

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

** PROBLEMS/SOLUTIONS/COMMENTS

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

9/80	21	80.2	80.0	720	718	472	59.1
	22	56.8	56.7				
	23	49.0	48.9				
	24	76.9	76.7				
	SYSTEM	65.7	65.6				
10/80	21	92.0	91.7	744	742		70.0
	22	86.3	86.0				
	23	22.1	22.0				
	24	70.4	70.2				
	SYSTEM						
11/80	21	63.1	44.2	720	504		41.0
	22	77.0	53.9				
	23	25.0	17.5				
	24	77.8	54.4				
	SYSTEM						

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

OPERATIVE POWER ASSOCIATION: COAL CREEK 2 (CONT.)

-----PERFORMANCE DATA-----											
MOD		MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
30	21			58.7		57.5					
	22			51.3		50.3					
	23			22.2		21.8					
	24			89.4		87.6					
	SYSTEM			55.4		54.3		744	730	404	65.2

** PROBLEMS/SOLUTIONS/COMMENTS

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

31	21	99.8	75.7		75.5					
	22	99.8	37.6		37.5					
	23	99.8	46.3		46.2					
	24	99.8	68.9		68.8					
	SYSTEM	99.8	57.1		57.0		744	743	424	57.2
31	21	99.7	72.5		72.5					
	22	99.7	37.9		37.8					
	23	99.7	32.8		32.7					
	24	99.7	82.6		82.4					
	SYSTEM	99.7	56.5		56.4		672	670	379	57.6
31	21	55.4	56.3		31.2					
	22	55.4	44.7		24.7					
	23	55.4	27.7		15.3					
	24	55.4	91.3		50.5					
	SYSTEM	55.4	55.1		30.5		744	412	227	39.2

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE FIRST QUARTER 1981 THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED.

ON MARCH 17 THE BOILER WAS TAKEN OUT OF SERVICE FOR A BOILER/TURBINE OVERHAUL, MAINTENANCE AND MODIFICATIONS. THE UNIT WILL BE OUT OF SERVICE FOR APPROXIMATELY TEN WEEKS.

81	21	100.0			0.0					
	22	100.0			0.0					
	23	100.0			0.0					
	24	100.0			0.0					
	SYSTEM	100.0			0.0		720	0	0	0.0
81	21	100.0			0.0					
	22	100.0			0.0					
	23	100.0			0.0					
	24	100.0			0.0					
	SYSTEM	100.0			0.0		744	0	0	0.0
81	21	100.0	26.5	100.0	10.3					
	22	100.0	10.0	100.0	3.9					
	23	100.0	56.6	100.0	21.9					
	24	100.0	18.6	100.0	7.2					
	SYSTEM	100.0	27.9	100.0	10.8		720	279	78	50.3

** PROBLEMS/SOLUTIONS/COMMENTS

UNIT WAS OFF-LINE DUE TO BOILER/TURBINE WARRANTY INSPECTION DURING THE MONTHS OF APRIL, MAY, AND PART OF JUNE.

DURING THE SECOND QUARTER 1981 THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED.

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

COOPERATIVE POWER ASSOCIATION: COAL CREEK 2 (CONT.)

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

7/81	21		72.5		63.7				
	22		9.5		8.3				
	23		60.6		53.2				
	24		23.9		21.0				
	SYSTEM		41.6		36.6	744	654	272	53.3
8/81	21		44.9		35.5				
	22		34.7		27.4				
	23		55.8		44.1				
	24		38.4		30.4				
	SYSTEM		43.5		34.4	744	588	256	51.0
9/81	21		16.6		16.4				
	22		91.8		90.6				
	23		50.1		49.4				
	24		82.8		81.7				
	SYSTEM		60.4		59.6	720	710	429	69.8

** PROBLEMS/SOLUTIONS/COMMENTS

NO FGD-RELATED PROBLEMS WERE REPORTED FOR THE THREE MONTH PERIOD.

10/81	21		54.6		54.6				
	22		86.8		86.8				
	23		76.6		76.6				
	24		85.7		85.7				
	SYSTEM		75.9		75.9	744	744	565	83.6
11/81	21		26.4		26.4				
	22		91.9		91.9				
	23		68.1		68.1				
	24		80.3		80.3				
	SYSTEM		66.7		66.7	720	720	480	67.4
12/81	21		77.2		77.1				
	22		56.2		56.1				
	23		70.8		70.7				
	24		63.3		63.2				
	SYSTEM		66.9		66.8	744	743	497	68.8

** PROBLEMS/SOLUTIONS/COMMENTS

GENERAL MAINTENANCE WAS PERFORMED ON THE FGD SYSTEM DURING THE FOURTH QUARTER. NO FGD FORCED OUTAGES WERE ENCOUNTERED.

1/82	21	100.0	82.4	100.0	82.3				
	22	100.0	54.9	100.0	54.8				
	23	100.0	92.9	100.0	92.7				
	24	100.0	63.0	100.0	62.9				
	SYSTEM	100.0	73.3	100.0	73.2	744	743	545	79.4
2/82	21	100.0	85.9	100.0	85.6				
	22	100.0	65.9	100.0	65.6				
	23	100.0	93.5	100.0	93.2				
	24	100.0	86.2	100.0	85.9				
	SYSTEM	100.0	82.9	100.0	82.6	672	670	555	73.8
3/82	21	100.0	93.6	100.0	88.3				
	22	100.0	61.5	100.0	58.1				
	23	100.0	46.0	100.0	43.4				
	24	100.0	54.3	100.0	51.2				
	SYSTEM	100.0	63.9	100.0	60.3	744	702	448	65.3

LITY FGD SURVEY: JANUARY - DECEMBER 1988

PERATIVE POWER ASSOCIATION: COAL CREEK 2 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR PROBLEMS OR FORCED OUTAGES WERE ENCOUNTERED DURING THE FIRST
 QUARTER OF 1982.

82	21	60.3	60.3	100.0	60.3				
	22	43.5	42.6	100.0	42.6				
	23	95.6	83.2	100.0	83.2				
	24	99.7	86.7	100.0	86.7				
	SYSTEM	74.8	68.2	100.0	68.2	720	720	491	73.1
82	21	98.6	72.0	100.0	71.9				
	22	87.2	32.7	100.0	32.7				
	23	64.5	28.0	100.0	27.9				
	24	36.3	7.0	100.0	7.0				
	SYSTEM	71.6	34.9	100.0	34.9	744	743	260	64.9
82	21	87.8	39.4	100.0	39.3				
	22	90.3	47.5	100.0	47.4				
	23	100.0	87.3	100.0	87.1				
	24	96.4	53.9	100.0	53.7				
	SYSTEM	93.6	57.0	100.0	56.9	720	718	409	64.0

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE SECOND QUARTER 1982 GENERAL MAINTENANCE AND CLEANING OF THE
 FGD SYSTEM ACCOUNTED FOR ANY UNAVAILABLE TIME.

82	SYSTEM	744
'82	SYSTEM	744
'82	SYSTEM	720
'82	SYSTEM	744
'82	SYSTEM	720
'82	SYSTEM	744
'83	SYSTEM	744
'83	SYSTEM	672
'83	SYSTEM	744

** PROBLEMS/SOLUTIONS/COMMENTS

INFORMATION WAS UNAVAILABLE FOR THE PERIOD OF JULY 1982 THROUGH MARCH 1983

'83	SYSTEM	720
'83	SYSTEM	744
'83	SYSTEM	720

** PROBLEMS/SOLUTIONS/COMMENTS

INFORMATION WAS UNAVAILABLE FOR THE PERIOD OF JULY 1982 THROUGH JUNE 1983.

'83	SYSTEM	744
'83	SYSTEM	744

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

COOPERATIVE POWER ASSOCIATION: COAL CREEK 2 (CONT.)

-----PERFORMANCE DATA-----											
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART. HOURS	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
9/83	SYSTEM									720	
** PROBLEMS/SOLUTIONS/COMMENTS											
THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE THIRD QUARTER OF 1983.											
10/83	SYSTEM									744	
11/83	SYSTEM									720	
12/83	SYSTEM									744	
** PROBLEMS/SOLUTIONS/COMMENTS											
THE UTILITY REPORTED THAT THE FGD SYSTEM AT COAL CREEK 2 WAS 100 PERCENT AVAILABLE THROUGHOUT 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	
** PROBLEMS/SOLUTIONS/COMMENTS											
DURING THE SCHEDULED OUTAGE IN MAY, CORRODING REHEAT DUCTWORK WAS REPLACED WITH STAINLESS STEEL.											
6/84	SYSTEM									720	
7/84	SYSTEM									744	
** PROBLEMS/SOLUTIONS/COMMENTS											
FGD SYSTEM AVAILABILITY DURING THE PERIOD OF JANUARY THROUGH JULY WAS REPORTED AS 100%.											
8/84	SYSTEM									744	
9/84	SYSTEM									720	
** PROBLEMS/SOLUTIONS/COMMENTS											
THE UTILITY REPORTED REPLACING DETERIORATING MIST ELIMINATOR FIBERGLASS LININGS DURING THE FIRST THREE QUARTERS OF 1984.											
10/84	SYSTEM									744	
11/84	SYSTEM									720	
12/84	SYSTEM									744	
** PROBLEMS/SOLUTIONS/COMMENTS											
THE UTILITY REPORTED THAT THE BOILER LOAD WAS REDUCED DUE TO PLUGGED MIST ELIMINATORS AND SPRAY HEADERS. THE PROBLEM DEPOSITS ARE HARD IN NATURE AND ARE BELIEVED TO BE CAUSED BY ALKALINE FLYASH WHICH IS USED AS A SCRUBBING ADDITIVE. THE UTILITY IS PRESENTING TESTING A CRYSTAL GROWTH											

LITY FGD SURVEY: JANUARY - DECEMBER 1988

PERATIVE POWER ASSOCIATION: COAL CREEK 2 (CONT.)

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

MODIFIER TO SEE OF THE SCALE CAN BE SOFTENED TO FACILITATE REMOVAL.

85	SYSTEM	744
85	SYSTEM	672
85	SYSTEM	744
85	SYSTEM	720
85	SYSTEM	744
85	SYSTEM	720
85	SYSTEM	744
85	SYSTEM	744
85	SYSTEM	720
85	SYSTEM	744
85	SYSTEM	720
85	SYSTEM	744

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THERE WERE NO MAJOR FGD-RELATED FORCED OUTAGES DURING THE YEAR 1985. HOWEVER, THE PLANT WAS DOWN SEPTEMBER 8 THROUGH OCTOBER 10 FOR A SCHEDULED TURBINE/BOILER MAINTENANCE OUTAGE. LIKE UNIT 1, THE SYSTEM IS STILL HAVING MIST ELIMINATOR PLUGGING PROBLEMS.

'86	SYSTEM	774
'86	SYSTEM	672
'86	SYSTEM	774
'86	SYSTEM	720
'86	SYSTEM	774
'86	SYSTEM	720
'86	SYSTEM	774
'86	SYSTEM	774
'86	SYSTEM	720
'86	SYSTEM	774
'86	SYSTEM	720
'86	SYSTEM	774

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY PLANS TO REPLACE THE ABSORBER BULK ENTRAINMENT SEPARATORS WITH ONES CONSTRUCTED OF 316L STAINLESS STEEL DURING THE BOILER OUTAGE IN 1987. IN ADDITION, RIGHT ANGLE NOZZLES LIKE THOSE USED IN UNIT 1 WILL ALSO BE INSTALLED. THE FRP MIST ELIMINATOR WILL REMAIN UNTIL A BETTER 316L DESIGN IS FOUND.

COOPERATIVE POWER ASSOCIATION: COAL CREEK 2 (CONT.)

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

THE UTILITY REPORTED THAT THE FGD SYSTEM AND UNIT OPERATED SUCCESSFULLY WITHOUT INCIDENT UNTIL NOVEMBER 18. ON THAT DATE, THE BOILER EXPLODED CAUSING APPROXIMATELY 50-60 MILLION DOLLARS WORTH OF DAMAGE. THE UNIT IS EXPECTED TO BE DOWN UNTIL DECEMBER 1987. THE UTILITY AND BOILER SUPPLIER ARE CURRENTLY INVESTIGATING THE REASON FOR THE EXPLOSION.

1/87	SYSTEM	744
2/87	SYSTEM	672
3/87	SYSTEM	744
4/87	SYSTEM	720
5/87	SYSTEM	744
6/87	SYSTEM	720
7/87	SYSTEM	744
8/87	SYSTEM	744
9/87	SYSTEM	720

** PROBLEMS/SOLUTIONS/COMMENTS

REPAIRS CONTINUED ON UNIT 2 DURING THE MONTH OF JANUARY THROUGH SEPTEMBER OF 1987. DURING THIS PERIOD, THE UTILITY REPLACED THE ABSORBER BULK ENTRAINMENT SEPERATORS WITH NEW UNITS CONSTRUCTED OF 316L STAINLESS STEEL.

10/87	SYSTEM	744
11/87	SYSTEM	720
12/87	SYSTEM	744

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY ANNOUNCED THAT UNIT 2 WAS PLACED BACK IN SERVICE ON OCTOBER 30, 1987. BOTTOM-ASH BUILD-UP IN THE BOTTOM-ASH HOPPER AND IN THE THROAT OF THE BOILER WAS BELIEVED TO HAVE CAUSED THE BOILER EXPLOSION. THE WEIGHT OF THE ASH WAS BELIEVED TO HAVE RUPTURED SEVERAL WATER WALL STEAM TUBING BUNDLES CAUSING THE BOILER TO OVER PRESSURIZE.

1/88	SYSTEM	774
2/88	SYSTEM	672
3/88	SYSTEM	774
4/88	SYSTEM	720
5/88	SYSTEM	774
6/88	SYSTEM	720
7/88	SYSTEM	774
8/88	SYSTEM	774
9/88	SYSTEM	720
10/88	SYSTEM	774
11/88	SYSTEM	720

ITY FGD SURVEY: JANUARY - DECEMBER 1988

ERATIVE POWER ASSOCIATION: COAL CREEK 2 (CONT.)

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

.8 SYSTEM

774

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT UNIT 2 OPERATED ALL OF 1988. THE UNIT WAS FORCED OFF-LINE A FEW TIMES DURING THE YEAR DUE TO MINOR BOILER TUBE LEAKS. NO UNIT OUTAGES WERE CAUSED DUE TO FGD SYSTEM OPERATION DURING THE YEAR. THE UNIT IS SCHEDULED TO COME OFF-LINE IN THE SPRING OF 1989 FOR ITS FIRST MAJOR OUTAGE SINCE RESTART.

SECTION 13
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

PANY NAME	DELMARVA POWER & LIGHT
NT NAME	DELAWARE CITY
T NUMBER	1
Y	DELAWARE CITY
TE	DELAWARE
ULATORY CLASSIFICATION	E
TICULATE EMISSION LIMITATION - NG/J	129. (0.300 LB/MMBTU)
EMISSION LIMITATION - NG/J	***** (***** LB/MMBTU)
EMISSION LIMITATION - NG/J	***** (***** LB/MMBTU)
PLANT GENERATING CAPACITY - MW	180
SS UNIT GENERATING CAPACITY - MW	28
UNIT GENERATING CAPACITY W/FGD - MW	27
UNIT GENERATING CAPACITY WO/FGD - MW	28
IVALENT SCRUBBED CAPACITY - MW	28
UNIT DATA - BOILER AND STACK	
BOILER SUPPLIER	RILEY STOKER
BOILER TYPE	PULVERIZED COAL
BOILER SERVICE LOAD	BASE
DESIGN BOILER FLUE GAS FLOW - CU.M/S	139.21 (295000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	215.6 (420 F)
STACK HEIGHT - M	152. (500 FT)
STACK SHELL	CONCRETE
STACK TOP DIAMETER - M	6.1 (20.0 FT)
FUEL DATA	
FUEL TYPE	COKE
FUEL GRADE	BITUMINOUS
AVERAGE HEAT CONTENT - J/G	32564. (14000 BTU/LB)
RANGE HEAT CONTENT - BTU/LB	13500-14500
AVERAGE ASH CONTENT - %	0.50
RANGE ASH CONTENT - %	0.3-0.7
AVERAGE MOISTURE CONTENT - %	0.70
RANGE MOISTURE CONTENT - %	0.5-1.2
AVERAGE SULFUR CONTENT - %	7.00
RANGE SULFUR CONTENT - %	5.0-8.0
AVERAGE CHLORIDE CONTENT - %	*****
RANGE CHLORIDE CONTENT - %	*****
PARTICLE CONTROL	
MECHANICAL COLLECTOR	
NUMBER	3
TYPE	TUBULAR
SUPPLIER	PRAT-DANIEL
PARTICLE REMOVAL EFFICIENCY - %	92.0
FABRIC FILTER	
NUMBER	0
TYPE	NONE
TYPICAL GAS/CLOTH RATIO - M/MIN	0.6 (2.0 FT/MIN)
ESP	
NUMBER	3
TYPE	COLD SIDE
SUPPLIER	WESTERN PREC. DIVISION, JOY
INLET FLUE GAS CAPACITY - CU.M/S	34.8 (73700 ACFM)
INLET FLUE GAS TEMPERATURE - C	54.4 (130 F)
PRESSURE DROP - KPA	0.2 (1. IN-H2O)
PARTICLE REMOVAL EFFICIENCY - %	95.0
PARTICLE SCRUBBER	
NUMBER	3
INITIAL START-UP DATE	4/1980
GENERIC TYPE	VENTURI TOWER
SPECIFIC TYPE	VARIABLE-THROAT/BOTTOM-ENTRY PLUMB BOB
TRADE NAME/COMMON NAME	N/A
SUPPLIER	AIRPOL
DIMENSIONS - FT	20 DIA X 70.0

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

SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	AISI 1110	
LINER GENERIC MATERIAL	ORGANIC; INORGANIC	
LINER SPECIFIC MATERIAL	GLASS FLAKE-FILLED POLYESTER; PREFIRED BRICK/SHA	
GAS CONTACTING DEVICE TYPE	NONE	
NUMBER OF CONTACTING ZONES	1	
LIQUID RECIRCULATION RATE - LITER/S	315.0	(5000 GPM)
L/G RATIO - LITER/CU.M	6.8	(50.9 GAL/1000ACF)
PRESSURE DROP - KPA	0.5	(2.0 IN-H2O)
INLET GAS FLOW RATE - CU.M/S	46.4	(98300 ACFM)
INLET GAS TEMPERATURE - C	221.1	(430 F)
SO2 REMOVAL EFFICIENCY - %	0.0	
PARTICLE REMOVAL EFFICIENCY - %	81.5	

*** FGD SYSTEM

** GENERAL DATA

SALEABLE PRODUCT/THROWAWAY PRODUCT	SALEABLE PRODUCT
SO2 REMOVAL MODE	WET SCRUBBING
PROCESS TYPE	WELLMAN LORD
SYSTEM SUPPLIER	DAVY MCKEE
A-E FIRM	DAVY MCKEE
DEVELOPMENT LEVEL	FULL SCALE
NEW/RETROFIT	RETROFIT
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	90.00
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	90.00
ENERGY CONSUMPTION - %	3.6
CURRENT STATUS	1
COMMERCIAL START-UP	5/1980
INITIAL START-UP	5/1980
CONTRACT AWARDED	9/1977

** DESIGN AND OPERATING PARAMETERS

DESIGN COAL SULFUR CONTENT - %	8.00	
DESIGN CHLORIDE CONTENT - %	*****	
SPACE REQUIREMENTS - SQ M	24280.3	(261360 SQ FT)
OPER. & MAINT. REQUIREMENT - MANHR/DAY	144.0	

** QUENCHER/PRESATURATOR

CONSTRUCTION MATERIAL GENERIC TYPE	NR
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR

** ABSORBER

NUMBER	3	
NUMBER OF SPARES	0	
GENERIC TYPE	TRAY TOWER	
SPECIFIC TYPE	VALVE TRAY	
TRADE NAME/COMMON TYPE	BUBBLE CAP TRAY TOWER	
SUPPLIER	DAVY MCKEE	
DIMENSIONS - FT	20.0 X 20.0	
SHELL GENERIC MATERIAL	INORGANIC	
SHELL SPECIFIC MATERIAL	HYDRAULICALLY-BONDED CONCRETE	
SHELL MATERIAL TRADE NAME/COMMON TYPE	PORTLAND CEMENT	
LINER GENERIC MATERIAL	INORGANIC	
LINER SPECIFIC MATERIAL	PREFIRED BRICK/SHAPES	
LINER MATERIAL TRADE NAME/COMMON TYPE	NR	
GAS CONTACTING DEVICE TYPE	VALVE TRAY	
NUMBER OF CONTACTING ZONES	4	
LIQUID RECIRCULATION RATE - LITER/S	25.	(400 GPM)
L/G RATIO - L/CU.M	0.7	(5.5 GAL/1000 ACF)
INLET GAS FLOW - CU. M/S	34.59	(73300 ACFM)
INLET GAS TEMPERATURE - C	54.4	(130 F)
PARTICLE REMOVAL EFFICIENCY - %	0.0	

** MIST ELIMINATOR

PRE-MIST ELIMINATOR/MIST ELIMINATOR	PRIMARY COLLECTOR
NUMBER PER SYSTEM	3
GENERIC TYPE	IMPINGEMENT
SPECIFIC TYPE	BAFFLE
TRADE NAME/COMMON TYPE	CLOSED VANE
CONFIGURATION	HORIZONTAL

LITY FGD SURVEY: JANUARY - DECEMBER 1988

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

NUMBER OF STAGES	1	
NUMBER OF PASSES PER STAGE	1	
FREEBOARD DISTANCE - M	1.83	(6.0 FT)
DISTANCE BETWEEN STAGES - CM	19.05	(7.5 IN)
PRESSURE DROP - KPA	0.1	(0.3 IN-H2O)
CONSTRUCTION MATERIAL GENERIC TYPE	ORGANIC	
CONSTRUCTION MATERIAL SPECIFIC TYPE	POLYPHENYLENE	
WASH WATER SOURCE	COOLED CONDENSATE	
WASH FREQUENCY	INTERMITTENT	
WASH RATE - L/S	3.2	(50 GAL/MIN)
* REHEATER		
NUMBER	3	
GENERIC TYPE	DIRECT COMBUSTION	
SPECIFIC TYPE	EXTERNAL COMBUSTION CHAMBER	
TRADE NAME/COMMON TYPE	NATURAL GAS	
TEMPERATURE INCREASE - C	27.8	(50 F)
INLET FLUE GAS FLOW RATE - CU. M/S	108.54	(230000 ACFM)
INLET FLUE GAS TEMPERATURE - C	54.4	(130 F)
OUTLET FLUE GAS TEMPERATURE - C	85.0	(185 F)
CONSTRUCTION MATERIAL GENERIC TYPE	NR	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR	
* FANS		
NUMBER	3	
NUMBER OF SPARES	0	
DESIGN	CENTRIFUGAL	
SUPPLIER	ROBINSON	
FUNCTION	BOOSTER	
APPLICATION	INDUCED DRAFT	
SERVICE	DRY	
FLUE GAS FLOW RATE - CU.M/S	139.21	(295000 ACFM)
FLUE GAS TEMPERATURE - C	215.6	(420 F)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	
* 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		
DIMENSIONS	8.0 X 8.0	
SHELL GENERIC MATERIAL TYPE	CARBON STEEL	
SHELL SPECIFIC MATERIAL TYPE	AISI 1110	
LINER GENERIC MATERIAL TYPE	ORGANIC	
LINER SPECIFIC MATERIAL TYPE	FIBER-REINFORCED POLYESTER	
* REAGENT PREPARATION EQUIPMENT		
FUNCTION	MIX TANK	
DEVICE	N/A	
DEVICE TYPE	AGITATED TANK	
* TANKS		
SERVICE	NUMBER	
-----	-----	
NR	****	
* PUMPS		
SERVICE	NUMBER	
-----	-----	
ABSORBER RECIRCULATION	****	
* SOLIDS CONCENTRATING/DEWATERING		
DEVICE	NONE	

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

*** SALEABLE BYPRODUCTS
 NATURE
 FULL LOAD QUANTITY - M T/H
 QUALITY - %
 DISPOSITION

SULFURIC ACID
 11.34 (12.50 TPH)
 93.0
 MARKETING

*** SLUDGE

** TREATMENT
 METHOD
 DEVICE
 PROPRIETARY PROCESS

N/A
 N/A
 N/A

** DISPOSAL
 NATURE
 TYPE
 SITE TREATMENT

FINAL
 POND
 CLAY LINING

** PROCESS CONTROL AND INSTRUMENTATION
 CHEMICAL PARAMETERS
 MONITOR LOCATION
 PROCESS CONTROL MANNER
 PROCESS CHEMISTRY MODE

PH, SOLIDS, SP.G., CONC.
 GAS OUTLET, SOLUTION OUTLET
 AUTOMATIC
 FEEDBACK

** WATER BALANCE
 WATER LOOP TYPE

CLOSED

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

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

** PROBLEMS/SOLUTIONS/COMMENTS

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

6/80	SYSTEM	98.9	98.9	98.9	98.9		720	720	712
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** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR PROBLEMS WERE ENCOUNTERED DURING JUNE.

7/80	SYSTEM	97.2	97.0	97.0	90.7		744	696	675
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** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS DOWN FOR PART OF THE MONTH IN JULY TO REPAIR A LEAK IN
 THE MIST ELIMINATOR.

8/80	SYSTEM	99.9	99.9	99.9	99.9		744	744	743
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** PROBLEMS/SOLUTIONS/COMMENTS

NO FGD-RELATED PROBLEMS WERE REPORTED DURING AUGUST.

9/80	SYSTEM	78.3	78.3	78.3	78.3		720	720	564
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LITY FGD SURVEY: JANUARY - DECEMBER 1988
MARVA POWER & LIGHT: DELAWARE CITY 1 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS OFF LINE DURING SEPTEMBER DUE TO NECESSARY REPAIR OF THE CIRCULATING PUMPS AND THE MIST ELIMINATOR.

FGD SYSTEM OUTAGE TIME OCCURRED DUE TO INLET DUCT EXPANSION JOINT REPAIRS.

80	SYSTEM	66.1	66.1	66.1	66.1	744	744	492
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** PROBLEMS/SOLUTIONS/COMMENTS

DURING OCTOBER SOME OF THE OUTAGE TIME WAS DUE TO PLUGGED SPRAY HEADERS ON THE MIST ELIMINATOR.

PROBLEMS WITH LEAKING CIRCULATING PUMPS OCCURRED IN OCTOBER.

OTHER OUTAGE TIME WAS DUE TO THE FAILURE OF ESP DISTRIBUTOR BAFFLES.

80	SYSTEM	93.8	96.0	96.0	93.8	720	704	676
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** PROBLEMS/SOLUTIONS/COMMENTS

FAILURE OF PRESCRUBBER RECIRCULATION PUMPS CAUSED OUTAGE TIME IN NOVEMBER.

80	SYSTEM	33.9	55.9	55.9	30.6	744	408	228
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** PROBLEMS/SOLUTIONS/COMMENTS

DURING DECEMBER THE BOILER WAS OUT OF SERVICE DUE TO A SCHEDULED MAINTENANCE OVERHAUL FOR APPROXIMATELY 360 HOURS. START-UP OF THE FGD SYSTEM WAS DELAYED ABOUT FIVE DAYS DUE TO MATERIAL DELIVERY PROBLEMS.

81	SYSTEM	90.0	90.0	90.0	90.0	744	744	670
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** PROBLEMS/SOLUTIONS/COMMENTS

DURING JANUARY THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED.

81	SYSTEM	86.0	84.0	84.0	76.0	672	607	512
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** PROBLEMS/SOLUTIONS/COMMENTS

DURING FEBRUARY OUTAGE TIME WAS DUE TO LEAKS IN THE MIST ELIMINATOR AND FAILURE OF THE PRESCRUBBER SPRAY NOZZLES.

81	SYSTEM	95.6	95.6	95.6	95.4	744	743	710
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** PROBLEMS/SOLUTIONS/COMMENTS

DURING MARCH THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED.

81	SYSTEM	74.0	83.0	83.0	74.0	720	643	531
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** PROBLEMS/SOLUTIONS/COMMENTS

DURING APRIL SOME OUTAGE TIME WAS CAUSED BY THE REPAIRS TO THE MIST ELIMINATOR SHELL AND INTERNALS.

ADDITIONAL OUTAGE TIME WAS DUE TO THE REPLACEMENT OF THE BOOSTER BLOWER DISCHARGE DUCT EXPANSION JOINT.

81	SYSTEM	98.1	98.1	98.1	98.1	744	744	730
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UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

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

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

** PROBLEMS/SOLUTIONS/COMMENTS

DURING MAY REPAIRS WERE PERFORMED ON THE MIST ELIMINATOR SHELL.

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

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO PROBLEMS WERE ENCOUNTERED DURING JUNE.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PER PART. HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
7/81	SYSTEM	99.2	99.2	99.2	99.2		744	744	738	

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PER PART. HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
8/81	SYSTEM	77.4	77.4	77.4	46.9		744	451	349	

** PROBLEMS/SOLUTIONS/COMMENTS

EXTENSIVE REPAIRS WERE MADE TO THE VENTURI PRESCRUBBER BRICK WORK DURING A SCHEDULED AUGUST BOILER OUTAGE.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PER PART. HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
9/81	SYSTEM	95.1	95.1	95.1	95.0		720	719	684	

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS DOWN FOR PART OF SEPTEMBER FOR REPAIRS TO THE PRESCRUBBER MIST ELIMINATOR.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PER PART. HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
10/81	SYSTEM	29.9	57.4	71.1	22.8		744	296	170	

** PROBLEMS/SOLUTIONS/COMMENTS

ON OCTOBER 1 THE UNIT WAS SHUTDOWN FOR AN OVERHAUL.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PER PART. HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
11/81	SYSTEM	70.1	70.1	70.1	70.1		720	720	505	

** PROBLEMS/SOLUTIONS/COMMENTS

DURING OCTOBER AND NOVEMBER CONTINUAL PROBLEMS WERE ENCOUNTERED WITH THE PRESCRUBBER CIRCULATING PUMPS. THIS PROBLEM RESULTED FROM PUMP PLUGGING RELATED TO INADEQUATE SCRUBBING OF THE GAS. THIS ULTIMATELY WAS THE RESULT OF AN INSUFFICIENT NUMBER OF PUMPS.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PER PART. HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
12/81	SYSTEM	72.6	67.6	68.4	59.4		744	654	442	

** PROBLEMS/SOLUTIONS/COMMENTS

OUTAGE TIME FOR THE BOILER DURING DECEMBER WAS DUE TO SUPERHEATER TUBE LEAKS.

CONTINUED PROBLEMS WITH THE PRESATURATOR CIRCULATING PUMPS AND PLUGGING OF THE PRESATURATOR AND ESP'S CAUSED THE SYSTEM UNAVAILABLE TIME.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PER PART. HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
1/82	SYSTEM	68.5	69.4	69.5	68.5		744	735	510	

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JANUARY THE SYSTEM WAS OFF-LINE PART OF THE MONTH DUE TO NECESSARY CLEANING OF THE MODULES AND TO REPLACE THE PRESATURATOR NOZZLE.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PER PART. HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
2/82	SYSTEM	91.5	91.5	91.5	91.5		672	672	615	

ITY FGD SURVEY: JANUARY - DECEMBER 1988
ARVA POWER & LIGHT: DELAWARE CITY 1 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JANUARY AND FEBRUARY LEAKS IN THE PRESATURATOR PIPING ACCOUNTED FOR SOME OF THE DOWN TIME.

PURGE LINE PLUGGING CAUSED ADDITIONAL OUTAGE TIME IN FEBRUARY.

12	SYSTEM	64.9	64.9	64.9	64.9	744	744	483
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** PROBLEMS/SOLUTIONS/COMMENTS

PROBLEMS WERE ENCOUNTERED WITH THE REGENERATING SECTION OF THE SYSTEM DURING MARCH.

12	SYSTEM	100.0	100.0	100.0	100.0	720	720	720
12	SYSTEM	92.2	92.2	92.2	92.2	744	744	686

** PROBLEMS/SOLUTIONS/COMMENTS

DURING APRIL AND MAY NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED.

32	SYSTEM	82.5	82.5	82.5	82.5	720	720	594
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** PROBLEMS/SOLUTIONS/COMMENTS

DURING JUNE THE SYSTEM WAS SHUT DOWN PART OF THE TIME TO REPAIR THE BRICK LINING IN THE PRESATURATOR.

32	SYSTEM	63.8	63.8	63.8	63.8	744	744	475
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** PROBLEMS/SOLUTIONS/COMMENTS

OUTAGE TIME OCCURRED DURING JULY DUE TO A HIGH PRESSURE DROP IN THE PRESATURATOR. THE DROP WAS CAUSED BY COKE CARRYOVER TO THE ESP SEAL POTS.

EVAPORATOR PROBLEMS ACCOUNTED FOR AN OUTAGE DURING THE MONTH.

82	SYSTEM	90.2	90.2	90.2	90.2	744	744	671
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** PROBLEMS/SOLUTIONS/COMMENTS

PART OF THE OUTAGE TIME DURING AUGUST WAS DUE TO LEAKS IN THE PRESATURATOR CIRCULATION PIPING.

FAILURE OF THE PRESATURATOR SPRAY NOZZLE TIP ALSO RESULTED IN DOWN TIME DURING THE MONTH.

82	SYSTEM	28.3	77.3	77.3	28.3	720	264	204
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** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS DOWN DURING PART OF SEPTEMBER FOR AN ANNUAL INSPECTION.

LEAKS IN THE PRESATURATOR RECIRCULATION PIPING CREATED DOWN TIME FOR THE FGD SYSTEM IN SEPTEMBER.

ADDITIONAL OUTAGE TIME RESULTED FROM LEAKS IN THE DUCTWORK EXPANSION JOINTS.

AN OUTAGE OCCURRED DURING SEPTEMBER FOR COKE SLAG BURN OUT.

'82	SYSTEM	98.9	98.9	98.9	98.9	744	744	736
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UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

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

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

** PROBLEMS/SOLUTIONS/COMMENTS

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

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL	PER BOILER	FGD	CAP.
11/82	SYSTEM	97.9	97.9	97.9	97.9		720	720	705

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD-RELATED PROBLEMS WERE REPORTED BY THE UTILITY DURING NOVEMBER.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL	PER BOILER	FGD	CAP.
12/82	SYSTEM	81.6	81.6	81.6	81.6		744	744	607

** PROBLEMS/SOLUTIONS/COMMENTS

DURING DECEMBER THE UNIT WAS DOWN FOR 45 HOURS TO CLEAN PLUGGED SCREENS ON THE PRESATURATOR CIRCULATION PUMPS.

THE REMAINDER OF DOWN TIME DURING THE MONTH WAS DUE TO PROBLEMS WITH THE ACID PLANTS.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL	PER BOILER	FGD	CAP.
1/83	SYSTEM	89.9	74.7	74.7	74.7		744	744	556

** PROBLEMS/SOLUTIONS/COMMENTS

OUTAGE TIME OCCURRED DURING JANUARY DUE TO THE BALANCING OF A BOOSTER FAN.

THE CLEANING OF A SUCTION SCREEN ON THE PRESATURATOR PRODUCED ADDITIONAL OUTAGE TIME IN JANUARY.

THE UNIT WAS DOWN DURING JANUARY TO PERMIT REPAIR WORK ON THE ACID PLANT.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL	PER BOILER	FGD	CAP.
2/83	SYSTEM	97.3	69.3	69.3	69.3		672	672	466

** PROBLEMS/SOLUTIONS/COMMENTS

REPAIR WORK ON THE ESP CAUSED AN OUTAGE DURING FEBRUARY.

THE UNIT WAS DOWN DURING FEBRUARY TO PERMIT REPAIR WORK ON THE ACID PLANT TAIL GAS LINE.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL	PER BOILER	FGD	CAP.
3/83	SYSTEM	95.6	95.6	95.6	95.6		744	744	711

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING MARCH.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL	PER BOILER	FGD	CAP.
4/83	SYSTEM	94.7	94.7	94.7	94.7		720	720	682

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL	PER BOILER	FGD	CAP.
5/83	SYSTEM	98.9	98.9	98.9	98.9		744	744	736

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING APRIL AND MAY.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL	PER BOILER	FGD	CAP.
6/83	SYSTEM	84.7	84.7	84.7	84.7		720	720	610

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

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

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

** PROBLEMS/SOLUTIONS/COMMENTS

REPAIRS ON THE BRICK LINING IN THE PRESATURATOR CAUSED A FORCED OUTAGE DURING JUNE.

/83	SYSTEM	100.0	100.0	100.0	100.0	744	744	744
/83	SYSTEM	96.0	96.0	100.0	96.0	744	744	714

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING JULY AND AUGUST.

/83	SYSTEM	71.3	92.8	92.8	71.3	720	553	513
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** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS SHUT DOWN ON SEPTEMBER 24 FOR AN ANNUAL INSPECTION AND MAINTENANCE.

/83	SYSTEM	50.7	86.9	86.9	50.7	744	434	377
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** PROBLEMS/SOLUTIONS/COMMENTS

UNIT 1 WAS OUT OF SERVICE FROM SEPTEMBER 24 TO OCTOBER 14, 1983 FOR A SCHEDULED OUTAGE. DURING THIS PERIOD AN ANNUAL BOILER INSPECTION AND FGD SYSTEM MAINTENANCE WAS CONDUCTED.

THE FGD SYSTEM WAS DOWN DURING PART OF OCTOBER DUE TO A LACK OF SODIUM SULFITE ABSORBING SOLUTION.

/83	SYSTEM	94.2	94.2	94.2	94.2	720	720	678
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** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD-RELATED OUTAGES WERE ENCOUNTERED DURING NOVEMBER.

/83	SYSTEM	82.8	82.8	82.8	82.8	744	744	616
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** PROBLEMS/SOLUTIONS/COMMENTS

FGD SYSTEM OUTAGE TIME DURING DECEMBER WAS DUE IN PART TO EXTREME COLD WEATHER CONDITIONS.

BRIEF OUTAGES OCCURRED DURING THE MONTH DUE TO MIST ELIMINATOR LEAKS.

/84	SYSTEM	98.9	98.9	98.9	98.9	744	744	736
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** PROBLEMS/SOLUTIONS/COMMENTS

A LACK OF ABSORBING SOLUTION DUE TO EVAPORATOR CIRCULATING PUMP PROBLEMS AND PLUGGED EVAPORATOR SOLUTION HEADERS LIMITED THE BURNING OF HIGH SULFUR COKE DURING JANUARY.

/84	SYSTEM	84.5	84.5	84.5	84.5	696	696	588
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** PROBLEMS/SOLUTIONS/COMMENTS

PRESATURATOR CLEANING CONTRIBUTED TO OUTAGE TIME DURING FEBRUARY.

THE UTILITY REPORTED REPLACING FALLEN ACID BRICK DURING FEBRUARY.

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

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

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

MIST ELIMINATOR REPAIRS ACCOUNTED FOR ADDITIONAL DOWN TIME DURING THE MONTH.

PRESATURATOR RECIRCULATING PROBLEMS WERE REPORTED DURING FEBRUARY.

3/84	SYSTEM	98.4	98.4	98.4	98.4	744	744	732
4/84	SYSTEM	99.6	99.6	99.6	99.6	720	720	717
5/84	SYSTEM	97.2	97.2	97.2	97.2	744	744	723

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD-RELATED PROBLEMS WERE REPORTED DURING MARCH THROUGH MAY.

6/84	SYSTEM	93.0	92.0	92.0	79.0	720	615	569
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** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE UNIT WAS DOWN PART OF THE MONTH TO REPAIR LEAKING BOILER TUBES. THE UTILITY ALSO EXPERIENCED PROBLEMS WITH THE FGD PRESCRUBBER CIRCULATING PUMPS AND SLURRY NEUTRALIZATION TANKS.

7/84	SYSTEM	91.0	91.0	91.0	91.0	744	744	677
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** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE MONTH OF JULY.

8/84	SYSTEM	57.0	57.0	57.0	57.0	744	744	424
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** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE FGD WAS DOWN APPROXIMATELY TWO WEEKS TO REPAIR A BOOSTER FAN AND TO CLEAN THE PRESCRUBBER.

9/84	SYSTEM	100.0	100.0	100.0	100.0	720	720	720
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** PROBLEMS/SOLUTIONS/COMMENTS

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

10/84	SYSTEM	99.0	99.0	99.0	99.0	744	744	737
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** PROBLEMS/SOLUTIONS/COMMENTS

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

11/84	SYSTEM	19.0	54.0	54.0	19.0	720	246	137
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** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS SHUT DOWN MOST OF NOVEMBER FOR AN ANNUAL OUTAGE.

12/84	SYSTEM	79.0	79.0	79.0	79.0	744	744	588
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** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS DOWN 104 HOURS IN DECEMBER BECAUSE OF THE INABILITY OF THE BOILER TO BURN COKE. THE UNIT WAS NOT ABLE TO BURN COKE BECAUSE OF A FLY ASH FAN OUTAGE.

LITY FGD SURVEY: JANUARY - DECEMBER 1988
MARVA POWER & LIGHT: DELAWARE CITY 1 (CONT.)

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

85 SYSTEM 86.2 86.2 86.2 86.2 744 744 641

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS OUT OF SERVICE DURING PART OF THE MONTH SO THAT REPAIRS
COULD BE MADE TO AN ASH POND RECIRCULATION LINE AND PUMP.

85 SYSTEM 94.0 94.0 94.0 94.0 672 672 632

85 SYSTEM 96.5 96.5 96.5 96.5 744 744 718

85 SYSTEM 95.8 95.8 95.8 95.8 720 720 690

85 SYSTEM 96.2 96.2 96.2 96.2 744 744 716

85 SYSTEM 98.6 98.6 98.6 98.6 720 720 710

85 SYSTEM 98.0 98.0 98.0 98.0 744 744 729

85 SYSTEM 100.0 100.0 100.0 100.0 744 744 744

** PROBLEMS/SOLUTIONS/COMMENTS

NO FGD SYSTEM PROBLEMS WERE REPORTED FOR THE MONTHS OF FEBRUARY THROUGH
AUGUST.

85 SYSTEM 32.2 87.5 87.5 32.2 720 265 232

85 SYSTEM 71.2 88.5 88.5 71.2 744 599 530

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS SHUT DOWN FOR A SCHEDULED ANNUAL OUTAGE DURING THE MONTH.
THE FGD SYSTEM WAS SHUT DOWN EARLY TO ALLOW FOR BOILER MULTICLONE
REPLACEMENT. THE OUTAGE CONTINUED INTO OCTOBER.

/85 SYSTEM 99.3 99.3 99.3 99.3 720 720 715

/85 SYSTEM 91.5 91.5 91.5 91.5 744 744 681

** PROBLEMS/SOLUTIONS/COMMENTS

NO FGD SYSTEM-RELATED PROBLEMS WERE REPORTED FOR THE MONTHS OF NOVEMBER
AND DECEMBER.

/86 SYSTEM 98.0 98.0 98.0 98.0 744 744 729

/86 SYSTEM 88.0 98.0 98.0 88.0 672 600 591

** PROBLEMS/SOLUTIONS/COMMENTS

UNIT 1 WAS OUT OF SERVICE 3 DAYS FOR BOILER TUBE LEAK REPAIRS.

/86 SYSTEM 98.0 98.0 98.0 98.0 744 744 729

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD SYSTEM-RELATED PROBLEMS WERE REPORTED FOR THE FIRST QUARTER
OF 1986.

/86 SYSTEM 98.0 98.0 98.0 98.0 720 720 706

/86 SYSTEM 99.0 99.0 99.0 99.0 744 744 737

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

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

-----PERFORMANCE DATA-----										
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
6/86	SYSTEM	99.0	99.0	99.0	99.0		720	720	713	
7/86	SYSTEM	98.0	98.0	98.0	98.0		744	743	729	
8/86	SYSTEM	99.0	99.0	99.0	99.0		744	744	737	
9/86	SYSTEM	86.0	97.0	97.0	86.0		720	634	619	
10/86	SYSTEM	55.0	100.0	100.0	55.0		744	407	409	
11/86	SYSTEM	65.0	98.0	98.0	65.0		720	481	468	

** PROBLEMS/SOLUTIONS/COMMENTS

NO FGD SYSTEM-RELATED PROBLEMS WERE REPORTED FOR THE MONTHS OF APRIL THROUGH AUGUST 1986. THE FGD SYSTEM WAS OUT OF SERVICE 86 HOURS IN SEPTEMBER BECAUSE OF A RUPTURED BOILER TUBE. UNIT 1 WAS OUT OF SERVICE FOR PART OF OCTOBER AND NOVEMBER FOR A SCHEDULED UNIT OUTAGE.

12/86	SYSTEM	97.0	97.0	97.0	97.0		744	744	722	
1/87	SYSTEM	99.1	99.1	99.1	99.1		744	744	737	
2/87	SYSTEM	99.6	99.6	99.6	99.6		672	672	669	

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED NO FGD SYSTEM-RELATED PROBLEMS DURING JANUARY OR FEBRUARY 1987.

3/87	SYSTEM	81.2	100.0	100.0	81.2		744	604	604	
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** PROBLEMS/SOLUTIONS/COMMENTS

UNIT 2 WAS OUT OF SERVICE FOR PART OF MARCH DUE TO BOILER TUBE LEAKS.

4/87	SYSTEM	97.4	97.4	97.4	97.4		720	720	701	
5/87	SYSTEM	99.6	99.6	99.6	99.6		744	744	741	
6/87	SYSTEM	94.6	94.6	94.6	94.6		720	720	681	
7/87	SYSTEM	93.0	93.0	93.0	93.0		744	744	692	
8/87	SYSTEM	99.3	99.3	99.3	99.3		744	744	739	
9/87	SYSTEM	97.8	97.8	97.8	97.8		720	720	704	
10/87	SYSTEM	90.5	90.5	90.5	90.5		744	744	673	

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD SYSTEM-RELATED PROBLEMS WERE REPORTED FOR THE PERIOD APRIL THROUGH OCTOBER 1987.

11/87	SYSTEM	17.8	100.0	100.0	17.8		720	128	128	
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** PROBLEMS/SOLUTIONS/COMMENTS

UNIT 1 WAS OUT OF SERVICE FOR AN ANNUAL OUTAGE IN NOVEMBER.

12/87	SYSTEM	95.8	95.8	95.8	95.8		744	744	713	
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ITY FGD SURVEY: JANUARY - DECEMBER 1988

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

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

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD SYSTEM-RELATED PROBLEMS WERE REPORTED FOR THE MONTH OF DECEMBER.

38	SYSTEM	64.0	64.0	64.0	64.0	744	744	476
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** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT 1 FGD SYSTEM SHUT DOWN PART OF JANUARY DUE TO ABSORBER PIPING REPAIRS AND LACK OF REAGENT SLURRY.

38	SYSTEM	91.0	98.0	98.0	91.0	696	643	633
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** PROBLEMS/SOLUTIONS/COMMENTS

UNIT 1 WAS DOWN FOR APPROXIMATELY 2 DAYS DUE TO BOILER TUBE LEAKS. NO MAJOR FGD-RELATED PROBLEMS WERE REPORTED.

38	SYSTEM	98.0	98.0	98.0	98.0	744	744	729
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38	SYSTEM	98.0	98.0	98.0	98.0	720	720	706
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88	SYSTEM	99.0	99.0	99.0	99.0	744	744	737
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88	SYSTEM	99.0	99.0	99.0	99.0	720	720	713
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** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD OR UNIT OUTAGES WERE ENCOUNTERED DURING THE PERIOD MARCH THROUGH JUNE 1988.

88	SYSTEM	89.0	89.0	89.0	89.0	744	744	662
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** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT 1 FGD SYSTEM WAS SHUT DOWN APPROXIMATELY 5 DAYS DUE TO LACK OF REAGENT SLURRY.

88	SYSTEM	98.0	98.0	98.0	98.0	744	744	729
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88	SYSTEM	93.0	100.0	100.0	93.0	720	670	660
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** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR UNIT OR FGD RELATED OUTAGES WERE ENCOUNTERED DURING THE MONTHS OF AUGUST AND SEPTEMBER 1988.

88	SYSTEM	11.0	100.0	100.0	11.0	744	83	82
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** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS OFF-LINE THE MAJORITY OF OCTOBER FOR AN ANNUAL OUTAGE.

88	SYSTEM	96.0	96.0	96.0	96.0	720	720	691
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88	SYSTEM	92.0	92.0	92.0	92.0	744	744	684
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** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR UNIT OR FGD-RELATED OUTAGES WERE ENCOUNTERED DURING THE MONTHS OF NOVEMBER AND DECEMBER 1988.

SECTION 13
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	DELMARVA POWER & LIGHT	
PLANT NAME	DELAWARE CITY	
UNIT NUMBER	2	
CITY	DELAWARE CITY	
STATE	DELAWARE	
REGULATORY CLASSIFICATION	E	
PERMIT EMISSION LIMITATION - NG/J	129.	(0.300 LB/MMBTU)
2 EMISSION LIMITATION - NG/J	*****	(***** LB/MMBTU)
1 EMISSION LIMITATION - NG/J	*****	(***** LB/MMBTU)
1 PLANT GENERATING CAPACITY - MW	180	
2 SS UNIT GENERATING CAPACITY - MW	28	
1 UNIT GENERATING CAPACITY W/FGD - MW	27	
1 UNIT GENERATING CAPACITY WO/FGD - MW	28	
1 DIVALENT SCRUBBED CAPACITY - MW	28	
* UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	RILEY STOKER	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	139.21	(295000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	215.6	(420 F)
STACK HEIGHT - M	152.	(500 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	6.1	(20.0 FT)
* FUEL DATA		
FUEL TYPE	COKE	
FUEL GRADE	BITUMINOUS	
AVERAGE HEAT CONTENT - J/G	32564.	(14000 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		13500-14500
AVERAGE ASH CONTENT - %	0.50	
RANGE ASH CONTENT - %	0.3-0.7	
AVERAGE MOISTURE CONTENT - %	0.70	
RANGE MOISTURE CONTENT - %	0.5-1.2	
AVERAGE SULFUR CONTENT - %	7.00	
RANGE SULFUR CONTENT - %	5.0-8.0	
AVERAGE CHLORIDE CONTENT - %	*****	
RANGE CHLORIDE CONTENT - %	****	
* PARTICLE CONTROL		
* MECHANICAL COLLECTOR		
NUMBER	3	
TYPE	TUBULAR	
SUPPLIER	PRAT-DANIEL	
PARTICLE REMOVAL EFFICIENCY - %	92.0	
* FABRIC FILTER		
NUMBER	0	
TYPE	NONE	
TYPICAL GAS/CLOTH RATIO - M/MIN	0.6	(2.0 FT/MIN)
* ESP		
NUMBER	3	
TYPE	COLD SIDE	
SUPPLIER	WESTERN PREC. DIVISION, JOY	
INLET FLUE GAS CAPACITY - CU.M/S	34.8	(73700 ACFM)
INLET FLUE GAS TEMPERATURE - C	54.4	(130 F)
PRESSURE DROP - KPA	0.2	(1. IN-H2O)
PARTICLE REMOVAL EFFICIENCY - %	95.0	
* PARTICLE SCRUBBER		
NUMBER	3	
INITIAL START-UP DATE	4/1980	
GENERIC TYPE	VENTURI TOWER	
SPECIFIC TYPE	VARIABLE-THROAT/BOTTOM-ENTRY PLUMB BOB	
TRADE NAME/COMMON NAME	N/A	
SUPPLIER	AIRPOL	
DIMENSIONS - FT	20 DIA X 70.0	

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

SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	AISI 1110	
LINER GENERIC MATERIAL	ORGANIC; INORGANIC	
LINER SPECIFIC MATERIAL	GLASS FLAKE-FILLED POLYESTER; PREFIRED BRICK/SHA	
GAS CONTACTING DEVICE TYPE	NONE	
NUMBER OF CONTACTING ZONES	1	
LIQUID RECIRCULATION RATE - LITER/S	315.0	(5000 GPM)
L/G RATIO - LITER/CU.M	6.8	(50.9 GAL/1000ACF)
PRESSURE DROP - KPA	0.5	(2.0 IN-H2O)
INLET GAS FLOW RATE - CU.M/S	46.4	(98300 ACFM)
INLET GAS TEMPERATURE - C	221.1	(430 F)
SO2 REMOVAL EFFICIENCY - %	0.0	
PARTICLE REMOVAL EFFICIENCY - %	81.5	

*** FGD SYSTEM

** GENERAL DATA

SALEABLE PRODUCT/THROWAWAY PRODUCT	SALEABLE PRODUCT
SO2 REMOVAL MODE	WET SCRUBBING
PROCESS TYPE	WELLMAN LORD
SYSTEM SUPPLIER	DAVY MCKEE
A-E FIRM	DAVY MCKEE
DEVELOPMENT LEVEL	FULL SCALE
NEW/RETROFIT	RETROFIT
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	90.00
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	90.00
ENERGY CONSUMPTION - %	3.6
CURRENT STATUS	1
COMMERCIAL START-UP	5/1980
INITIAL START-UP	5/1980
CONTRACT AWARDED	9/1977

** DESIGN AND OPERATING PARAMETERS

DESIGN COAL SULFER CONTENT - %	8.00	
DESIGN CHLORIDE CONTENT - %	*****	
SPACE REQUIREMENTS - SQ M	24280.3	(261360 SQ FT)
OPER. & MAINT. REQUIREMENT - MANHR/DAY	144.0	

** QUENCHER/PRESATURATOR

CONSTRUCTION MATERIAL GENERIC TYPE	NR
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR

** ABSORBER

NUMBER	3	
NUMBER OF SPARES	0	
GENERIC TYPE	TRAY TOWER	
SPECIFIC TYPE	VALVE TRAY	
TRADE NAME/COMMON TYPE	BUBBLE CAP TRAY TOWER	
SUPPLIER	DAVY MCKEE	
DIMENSIONS - FT	20.0 X 20.0	
SHELL GENERIC MATERIAL	INORGANIC	
SHELL SPECIFIC MATERIAL	HYDRAULICALLY-BONDED CONCRETE	
SHELL MATERIAL TRADE NAME/COMMON TYPE	PORTLAND CEMENT	
LINER GENERIC MATERIAL	INORGANIC	
LINER SPECIFIC MATERIAL	PREFIRED BRICK/SHAPES	
LINER MATERIAL TRADE NAME/COMMON TYPE	NR	
GAS CONTACTING DEVICE TYPE	VALVE TRAY	
NUMBER OF CONTACTING ZONES	4	
LIQUID RECIRCULATION RATE - LITER/S	25.	(400 GPM)
L/G RATIO - L/CU.M	0.7	(5.5 GAL/1000 ACF)
INLET GAS FLOW - CU. M/S	34.59	(73300 ACFM)
INLET GAS TEMPERATURE - C	54.4	(130 F)
PARTICLE REMOVAL EFFICIENCY - %	0.0	

** MIST ELIMINATOR

PRE-MIST ELIMINATOR/MIST ELIMINATOR	PRIMARY COLLECTOR
NUMBER PER SYSTEM	3
GENERIC TYPE	IMPINGEMENT
SPECIFIC TYPE	BAFFLE
TRADE NAME/COMMON TYPE	CLOSED VANE
CONFIGURATION	HORIZONTAL

ILITY FGD SURVEY: JANUARY - DECEMBER 1988

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

NUMBER OF STAGES	1	
NUMBER OF PASSES PER STAGE	1	
FREEBOARD DISTANCE - M	1.83	(6.0 FT)
DISTANCE BETWEEN STAGES - CM	19.05	(7.5 IN)
PRESSURE DROP - KPA	0.1	(0.3 IN-H2O)
CONSTRUCTION MATERIAL GENERIC TYPE	ORGANIC	
CONSTRUCTION MATERIAL SPECIFIC TYPE	POLYPHENYLENE	
WASH WATER SOURCE	COOLED CONDENSATE	
WASH FREQUENCY	INTERMITTENT	
WASH RATE - L/S	3.2	(50 GAL/MIN)
REHEATER	3	
NUMBER		
GENERIC TYPE	DIRECT COMBUSTION	
SPECIFIC TYPE	EXTERNAL COMBUSTION CHAMBER	
TRADE NAME/COMMON TYPE	NATURAL GAS	
TEMPERATURE INCREASE - C	27.8	(50 F)
INLET FLUE GAS FLOW RATE - CU. M/S	108.54	(230000 ACFM)
INLET FLUE GAS TEMPERATURE - C	54.4	(130 F)
OUTLET FLUE GAS TEMPERATURE - C	85.0	(185 F)
CONSTRUCTION MATERIAL GENERIC TYPE	NR	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR	
FANS	3	
NUMBER	0	
NUMBER OF SPARES		
DESIGN	CENTRIFUGAL	
SUPPLIER	ROBINSON	
FUNCTION	BOOSTER	
APPLICATION	INDUCED DRAFT	
SERVICE	DRY	
FLUE GAS FLOW RATE - CU.M/S	139.21	(295000 ACFM)
FLUE GAS TEMPERATURE - C	215.6	(420 F)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	
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		
DIMENSIONS	8.0 X 8.0	
SHELL GENERIC MATERIAL TYPE	CARBON STEEL	
SHELL SPECIFIC MATERIAL TYPE	AISI 1110	
LINER GENERIC MATERIAL TYPE	ORGANIC	
LINER SPECIFIC MATERIAL TYPE	FIBER-REINFORCED POLYESTER	
REAGENT PREPARATION EQUIPMENT		
FUNCTION	MIX TANK	
DEVICE	N/A	
DEVICE TYPE	AGITATED TANK	
TANKS		
SERVICE	NUMBER	
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NR	****	
PUMPS		
SERVICE	NUMBER	
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ABSORBER RECIRCULATION	****	
SOLIDS CONCENTRATING/DEWATERING		
DEVICE	NONE	

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

*** SALEABLE BYPRODUCTS
 NATURE
 FULL LOAD QUANTITY - M T/H
 QUALITY - %
 DISPOSITION

SULFURIC ACID
 11.34 (12.50 TPH)
 93.0
 MARKETING

*** SLUDGE

** TREATMENT
 METHOD
 DEVICE
 PROPRIETARY PROCESS

N/A
 N/A
 N/A

** DISPOSAL
 NATURE
 TYPE
 SITE TREATMENT

FINAL
 POND
 CLAY LINING

** PROCESS CONTROL AND INSTRUMENTATION
 CHEMICAL PARAMETERS
 MONITOR LOCATION
 PROCESS CONTROL MANNER
 PROCESS CHEMISTRY MODE

PH, SOLIDS, SP.G., CONC.
 GAS OUTLET, SOLUTION OUTLET
 AUTOMATIC
 FEEDBACK

** WATER BALANCE
 WATER LOOP TYPE

CLOSED

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

5/80 SYSTEM 100.0 100.0 100.0 32.3 744 240 240

** PROBLEMS/SOLUTIONS/COMMENTS

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

6/80 SYSTEM 80.4 80.4 80.4 80.4 720 720 579

** PROBLEMS/SOLUTIONS/COMMENTS

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

FAILURE OF THE CIRCULATION PUMPS ALSO CAUSED OUTAGE TIME DURING THE MONTH.

7/80 SYSTEM 50.1 50.1 50.1 50.1 744 744 373

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS DOWN FOR PART OF THE MONTH TO REPAIR A LEAK IN THE MIST
 ELIMINATOR. IT WAS ALSO DOWN TO REBUILD THE CHEVRON PACKING.

8/80 SYSTEM 92.9 92.9 92.9 92.9 744 744 691

** PROBLEMS/SOLUTIONS/COMMENTS

REPAIRS WERE MADE IN THE ESP DURING AUGUST.

9/80 SYSTEM 78.2 78.2 78.2 78.2 720 720 563

LITY FGD SURVEY: JANUARY - DECEMBER 1988
MARVA POWER & LIGHT: DELAWARE CITY 2 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS OFF LINE DURING SEPTEMBER DUE TO NECESSARY REPAIR OF THE CIRCULATING PUMPS AND THE MIST ELIMINATOR.

FGD SYSTEM OUTAGE TIME OCCURRED DUE TO INLET DUCT EXPANSION JOINT REPAIRS.

80	SYSTEM	60.0	60.0	60.0	60.0	744	743	445
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** PROBLEMS/SOLUTIONS/COMMENTS

DURING OCTOBER THE MAJORITY OF DOWN TIME WAS DUE TO THE ACID PLANT BEING DOWN. IT WAS UNABLE TO PROCESS SO2 FROM THE WELLMAN LORD SOLUTION REGENERATION SECTION.

80	SYSTEM	98.3	98.3	98.3	98.3	720	720	708
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** PROBLEMS/SOLUTIONS/COMMENTS

DURING NOVEMBER OUTAGE TIME WAS REQUIRED TO REPAIR LEAKS IN THE PRE-SCRUBBER.

80	SYSTEM	100.0	100.0	100.0	100.0	744	744	744
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** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED NO FGD-RELATED PROBLEMS DURING THE MONTH OF DECEMBER.

81	SYSTEM	93.0	93.0	93.0	93.0	744	744	692
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81	SYSTEM	96.0	96.0	96.0	96.0	672	672	648
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** PROBLEMS/SOLUTIONS/COMMENTS

DURING JANUARY AND FEBRUARY THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED.

81	SYSTEM	57.5	89.0	89.0	57.5	744	481	428
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** PROBLEMS/SOLUTIONS/COMMENTS

DURING MARCH THE BOILER WAS OUT OF SERVICE FOR PART OF THE MONTH DUE TO AN OVERHAUL.

REPAIRS TO A LEAK IN THE MIST ELIMINATOR CAUSED SOME OUTAGE TIME.

81	SYSTEM	64.0	84.0	84.0	64.0	720	553	464
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** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER WAS OUT OF SERVICE APPROXIMATELY 167 HOURS DURING APRIL DUE TO A SCHEDULED MAINTENANCE OUTAGE.

THE FGD SYSTEM WAS UNAVAILABLE APPROXIMATELY 256 HOURS DUE TO THE REPLACEMENT OF THE PRESATURATOR MIST ELIMINATOR INTERNALS AND THE BRICK LINING.

81	SYSTEM	97.5	97.5	97.5	97.5	744	744	726
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** PROBLEMS/SOLUTIONS/COMMENTS

DURING MAY REPAIRS WERE PERFORMED ON THE BOOSTER BLOWER INSPECTION DOOR.

81	SYSTEM	75.8	75.8	75.8	75.8	720	720	546
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DELMARVA POWER & LIGHT: DELAWARE CITY 2 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

ON JUNE 23 THE SYSTEM WAS SHUT DOWN DUE TO A HIGH PRESSURE DROP. ON INSPECTION, IT WAS DISCOVERED THAT THE PRESATURATOR NOZZLE HAD FAILED, THERE WAS A CONSIDERABLE COKE BUILDUP IN THE PRESATURATOR MIST ELIMINATOR BOX, THE MIST ELIMINATOR CHEVRONS HAD FAILED, THERE WAS A LARGE COKE BUILDUP IN THE ESP INLET SEAL POT AND A HIGH SOLIDS BUILDUP IN THE BOTTOM OF THE SO2 ABSORBER. REPAIRS CONSISTED OF REPLACING THE PRESATURATOR NOZZLE TIP AND CLEANING THE BUILDUP.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART. HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
7/81	SYSTEM	76.9	76.9	76.9	76.9		744	744	572	

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JULY, THE ACID BRICK LINING ON THE INLET TO THE PRESCRUBBER FAILED. IN ADDITION, PROBLEMS WERE ENCOUNTERED WITH THE PRESCRUBBER NOZZLE TIP.

8/81	SYSTEM	97.8	97.8	97.8	97.8		744	744	728	
9/81	SYSTEM	99.2	96.3	96.3	86.7		720	648	624	

** PROBLEMS/SOLUTIONS/COMMENTS

DURING SEPTEMBER, THE BOILER WAS OFF LINE FOR 72 HOURS TO REPAIR A SUPER-HEATER TUBE LEAK.

10/81	SYSTEM	100.0	100.0	100.0	100.0		744	744	744	
11/81	SYSTEM	89.2	89.2	89.2	89.2		720	720	642	

** PROBLEMS/SOLUTIONS/COMMENTS

DURING NOVEMBER THE FGD SYSTEM WAS DOWN 62 HOURS TO CLEAN THE ESP SEAL POT AND TO REPLACE THE TIP OF A PRESATURATOR SPRAY NOZZLE.

12/81	SYSTEM	98.9	98.9	98.9	98.9		744	744	736	
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** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING DECEMBER.

1/82	SYSTEM	78.5	78.5	78.5	78.5		744	744	584	
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** PROBLEMS/SOLUTIONS/COMMENTS

SOME OF THE OUTAGE TIME IN JANUARY WAS DUE TO A STEAM SHORTAGE.

2/82	SYSTEM	79.7	79.7	79.7	79.7		672	672	536	
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** PROBLEMS/SOLUTIONS/COMMENTS

SOME OF THE OUTAGE TIME IN JANUARY AND FEBRUARY WAS DUE TO THE REPLACEMENT OF A BOOSTER BLOWER BEARING.

THE SYSTEM WAS OFF-LINE PART OF THE MONTH TO REPAIR A PRESATURATOR CIRCULATING PUMP.

OUTAGE TIME WAS NECESSARY TO UNPLUG THE PURGE LINE IN FEBRUARY.

3/82	SYSTEM	46.4	75.3	75.3	46.4		744	458	345	
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LITY FGD SURVEY: JANUARY - DECEMBER 1988
MARVA POWER & LIGHT: DELAWARE CITY 2 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

DURING MARCH THE BOILER WAS OFF-LINE PART OF THE TIME FOR THE ANNUAL OVERHAUL.

THE SYSTEM WAS UNAVAILABLE PART OF THE MONTH DUE TO PROBLEMS WITH THE SCRUBBING SOLUTION SECTION.

82	SYSTEM	69.7	97.8	97.8	69.7	720	513	502
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** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER WAS OFF-LINE DURING APRIL DUE TO THE ANNUAL OVERHAUL WHICH STARTED IN MARCH.

82	SYSTEM	96.0	96.0	96.0	96.0	744	744	714
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** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING MAY.

82	SYSTEM	96.6	96.6	96.6	96.6	720	720	696
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** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE EXPERIENCED DURING JUNE.

82	SYSTEM	89.9	89.9	89.9	89.9	744	744	669
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** PROBLEMS/SOLUTIONS/COMMENTS

A LACK OF SOLUTION DUE TO EVAPORATOR PROBLEMS ACCOUNTED FOR OUTAGE TIME DURING JULY.

82	SYSTEM	94.2	95.0	95.0	94.2	744	738	701
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** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED BY THE UTILITY DURING AUGUST.

'82	SYSTEM	93.9	93.9	93.9	93.9	720	720	676
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** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING SEPTEMBER.

'82	SYSTEM	98.4	98.4	98.4	98.4	744	744	732
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'82	SYSTEM	97.2	97.2	97.2	97.2	720	720	700
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'82	SYSTEM	97.7	97.7	97.7	97.7	744	744	727
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** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE OCTOBER - DECEMBER PERIOD.

'83	SYSTEM	98.7	98.7	98.7	98.7	744	744	734
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UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

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

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

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING JANUARY.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL	PER BOILER	FGD	CAP.
						SO2 PART.	HOURS	HOURS	HOURS FACTOR
2/83	SYSTEM	97.5	97.5	97.5	97.5		672	672	655

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD-RELATED PROBLEMS WERE REPORTED BY THE UTILITY DURING FEBRUARY.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL	PER BOILER	FGD	CAP.
						SO2 PART.	HOURS	HOURS	HOURS FACTOR
3/83	SYSTEM	32.0	88.8	88.8	32.0		744	268	238

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER WAS DOWN FROM MARCH 12 TO MARCH 31 FOR AN ANNUAL OUTAGE.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL	PER BOILER	FGD	CAP.
						SO2 PART.	HOURS	HOURS	HOURS FACTOR
4/83	SYSTEM	96.8	96.8	96.8	96.8		720	720	697

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING APRIL.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL	PER BOILER	FGD	CAP.
						SO2 PART.	HOURS	HOURS	HOURS FACTOR
5/83	SYSTEM	91.7	91.7	91.7	91.7		744	744	682

** PROBLEMS/SOLUTIONS/COMMENTS

REPAIRS TO THE ESP CAUSED A FORCED OUTAGE DURING MAY.

BOOSTER FAN REPAIRS ALSO CAUSED DOWN TIME DURING THE MONTH.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL	PER BOILER	FGD	CAP.
						SO2 PART.	HOURS	HOURS	HOURS FACTOR
6/83	SYSTEM	81.0	81.0	81.0	81.0		720	720	583

** PROBLEMS/SOLUTIONS/COMMENTS

DOWN TIME OCCURRED DURING JUNE DUE TO REPAIRS ON A BOOSTER FAN.

REPAIRS ON A PRESATURATOR SPRAY NOZZLE ALSO FORCED THE SYSTEM OUT OF SERVICE DURING PART OF JUNE.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL	PER BOILER	FGD	CAP.
						SO2 PART.	HOURS	HOURS	HOURS FACTOR
7/83	SYSTEM	86.6	86.6	86.6	86.6		744	744	644

** PROBLEMS/SOLUTIONS/COMMENTS

UNIT 2 WAS DOWN DURING PART OF JULY TO REMOVE A SOLIDS BUILD UP IN THE PRE SCRUBBER AND PRESCRUBBER INLET DUCT. SOME PRESCRUBBER SPRAY NOZZLES WERE REPLACED DURING THIS PERIOD.

BOOSTER FAN REPAIRS WERE MADE AT UNIT 2 DURING JULY.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL	PER BOILER	FGD	CAP.
						SO2 PART.	HOURS	HOURS	HOURS FACTOR
8/83	SYSTEM	98.0	98.0	100.0	98.0		744	744	729

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING AUGUST.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL	PER BOILER	FGD	CAP.
						SO2 PART.	HOURS	HOURS	HOURS FACTOR
9/83	SYSTEM	81.8	81.8	81.8	81.8		720	720	589

LITY FGD SURVEY: JANUARY - DECEMBER 1988
MARVA POWER & LIGHT: DELAWARE CITY 2 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

UNIT 2 WAS DOWN DURING PART OF SEPTEMBER TO REPAIR BRICKWORK AT THE INLET TO THE PRESCRUBBER AND TO CLEAN THE PRESCRUBBER.

THE UNIT WAS DOWN DURING PART OF THE MONTH TO CLEAN THE ESP INLET SEAL POTS.

83	SYSTEM	98.7	98.7	98.7	98.7	744	744	734
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** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD-RELATED OUTAGES WERE ENCOUNTERED DURING OCTOBER.

83	SYSTEM	82.2	82.2	82.2	82.2	720	720	592
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** PROBLEMS/SOLUTIONS/COMMENTS

PRESCRUBBER SPRAY NOZZLES WERE REPLACED DURING NOVEMBER.

MIST ELIMINATOR LEAKS WERE REPAIRED DURING NOVEMBER.

THE PRESCRUBBER WAS CLEANED DURING THE MONTH CONTRIBUTING TO FGD SYSTEM DOWN TIME.

'83	SYSTEM	92.2	92.2	92.2	92.2	744	744	686
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** PROBLEMS/SOLUTIONS/COMMENTS

MIST ELIMINATOR LEAKS RESULTED IN FGD SYSTEM OUTAGES DURING THE MONTH.

LEAKS IN THE PRESCRUBBER CIRCULATION PIPING ALSO CONTRIBUTED TO DOWN TIME DURING DECEMBER.

'84	SYSTEM	81.7	81.7	81.7	81.7	744	744	608
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** PROBLEMS/SOLUTIONS/COMMENTS

A LACK OF ABSORBING SOLUTION DUE TO EVAPORATOR CIRCULATING PUMP PROBLEMS AND PLUGGED EVAPORATOR SOLUTION HEADERS LIMITED THE BURNING OF HIGH SULFUR COKE DURING JANUARY.

THE UTILITY REPORTED THAT BOOSTER FAN REPAIRS WERE MADE DURING JANUARY.

THE REPAIR OF BROKEN WIRES IN THE ESP'S RESULTED IN OUTAGE TIME DURING THE MONTH.

THE FAILURE OF PRESATURATOR CIRCULATING PUMPS ACCOUNTED FOR ADDITIONAL DOWN TIME DURING JANUARY.

THE REMOVAL OF COKE BUILD UP IN THE ESP'S CONTRIBUTED TO FGD SYSTEM DOWN TIME DURING THE MONTH.

/84	SYSTEM	93.8	93.8	93.8	93.8	696	696	653
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/84	SYSTEM	96.4	96.4	96.4	96.4	744	744	717
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/84	SYSTEM	98.2	98.2	98.2	98.2	720	720	707
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UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

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

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

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD-RELATED PROBLEMS WERE REPORTED DURING FEBRUARY THROUGH APRIL.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
5/84	SYSTEM	23.1	53.1	56.1	21.0		744	294	156	

** PROBLEMS/SOLUTIONS/COMMENTS

THE ABSORBER WAS DOWN FOR MAINTENANCE DURING THE ANNUAL BOILER OUTAGE IN MAY.

PROBLEMS WITH PLUGGING OF THE PRESATURATOR WERE REPORTED DURING MAY.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
6/84	SYSTEM	83.0	83.0	83.0	83.0		720	720	598	

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE FGD SYSTEM WAS DOWN APPROXIMATELY 5 DAYS FOR SCHEDULED MAINTENANCE.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
7/84	SYSTEM	54.0	54.0	54.0	54.0		744	744	402	

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THE FGD WAS REMOVED FROM SERVICE PART OF JULY TO REPAIR A BOOSTER FAN BEARING AND ALSO TO CLEAN THE PRESCRUBBER MIST ELIMINATOR BOX, SEAL POT, AND ESP'S DUE TO FAILURE OF PRESCRUBBER SPRAY NOZZLE.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
8/84	SYSTEM	84.0	84.0	84.0	84.0		744	744	625	

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS SHUT DOWN PART OF AUGUST TO REPAIR ESP'S.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
9/84	SYSTEM	89.0	89.0	89.0	89.0		720	720	641	

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS SHUT DOWN PART OF SEPTEMBER TO REPAIR ESP'S.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
10/84	SYSTEM	95.0	95.0	95.0	95.0		744	744	707	

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE MONTH OF OCTOBER.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
11/84	SYSTEM	81.0	81.0	81.0	81.0		720	720	583	

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE UNIT WAS DOWN PART OF NOVEMBER BECAUSE OF PROBLEMS WITH THE ACID PLANT.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
12/84	SYSTEM	43.0	43.0	43.0	43.0		744	744	310	

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS DOWN MOST OF DECEMBER TO REPAIR THE LOST BRICK LINING IN THE PRESCRUBBER.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
1/85	SYSTEM	89.1	89.1	89.1	89.1		744	744	663	

CITY FGD SURVEY: JANUARY - DECEMBER 1988

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

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

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS OUT OF SERVICE DURING PART OF THE MONTH SO THAT REPAIRS
 COULD BE MADE TO AN ASH POND RECIRCULATION LINE AND PUMP.

35	SYSTEM	98.4	98.4	98.4	98.4	672	672	661
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** PROBLEMS/SOLUTIONS/COMMENTS

NO FGD SYSTEM PROBLEMS WERE REPORTED FOR THE MONTH OF FEBRUARY.

35	SYSTEM	32.4	83.9	96.3	28.1	744	249	209
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** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS REMOVED FROM SERVICE FOR A SCHEDULED ANNUAL OUTAGE
 DURING MARCH.

35	SYSTEM	100.0	100.0	100.0	100.0	720	720	720
35	SYSTEM	99.1	99.1	99.1	99.1	744	744	737
35	SYSTEM	98.6	98.6	98.6	98.6	720	720	710
35	SYSTEM	97.8	97.8	97.8	97.8	744	744	728
35	SYSTEM	98.8	98.8	98.8	98.8	744	744	735
35	SYSTEM	99.6	99.6	99.6	99.6	720	720	717
35	SYSTEM	87.2	87.2	87.2	87.2	744	744	649
35	SYSTEM	94.9	94.9	94.9	94.9	720	720	683
35	SYSTEM	98.4	98.4	98.4	98.4	744	744	732

** PROBLEMS/SOLUTIONS/COMMENTS

NO FGD SYSTEM PROBLEMS WERE REPORTED FOR THE MONTHS OF APRIL THROUGH
 DECEMBER.

86	SYSTEM	98.0	98.0	98.0	98.0	744	744	729
86	SYSTEM	88.0	98.0	98.0	88.0	672	600	591

** PROBLEMS/SOLUTIONS/COMMENTS

UNIT 2 WAS OUT OF SERVICE 3 DAYS FOR BOILER TUBE LEAK REPAIRS.

86	SYSTEM	19.0	100.0	100.0	19.0	744	141	141
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** PROBLEMS/SOLUTIONS/COMMENTS

UNIT WAS OUT OF SERVICE MOST OF THE MONTH FOR A SCHEDULED ANNUAL BOILER/
 TURBINE OUTAGE.

NO MAJOR FGD SYSTEM-RELATED PROBLEMS WERE REPORTED FOR THE FIRST QUARTER
 OF 1986.

86	SYSTEM	91.0	91.0	91.0	91.0	720	720	655
86	SYSTEM	93.0	93.0	93.0	93.0	744	744	692

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

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

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

** PROBLEMS/SOLUTIONS/COMMENTS

NO FGD SYSTEM-RELATED PROBLEMS WERE REPORTED FOR THE MONTHS OF APRIL OR MAY. THE UNIT WAS TAKEN OUT OF SERVICE IN MAY FOR A SCHEDULED ANNUAL OUTAGE.

6/86	SYSTEM	97.0	97.0	97.0	97.0	720	720	698
7/86	SYSTEM	100.0	100.0	100.0	100.0	744	744	744
8/86	SYSTEM	97.0	97.0	97.0	97.0	744	744	722
9/86	SYSTEM	100.0	100.0	100.0	100.0	720	720	720
10/86	SYSTEM	98.0	98.0	98.0	98.0	744	744	729
11/86	SYSTEM	98.0	98.0	98.0	98.0	720	720	706
12/86	SYSTEM	99.0	99.0	99.0	99.0	744	744	737

** PROBLEMS/SOLUTIONS/COMMENTS

NO FGD SYSTEM-RELATED PROBLEMS WERE REPORTED FOR THE MONTHS OF JUNE THROUGH DECEMBER 1986.

1/87	SYSTEM	98.9	98.9	98.9	98.9	744	744	736
2/87	SYSTEM	99.6	99.6	99.6	99.6	672	672	669

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED NO MAJOR FGD SYSTEM-RELATED PROBLEMS DURING JANUARY OR FEBRUARY, 1987.

3/87	SYSTEM	87.0	99.4	99.4	87.0	744	651	647
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** PROBLEMS/SOLUTIONS/COMMENTS

UNIT 2 WAS OUT OF SERVICE FOR PART OF MARCH DUE TO BOILER TUBE LEAKS.

4/87	SYSTEM	100.0	100.0	100.0	100.0	720	720	720
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** PROBLEMS/SOLUTIONS/COMMENTS

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

5/87	SYSTEM	22.0	100.0	100.0	22.0	744	164	164
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** PROBLEMS/SOLUTIONS/COMMENTS

UNIT 2 WAS OUT OF SERVICE FOR AN ANNUAL OUTAGE DURING THE MONTH OF MAY.

6/87	SYSTEM	88.1	88.1	88.1	88.1	720	720	634
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** PROBLEMS/SOLUTIONS/COMMENTS

UNIT 2 ABSORBER WAS OUT OF SERVICE FOR PIPING REPAIRS DURING JUNE.

UNIT 2 ABSORBER WAS DOWN DURING JUNE FOR PRECIPITATOR REPAIRS.

7/87	SYSTEM	4.3	4.3	4.3	4.3	744	744	32
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LITY FGD SURVEY: JANUARY - DECEMBER 1988
MARVA POWER & LIGHT: DELAWARE CITY 2 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

UNIT 2 WAS OUT OF SERVICE FOR BLOWER MOTOR REPAIRS DURING JULY.

87	SYSTEM	99.2	99.2	99.2	99.2	744	744	738
87	SYSTEM	98.3	98.3	98.3	98.3	720	720	708

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD SYSTEM-RELATED PROBLEMS WERE REPORTED FOR AUGUST OR SEPTEMBER.

87	SYSTEM	84.9	84.9	84.9	84.9	744	744	632
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** PROBLEMS/SOLUTIONS/COMMENTS

UNIT 2 ABSORBER WAS OUT OF SERVICE FOR PIPING REPAIRS DURING OCTOBER.

87	SYSTEM	100.0	100.0	99.3	100.0	720	739	720
87	SYSTEM	97.0	97.0	97.0	97.0	744	744	722

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD SYSTEM-RELATED PROBLEMS WERE REPORTED FOR THE MONTHS OF NOVEMBER OR DECEMBER 1987.

88	SYSTEM	96.0	96.0	96.0	96.0	744	744	714
88	SYSTEM	99.0	99.0	99.0	99.0	696	696	689

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD-RELATED OR UNIT OUTAGES WERE ENCOUNTERED DURING THE MONTHS OF JANUARY AND FEBRUARY 1988.

88	SYSTEM	29.0	100.0	100.0	29.0	744	213	216
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** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS OFF-LINE THE MAJORITY OF MARCH FOR AN ANNUAL OUTAGE.

88	SYSTEM	90.0	97.0	97.0	90.0	720	669	648
88	SYSTEM	93.0	100.0	100.0	93.0	744	694	692

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD-RELATED OR UNIT OUTAGES WERE ENCOUNTERED DURING THE MONTHS OF APRIL AND MAY 1988.

88	SYSTEM	88.0	88.0	99.0	88.0	720	638	634
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** PROBLEMS/SOLUTIONS/COMMENTS

UNIT 2 WAS SHUT DOWN APPROXIMATELY 5 DAYS DUE TO BOILER TUBE LEAKS.

88	SYSTEM	96.0	96.0	96.0	96.0	744	744	714
88	SYSTEM	92.0	92.0	92.0	92.0	744	744	684

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

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

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

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD-RELATED OR UNIT OUTAGES WERE ENCOUNTERED DURING THE MONTHS OF
 JULY AND AUGUST 1988.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
9/88	SYSTEM	88.0	95.0	95.0	88.0		720	669	634	

** PROBLEMS/SOLUTIONS/COMMENTS

UNIT 2 WAS SHUT DOWN FOR APPROXIMATELY 2 DAYS IN SEPTEMBER TO REPLACE A
 BOILER FEED WATER VALVE.

10/88	SYSTEM	99.0	99.0	99.0	99.0		744	744	737	
11/88	SYSTEM	98.0	98.0	98.0	98.0		720	720	706	
12/88	SYSTEM	99.0	99.0	99.0	99.0		744	744	737	

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD-RELATED OR UNIT OUTAGES WERE ENCOUNTERED DURING THE PERIOD
 OCTOBER THROUGH DECEMBER 1988.

SECTION 13

DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	DELMARVA POWER & LIGHT
PLANT NAME	DELAWARE CITY
UNIT NUMBER	3
CITY	DELAWARE CITY
STATE	DELAWARE
REGULATORY CLASSIFICATION	E
PARTICULATE EMISSION LIMITATION - NG/J	129. (0.300 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	***** (***** LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	***** (***** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	180
GROSS UNIT GENERATING CAPACITY - MW	75
NET UNIT GENERATING CAPACITY W/FGD - MW	40
NET UNIT GENERATING CAPACITY WO/FGD - MW	44
EQUIVALENT SCRUBBED CAPACITY - MW	75
** UNIT DATA - BOILER AND STACK	
BOILER SUPPLIER	RILEY STOKER
BOILER TYPE	PULVERIZED COAL
BOILER SERVICE LOAD	BASE
DESIGN BOILER FLUE GAS FLOW - CU.M/S	139.21 (295000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	215.6 (420 F)
STACK HEIGHT - M	152. (500 FT)
STACK SHELL	CONCRETE
STACK TOP DIAMETER - M	6.1 (20.0 FT)
** FUEL DATA	
FUEL TYPE	COKE
FUEL GRADE	BITUMINOUS
AVERAGE HEAT CONTENT - J/G	32564. (14000 BTU/LB)
RANGE HEAT CONTENT - BTU/LB	13500-14500
AVERAGE ASH CONTENT - %	0.50
RANGE ASH CONTENT - %	0.3-0.7
AVERAGE MOISTURE CONTENT - %	0.70
RANGE MOISTURE CONTENT - %	0.5-1.2
AVERAGE SULFUR CONTENT - %	7.00
RANGE SULFUR CONTENT - %	5.0-8.0
AVERAGE CHLORIDE CONTENT - %	*****
RANGE CHLORIDE CONTENT - %	****
*** PARTICLE CONTROL	
** MECHANICAL COLLECTOR	
NUMBER	3
TYPE	TUBULAR
SUPPLIER	PRAT-DANIEL
PARTICLE REMOVAL EFFICIENCY - %	92.0
** FABRIC FILTER	
NUMBER	0
TYPE	NONE
TYPICAL GAS/CLOTH RATIO - M/MIN	0.6 (2.0 FT/MIN)
** ESP	
NUMBER	3
TYPE	COLD SIDE
SUPPLIER	WESTERN PREC. DIVISION, JOY
INLET FLUE GAS CAPACITY - CU.M/S	34.8 (73700 ACFM)
INLET FLUE GAS TEMPERATURE - C	54.4 (130 F)
PRESSURE DROP - KPA	0.2 (1. IN-H2O)
PARTICLE REMOVAL EFFICIENCY - %	95.0
** PARTICLE SCRUBBER	
NUMBER	3
INITIAL START-UP DATE	4/1980
GENERIC TYPE	VENTURI TOWER
SPECIFIC TYPE	VARIABLE-THROAT/BOTTOM-ENTRY PLUMB BOB
TRADE NAME/COMMON NAME	N/A
SUPPLIER	AIRPOL
DIMENSIONS - FT	20 DIA X 70.0

LITY FGD SURVEY: JANUARY - DECEMBER 1988

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

SHELL GENERIC MATERIAL	CARBON STEEL
SHELL SPECIFIC MATERIAL	AISI 1110
LINER GENERIC MATERIAL	ORGANIC; INORGANIC
LINER SPECIFIC MATERIAL	GLASS FLAKE-FILLED POLYESTER; PREFIRED BRICK/SHA
GAS CONTACTING DEVICE TYPE	NONE
NUMBER OF CONTACTING ZONES	1
LIQUID RECIRCULATION RATE - LITER/S	315.0 (5000 GPM)
L/G RATIO - LITER/CU.M	6.8 (50.9 GAL/1000ACF)
PRESSURE DROP - KPA	0.5 (2.0 IN-H2O)
INLET GAS FLOW RATE - CU.M/S	46.4 (98300 ACFM)
INLET GAS TEMPERATURE - C	221.1 (430 F)
SO2 REMOVAL EFFICENCY - %	0.0
PARTICLE REMOVAL EFFICIENCY - %	81.5

FGD SYSTEM

GENERAL DATA	SALEABLE PRODUCT
SALEABLE PRODUCT/THROWAWAY PRODUCT	WET SCRUBBING
SO2 REMOVAL MODE	WELLMAN LORD
PROCESS TYPE	DAVY MCKEE
SYSTEM SUPPLIER	DAVY MCKEE
A-E FIRM	FULL SCALE
DEVELOPMENT LEVEL	RETROFIT
NEW/RETROFIT	
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	90.00
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	90.00
ENERGY CONSUMPTION - %	5.3
CURRENT STATUS	1
COMMERCIAL START-UP	5/1980
INITIAL START-UP	5/1980
CONTRACT AWARDED	9/1977

DESIGN AND OPERATING PARAMETERS	
DESIGN COAL SULFUR CONTENT - %	8.00
DESIGN CHLORIDE CONTENT - %	*****
SPACE REQUIREMENTS - SQ M	24280.3 (261360 SQ FT)
OPER. & MAINT. REQUIREMENT - MANHR/DAY	144.0

QUENCHER/PRESATURATOR	
CONSTRUCTION MATERIAL GENERIC TYPE	NR
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR

ABSORBER	
NUMBER	3
NUMBER OF SPARES	0
GENERIC TYPE	TRAY TOWER
SPECIFIC TYPE	VALVE TRAY
TRADE NAME/COMMON TYPE	BUBBLE CAP TRAY TOWER
SUPPLIER	DAVY MCKEE
DIMENSIONS - FT	20.0 X 20.0
SHELL GENERIC MATERIAL	INORGANIC
SHELL SPECIFIC MATERIAL	HYDRAULICALLY-BONDED CONCRETE
SHELL MATERIAL TRADE NAME/COMMON TYPE	PORTLAND CEMENT
LINER GENERIC MATERIAL	INORGANIC
LINER SPECIFIC MATERIAL	PREFIRED BRICK/SHAPES
LINER MATERIAL TRADE NAME/COMMON TYPE	NR
GAS CONTACTING DEVICE TYPE	VALVE TRAY
NUMBER OF CONTACTING ZONES	4
LIQUID RECIRCULATION RATE - LITER/S	25. (400 GPM)
L/G RATIO - L/CU.M	0.7 (5.5 GAL/1000 ACF)
INLET GAS FLOW - CU. M/S	34.59 (73300 ACFM)
INLET GAS TEMPERATURE - C	54.4 (130 F)
PARTICLE REMOVAL EFFICIENCY - %	0.0

MIST ELIMINATOR	PRIMARY COLLECTOR
PRE-MIST ELIMINATOR/MIST ELIMINATOR	3
NUMBER PER SYSTEM	IMPINGEMENT
GENERIC TYPE	BAFFLE
SPECIFIC TYPE	CLOSED VANE
TRADE NAME/COMMON TYPE	HORIZONTAL
CONFIGURATION	

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

NUMBER OF STAGES	1	
NUMBER OF PASSES PER STAGE	1	
FREEBOARD DISTANCE - M	1.83	(6.0 FT.)
DISTANCE BETWEEN STAGES - CM	19.05	(7.5 IN.)
PRESSURE DROP - KPA	0.1	(0.3 IN-H ₂ O)
CONSTRUCTION MATERIAL GENERIC TYPE	ORGANIC	
CONSTRUCTION MATERIAL SPECIFIC TYPE	POLYPHENYLENE	
WASH WATER SOURCE	COOLED CONDENSATE	
WASH FREQUENCY	INTERMITTENT	
WASH RATE - L/S	3.2	(50 GAL/MIN)
** REHEATER		
NUMBER	3	
GENERIC TYPE	DIRECT COMBUSTION	
SPECIFIC TYPE	EXTERNAL COMBUSTION CHAMBER	
TRADE NAME/COMMON TYPE	NATURAL GAS	
TEMPERATURE INCREASE - C	27.8	(50 F)
INLET FLUE GAS FLOW RATE - CU. M/S	108.54	(230000 ACFM)
INLET FLUE GAS TEMPERATURE - C	54.4	(130 F)
OUTLET FLUE GAS TEMPERATURE - C	85.0	(185 F)
CONSTRUCTION MATERIAL GENERIC TYPE	NR	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR	
** FANS		
NUMBER	3	
NUMBER OF SPARES	0	
DESIGN	CENTRIFUGAL	
SUPPLIER	ROBINSON	
FUNCTION	BOOSTER	
APPLICATION	INDUCED DRAFT	
SERVICE	DRY	
FLUE GAS FLOW RATE - CU.M/S	139.21	(295000 ACFM)
FLUE GAS TEMPERATURE - C	215.6	(420 F)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	
** 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		
DIMENSIONS	8.0 X 8.0	
SHELL GENERIC MATERIAL TYPE	CARBON STEEL	
SHELL SPECIFIC MATERIAL TYPE	AISI 1110	
LINER GENERIC MATERIAL TYPE	ORGANIC	
LINER SPECIFIC MATERIAL TYPE	FIBER-REINFORCED POLYESTER	
** REAGENT PREPARATION EQUIPMENT		
FUNCTION	MIX TANK	
DEVICE	N/A	
DEVICE TYPE	AGITATED TANK	
** TANKS		
SERVICE	NUMBER	
-----	-----	
NR	****	
** PUMPS		
SERVICE	NUMBER	
-----	-----	
ABSORBER RECIRCULATION	****	
** SOLIDS CONCENTRATING/DEWATERING		
DEVICE	NONE	

...ITY FGD SURVEY: JANUARY - DECEMBER 1988

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

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

SLUDGE

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

DISPOSAL	
NATURE	FINAL
TYPE	POND
SITE TREATMENT	CLAY LINING

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

WATER BALANCE	
WATER LOOP TYPE	CLOSED

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

100 MODULE AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER BOILER HOURS	FGD HOURS	CAP. FACTOR
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80	SYSTEM	100.0	100.0	100.0	32.3	744	240	240
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** PROBLEMS/SOLUTIONS/COMMENTS

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

'80	SYSTEM	86.4	86.4	86.4	86.4	720	720	622
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** PROBLEMS/SOLUTIONS/COMMENTS

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

/80	SYSTEM	95.3	95.3	95.3	95.3	744	744	709
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** PROBLEMS/SOLUTIONS/COMMENTS

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

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

/80	SYSTEM	73.3	73.3	73.3	73.3	744	744	545
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** PROBLEMS/SOLUTIONS/COMMENTS

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

/80	SYSTEM	46.4	46.4	46.4	46.4	720	720	334
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DELMARVA POWER & LIGHT: DELAWARE CITY 3 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

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

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

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

10/80	SYSTEM	44.2	44.2	44.2	44.2	744	744	329
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** PROBLEMS/SOLUTIONS/COMMENTS

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

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

DURING OCTOBER PROBLEMS WERE ENCOUNTERED WITH THE MIST ELIMINATORS.

11/80	SYSTEM	0.0	0.0	0.0	0.0	720	279	0
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** PROBLEMS/SOLUTIONS/COMMENTS

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

12/80	SYSTEM	82.4	79.2	79.2	79.2	744	744	589
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** PROBLEMS/SOLUTIONS/COMMENTS

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

1/81	SYSTEM	64.0	64.0	64.0	64.0	744	744	479
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** PROBLEMS/SOLUTIONS/COMMENTS

DURING JANUARY PROBLEMS WERE ENCOUNTERED WITH LEAKS IN THE RECIRCULATION PIPES AND THE MIST ELIMINATOR CAUSING OUTAGE TIME.

2/81	SYSTEM	88.0	88.0	88.0	88.0	672	672	590
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** PROBLEMS/SOLUTIONS/COMMENTS

FAILURE OF THE RECIRCULATION PUMPS CAUSED SOME OUTAGE TIME DURING FEBRUARY

LEAKS IN THE RECIRCULATION PIPES CAUSED ADDITIONAL OUTAGE TIME DURING THE MONTH.

3/81	SYSTEM	83.3	83.3	83.3	83.3	744	744	620
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** PROBLEMS/SOLUTIONS/COMMENTS

DURING MARCH DOWNTIME WAS EXPERIENCED DUE TO CONTINUING REPAIRS TO THE RECIRCULATION PIPES.

ADDITIONAL OUTAGE TIME WAS DUE TO THE REPAIRS TO THE MIST ELIMINATOR.

LITY FGD SURVEY: JANUARY - DECEMBER 1988

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

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

81	SYSTEM	93.0	93.0	93.0	93.0		720	720	669	
** PROBLEMS/SOLUTIONS/COMMENTS										
DURING APRIL SOME OUTAGE TIME WAS DUE TO REPAIRS ON A HOLE IN THE ESP CELL										
ADDITIONAL OUTAGE TIME WAS DUE TO THE REPLACEMENT OF A PRESATURATOR SPRAY NOZZLE.										
81	SYSTEM	76.1	76.1	76.1	76.1		744	744	566	
** PROBLEMS/SOLUTIONS/COMMENTS										
DURING MAY THE PRESATURATOR SHELL MATERIAL FAILED AND AN OUTAGE WAS NECES- SARY TO REPAIR THE HOLE.										
THE PRESATURATOR SPRAY NOZZLE FAILED ACCOUNTING FOR ADDITIONAL OUTAGE TIME.										
81	SYSTEM	100.0	100.0	100.0	100.0		720	720	720	
** PROBLEMS/SOLUTIONS/COMMENTS										
THE UTILITY REPORTED THAT NO PROBLEMS WERE ENCOUNTERED DURING JUNE.										
'81	SYSTEM	98.9	98.9	98.9	98.9		744	744	736	
'81	SYSTEM	100.0	100.0	100.0	100.0		744	744	744	
'81	SYSTEM	89.9	90.0	90.0	89.9		720	719	647	
** PROBLEMS/SOLUTIONS/COMMENTS										
THE FGD SYSTEM WAS OFF LINE FOR PART OF SEPTEMBER TO REPAIR THE ABSORBER MIST ELIMINATOR.										
'81	SYSTEM	78.2	86.3	86.4	78.2		744	674	582	
** PROBLEMS/SOLUTIONS/COMMENTS										
DURING OCTOBER SOME OUTAGE TIME WAS REQUIRED FOR MIST ELIMINATOR REPAIR. THE MIST ELIMINATOR WAS DAMAGED BY HEAT FROM THE REHEATER DURING AN ELECTRICAL SHUTDOWN IN SEPTEMBER.										
CARRYOVER INTO THE OVERHEAD DUCT CAUSED A SYSTEM SHUTDOWN FOR CLEANING.										
THE UNIT WAS SHUTDOWN ON OCTOBER 27 FOR AN OVERHAUL.										
/81	SYSTEM	42.2	88.9	88.9	42.2		720	342	304	
** PROBLEMS/SOLUTIONS/COMMENTS										
THE UNIT OVERHAUL CONTINUED INTO NOVEMBER. FOLLOWING STARTUP IT WAS NECESSARY TO TAKE TWO SHORT SHUTDOWNS TO UNPLUG A WATER LINE.										
/81	SYSTEM	95.3	95.3	95.3	95.3		744	744	709	
** PROBLEMS/SOLUTIONS/COMMENTS										
DURING DECEMBER NO MAJOR PROBLEMS WERE ENCOUNTERED WITH EITHER THE BOILER OR THE FGD SYSTEM.										
/82	SYSTEM	84.8	84.8	84.8	84.8		744	744	631	

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

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

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

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JANUARY SOME OUTAGE TIME WAS DUE TO A STEAM SHORTAGE.

THE ESP DRAIN LINES WERE CLEANED DURING THE MONTH.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PER PART. HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
2/82	SYSTEM	97.2	97.2	97.2	97.2		672	672	653	

** PROBLEMS/SOLUTIONS/COMMENTS

DURING FEBRUARY THE PURGE LINE WAS REPAIRED.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PER PART. HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
3/82	SYSTEM	56.8	56.8	56.8	56.8		744	744	423	

** PROBLEMS/SOLUTIONS/COMMENTS

DURING MARCH PROBLEMS WITH THE SOLUTION REGENERATION SECTION HINDERED THE FGD SYSTEM OPERATION PART OF THE TIME.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PER PART. HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
4/82	SYSTEM	78.9	78.9	78.9	78.9		720	720	568	

** PROBLEMS/SOLUTIONS/COMMENTS

DURING APRIL THE SYSTEM WAS SHUT DOWN FOR 152 HOURS TO BALANCE THE BOOSTER BLOWER.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PER PART. HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
5/82	SYSTEM	96.4	96.4	96.4	96.4		744	744	717	

** PROBLEMS/SOLUTIONS/COMMENTS

DURING MAY THE FGD SYSTEM OPERATED WITH NO MAJOR PROBLEMS BEING ENCOUNTERED.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PER PART. HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
6/82	SYSTEM	99.4	99.4	99.4	99.4		720	720	716	

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE EXPERIENCED DURING JUNE.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PER PART. HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
7/82	SYSTEM	90.7	90.7	90.7	90.7		744	744	675	

** PROBLEMS/SOLUTIONS/COMMENTS

A LACK OF SOLUTION DUE TO EVAPORATOR PROBLEMS ACCOUNTED FOR OUTAGE TIME DURING JULY.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PER PART. HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
8/82	SYSTEM	100.0	100.0	100.0	100.0		744	744	744	

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING AUGUST.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PER PART. HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
9/82	SYSTEM	65.7	65.7	65.7	65.7		720	720	473	

** PROBLEMS/SOLUTIONS/COMMENTS

PROBLEMS WITH BOOSTER FAN VIBRATIONS RESULTED IN OUTAGE TIME DURING SEPTEMBER.

A PLUGGAGE PROBLEM IN THE ESP SEAL POTS ALSO CONTRIBUTED TO OUTAGE TIME DURING THE MONTH.

LITY FGD SURVEY: JANUARY - DECEMBER 1988
MARVA POWER & LIGHT: DELAWARE CITY 3 (CONT.)

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

ADDITIONAL OUTAGE TIME WAS ATTRIBUTED TO LEAKS IN THE PRESATURATOR CIRCULATION PIPING.									
82	SYSTEM	44.6	92.0	92.0	44.6		744	361	332
** PROBLEMS/SOLUTIONS/COMMENTS									
DURING OCTOBER THE UNIT WAS DOWN FOR AN ANNUAL INSPECTION.									
82	SYSTEM	78.9	97.9	97.9	78.9		720	580	568
** PROBLEMS/SOLUTIONS/COMMENTS									
DURING NOVEMBER THE UNIT WAS DOWN FOR AN ANNUAL INSPECTION.									
82	SYSTEM	98.7	98.7	98.7	98.7		744	744	734
** PROBLEMS/SOLUTIONS/COMMENTS									
THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING DECEMBER.									
83	SYSTEM	93.4	93.0	93.0	88.0		744	704	655
** PROBLEMS/SOLUTIONS/COMMENTS									
AN OUTAGE OCCURRED DURING THE MONTH DUE TO THE CLEANING OF THE PRESATURATOR SUCTION SCREENS.									
THE REPAIR OF A CRACKED NOZZLE ON THE PRESATURATOR CAUSED ADDITIONAL DOWN TIME DURING JANUARY.									
83	SYSTEM	100.0	100.0	100.0	100.0		672	672	672
** PROBLEMS/SOLUTIONS/COMMENTS									
THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING FEBRUARY.									
83	SYSTEM	94.8	94.8	94.8	94.8		744	744	705
** PROBLEMS/SOLUTIONS/COMMENTS									
AN OUTAGE OCCURRED DURING MARCH DUE TO THE CLEANING OF A PRESATURATOR CIRCULATION PUMP SUCTION SCREEN.									
THE REPAIR OF BROKEN WIRE IN AN ESP ALSO RESULTED IN DOWN TIME DURING MARCH.									
83	SYSTEM	99.3	99.3	99.3	99.3		720	720	715
83	SYSTEM	99.3	99.3	99.3	99.3		744	744	739
** PROBLEMS/SOLUTIONS/COMMENTS									
THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING APRIL AND MAY.									
83	SYSTEM	100.0	100.0	100.0	100.0		720	720	720

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

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

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

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING JUNE.

7/83 SYSTEM 92.5 92.5 92.5 92.5 744 744 688

** PROBLEMS/SOLUTIONS/COMMENTS

UNIT 3 WAS DOWN DURING PART OF JULY FOR ESP REPAIRS.

THE UNIT WAS DOWN DURING THE MONTH FOR REMOVAL OF SOLIDS BUILD UP IN THE PRESCRUBBER.

8/83 SYSTEM 93.0 93.0 100.0 93.0 744 744 692

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING AUGUST.

9/83 SYSTEM 86.3 86.3 86.3 86.3 720 720 621

** PROBLEMS/SOLUTIONS/COMMENTS

UNIT 3 WAS DOWN DURING PART OF SEPTEMBER TO REPAIR LEAKS ON THE PRESCRUBBER SPRAY NOZZLE FLANGE. IN ADDITION, A CERAMIC SPRAY NOZZLE TIP FAILED TWICE DURING THIS PERIOD.

10/83 SYSTEM 100.0 97.4 97.4 84.1 744 643 626

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD-RELATED OUTAGES WERE ENCOUNTERED DURING OCTOBER.

11/83 SYSTEM 58.6 89.4 89.4 53.8 720 433 387

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT AN ANNUAL BOILER OUTAGE TOOK PLACE DURING NOVEMBER.

12/83 SYSTEM 58.7 78.7 78.7 58.7 744 555 437

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS DOWN DURING PART OF DECEMBER FOR AN ANNUAL OUTAGE.

FGD SYSTEM OUTAGE TIME DURING DECEMBER WAS DUE IN PART TO A LACK OF SODIUM SULFITE ABSORBING SOLUTION RESULTING FROM EVAPORATOR PROBLEMS.

1/84 SYSTEM 95.6 95.6 95.6 95.6 744 744 711

** PROBLEMS/SOLUTIONS/COMMENTS

A LACK OF ABSORBING SOLUTION DUE TO EVAPORATOR CIRCULATING PUMP PROBLEMS AND PLUGGED EVAPORATOR SOLUTION HEADERS LIMITED THE BURNING OF HIGH SULFUR COKE DURING JANUARY.

2/84 SYSTEM 97.6 97.6 97.6 97.6 696 696 679

LITY FGD SURVEY: JANUARY - DECEMBER 1988
MARVA POWER & LIGHT: DELAWARE CITY 3 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD-RELATED PROBLEMS WERE REPORTED DURING FEBRUARY.

84	SYSTEM	84.5	84.5	84.5	84.5	744	744	629
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** PROBLEMS/SOLUTIONS/COMMENTS

PRESATURATOR CLEANING ACCOUNTED FOR OUTAGE TIME DURING THE MONTH.

PRESATURATOR CIRCULATION PUMP REPAIRS WERE MADE DURING MARCH.

FGD SYSTEM OUTAGE TIME DURING MARCH WAS DUE IN PART TO THE REPAIR OF A BROKEN INSULATOR ON THE ESP.

84	SYSTEM	89.0	79.9	87.1	74.0	720	667	533
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** PROBLEMS/SOLUTIONS/COMMENTS

LEAKS IN THE MIST ELIMINATOR SHELL WERE REPAIRED DURING APRIL.

LEAKS IN THE BOOSTER FAN DISCHARGE DUCTWORK WERE REPAIRED DURING APRIL.

THE FGD SYSTEM WAS DOWN DURING PART OF THE MONTH TO CLEAN THE PRESATURATOR

A BOILER TUBE LEAK ACCOUNTED FOR 108 HOURS OF DOWN TIME DURING APRIL.

84	SYSTEM	86.8	86.8	86.8	86.8	744	744	646
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** PROBLEMS/SOLUTIONS/COMMENTS

THE FAILURE OF A PRESATURATOR CIRCULATING PUMP MOTOR OCCURRED DURING MAY.

FAILURE OF A RUBBER LINED PIPE IN THE PRESATURATOR CIRCUIT RESULTED IN DOWN TIME DURING MARCH.

PRESATURATOR PLUGGING PROBLEMS WERE REPORTED DURING MAY.

/84	SYSTEM	96.0	96.0	96.0	96.0	720	720	691
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** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE MONTH OF JUNE.

/84	SYSTEM	86.0	86.0	86.0	86.0	744	744	630
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** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE FGD WAS DOWN PART OF JULY TO CLEAN THE PRESCRUBBER.

/84	SYSTEM	88.0	88.0	88.0	88.0	744	744	655
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** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD WAS SHUT DOWN PART OF AUGUST TO REPAIR ESP'S.

/84	SYSTEM	70.0	91.0	91.0	70.0	720	522	504
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UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

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

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

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS SHUT DOWN PART OF SEPTEMBER TO REPAIR A BOILER TUBE LEAK.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL	PER BOILER	FGD	CAP.
						SO2 PART.	HOURS	HOURS	HOURS FACTOR
10/84	SYSTEM	26.0	76.0	76.0	26.0		744	251	193

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS SHUT DOWN MOST OF OCTOBER FOR AN ANNUAL OUTAGE.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL	PER BOILER	FGD	CAP.
						SO2 PART.	HOURS	HOURS	HOURS FACTOR
11/84	SYSTEM	49.0	64.0	64.0	49.0		720	552	353

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE UNIT WAS DOWN IN NOVEMBER BECAUSE OF PROBLEMS WITH THE ACID PLANTS AND BECAUSE OF PROBLEMS WITH THE BOILER COKE FEED SYSTEM.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL	PER BOILER	FGD	CAP.
						SO2 PART.	HOURS	HOURS	HOURS FACTOR
12/84	SYSTEM	84.0	84.0	84.0	84.0		744	744	625

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED EXPERIENCING COKE FEEDER DUCT PROBLEMS WITH THE BOILER DURING THE MONTH OF DECEMBER.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL	PER BOILER	FGD	CAP.
						SO2 PART.	HOURS	HOURS	HOURS FACTOR
1/85	SYSTEM	75.8	74.1	74.1	69.4		744	696	516

** PROBLEMS/SOLUTIONS/COMMENTS

A BOILER SUPERHEATER LEAK AND ESP REPAIRS CAUSED THE FGD SYSTEM TO BE OUT OF SERVICE DURING PART OF THE MONTH.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL	PER BOILER	FGD	CAP.
						SO2 PART.	HOURS	HOURS	HOURS FACTOR
2/85	SYSTEM	88.1	88.1	88.1	88.1		672	672	592

** PROBLEMS/SOLUTIONS/COMMENTS

LEAKS IN THE ESP'S CAUSED SOME FGD SYSTEM DOWNTIME IN FEBRUARY.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL	PER BOILER	FGD	CAP.
						SO2 PART.	HOURS	HOURS	HOURS FACTOR
3/85	SYSTEM	99.1	99.1	99.1	99.1		744	744	737

** PROBLEMS/SOLUTIONS/COMMENTS

NO FGD SYSTEM PROBLEMS WERE REPORTED FOR THE MONTH OF MARCH.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL	PER BOILER	FGD	CAP.
						SO2 PART.	HOURS	HOURS	HOURS FACTOR
4/85	SYSTEM	79.3	79.3	90.3	79.3		720	720	571

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL	PER BOILER	FGD	CAP.
						SO2 PART.	HOURS	HOURS	HOURS FACTOR
5/85	SYSTEM	38.6	98.6	98.6	38.6		744	291	287

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS TAKEN OUT OF SERVICE FOR A SCHEDULED ANNUAL OUTAGE IN APRIL. THE OUTAGE CONTINUED INTO MAY.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL	PER BOILER	FGD	CAP.
						SO2 PART.	HOURS	HOURS	HOURS FACTOR
6/85	SYSTEM	96.9	96.9	96.9	96.9		720	720	698

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL	PER BOILER	FGD	CAP.
						SO2 PART.	HOURS	HOURS	HOURS FACTOR
7/85	SYSTEM	97.8	98.1	98.1	97.8		744	742	728

** PROBLEMS/SOLUTIONS/COMMENTS

NO FGD SYSTEM-RELATED PROBLEMS WERE REPORTED FOR THE MONTHS OF JUNE OR JULY.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL	PER BOILER	FGD	CAP.
						SO2 PART.	HOURS	HOURS	HOURS FACTOR
8/85	SYSTEM	90.5	90.5	90.5	90.5		744	744	673

LITY FGD SURVEY: JANUARY - DECEMBER 1988
MARVA POWER & LIGHT: DELAWARE CITY 3 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

MIST ELIMINATOR LEAK REPAIR WORK WAS THE SOURCE OF PART OF THE AUGUST FGD SYSTEM OUTAGE TIME.

IOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
'85	SYSTEM	97.5	97.5	97.5	97.5		720	720	702	

** PROBLEMS/SOLUTIONS/COMMENTS

NO FGD SYSTEM PROBLEMS WERE REPORTED FOR THE MONTH OF SEPTEMBER.

IOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
'85	SYSTEM	76.6	89.3	76.6	76.6		744	638	570	

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER WAS OUT OF SERVICE FOR COKE MILL CONVEYING SYSTEM REPAIR WORK IN OCTOBER.

IOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
'85	SYSTEM	99.7	99.7	99.7	99.7		720	720	718	

IOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
'85	SYSTEM	96.2	96.2	96.2	96.2		744	744	716	

** PROBLEMS/SOLUTIONS/COMMENTS

NO FGD SYSTEM-RELATED PROBLEMS WERE REPORTED FOR THE MONTHS OF NOVEMBER AND DECEMBER.

IOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
'86	SYSTEM	98.0	98.0	98.0	98.0		744	744	729	

IOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
'86	SYSTEM	99.0	99.0	99.0	99.0		672	672	665	

IOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
'86	SYSTEM	98.0	98.0	98.0	98.0		744	744	729	

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD SYSTEM-RELATED PROBLEMS WERE REPORTED FOR THE FIRST QUARTER OF 1986.

IOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
/86	SYSTEM	33.0	100.0	100.0	33.0		720	236	238	

** PROBLEMS/SOLUTIONS/COMMENTS

THE ANNUAL UNIT 3 OUTAGE BEGAN IN APRIL.

IOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
/86	SYSTEM	81.0	99.0	99.0	81.0		744	609	603	

IOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
/86	SYSTEM	95.0	95.0	95.0	95.0		720	720	684	

IOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
/86	SYSTEM	94.0	94.0	94.0	94.0		744	744	699	

IOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
/86	SYSTEM	100.0	100.0	100.0	100.0		744	744	744	

IOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
/86	SYSTEM	94.0	96.0	96.0	94.0		720	706	677	

IOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
/86	SYSTEM	94.0	99.0	99.0	94.0		744	704	699	

IOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
/86	SYSTEM	100.0	100.0	100.0	100.0		720	720	720	

IOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
/86	SYSTEM	99.0	99.0	99.0	99.0		744	744	737	

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

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

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

** PROBLEMS/SOLUTIONS/COMMENTS

NO FGD SYSTEM-RELATED PROBLEMS WERE REPORTED FOR THE MONTHS OF APRIL THROUGH DECEMBER 1986.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PER PART. HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
1/87	SYSTEM	98.5	98.5	98.5	98.5		744	744	733	

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED NO MAJOR FGD SYSTEM-RELATED PROBLEMS FOR THE MONTH OF JANUARY.

2/87	SYSTEM	42.6	99.3	99.3	42.6		672	288	286	
3/87	SYSTEM	67.3	93.5	93.5	67.3		744	536	501	

** PROBLEMS/SOLUTIONS/COMMENTS

UNIT 3 WAS DOWN FOR A SCHEDULED OUTAGE DURING FEBRUARY AND MARCH 1987.

4/87	SYSTEM	98.9	98.9	98.9	98.9		720	720	712	
5/87	SYSTEM	99.6	99.6	99.6	99.6		744	744	741	
6/87	SYSTEM	93.1	93.1	93.1	93.1		720	720	670	
7/87	SYSTEM	95.8	95.8	95.8	95.8		744	744	713	
8/87	SYSTEM	98.1	98.1	98.1	98.1		744	744	730	
9/87	SYSTEM	98.5	98.5	98.5	98.5		720	720	709	
10/87	SYSTEM	92.1	92.1	92.1	92.1		744	744	685	
11/87	SYSTEM	100.0	97.0	97.0	100.0		720	744	720	
12/87	SYSTEM	97.8	97.8	97.8	97.8		744	744	728	

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD SYSTEM-RELATED PROBLEMS WERE REPORTED FOR THE PERIOD OF APRIL THROUGH DECEMBER.

1/88	SYSTEM	88.0	88.0	88.0	88.0		744	744	655	
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** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM ON UNIT 3 WAS SHUT DOWN FOR APPROXIMATELY 5 DAYS DUE TO LACK OF REAGENT SLURRY.

2/88	SYSTEM	80.0	90.0	90.0	80.0		696	620	557	
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** PROBLEMS/SOLUTIONS/COMMENTS

UNIT 3 WAS SHUT DOWN FOR APPROXIMATELY 3 DAYS DURING THE MONTH OF FEBRUARY DUE TO BOILER TUBE LEAKS.

3/88	SYSTEM	99.0	99.0	99.0	99.0		744	744	737	
4/88	SYSTEM	90.0	99.0	99.0	90.0		720	653	648	

ILITY FGD SURVEY: JANUARY - DECEMBER 1988

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

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

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD-RELATED OR UNIT OUTAGES WERE ENCOUNTERED FOR THE MONTHS OF
 MARCH AND APRIL 1988.

'88	SYSTEM	61.0	84.0	84.0	61.0	744	540	454
'88	SYSTEM	58.0	100.0	100.0	58.0	720	416	418

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS SHUT DOWN FOR APPROXIMATELY 26 DAYS DURING THE MONTHS OF MAY
 AND JUNE DUE TO AN ANNUAL OUTAGE.

'88	SYSTEM	95.0	95.0	95.0	95.0	744	744	707
'88	SYSTEM	99.0	99.0	99.0	99.0	744	744	737
'88	SYSTEM	95.0	100.0	100.0	95.0	720	688	684
'88	SYSTEM	96.0	96.0	96.0	96.0	744	744	714

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD-RELATED OR UNIT OUTAGES WERE REPORTED FOR THE PERIOD JULY
 THROUGH OCTOBER 1988.

'88	SYSTEM	19.0	100.0	100.0	19.0	720	139	137
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** PROBLEMS/SOLUTIONS/COMMENTS

UNIT 3 WAS SHUT DOWN THE MAJORITY OF THE MONTH FOR REPAIRS.

'88	SYSTEM	91.0	100.0	100.0	91.0	744	675	677
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** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD-RELATED OR UNIT OUTAGES WERE REPORTED FOR THE MONTH OF
 DECEMBER.

SECTION 13
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

PANY NAME	DESERET GEN & TRANS
NT NAME	BONANZA
T NUMBER	1
Y	VERNAL
TE	UTAH
PLATORY CLASSIFICATION	A
TICULATE EMISSION LIMITATION - NG/J	***** (***** LB/MMBTU)
EMISSION LIMITATION - NG/J	***** (***** LB/MMBTU)
EMISSION LIMITATION - NG/J	***** (***** LB/MMBTU)
PLANT GENERATING CAPACITY - MW	800
SS UNIT GENERATING CAPACITY - MW	427
UNIT GENERATING CAPACITY W/FGD - MW	409
UNIT GENERATING CAPACITY WO/FGD - MW	422
IVALENT SCRUBBED CAPACITY - MW	427

UNIT DATA - BOILER AND STACK	
BOILER SUPPLIER	FOSTER WHEELER
BOILER TYPE	PULVERIZED COAL
BOILER SERVICE LOAD	BASE
DESIGN BOILER FLUE GAS FLOW - CU.M/S	***** (***** 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	24423. (10500 BTU/LB)
RANGE HEAT CONTENT - BTU/LB	*****
AVERAGE ASH CONTENT - %	10.00
RANGE ASH CONTENT - %	*****
AVERAGE MOISTURE CONTENT - %	8.50
RANGE MOISTURE CONTENT - %	*****
AVERAGE SULFUR CONTENT - %	0.50
RANGE SULFUR CONTENT - %	*****
AVERAGE CHLORIDE CONTENT - %	*****
RANGE CHLORIDE CONTENT - %	*****

PARTICLE CONTROL

FABRIC FILTER	
NUMBER	1
SUPPLIER	ECOLAIRE
PARTICLE REMOVAL EFFICIENCY - %	99.8

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
SYSTEM SUPPLIER	COMBUSTION ENGINEERING
A-E FIRM	BURNS & MCDONNELL
DEVELOPMENT LEVEL	FULL SCALE
NEW/RETROFIT	NEW
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.60
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	95.00

DESERET GEN & TRANS: BONANZA 1 (CONT.)

ENERGY CONSUMPTION - %	3.0
CURRENT STATUS	1
COMMERCIAL START-UP	5/1986
INITIAL START-UP	12/1985
CONTRACT AWARDED	7/1980
** DESIGN AND OPERATING PARAMETERS	
DESIGN COAL SULFUR CONTENT - %	0.50
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	NONE
SPECIFIC TYPE	N/A
TRADE NAME/COMMON TYPE	N/A
PERCENT GAS BYPASSED - AVG	0.0
CONSTRUCTION MATERIAL GENERIC TYPE	NR
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR
** FANS	
DESIGN	NR
FUNCTION	NA
APPLICATION	NR
SERVICE	NA
CONSTRUCTION MATERIAL GENERIC TYPE	NA
** 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	NA

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

SERET GEN & TRANS: BONANZA 1 (CONT.)

* TANKS	
SERVICE	NUMBER
-----	-----
NR	****
* PUMPS	
SERVICE	NUMBER
-----	-----
NR	****
* SOLIDS CONCENTRATING/DEWATERING	
DEVICE	THICKENER
NUMBER	1
* SOLIDS CONCENTRATING/DEWATERING	
DEVICE	VACUUM FILTER
NUMBER	1
* SALEABLE BYPRODUCTS	
NATURE	NONE
DISPOSITION	N/A
* SLUDGE	
* TREATMENT	
METHOD	DEWATERED
DEVICE	NR
PROPRIETARY PROCESS	N/A
* DISPOSAL	
NATURE	FINAL
TYPE	LANDFILL
LOCATION	ON-SITE
SITE TREATMENT	NONE
* WATER BALANCE	
WATER LOOP TYPE	CLOSED
SOURCE OF MAKEUP WATER	COOLING TOWER BLOWDOWN

-----PERFORMANCE DATA-----						
RIOO	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL
						SO2 PART.
						HOURS
						HOURS
						HOURS
						FACTOR

/85 SYSTEM

744

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY ANNOUNCED THAT INITIAL OPERATIONS OF THE BONANZA FGD SYSTEM BEGAN IN DECEMBER, 1985. THE PLANT IS EXPECTED TO GO COMMERCIAL SOME TIME IN THE SPRING OF 1986.

/86 SYSTEM

774

/86 SYSTEM

672

/86 SYSTEM

774

/86 SYSTEM

720

/86 SYSTEM

774

DESERET GEN & TRANS: BONANZA 1 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE UNIT WAS DECLARED COMMERCIAL MAY 1, 1986.

6/86	SYSTEM	720
7/86	SYSTEM	774
8/86	SYSTEM	774
9/86	SYSTEM	720
10/86	SYSTEM	774
11/86	SYSTEM	720
12/86	SYSTEM	774

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR UNIT/FGD OUTAGES WERE ENCOUNTERED DURING THE YEAR 1986.

1/87	SYSTEM	744
2/87	SYSTEM	672
3/87	SYSTEM	744
4/87	SYSTEM	720
5/87	SYSTEM	744
6/87	SYSTEM	720
7/87	SYSTEM	744

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED OUTAGES WERE ENCOUNTERED DURING THE PERIOD JANUARY THROUGH JULY 1987.

8/87	SYSTEM	744
9/87	SYSTEM	720
10/87	SYSTEM	744

** PROBLEMS/SOLUTIONS/COMMENTS

THE FIRST MAJOR UNIT INSPECTION TOOK PLACE FROM MID-AUGUST THROUGH OCTOBER 12, 1987. DURING THIS 10-WEEK OUTAGE PERIOD, THE ABSORBER INLET DUCTWORK AT THE WET/DRY INTERFACE WAS RECLADDED WITH HASTELLOY C-22 (APPROXIMATELY 300 SQUARE FEET). THE ORIGINAL ALLOY 904L SHOWED SIGNS OF PITTING.

11/87	SYSTEM	720
12/87	SYSTEM	744

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED OUTAGES WERE ENCOUNTERED DURING THE MONTHS OF NOVEMBER OR DECEMBER 1987. THE NEXT UNIT OUTAGE IS SCHEDULED FOR THE FALL OF 1988.

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

SERET GEN & TRANS: BONANZA 1 (CONT.)

-----PERFORMANCE DATA-----											
R100	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
/88	SYSTEM								774		
/88	SYSTEM								672		
/88	SYSTEM								774		
/88	SYSTEM								720		
/88	SYSTEM								774		
/88	SYSTEM								720		
/88	SYSTEM								774		
/88	SYSTEM								774		
/88	SYSTEM								720		
/88	SYSTEM								774		
/88	SYSTEM								720		
/88	SYSTEM								774		

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE C-22 CLADDING INSTALLED IN WET/DRY INTERFACE AREAS OF THE SPRAY TOWERS HAS PERFORMED VERY WELL TO DATE. THE UTILITY IS NOW CONSIDERING THE POSSIBILITY OF INSTALLING MORE OF THE CLADDING IN OTHER ABSORBER AREAS.

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED OUTAGES WERE ENCOUNTERED DURING 1988. THE PLANT WAS ONLY SHUTDOWN ONCE FOR APPROXIMATELY 10 DAYS FOR A SCHEDULED MAINTENANCE OUTAGE.

SECTION 13
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	DUQUESNE LIGHT	
PLANT NAME	ELRAMA	
UNIT NUMBER	1-4	
STATE	PENNSYLVANIA	
REGULATORY CLASSIFICATION	C	
PERMIT EMISSION LIMITATION - NG/J	34.	(0.080 LB/MMBTU)
PERMIT EMISSION LIMITATION - NG/J	258.	(0.600 LB/MMBTU)
PERMIT EMISSION LIMITATION - NG/J	*****	(***** LB/MMBTU)
PLANT GENERATING CAPACITY - MW	487	
PERMIT UNIT GENERATING CAPACITY - MW	510	
UNIT GENERATING CAPACITY W/FGD - MW	487	
UNIT GENERATING CAPACITY WO/FGD - MW	497	
PERMIT UNIT GENERATING CAPACITY - MW	510	
UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	BABCOCK & WILCOX	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	972.11	(2060000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	148.9	(300 F)
STACK HEIGHT - M	121.	(398 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	7.9	(26.0 FT)
FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	BITUMINOUS	
AVERAGE HEAT CONTENT - J/G	26907.	(11568 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		11500-12500
AVERAGE ASH CONTENT - %	16.80	
RANGE ASH CONTENT - %	14.0-18.3	
AVERAGE MOISTURE CONTENT - %	5.93	
RANGE MOISTURE CONTENT - %	4.30-7.06	
AVERAGE SULFUR CONTENT - %	2.05	
RANGE SULFUR CONTENT - %	1.49-2.91	
AVERAGE CHLORIDE CONTENT - %	0.04	
RANGE CHLORIDE CONTENT - %	0.03-0.05	
PARTICLE CONTROL		
MECHANICAL COLLECTOR		
NUMBER	4	
NUMBER OF SPARES	0	
TYPE	MULTICLONE	
SUPPLIER	RESEARCH-COTTRELL '1, 2, & 3!; JOY WESTERN '4!	
INLET FLUE GAS CAPACITY - CU.M/S	972.1	(2060000 ACFM)
INLET FLUE GAS TEMPERATURE - C	148.9	(300 F)
PRESSURE DROP - KPA	0.7	(3. IN-H2O)
PARTICLE REMOVAL EFFICIENCY - %	95.0	
ESP		
NUMBER	10	
NUMBER OF SPARES	0	
TYPE	COLD SIDE	
SUPPLIER	RESEARCH COTTRELL '1, 2, & 3!; JOY WESTERN '4!	
INLET FLUE GAS CAPACITY - CU.M/S	972.1	(2060000 ACFM)
INLET FLUE GAS TEMPERATURE - C	148.9	(300 F)
PRESSURE DROP - KPA	0.2	(1. IN-H2O)
PARTICLE REMOVAL EFFICIENCY - %	95.0	
PARTICLE SCRUBBER		
NUMBER	0	
GENERIC TYPE	N/A	
SPECIFIC TYPE	N/A	
FGD SYSTEM		

DUQUESNE LIGHT: ELRAMA 1-4 (CONT.)

** GENERAL DATA	
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT
SO2 REMOVAL MODE	WET SCRUBBING
PROCESS TYPE	LIME
PROCESS ADDITIVES	MAGNESIUM OXIDE; SODIUM
SYSTEM SUPPLIER	GE ENVIRONMENTAL SERVICES
A-E FIRM	GIBBS & HILL
DEVELOPMENT LEVEL	FULL SCALE
NEW/RETROFIT	RETROFIT
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.30
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	83.00
ENERGY CONSUMPTION - %	2.0
CURRENT STATUS	1
COMMERCIAL START-UP	10/1975
INITIAL START-UP	10/1975
CONTRACT AWARDED	12/1970
** DESIGN AND OPERATING PARAMETERS	
DESIGN COAL SULFUR CONTENT - %	2.50
DESIGN COAL HEAT CONTENT - J/G	26749.0 (11500 BTU/LB)
DESIGN COAL ASH CONTENT - %	17.00
DESIGN MOISTURE CONTENT - %	6.00
DESIGN CHLORIDE CONTENT - %	0.03
OPER. & MAINT. REQUIREMENT - MANHR/DAY	296.0
** QUENCHER/PRESATURATOR	
NUMBER	0
** ABSORBER	
NUMBER	5
NUMBER OF SPARES	1
GENERIC TYPE	VENTURI TOWER
SPECIFIC TYPE	VARIABLE-THROAT/TOP-ENTRY PLUMB BOB
TRADE NAME/COMMON TYPE	N/A
SUPPLIER	GE ENVIRONMENTAL SERVICES
DIMENSIONS - FT	31.3 X 66.4
SHELL GENERIC MATERIAL	CARBON STEEL; STAINLESS STEEL `ABSORBER INTERNAL
SHELL SPECIFIC MATERIAL	AISI 1110; AUSTENITIC
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A; TYPE 316L
LINER GENERIC MATERIAL	ORGANIC; INORGANIC
LINER SPECIFIC MATERIAL	MAT-REINFORCED POLYESTER; GLASS FLAKE-FILLED POL
LINER MATERIAL TRADE NAME/COMMON TYPE	CEILCRETE 2500AR; FLAKELINE 103; ACID RESISTANT
GAS CONTACTING DEVICE TYPE	NONE
NUMBER OF CONTACTING ZONES	1
LIQUID RECIRCULATION RATE - LITER/S	1071. (17000 GPM)
L/G RATIO - L/CU.M	4.4 (33.0 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	2.0 (8.0 IN-H2O)
SUPERFICIAL GAS VELOCITY - M/SEC	45.7 (150.0 FT/S)
INLET GAS FLOW - CU. M/S	243.03 (515000 ACFM)
INLET GAS TEMPERATURE - C	148.9 (300 F)
SO2 REMOVAL EFFICIENCY - %	83.0
PARTICLE REMOVAL EFFICIENCY - %	94.0
** MIST ELIMINATOR	
PRE-MIST ELIMINATOR/MIST ELIMINATOR	PRIMARY COLLECTOR `EXTERNAL!
NUMBER PER SYSTEM	5
NUMBER OF SPARES PER SYSTEM	1
NUMBER PER MODULE	1
GENERIC TYPE	IMPINGEMENT
SPECIFIC TYPE	BAFFLE
TRADE NAME/COMMON TYPE	OPEN VANE `SLAT!
MANUFACTURER	HEIL
CONFIGURATION	HORIZONTAL
NUMBER OF STAGES	1
NUMBER OF PASSES PER STAGE	4
DISTANCE BETWEEN VANES - CM	7.6 (3.00 IN)
VANE ANGLES - DEGREES	90
PRESSURE DROP - KPA	0.0 (0.2 IN-H2O)
SUPERFICIAL GAS VELOCITY - M/S	3.4 (11.0 FT/S)
CONSTRUCTION MATERIAL GENERIC TYPE	ORGANIC
CONSTRUCTION MATERIAL SPECIFIC TYPE	FIBER-REINFORCED POLYESTER

LITY FGD SURVEY: JANUARY - DECEMBER 1988

UESNE LIGHT: ELRAMA 1-4 (CONT.)

WASH WATER SOURCE	FRESH MAKEUP WATER OR THICKENER OVERFLOW
WASH FREQUENCY	TOP-MANUAL ONCE/WEEK
FANS	
NUMBER	5
NUMBER OF SPARES	1
DESIGN	CENTRIFUGAL
SUPPLIER	GREEN FUEL ECONOMIZER
FUNCTION	BOOSTER
APPLICATION	INDUCED DRAFT
SERVICE	WET
FLUE GAS FLOW RATE - CU.M/S	259.54 (550000 ACFM)
FLUE GAS TEMPERATURE - C	54.4 (130 F)
PRESSURE DROP - KPA	7.0 (23.0 IN-H2O)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL; HIGH ALLOY; HIGH ALLOY; STAINLESS
DAMPERS	
NUMBER	5
FUNCTION	SHUT-OFF
GENERIC TYPE	BUTTERFLY
SPECIFIC TYPE	NR
MANUFACTURER	NR
MODULATION	OPEN/CLOSED
SEAL AIR FLOW - CU. M/S	0.00 (0 ACFM)
SERVICE CONDITIONS	300
CONSTRUCTION MATERIAL GENERIC TYPE	STAINLESS STEEL/CARBON STEEL
CONSTRUCTION MATERIAL SPECIFIC TYPE	AUSTENITIC; AISI 1110
LINER GENERIC MATERIAL TYPE	NONE
LINER SPECIFIC MATERIAL TYPE	N/A
DAMPERS	
NUMBER	5
FUNCTION	SHUT-OFF
GENERIC TYPE	LOUVER
SPECIFIC TYPE	PARALLEL BLADE MULTILOUVER
MANUFACTURER	ALLIS-CHALMERS
MODULATION	OPEN/CLOSED
SEAL AIR FLOW - CU. M/S	0.00 (0 ACFM)
SERVICE CONDITIONS	NR
CONSTRUCTION MATERIAL GENERIC TYPE	STAINLESS STEEL/CARBON STEEL
CONSTRUCTION MATERIAL SPECIFIC TYPE	AUSTENITIC; AISI 1110
LINER GENERIC MATERIAL TYPE	ORGANIC
LINER SPECIFIC MATERIAL TYPE	GLASS FLAKE-FILLED POLYESTER
DAMPERS	
NUMBER	5
FUNCTION	SHUT-OFF
GENERIC TYPE	LOUVER
SPECIFIC TYPE	PARALLEL BLADE MULTILOUVER
MANUFACTURER	ALLIS-CHALMERS
MODULATION	OPEN/CLOSED
SEAL AIR FLOW - CU. M/S	0.00 (0 ACFM)
SERVICE CONDITIONS	NR
CONSTRUCTION MATERIAL GENERIC TYPE	STAINLESS STEEL/CARBON STEEL
CONSTRUCTION MATERIAL SPECIFIC TYPE	AUSTENITIC; AISI 1110
LINER GENERIC MATERIAL TYPE	ORGANIC
LINER SPECIFIC MATERIAL TYPE	GLASS FLAKE-FILLED POLYESTER
DUCTWORK	
LOCATION	ABSORBER INLET
CONFIGURATION	CIRCULAR
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	ABSORBER OUTLET
CONFIGURATION	RECTANGULAR
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
SHELL SPECIFIC MATERIAL TYPE	AISI 1110

DUQUESNE LIGHT: ELRAMA 1-4 (CONT.)

LINER GENERIC MATERIAL TYPE	ORGANIC
LINER SPECIFIC MATERIAL TYPE	GLASS FLAKE-FILLED POLYESTER
** DUCTWORK	
LOCATION	PRECOLLECTOR OUTLET
CONFIGURATION	CIRCULAR
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
SHELL SPECIFIC MATERIAL TYPE	AISI 1110
LINER GENERIC MATERIAL TYPE	ORGANIC
LINER SPECIFIC MATERIAL TYPE	GLASS FLAKE-FILLED POLYESTER
** REAGENT PREPARATION EQUIPMENT	
FUNCTION	SLAKER
DEVICE	PASTE
DEVICE TYPE	N/A
MANUFACTURER	WALLACE & TIERNAN
NUMBER	5
NUMBER OF SPARES	2
FULL LOAD DRY FEED CAPACITY - M.TONS/HR	3.6 (4 TPH)
PRODUCT QUALITY - % SOLIDS	22.5
** TANKS	
SERVICE	NUMBER
-----	-----
THICKENER OVERFLOW	1
LIME SLURRY DILUTION	1
ABSORBER EFFLUENT HOLD	5
THICKENER POLMER MIX	1
THICKENER DISTRIBUTION BOX	1
WATER STORAGE	2
** PUMPS	
SERVICE	NUMBER
-----	-----
ABSORBER RECIRCULATION	10
LIME SLURRY FEED	5
THICKENER OVERFLOW	3
THICKENER UNDERFLOW	3
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	THICKENER
NUMBER	2
NUMBER OF SPARES	0
DIMENSIONS - FT	120 DIA X 8.5 HIGH
CAPACITY	229500
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	BITUMINOUS BASE MODIFIED ASPHALT `FLOOR!; MICA F
BELT GENERIC MATERIAL TYPE	RUBBER-CLAD CARBON STEEL
FEED STREAM SOURCE	ABSORBER BLEED STREAM
FEED STREAM CHARACTERISTICS	5% SOLIDS
OUTLET STREAM CHARACTERISTICS	35-40% SOLIDS
OVERFLOW STREAM CHARACTERISTICS	0.1%
OUTLET STREAM DISPOSITION	TO VACUUM FILTER
OVERFLOW STREAM DISPOSITION	THICKENER OVERFLOW TANK
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	VACUUM FILTER
NUMBER	2
NUMBER OF SPARES	1
DIMENSIONS - FT	650 SQ FT & 750 SQ FT
CAPACITY	60 TONS/HR
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
SHELL SPECIFIC MATERIAL TYPE	AISI 1110
BELT GENERIC MATERIAL TYPE	ORGANIC
BELT SPECIFIC MATERIAL TYPE	NYLON
FEED STREAM SOURCE	THICKENER UNDERFLOW
FEED STREAM CHARACTERISTICS	35-40% SOLIDS
OUTLET STREAM CHARACTERISTICS	50% SOLIDS
OVERFLOW STREAM CHARACTERISTICS	0.1

LITY FGD SURVEY: JANUARY - DECEMBER 1988

UESNE LIGHT: ELRAMA 1-4 (CONT.)

OUTLET STREAM DISPOSITION	TO SLUDGE TREATMENT
OVERFLOW STREAM DISPOSITION	COLLECTED IN A DISTRIBUTION BOX & THEN TRANSFERR
SALEABLE BYPRODUCTS	
NATURE	NONE
DISPOSITION	N/A
SLUDGE	
% ASH - DRY	50.0
% OTHER COMPOUNDS - DRY	50.0
TREATMENT	
METHOD	FIXATION
DEVICE	PUG MILL
PROPRIETARY PROCESS	CONVERSION SYSTEMS 'POZ-O-TEC'
INLET QUALITY - %	37.5
DISPOSAL	
NATURE	FINAL
TYPE	LANDFILL
LOCATION	OFF-SITE
SITE TRANSPORTATION METHOD	TRUCK
SITE TREATMENT	NONE
SITE SERVICE LIFE - YRS	10
PROCESS CONTROL AND INSTRUMENTATION	
PROCESS STREAM	RECIRCULATING SLURRY
CHEMICAL PARAMETERS	PH
PHYSICAL VARIABLES	FLOW
CONTROL LEVELS	PH 7.7
MONITOR TYPE	UNIVERSAL UNILOC
MONITOR LOCATION	INLET TANGENTIAL NOZZLE TO ABSORBER
PROCESS CONTROL MANNER	AUTOMATIC
PROCESS CHEMISTRY MODE	FEEDBACK
WATER BALANCE	
WATER LOOP TYPE	OPEN
EFFLUENT WATER LOSS - LITERS/S	18.9 (300 GPM)
RECEIVING WATER STREAM	MONONGAHELA RIVER
SOURCE OF MAKEUP WATER	RIVER WATER
CHEMICALS AND CONSUMPTION	
FUNCTION	ABSORBENT
NAME	MAGNESIUM-MODIFIED LIME
PRINCIPAL CONSTITUENT	CAO, MGO
SOURCE/SUPPLIER	DRAVO
CONSUMPTION	175-200 TPD
UTILIZATION - %	90.0
POINT OF ADDITION	SLAKER
* FGD SPARE CAPACITY INDICES	
ABSORBER - %	25.0
MIST ELIMINATOR - %	25.0
FAN - %	25.0
SLAKER - %	67.0
EFFLUENT HOLD TANK - %	25.0
RECIRCULATION PUMP - %	25.0
THICKENER - %	0.0
VACUUM FILTER - %	100.0
* FGD SPARE COMPONENT INDICES	
ABSORBER	1.0
MIST ELIMINATOR	1.0
FAN	1.0
SLAKER	0.8
EFFLUENT HOLD TANK	1.0
RECIRCULATION PUMP	1.0

DUQUESNE LIGHT: ELRAMA 1-4 (CONT.)

THICKENER	0.0
VACUUM FILTER	1.0

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

0/75 SYSTEM

** PROBLEMS/SOLUTIONS/COMMENTS

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

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

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

10/75 SYSTEM

744 744

** PROBLEMS/SOLUTIONS/COMMENTS

THE SCRUBBING SYSTEM BEGAN OPERATIONS WITH ONE BOILER CONNECTED TO THE SYSTEM (100 MW) DURING THE MONTH. THE SCRUBBING SYSTEM IS CURRENTLY IN THE SHAKEDOWN PHASE OF OPERATION.

11/75 SYSTEM

720 720

12/75 SYSTEM

744 744

** PROBLEMS/SOLUTIONS/COMMENTS

THE SYSTEM IS STILL OPERATING WITH ONE BOILER CONNECTED. THE UTILITY IS PLANNING TO CONNECT ONE OR TWO ADDITIONAL BOILERS TO THE SYSTEM IN LATE JANUARY.

1/76 SYSTEM

744 744

** PROBLEMS/SOLUTIONS/COMMENTS

FOUR OF THE FIVE SCRUBBER VESSELS HAVE BEEN IN SERVICE IN VARIOUS COMBINATIONS, AND THE SERVICE HOURS THROUGH JANUARY 31, 1976 ARE:

NO. 1 - 69 HOURS
NO. 2 - 1508 HOURS
NO. 3 - 976 HOURS
NO. 4 - 838 HOURS

THE FIFTH VESSEL HAS NOT BEEN IN SERVICE BECAUSE IT IS BEING SERVICED FOR THE TRIAL INSTALLATION OF RUBBER LINED RECYCLE PUMPS.

2/76 SYSTEM

696 696

3/76 SYSTEM

744 744

4/76 SYSTEM

720 720

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

** PROBLEMS/SOLUTIONS/COMMENTS

THE SYSTEM OPERATED DURING MARCH AND APRIL WITH TWO BOILERS COUPLED INTO THE SCRUBBING SYSTEM. REVISIONS TO THE FIFTH SCRUBBING VESSEL HAVE BEEN COMPLETED AND OPERATIONS ARE PROCEEDING WITH TWO RUBBER-LINED RECYCLE PUMPS.

/76	SYSTEM							744	744	
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/76	SYSTEM							720	720	
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** PROBLEMS/SOLUTIONS/COMMENTS

THE SYSTEM IS STILL OPERATING WITH TWO BOILERS COUPLED INTO THE SCRUBBING SYSTEM. THE IUCS SLUDGE FIXATION SYSTEM IS CONTINUING TO OPERATE AT THIS STATION.

THE FIFTH SCRUBBING VESSEL WAS TAKEN OUT OF SERVICE FOR REPAIRS AND MODIFICATIONS REQUIRED FOR THE RUBBER-LINED RECYCLE PUMPS.

THE UTILITY IS CURRENTLY CONDUCTING A PERFORMANCE TEST ON THE SCRUBBING SYSTEM IN THE TWO BOILER OPERATION MODE.

/76	SYSTEM							744	744	
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/76	SYSTEM							744	744	
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** PROBLEMS/SOLUTIONS/COMMENTS

THE FIFTH SCRUBBING VESSEL EMPLOYING TWO RUBBER-LINED RECYCLE PUMPS WAS OPERATIONAL FOR A SHORT PERIOD OF TIME DURING THE REPORTING MONTHS. TWO BOILERS REMAIN COUPLED INTO THE SCRUBBING SYSTEM. THE CONSTRUCTION OF ADDITIONAL LIME STORAGE SILOS AND A THICKENER WILL BE REQUIRED FOR FULL SCALE OPERATION. THE UTILITY HAS SIGNED A LETTER OF INTENT WITH IUCS FOR A LONG TERM SLUDGE FIXATION SYSTEM. HIGH CALCIUM LIME IS STILL BEING EMPLOYED IN THE SCRUBBING SYSTEM.

/76	SYSTEM							720	720	
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/76	SYSTEM							744	744	
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** PROBLEMS/SOLUTIONS/COMMENTS

OPERATIONS AT THIS STATION DURING THE REPORT PERIOD PROCEEDED WITH TWO BOILERS COUPLED INTO THE FIVE-MODULE SCRUBBING SYSTEM. THE FIFTH SCRUBBING VESSEL WAS OPERATIONAL DURING THE REPORT PERIOD WITH THE RUBBER-LINE RECYCLE PUMPS IN SERVICE. OPERATIONS ARE STILL PROCEEDING ON AN OPEN WATER-LOOP BASIS. PART OF THE THICKENER OVERFLOW IS STILL BEING DIVERTED TO THE ASH POND AND NOT RECYCLED BACK TO THE PROCESS. BECAUSE BOTH BEAVER VALLEY AND BRUCE MANSFIELD STATIONS ARE FULLY OPERATIONAL, THIS STATION HAS BEEN RELEGATED TO PEAK LOAD OPERATIONS. GENERAL LOAD OPERATIONS ARE FULL CAPACITY IN THE DAYTIME AND 50 TO 60% REDUCTION AT NIGHT.

TESTS WERE CONDUCTED DURING THE PERIOD TO DETERMINE PARTICULATE AND SO2 REMOVAL EFFICIENCIES. SO2 REMOVAL EFFICIENCY WAS 50%. PARTICULATE EMISSIONS WERE BEING REDUCED WELL BELOW 0.1 LB/MM BTU STANDARD (ACTUAL RESULTS: 0.04 LB/MM BTU). THESE RESULTS WERE BASED ON TWO BOILERS COUPLED INTO THE FIVE SCRUBBING MODULES WHILE BURNING MEDIUM-SULFUR (1.0 TO 2.8%) COAL. THE MECHANICAL COLLECTORS AND ESP'S WERE IN SERVICE DURING THE TESTS.

/76	SYSTEM							720	720	
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/76	SYSTEM							744	744	
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DUQUESNE LIGHT: ELRAMA 1-4 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

THE SCRUBBER REMAINED IN SERVICE THROUGHOUT THE REPORT PERIOD WITH TWO BOILERS COUPLED INTO THE SCRUBBING SYSTEM. A RECYCLE PUMP EVALUATION IS BEING CONDUCTED BY THE UTILITY AT BOTH PHILLIPS AND ELRAMA STATIONS.

OBSERVATIONS OF THE RUBBER-LINED RECYCLE PUMPS INDICATE SOME SEVERE ABRASION AND GOUGING HAVE OCCURRED AFTER 1000 HOURS OF SERVICE TIME.

1/77	SYSTEM	744	744
2/77	SYSTEM	672	672
3/77	SYSTEM	744	744

** PROBLEMS/SOLUTIONS/COMMENTS

TESTING WITH THIOSORBIC LIME WAS CONDUCTED DURING THE PERIOD.

THE SCRUBBER PLANT CONTINUED OPERATIONS DURING JANUARY AND FEBRUARY WITH TWO BOILERS COUPLED INTO THE SYSTEM. INSTALLATION OF THE ADDITIONAL THICKENER LIME FEEDERS AND SILOS IS STILL IN PROGRESS. FULL COMPLIANCE OPERATION FOR THIS STATION IS SCHEDULED FOR EARLY 1978. THE FULL COMPLIANCE STRATEGY WILL CONSIST OF THE FOLLOWING: 83% SO2 REMOVAL FOR 2% SULFUR COAL UTILIZING THIOSORBIC LIME (6-12% MG), FIXATING THE SCRUBBER SLUDGE WITH THE IUCS POZ-O-TEC STABILIZATION METHOD AND HAULING THIS MATERIAL TO AN OFFSITE DISPOSAL/LANDFILL AREA. CURRENT SO2 AND PARTICULATE REMOVAL EFFICIENCIES ARE 50 AND 99+%, RESPECTIVELY. THE INTERIM IUCS UNIT NOW IN SERVICE CONSISTS OF THE OLD MOHAVE PROTOTYPE PLUS A VACUUM FILTER. THE STABILIZATION MATERIAL HAS BEEN UTILIZED IN A PARKING LOT CONSTRUCTION PROJECT. IUCS HAS BEEN AWARDED A 10-YEAR CONTRACT FOR THE CONTINUED USE OF THIS SYSTEM FOR FUTURE PLANT OPERATIONS.

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

** PROBLEMS/SOLUTIONS/COMMENTS

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

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

** PROBLEMS/SOLUTIONS/COMMENTS

DUQUESNE LIGHT REPORTED THE FOLLOWING ITEMS FOR THE ELRAMA SCRUBBER PLANT DURING THE REPORT PERIOD:

- TWO BOILERS (200 MW) WERE COUPLED INTO THE SCRUBBER PLANT.
- THE INTERIM IUCS STABILIZATION UNIT (MOHAVE PROTOTYPE) CONTINUED TO FIX ATE SCRUBBER WASTES.
- CONSTRUCTION OF THE TWO ADDITIONAL THICKENERS CONTINUED (CONSTRUCTION 1 ON SCHEDULE).
- FULL PLANT COMPLIANCE IS PROJECTED FOR FEBRUARY 1978.
- SO2 REMOVAL EFFICIENCY IS APPROXIMATELY 50%.
- ELRAMA IS OPERATING IN A BASE/INTERMEDIATE LOAD MODE (FULL LOAD DAYTIME HALF LOAD NIGHT-TIME). 1976 CAPACITY FACTOR WAS 69.5%.

8/77	SYSTEM	744	744
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LITY FGD SURVEY: JANUARY - DECEMBER 1988

UESN LIGHT: ELRAMA 1-4 (CONT.)

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

77 SYSTEM 720 720

** PROBLEMS/SOLUTIONS/COMMENTS

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

77 SYSTEM 744 744

** PROBLEMS/SOLUTIONS/COMMENTS

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

MODULE 201 WAS AVAILABLE FOR THE ENTIRE MONTH OF OCTOBER.

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

MODULE 501 EXPERIENCED RECYCLE PUMP OUTAGES IN LATE NOVEMBER.

NEW RUBBER LINED WORMEN RECYCLE PUMPS WERE INSTALLED. THE LIME HANDLING SYSTEM INSTALLATION WORK CONTINUED. THE LAST TWO BOILERS ARE EXPECTED TO BE TIED INTO THE FGD SYSTEM BY JANUARY 1978.

77 101	0.0	0.0			
201	11.7	11.7			
301	93.3	93.3			
401	22.5	22.5			
501	59.2	59.2			
SYSTEM	46.7	46.7	720	720	336

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE 101, 201 AND 401 HAVE LOW OPERATIONAL HOURS BECAUSE ONLY TWO BOILE ARE TIED INTO THE FGD SYSTEM TO DATE.

THE SLUDGE HANDLING SYSTEM IS FUNCTIONING PROPERLY AND IS NOW IN FULL SERVICE.

TUBE LEAKS FORCED A BOILER OUTAGE IN NOVEMBER.

77 SYSTEM 744 744

78 101	94.1	94.1			
201	90.5	90.5			
301	5.1	5.1			
401	24.3	24.3			
501	3.5	3.5			
SYSTEM	54.4	54.4	744	744	405

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE PERIOD THE UTILITY REPORTED THAT A NEW WORMEN RECYCLE PUMP INSTALLED IN NOVEMBER EXPERIENCED JACK SHAFT BEARING PROBLEMS RESULTING IN REMOVAL OF SCRUBBER TRAIN 501 FROM SERVICE.

BOILER NO. 4 WAS CONNECTED, ADDING AN ADDITIONAL 176 MW OF FLUE GAS LOAD TO THE FGD SYSTEM.

THE IUCS SLUDGE DISPOSAL FACILITY IS IN SERVICE PRODUCING GOOD PRODUCT. LOW LOAD AND A COAL STRIKE HAVE HAMPERED GOOD SCRUBBER OPERATIONS. SOME

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

DUQUESNE LIGHT: ELRAMA 1-4 (CONT.)

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

OUTAGE TIME HAS BEEN SCHEDULED FOR MARCH.

2/78	101		70.8		30.4			
	201		96.2		41.2			
	301		0.0		0.0			
	401		37.2		15.9			
	501		40.0		18.0			
	SYSTEM		61.1		26.4	672	288	177
3/78	SYSTEM		0.0		0.0	744	216	141

** PROBLEMS/SOLUTIONS/COMMENTS

THE SYSTEM WAS SHUTDOWN ON FEBRUARY 11 AS A RESULT OF A COAL SHORTAGE. BOILERS 1, 2 AND 4 ARE NOW COMPLETELY CONNECTED TO THE FGD SYSTEM. BOILER 3 IS UNDERGOING AN EXTENSIVE OVERHAUL AND WILL BE CONNECTED TO THE SYSTEM IN LATE APRIL.

BOILER EXIT DAMPERS WERE LINED WITH 316 SS ON AREAS OF HIGH EROSION CAUSE BY FLYASH IMPINGEMENT DURING THE OUTAGE.

EXPANSION JOINTS IN THE UPSTREAM DUCTWORK WERE SHIELDED BY METAL PLATES WHICH WERE WELDED AT ONE END DURING THE FEBRUARY-MARCH PERIOD. EXPANSION JOINTS IN THE DOWNSTREAM DUCTWORK WERE COMPLETELY REPLACED. THE DOWNSTREAM DUCTWORK WAS RELINED WITH CEILCOTE.

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

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

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

** PROBLEMS/SOLUTIONS/COMMENTS

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

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

** PROBLEMS/SOLUTIONS/COMMENTS

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

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

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

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

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

QUESNE LIGHT: ELRAMA 1-4 (CONT.)

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

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

** PROBLEMS/SOLUTIONS/COMMENTS

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

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

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

A PARTICLE EMISSION COMPLIANCE TEST WAS RUN IN DECEMBER WHICH SHOWED THE UNIT TO BE IN COMPLIANCE.

/78	101		100.0	76.6	100.0	76.6					
	201		98.9	98.9	98.9	98.9					
	301		100.0	100.0	100.0	100.0					
	401		80.5	80.5	80.5	80.5					
	501		78.6	78.6	78.6	78.6					
	SYSTEM		100.0	100.0	100.0	100.0		744	744	744	
/78	101		100.0	100.0	100.0	100.0					
	201		100.0	78.4	100.0	78.4					
	301		100.0	84.2	100.0	84.2					
	401		100.0	86.8	100.0	86.8					
	501		81.1	62.5	76.8	62.5					
	SYSTEM		100.0	100.0	100.0	100.0		720	720	720	

** PROBLEMS/SOLUTIONS/COMMENTS

THE PARTICLE EMISSION TEST RUN IN AUGUST SHOWED THAT THE UNIT MET STATE STANDARDS. THE SO2 TEST WILL HAVE TO BE RERUN BECAUSE OF SAMPLING ERRORS.

THE UTILITY REPORTED DURING THE OCTOBER-NOVEMBER PERIOD THAT IT HAS HAD SOME PROBLEMS WITH AN INSUFFICIENT LIME SUPPLY.

/78	101		100.0	94.7	100.0	94.7					
	201		76.3	72.7	75.4	72.7					
	301		93.0	85.6	92.5	85.6					
	401		68.0	64.8	66.9	64.8					
	501		97.9	69.5	97.0	69.5					
	SYSTEM		100.0	100.0	100.0	96.8		744	744	720	

** PROBLEMS/SOLUTIONS/COMMENTS

DURING DECEMBER A SO2 EMISSION COMPLIANCE TEST WAS RUN AND THE UNIT WAS FOUND TO BE WITHIN THE ALLOWABLE STANDARD OF 0.6 LB/MM BTU.

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

DUQUESNE LIGHT: ELRAMA 1-4 (CONT.)

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

1/79	101	44.7	39.8	41.9	39.8					
	201	100.0	95.2	100.0	95.2					
	301	67.8	60.2	65.3	60.2					
	401	100.0	100.0	100.0	100.0					
	501	100.0	100.0	100.0	100.0					
	SYSTEM	100.0	100.0	100.0	98.8			744	744	735

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY HAS STARTED HAULING SLUDGE OFF-SITE TO AN AREA ABOUT 10 MILES AWAY.

2/79	101	100.0	100.0	100.0	100.0					
	201	90.2	90.2	90.2	90.2					
	301	14.1	14.1	14.1	14.1					
	401	97.8	97.3	97.8	97.3					
	501	100.0	100.0	100.0	100.0					
	SYSTEM	100.0	100.0	100.0	100.0			672	672	672
3/79	101	98.9	95.4	98.8	95.4					
	201	100.0	91.0	100.0	91.0					
	301	77.7	73.8	76.8	73.8					
	401	54.5	39.2	46.3	39.2					
	501	70.4	65.9	69.0	65.9					
	SYSTEM	100.0	100.0	97.7	91.4			744	744	680
4/79	101	64.1	61.9	63.3	61.9					
	201	57.4	53.5	55.7	53.5					
	301	100.0	99.3	100.0	99.3					
	401	100.0	89.9	100.0	89.9					
	501	92.8	90.4	92.6	90.4					
	SYSTEM	100.0	95.6	100.0	95.6			720	720	688
5/79	101	100.0	100.0	100.0	100.0					
	201	97.8	97.8	97.8	97.8					
	301	100.0	83.1	100.0	83.1					
	401	100.0	100.0	100.0	100.0					
	501	51.6	21.4	30.6	21.4					
	SYSTEM	100.0	100.0	100.0	100.0			744	744	744
6/79	101	100.0	100.0	100.0	100.0					
	201	98.5	58.5	97.5	58.5					
	301	93.3	40.0	85.7	40.0					
	401	100.0	100.0	100.0	100.0					
	501	100.0	100.0	100.0	100.0					
	SYSTEM	100.0	100.0	100.0	99.6			720	720	717
7/79	101	100.0	81.0	100.0	81.0					
	201	100.0	94.8	100.0	94.8					
	301	86.0	86.0	86.0	86.0					
	401	100.0	99.3	100.0	99.3					
	501	40.7	40.7	40.7	40.7					
	SYSTEM	100.0	100.0	100.0	100.0			744	744	744
8/79	101	100.0	98.7	100.0	98.7					
	201	100.0	100.0	100.0	100.0					
	301	100.0	96.5	100.0	96.5					
	401	41.2	33.3	36.2	33.3					
	501	72.8	72.8	72.8	72.8					
	SYSTEM	100.0	100.0	100.0	100.0			744	744	744
9/79	101	44.0	35.0	38.4	35.0					

ILITY FGD SURVEY: JANUARY - DECEMBER 1988

QUESNE LIGHT: ELRAMA 1-4 (CONT.)

-----PERFORMANCE DATA-----											
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	201	100.0	93.3	100.0	93.3						
	301	100.0	86.6	100.0	86.6						
	401	90.0	90.0	100.0	90.0						
	501	76.9	70.0	75.2	70.0						
	SYSTEM	100.0	93.8	100.0	93.8			720	720	675	
/79	101	100.0	100.0	100.0	100.0						
	201	100.0	96.1	100.0	96.1						
	301	47.8	34.6	39.1	34.6						
	401	94.4	87.3	94.0	87.3						
	501	84.4	84.5	84.4	84.5						
	SYSTEM	100.0	100.0	100.0	100.0			744	744	744	
/79	101	100.0	100.0	100.0	100.0						
	201	15.3	15.2	15.3	15.2						
	301	92.4	92.5	92.4	92.5						
	401	100.0	98.3	100.0	98.3						
	501	95.0	93.9	94.9	93.9						
	SYSTEM	100.0	100.0	100.0	100.0			720	720	720	
/79	101	100.0	51.6	100.0	48.5						
	201	100.0	90.9	100.0	85.5						
	301	100.0	100.0	96.1	100.0						
	401	88.1	68.6	84.4	64.5						
	501	100.0	100.0	100.0	100.0						
	SYSTEM	100.0	100.0	100.0	98.7			744	700	734	

** PROBLEMS/SOLUTIONS/COMMENTS

THERE WERE NO SCRUBBER-RELATED OUTAGES DURING THE SEPTEMBER THROUGH DECEMBER PERIOD.

A NEW SO2 MONITOR, WHICH WAS INSTALLED IN OCTOBER, HAS PLUGGED ONLY ONCE SINCE INSTALLATION AND HAS REQUIRED ONLY FOUR HOURS OF MAINTENANCE PER WEEK.

/80	101	95.8	91.2	94.8	75.2					
	201	87.1	100.0	87.1	87.1					
	301	84.6	100.0	84.6	84.6					
	401	86.4	55.6	77.1	45.8					
	501	100.0	100.0	100.0	100.0					
	SYSTEM	100.0	100.0	100.0	98.2		744	613	528	
/80	101	100.0	85.4	100.0	60.5					
	201	100.0	100.0	100.0	96.6					
	301	100.0	100.0	100.0	100.0					
	401	100.0	100.0	100.0	70.7					
	501	77.6	56.8	64.0	40.2					
	SYSTEM	100.0	100.0	100.0	92.0		696	493	427	

** PROBLEMS/SOLUTIONS/COMMENTS

THE NEW SO2 MONITOR INSTALLED LAST OCTOBER IS STILL OPERATING WELL AND HAS LOGGED SIX MONTHS OF OPERATION.

THE HIGH AVAILABILITIES ARE DUE TO THE 5TH MODULE BEING A TRUE SPARE. AS OF FEBRUARY 1980 AND ARE STILL OPERATING WITHOUT ANY MAJOR PROBLEMS.

THE TWO RUBBER LINED WORMEN RECYCLE PUMPS HAVE NOW LOGGED 14,000 HOURS

/80	101	100.0	100.0	100.0	100.0					
	201	100.0	100.0	100.0	100.0					
	301	73.7	73.7	73.7	73.7					

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

DUQUESNE LIGHT: ELRAMA 1-4 (CONT.)

-----PERFORMANCE DATA-----											
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	401	100.0	48.4	100.0	48.4						
	501	78.1	78.1	78.1	78.1						
	SYSTEM	100.0	100.0	100.0	100.0			744	744	595	

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS AVAILABLE FOR OPERATION THE ENTIRE MONTH OF MARCH.

4/80	101	40.3	38.1	40.0	40.0						
	201	72.3	72.3	72.3	72.3						
	301	87.3	87.3	87.3	87.3						
	401	100.0	100.0	100.0	100.0						
	501	100.0	100.0	100.0	100.0						
	SYSTEM	99.4	99.4	100.0	99.4			720	720	572	

** PROBLEMS/SOLUTIONS/COMMENTS

DURING APRIL THE 101 AND 201 RECYCLE PUMP IMPELLERS HAD TO BE REPLACED. THIS CAUSED EIGHT HOURS OF OUTAGE TIME FOR THESE TWO MODULES. NO OTHER FGD SYSTEM OUTAGES OCCURRED.

5/80	101	100.0	100.0	100.0	100.0						
	201	40.1	37.1	38.2	37.1						
	301	94.1	89.0	93.8	89.0						
	401	90.3	71.2	88.0	71.2						
	501	96.8	96.8	96.8	96.8						
	SYSTEM	100.0	98.5	100.0	98.5			744	744	586	

** PROBLEMS/SOLUTIONS/COMMENTS

DURING MAY THE FGD SYSTEM WAS AVAILABLE FOR OPERATION THE ENTIRE MONTH.

6/80	101	100.0	100.0	100.0	100.0						
	201	100.0	97.8	100.0	97.8						
	301	100.0	96.7	100.0	96.7						
	401	0.0	0.0	0.0	0.0						
	501	100.0	100.0	100.0	100.0						
	SYSTEM	100.0	98.6	99.7	98.6			720	720	710	61.6

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JUNE MODULE 401 WAS CLEANED AND THE CEILCOTE LINER WAS REPLACED. THIS IS THE FIRST TIME SINCE START UP (APPROXIMATELY 17,000 OPERATING HOURS) THAT ANY MODULE NEEDED RELINED.

DURING JUNE NO FGD-RELATED PROBLEMS OCCURRED ON MODULES 101, 201, 301 OR 501.

7/80	101	100.0	64.9	100.0	64.9						
	201	100.0	91.1	100.0	91.1						
	301	98.5	85.6	98.3	85.6						
	401	75.8	75.8	75.8	75.8						
	501	35.5	12.9	16.7	12.9						
	SYSTEM	100.0	82.6	97.7	82.6			744	744	615	66.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE RELINING OF MODULE 401 CONTINUED INTO PART OF JULY.

8/80	101	30.9	21.2	23.5	21.2						
	201	100.0	94.8	100.0	94.8						
	301	100.0	93.3	100.0	93.3						
	401	99.1	99.1	99.1	99.1						

ILITY FGD SURVEY: JANUARY - DECEMBER 1988

QUESNE LIGHT: ELRAMA 1-4 (CONT.)

-----PERFORMANCE DATA-----									
RIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART. HOURS	PER BOILER HOURS	FGD CAP. HOURS FACTOR
	501	83.9	82.5	83.7	82.5				
	SYSTEM	100.0	97.7	100.0	97.7		744	744	727 65.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE RELINING WITH CEILCOTE ON MODULE 501 COMMENCED IN JULY AND CONTINUED FOR APPROXIMATELY 120 HOURS IN AUGUST.

THE RELINING OF MODULE 101 WITH CEILCOTE STARTED IN AUGUST ACCOUNTING FOR THE LOW AVAILABILITY DURING THE MONTH.

/80	101	59.7	59.7	59.7	59.7				
	201	39.0	22.8	27.2	22.8				
	301	100.0	100.0	100.0	96.0				
	401	100.0	100.0	100.0	100.0				
	501	100.0	99.2	100.0	99.2				
	SYSTEM	99.7	95.4	96.8	94.4		720	720	680 64.5

/80	101	97.9	95.8	97.8	95.8				
	201	32.4	23.3	25.6	23.3				
	301	98.5	98.5	98.5	98.5				
	401	90.5	72.7	88.3	72.7				
	501	98.5	96.5	98.4	96.5				
	SYSTEM	100.0	96.8	100.0	96.8		744	744	720 75.1

/80	101	68.8	68.8	68.8	68.8				
	201	96.4	96.4	96.4	96.4				
	301	62.6	59.3	61.4	59.3				
	401	93.8	93.8	93.8	93.8				
	501	77.2	77.2	77.2	77.2				
	SYSTEM	99.8	98.9	99.4	98.9		720	720	711 79.3

** PROBLEMS/SOLUTIONS/COMMENTS

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

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

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

2/80	101	73.0	55.1	67.1	55.1				
	201	100.0	81.3	100.0	81.3				
	301	98.9	94.6	98.9	94.6				
	401	48.4	48.4	48.4	48.4				
	501	94.9	93.4	94.8	93.4				
	SYSTEM	100.0	93.3	100.0	93.3		744	744	694 54.8

1/81	101	100.0	100.0	100.0	100.0				
	201	92.5	51.1	87.1	51.1				
	301	100.0	96.6	100.0	96.6				
	401	32.2	0.0	0.0	0.0				
	501	88.2	51.1	81.2	51.1				
	SYSTEM	100.0	74.7	92.1	74.7		744	744	556 41.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING DECEMBER AND JANUARY.

2/81	101	92.1	51.6	73.5	51.6				
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UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

DUQUESNE LIGHT: ELRAMA 1-4 (CONT.)

-----PERFORMANCE DATA-----										
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	201	99.1	86.5	88.2	86.5					
	301	98.9	93.2	98.9	93.2					
	401	3.6	3.6	3.6	3.6					
	501	95.2	93.6	95.2	93.6					
	SYSTEM	97.2	82.1	89.9	82.1		672	672	552	33.6

** PROBLEMS/SOLUTIONS/COMMENTS

DURING FEBRUARY THE RUBBER LININGS ON THE FAN HOUSINGS OF MODULES 201 AND 301 WERE REPLACED WITH INCONEL 825.

3/81	101	59.8	38.7	49.1	38.7					
	201	59.1	59.1	59.1	59.1					
	301	53.6	53.6	53.6	53.6					
	401	21.1	21.1	21.1	21.1					
	501	59.9	58.9	59.5	58.9					
	SYSTEM	63.4	57.9	60.6	57.9		744	744	431	41.4

** PROBLEMS/SOLUTIONS/COMMENTS

UTILITY REPORTED THAT THE LOW BOILER CAPACITY FACTOR FOR THE MONTH OF MARCH WAS DUE TO THE COAL STRIKE (BOILERS WERE RUN AT REDUCED LOAD TO CONSERVE FUEL). GENERAL CLEANING WAS PERFORMED ON BOTH BOILERS AND FGD SYSTEM DURING THE MONTH.

THE FGD SYSTEM WAS DOWN FOR 10 DAYS TO REPAIR THE DUCTWORK AND EXPANSION JOINT LOCATED AT THE STACK. DURING THE OUTAGE, THE STACK, DAMPERS, AND REMAINING EXPANSION JOINTS WERE INSPECTED. THE STACK INSPECTION SHOWED MINOR DETERIORATION OF THE STACK FLUE.

4/81	101	88.1	76.9	86.6	76.9					
	201	72.3	46.2	62.5	46.2					
	301	90.0	82.6	89.2	82.6					
	401	86.7	85.6	86.6	85.6					
	501	94.2	82.3	93.4	82.3					
	SYSTEM	100.0	93.4	100.0	93.4		720	719	672	68.6

** PROBLEMS/SOLUTIONS/COMMENTS

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

THE RUBBER COATED FAN HOUSING ON NUMBER 401 ID FAN WAS SPRAYED WITH A POLYURETHANE COATING TO PROTECT AGAINST CORROSION/EROSION EFFECTS.

SODIUM THIOSULFATE ADDITION WAS INITIATED IN APRIL TO AID AGAINST SCALING (HIGH EXCESS AIR PROBLEMS WHEN BOILERS RUN AT REDUCED LOADS).

5/81	101	100.0	96.7	100.0	96.7					
	201	0.0	0.0	0.0	0.0					
	301	100.0	100.0	100.0	100.0					
	401	100.0	67.0	100.0	67.0					
	501	88.7	50.2	81.7	50.2					
	SYSTEM	97.2	78.5	95.4	78.5		744	744	584	46.7

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE MONTH OF MAY THE INGERSOLL RAND RECYCLE PUMPS ON MODULE 201 WERE REPLACED WITH RUBBER LINED WORMAN PUMPS.

6/81	101	95.4	92.6	97.1	92.6					
	201	61.7	61.7	61.7	61.7					
	301	93.3	86.0	92.8	86.0					
	401	88.3	76.7	86.8	76.7					

LITY FGD SURVEY: JANUARY - DECEMBER 1988

UESNE LIGHT: ELRAMA 1-4 (CONT.)

-----PERFORMANCE DATA-----											
100		MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
		501	63.9	41.5	53.5	41.5					
		SYSTEM	100.0	89.6	98.0	89.6		720	720	645	58.0
81	101	98.9	86.0	98.8	86.0						
	201	100.0	98.9	100.0	98.9						
	301	0.0	0.0	0.0	0.0						
	401	98.4	93.3	98.2	93.3						
	501	100.0	100.0	100.0	100.0						
	SYSTEM	99.3	94.6	99.3	94.6		744	744	704	67.0	

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JULY, MODULE 301 WAS OUT OF SERVICE FOR GENERAL CLEANING AND FOR TH
INSTALLATION OF POLYURETHANE IN THE FAN HOUSING.

81	101	97.3	90.5	97.3	90.5					
	201	98.9	58.5	98.2	58.5					
	301	0.0	0.0	0.0	0.0					
	401	97.7	95.6	97.5	95.6					
	501	97.4	80.9	96.9	80.9					
	SYSTEM	97.8	81.4	97.5	81.4		744	744	606	43.0

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE 301 REMAINED DOWN DURING AUGUST FOR MAINTENANCE AND CLEANING.

81	101	100.0	68.2	100.0	68.2					
	201	100.0	98.3	100.0	98.3					
	301	0.0	0.0	0.0	0.0					
	401	100.0	87.2	100.0	87.2					
	501	100.0	51.0	100.0	51.0					
	SYSTEM	100.0	76.2	100.0	76.2		720	720	549	39.8

** PROBLEMS/SOLUTIONS/COMMENTS

DURING SEPTEMBER MODULE 301 WAS OUT OF SERVICE FOR CLEANING AND TO REPLACE
THE RECYCLE PUMP.

81	101	85.6	62.1	81.2	62.1					
	201	100.0	95.3	100.0	95.3					
	301	0.0	0.0	0.0	0.0					
	401	96.0	94.0	95.8	94.0					
	501	100.0	57.6	100.0	57.6					
	SYSTEM	95.4	77.2	94.2	77.2		744	744	574	45.0

** PROBLEMS/SOLUTIONS/COMMENTS

DURING OCTOBER THE SO2 MONITORS WERE CERTIFIED. TO DATE, THE MONITORS
HAVE AN EXCELLENT PERFORMANCE RECORD.

THE UTILITY CONTINUES TO ADD SODIUM THIOSULFATE TO CONTROL SCALE
BELIEVED TO BE CAUSED BY LOAD FLUCTUATIONS.

81	101	100.0	69.0	100.0	69.0					
	201	100.0	100.0	100.0	100.0					
	301	0.0	0.0	0.0	0.0					
	401	100.0	84.8	100.0	84.8					
	501	100.0	55.0	100.0	55.0					
	SYSTEM	100.0	77.2	100.0	77.2		720	720	556	48.0

DUQUESNE LIGHT: ELRAMA 1-4 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

DURING NOVEMBER, THE MODULE 301 RECYCLE PUMPS WERE REPLACED WITH RUBBER
 LINED PUMPS.

12/81	101	100.0	30.3	100.0	30.3				
	201	94.5	80.2	93.5	80.2				
	301	91.9	90.7	91.7	90.7				
	401	13.5	13.5	13.5	13.5				
	501	100.0	26.2	100.0	26.2				
	SYSTEM	99.9	60.2	99.7	60.2	744	744	448	46.0

** PROBLEMS/SOLUTIONS/COMMENTS

DURING DECEMBER, THE UTILITY REPORTED EXPERIENCING PROBLEMS WITH THE
 PROCESS CHEMISTRY DUE TO LOAD FLUCTUATIONS.

1/82	101	60.0	43.2	51.9	43.2				
	201	96.6	94.0	96.5	94.0				
	301	100.0	94.4	79.3	94.4				
	401	90.8	90.8	90.8	90.8				
	501	53.7	49.6	51.7	49.6				
	SYSTEM	100.0	94.4	79.3	94.4	744	744	702	73.0

2/82	101	0.0	0.0	0.0	0.0				
	201	79.6	78.5	79.4	78.5				
	301	96.3	93.9	96.2	93.9				
	401	100.0	82.6	100.0	82.6				
	501	91.4	81.3	90.4	81.3				
	SYSTEM	91.8	84.1	71.7	84.1	672	672	565	59.0

3/82	101	0.0	0.0	0.0	0.0				
	201	98.2	97.1	98.2	97.1				
	301	95.8	85.2	95.4	85.2				
	401	91.6	90.8	91.5	90.8				
	501	100.0	98.3	100.0	98.3				
	SYSTEM	96.4	92.8	76.5	92.8	744	744	691	67.0

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE FIRST QUARTER OF 1982, THE MODULE 101 RECYCLE PUMPS WERE
 REPLACED WITH RUBBER LINED PUMPS.

4/82	SYSTEM					720			
5/82	SYSTEM					744			
6/82	SYSTEM					720			

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE SECOND QUARTER THE CONVERSION OF THE RECYCLE PUMPS TO RUBBER
 LINED PUMPS WAS COMPLETED.

7/82	SYSTEM					744			
8/82	SYSTEM					744			
9/82	SYSTEM					720			
10/82	SYSTEM					744			
11/82	SYSTEM					720			

LITY FGD SURVEY: JANUARY - DECEMBER 1988

UESNE LIGHT: ELRAMA 1-4 (CONT.)

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

82 SYSTEM 744

83 SYSTEM 744

83 SYSTEM 672

83 SYSTEM 744

** PROBLEMS/SOLUTIONS/COMMENTS

INFORMATION WAS UNAVAILABLE FOR THE PERIOD OF JULY 1982 THROUGH MARCH 1983

83 SYSTEM 720

83 SYSTEM 744

83 SYSTEM 720

** PROBLEMS/SOLUTIONS/COMMENTS

INFORMATION WAS UNAVAILABLE FOR THE PERIOD OF JULY 1982 THROUGH JUNE 1983.

83 SYSTEM 744

83 SYSTEM 744

83 SYSTEM 720

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED COMPLIANCE WITH STACK EMISSION TESTS CONDUCTED IN JUL
AND AUGUST 1983.

83 SYSTEM 744

83 SYSTEM 720

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED A TWO WEEK ANNUAL OUTAGE IN NOVEMBER, DURING WHICH
TIME DAMPER AND DUCTWORK SECTIONS WERE REPAIRED.

83 SYSTEM 744

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED INSTALLING A PILOT SCRUBBER MODULE AT THE ELRAMA STA-
TION DURING THE FOURTH QUARTER. THE 750 ACFM MODULE WILL BE USED TO TEST
THE USE OF ADDITIVES IN CONJUNCTION WITH THEIR LIME PROCESS.

84 SYSTEM 744

84 SYSTEM 696

84 SYSTEM 744

84 SYSTEM 720

84 SYSTEM 744

84 SYSTEM 720

84 SYSTEM 744

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

DUQUESNE LIGHT: ELRAMA 1-4 (CONT.)

-----PERFORMANCE DATA-----										
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
8/84	SYSTEM								744	
9/84	SYSTEM								720	
** PROBLEMS/SOLUTIONS/COMMENTS OVERALL FGD SYSTEM AVAILABILITY FOR THE FIRST THREE QUARTERS OF 1984 WAS ESTIMATED AT 90%. THE UTILITY REPORTED THAT DUE TO A TIGHTENING OF THE WATER LOOP, IT IS NO LONGER NECESSARY TO SPIKE THE THIOSORBIC LIME WITH DOLOMITIC LIME. THE MAGNESIUM OXIDE CONTENT OF THE THIOSORBIC LIME IS SUFFICIENT FOR OPERATIONS. THE UTILITY IS NOW DIVERTING INDUCED DRAFT FAN SPRAY WATER TO AN ASH POND INSTEAD OF RECYCLING TO THE ABSORBERS. LIME CONSUMPTION HAS IMPROVED SINCE THE HIGHLY ACIDIC SPRAY WATER IS NO LONGER INTRODUCED IN THE SYSTEM. THE UTILITY REPORTED A THREE WEEK SCHEDULED ANNUAL OUTAGE IN THE FIRST THREE QUARTERS OF 1984. DURING THIS TIME REPAIRS WERE MADE TO DUCTWORK AND DAMPERS. MIST ELIMINATOR TURN VANES WERE ALSO REPLACED. THE 1000 CFM PILOT SCRUBBER LOANED TO THE UTILITY BY DRAVO IS NOW IN OPERATION. THIS PILOT SCRUBBER IS USED TO TEST VARIOUS ADDITIVES TO THE LIME PROCESS SUCH AS SODIUM THIOSULFATE AND OTHER ORGANIC ADDITIVES.										
10/84	SYSTEM								744	
11/84	SYSTEM								720	
12/84	SYSTEM								744	
** PROBLEMS/SOLUTIONS/COMMENTS THE UTILITY REPORTED THAT DUE TO A SLOW DOWN IN THE STEEL INDUSTRY, UNIT LOAD HAS BEEN REDUCED. TESTING OF THE 1000 CFM PILOT SCRUBBER IS NOW UNDERWAY. VARIOUS ADDITIVES FOR ENHANCING LIME UTILIZATION AND SO2 REMOVAL WILL BE INVESTIGATED. WORK CONTINUED ON PRESSURIZING THE STACK ANNULUS TO CONTROL FLUE GAS LEAKAGE. THE UTILITY REPORTED A FOURTH QUARTER AVAILABILITY OF 90% FOR THEIR CONTINUOUS EMISSION MONITORS(CEM). THE STATE OF PENNSYLVANIA HAS IMPLEMENTED NEW PENALTIES FOR CEM AVAILABILITY. THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE FOURTH QUARTER OF 1984.										
1/85	SYSTEM								744	
2/85	SYSTEM								672	
3/85	SYSTEM								744	
4/85	SYSTEM								720	
** PROBLEMS/SOLUTIONS/COMMENTS THE UNIT/FGD WERE OFF-LINE APPROXIMATELY 3 WEEKS DURING THE MONTH OF APRIL FOR A SCHEDULED MAINTENANCE OUTAGE. DURING THIS OUTAGE, THE STACK ANNULUS WORK WAS COMPLETED AND OUTLET DUCTWORK CEILCOTE LINER REPAIRS WERE MADE.										

ILITY FGD SURVEY: JANUARY - DECEMBER 1988

QUESNE LIGHT: ELRAMA 1-4 (CONT.)

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

/85	SYSTEM	744
/85	SYSTEM	720
/85	SYSTEM	744
/85	SYSTEM	744
/85	SYSTEM	720
/85	SYSTEM	744
/85	SYSTEM	720
/85	SYSTEM	744

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT DUE TO CUTBACKS IN POWER DEMAND IN THE HEAVY METALS AND STEEL INDUSTRIES, THEY HAVE LOST APPROXIMATELY 40% OF THEIR MARKET OR APPROXIMATELY 400 MW OF CAPACITY. THE ELRAMA FACILITY IS CURRENTLY RUNNING AT 50% OF CAPACITY AND IS NOW CONSIDERED TO BE A CYCLIC LOADED UNIT.

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE YEAR 1985.

/86	SYSTEM	774
/86	SYSTEM	672
/86	SYSTEM	774
/86	SYSTEM	720
/86	SYSTEM	774
/86	SYSTEM	720
/86	SYSTEM	774
/86	SYSTEM	774
/86	SYSTEM	720
/86	SYSTEM	774
/86	SYSTEM	720
/86	SYSTEM	774

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY IS CURRENTLY ACHIEVING 90% SO2 REMOVAL WITH THE FGD SYSTEM. THEY ALSO REPORTED USING 50 TONS/HR OF THE ANTI-SCALING AGENT SODIUM THIOSULFATE.

ELRAMA 1-4 OPERATED AT APPROXIMATELY 50% CAPACITY DURING 1986. THE UTILITY REPORTED THAT UNIT 4 MAY BE PUT ON COLD STANDBY IN 1987 DUE TO REDUCED LOAD CAPACITY AND THE STARTUP OF NUCLEAR UNITS. WITH THE EXCEPTION OF A SCHEDULED TWO WEEK OUTAGE IN SEPTEMBER, NO MAJOR UNIT OR FGD-RELATED OUTAGES WERE ENCOUNTERED DURING 1986.

1/87	SYSTEM	744
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UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

DUQUESNE LIGHT: ELRAMA 1-4 (CONT.)

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

2/87	SYSTEM						672		
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3/87	SYSTEM						744		
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** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED OUTAGES WERE ENCOUNTERED DURING THE FIRST QUARTER OF 1987.

4/87	SYSTEM						720		
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** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE UNITS WERE OFF-LINE FOR 2 WEEKS DURING THE MONTH OF APRIL FOR A SCHEDULED SPRING MAINTENANCE OUTAGE. DURING THIS OUTAGE THE UTILITY INSPECTED AND REPAIRED THE ABSORBER OUTLET DUCTWORK AND LOUVRE DAMPERS. THE ACID RESISTANT STACK ALIGNMENT SHOWED NO SIGNS OF LEANING OR DETERIORATION. THIS IS A CONCERN SINCE THE UTILITY STOPPED USING ITS REHEATER.

5/87	SYSTEM						744		
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6/87	SYSTEM						720		
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7/87	SYSTEM						744		
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8/87	SYSTEM						744		
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9/87	SYSTEM						720		
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10/87	SYSTEM						744		
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11/87	SYSTEM						720		
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12/87	SYSTEM						744		
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** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT ALL OF THE RUBBER LINED WET ID FANS WERE RECLADDING WITH INCONEL 625. MOST OF THE WORK WAS COMPLETED DURING THE FIRST HALF OF THE YEAR DURING REDUCED UNIT LOADING WITH THE WORK BEING COMPLETED BY NOVEMBER 1987. THE UTILITY ALSO REPORTED THAT UNIT 2 WAS OFF-LINE THE MAJORITY OF THE FIRST HALF OF THE YEAR DUE TO TURBINE REPAIRS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED OUTAGES WERE ENCOUNTERED DURING THE REST OF MAY THROUGH DECEMBER 1987.

1/88	SYSTEM						774		
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2/88	SYSTEM						672		
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3/88	SYSTEM						774		
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4/88	SYSTEM						720		
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5/88	SYSTEM						774		
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6/88	SYSTEM						720		
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7/88	SYSTEM						774		
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8/88	SYSTEM						774		
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UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

QUESNE LIGHT: ELRAMA 1-4 (CONT.)

-----PERFORMANCE DATA-----						
MOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL
						SO2 PART. HOURS
						PER BOILER FGD CAP.
						HOURS HOURS HOURS FACTOR
/88	SYSTEM					720
/88	SYSTEM					774
/88	SYSTEM					720
/88	SYSTEM					774

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED OUTAGES WERE ENCOUNTERED DURING 1988. ELRAMA 1-4 WAS CYCLED MOST OF THE YEAR DUE TO LOAD DEMAND. THE PLANT IS OPERATING CURRENTLY AT 50 PERCENT CAPACITY. NO FGD SYSTEM OPERATING PROBLEMS HAVE RESULTED, TO DATE DUE TO STARTUP/SHUTDOWN OPERATIONS ASSOCIATED WITH CYCLING THE UNITS. THE SYSTEM WAS INSPECTED DURING A THREE WEEK SCHEDULED MAINTENANCE OUTAGE IN THE SPRING. THE ONLY MAJOR PROBLEM FOUND DURING THE INSPECTION WAS THAT THE ORIGINAL INSTALLED FAN BLADE BOLTS HAD BEGUN TO CRACK. THE UTILITY PLANS TO HAVE ALL OF THE FAN BOLTS EVENTUALLY REPLACED.

SECTION 13
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	DUQUESNE LIGHT	
PLANT NAME	PHILLIPS	
UNIT NUMBER	1-6	
CITY	SOUTH HEIGHTS	
STATE	PENNSYLVANIA	
REGULATORY CLASSIFICATION	C	
PERMIT EMISSION LIMITATION - NG/J	34.	(0.080 LB/MMBTU)
PERMIT EMISSION LIMITATION - NG/J	258.	(0.600 LB/MMBTU)
PERMIT EMISSION LIMITATION - NG/J	*****	(***** LB/MMBTU)
PLANT GENERATING CAPACITY - MW	387	
PERMIT UNIT GENERATING CAPACITY - MW	408	
PLANT UNIT GENERATING CAPACITY W/FGD - MW	335	
PLANT UNIT GENERATING CAPACITY WO/FGD - MW	349	
PERMIT UNIT GENERATING CAPACITY - MW	408	
* UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	FOSTER WHEELER	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	CYCLING	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	1047.62	(2220000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	183.3	(362 F)
STACK HEIGHT - M	104.	(340 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	7.9	(26.0 FT)
* FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	BITUMINOUS	
AVERAGE HEAT CONTENT - J/G	26907.	(11568 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		11500-12500
AVERAGE ASH CONTENT - %	16.80	
RANGE ASH CONTENT - %	14.0-18.3	
AVERAGE MOISTURE CONTENT - %	5.93	
RANGE MOISTURE CONTENT - %	4.3-7.1	
AVERAGE SULFUR CONTENT - %	2.05	
RANGE SULFUR CONTENT - %	1.5-2.9	
AVERAGE CHLORIDE CONTENT - %	0.04	
RANGE CHLORIDE CONTENT - %	.03-.05	
* PARTICLE CONTROL		
* MECHANICAL COLLECTOR		
NUMBER	6	
NUMBER OF SPARES	0	
TYPE	MULTICLONE	
SUPPLIER	RESEARCH-COTTRELL	
INLET FLUE GAS CAPACITY - CU.M/S	174.6	(370000 ACFM)
INLET FLUE GAS TEMPERATURE - C	183.3	(362 F)
PRESSURE DROP - KPA	0.1	(1. IN-H2O)
* ESP		
NUMBER	6	
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	183.3	(362 F)
PRESSURE DROP - KPA	0.1	(1. IN-H2O)
PARTICLE REMOVAL EFFICIENCY - %	70.0	
* PARTICLE SCRUBBER		
NUMBER	0	
GENERIC TYPE	NONE	
SPECIFIC TYPE	N/A	
TRADE NAME/COMMON NAME	N/A	
LINER GENERIC MATERIAL	ORGANIC	

DUQUESNE LIGHT: PHILLIPS 1-6 (CONT.)

*** FGD SYSTEM

** GENERAL DATA

SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT
SO2 REMOVAL MODE	WET SCRUBBING
PROCESS TYPE	LIME
PROCESS ADDITIVES	MAGNESIUM OXIDE; SODIUM
SYSTEM SUPPLIER	GE ENVIRONMENTAL SERVICES
A-E FIRM	GIBBS & HILL
DEVELOPMENT LEVEL	FULL SCALE
NEW/RETROFIT	RETROFIT
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.00
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	83.00
ENERGY CONSUMPTION - %	3.4
CURRENT STATUS	1
COMMERCIAL START-UP	6/1974
INITIAL START-UP	7/1973
CONTRACT AWARDED	7/1971

** DESIGN AND OPERATING PARAMETERS

DESIGN COAL SULFUR CONTENT - %	2.50	
DESIGN COAL HEAT CONTENT - J/G	25586.0	(11000 BTU/LB)
DESIGN COAL ASH CONTENT - %	21.00	
DESIGN MOISTURE CONTENT - %	7.00	
DESIGN CHLORIDE CONTENT - %	0.10	
SPACE REQUIREMENTS - SQ M	24246.9	(261000 SQ FT)
OPER. & MAINT. REQUIREMENT - MANHR/DAY	140.0	

** QUENCHER/PRESATURATOR
TYPE

NONE

** ABSORBER

NUMBER	4	
NUMBER OF SPARES	0	
GENERIC TYPE	VENTURI TOWER	
SPECIFIC TYPE	VARIABLE-THROAT/SIDE-MOVABLE BLADES	
TRADE NAME/COMMON TYPE	N/A	
SUPPLIER	GE ENVIRONMENTAL SERVICES	
DIMENSIONS - FT	40.0 X 66.0	
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	MAT-REINFORCED EPOXY; GLASS FLAKE-FILLED POLYEST	
LINER MATERIAL TRADE NAME/COMMON TYPE	COROLINE 505AR; FLAKELINE 103	
GAS CONTACTING DEVICE TYPE	VARIABLE THROAT VENTURI	
NUMBER OF CONTACTING ZONES	1	
LIQUID RECIRCULATION RATE - LITER/S	1008.	(16000 GPM)
L/G RATIO - L/CU.M	3.9	(29.1 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	2.0	(8.0 IN-H2O)
SUPERFICIAL GAS VELOCITY - M/SEC	45.7	(150.0 FT/S)
INLET GAS FLOW - CU. M/S	259.54	(550000 ACFM)
INLET GAS TEMPERATURE - C	183.3	(362 F)
SO2 REMOVAL EFFICIENCY - %	84.0	
PARTICLE REMOVAL EFFICIENCY - %	99.0	

** MIST ELIMINATOR

PRE-MIST ELIMINATOR/MIST ELIMINATOR	PRIMARY COLLECTOR `EXTERNAL!	
NUMBER PER SYSTEM	3	
NUMBER OF SPARES PER SYSTEM	0	
NUMBER PER MODULE	1	
GENERIC TYPE	IMPINGEMENT	
SPECIFIC TYPE	BAFFLE	
TRADE NAME/COMMON TYPE	CLOSED VANE	
MANUFACTURER	HEIL	
CONFIGURATION	HORIZONTAL	
NUMBER OF STAGES	1	
NUMBER OF PASSES PER STAGE	4	
FREEBOARD DISTANCE - M	5.79	(19.0 FT)
DISTANCE BETWEEN VANES - CM	5.1	(2.00 IN)

ILITY FGD SURVEY: JANUARY - DECEMBER 1988

UESME LIGHT: PHILLIPS 1-6 (CONT.)

VANE ANGLES - DEGREES	90
PRESSURE DROP - KPA	1.0 (4.0 IN-H2O)
SUPERFICIAL GAS VELOCITY - M/S	3.0 (10.0 FT/S)
CONSTRUCTION MATERIAL GENERIC TYPE	ORGANIC
CONSTRUCTION MATERIAL SPECIFIC TYPE	FIBER-REINFORCED POLYESTER
WASH WATER SOURCE	THICKENER OVERFLOW
WASH FREQUENCY	CONTINUOUS
* FANS	
NUMBER	4
NUMBER OF SPARES	0
DESIGN	CENTRIFUGAL
SUPPLIER	GREEN FUEL ECONOMIZER
FUNCTION	BOOSTER
APPLICATION	INDUCED DRAFT
SERVICE	WET
FLUE GAS FLOW RATE - CU.M/S	188.76 (400000 ACFM)
FLUE GAS TEMPERATURE - C	51.7 (125 F)
PRESSURE DROP - KPA	5.2 (17.0 IN-H2O)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL; HIGH ALLOY; HIGH ALLOY; STAINLESS
* DAMPERS	
NUMBER	4
FUNCTION	SHUT-OFF
GENERIC TYPE	BUTTERFLY
SPECIFIC TYPE	N/A
MODULATION	OPEN/CLOSED
SEAL AIR FLOW - CU. M/S	0.00 (0 ACFM)
CONSTRUCTION MATERIAL GENERIC TYPE	LINED CARBON STEEL
CONSTRUCTION MATERIAL SPECIFIC TYPE	AISI 1110
LINER GENERIC MATERIAL TYPE	STAINLESS STEEL
LINER SPECIFIC MATERIAL TYPE	AUSTENITIC
* DAMPERS	
NUMBER	4
FUNCTION	SHUT-OFF
GENERIC TYPE	LOUVER
SPECIFIC TYPE	PARALLEL BLADE MULTILOUVER
MODULATION	OPEN/CLOSED
SEAL AIR FLOW - CU. M/S	0.00 (0 ACFM)
CONSTRUCTION MATERIAL GENERIC TYPE	STAINLESS STEEL
CONSTRUCTION MATERIAL SPECIFIC TYPE	AUSTENITIC
LINER GENERIC MATERIAL TYPE	STAINLESS STEEL
LINER SPECIFIC MATERIAL TYPE	AUSTENITIC
* DAMPERS	
NUMBER	4
FUNCTION	SHUT-OFF
GENERIC TYPE	LOUVER
SPECIFIC TYPE	PARALLEL BLADE MULTILOUVER
MODULATION	OPEN/CLOSED
SEAL AIR FLOW - CU. M/S	0.00 (0 ACFM)
CONSTRUCTION MATERIAL GENERIC TYPE	STAINLESS STEEL
CONSTRUCTION MATERIAL SPECIFIC TYPE	AUSTENITIC
LINER GENERIC MATERIAL TYPE	NR
LINER SPECIFIC MATERIAL TYPE	NR
* DUCTWORK	
LOCATION	SCRUBBER INLET
CONFIGURATION	RECTANGULAR
DIMENSIONS	NA
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	SCRUBBER OUTLET
CONFIGURATION	RECTANGULAR
DIMENSIONS	NA
SHELL GENERIC MATERIAL TYPE	CARBON STEEL

DUQUESNE LIGHT: PHILLIPS 1-6 (CONT.)

SHELL SPECIFIC MATERIAL TYPE	AISI 1110
LINER GENERIC MATERIAL TYPE	ORGANIC
LINER SPECIFIC MATERIAL TYPE	GLASS FLAKE-FILLED POLYESTER
** REAGENT PREPARATION EQUIPMENT	
FUNCTION	SLAKER
DEVICE	SLAKER
DEVICE TYPE	PASTE
MANUFACTURER	WALLACE & TIERNAN
NUMBER	4
NUMBER OF SPARES	0
FULL LOAD DRY FEED CAPACITY - M.TONS/HR	3.6 (4 TPH)
PRODUCT QUALITY - % SOLIDS	22.5
** TANKS	
SERVICE	NUMBER
-----	-----
ABSORBER RECYCLE	4
REAGENT PREP PRODUCT	1
THICKENER OVERFLOW	1
SLUDGE STABILIZATION	1
** PUMPS	
SERVICE	NUMBER
-----	-----
SCRUBBER/ABSORBER RECIRCULATION	8
THICKENER OVERFLOW	6
THICKENER UNDERFLOW	1
SLURRY FEED	5
MAKEUP WATER	1
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	VACUUM FILTER
NUMBER	2
NUMBER OF SPARES	1
CONFIGURATION	CIRCULAR
DIMENSIONS - FT	12(DIA)X16
CAPACITY	150 LB/HR/SQ FT OF CLOTH
FEED STREAM SOURCE	THICKENER UNDERFLOW
FEED STREAM CHARACTERISTICS	30-35% SOLIDS
OUTLET STREAM CHARACTERISTICS	50% SOLIDS
OVERFLOW STREAM CHARACTERISTICS	<0.1% SOLIDS
OUTLET STREAM DISPOSITION	SLUDGE TREATMENT
OVERFLOW STREAM DISPOSITION	THICKENER UNDERFLOW TANK
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	THICKENER
NUMBER	3
NUMBER OF SPARES	1
CONFIGURATION	CIRCULAR
DIMENSIONS - FT	75.0 DIA
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
SHELL SPECIFIC MATERIAL TYPE	AISI 1110
LINER GENERIC MATERIAL TYPE	ORGANIC
LINER SPECIFIC MATERIAL TYPE	GLASS FLAKE-FILLED POLYESTER
FEED STREAM SOURCE	ABSORBER BLEED
FEED STREAM CHARACTERISTICS	5% SOLIDS
OUTLET STREAM CHARACTERISTICS	30-35% SOLIDS
OUTLET STREAM DISPOSITION	VACUUM FILTER
OVERFLOW STREAM DISPOSITION	ME WASH
*** SALEABLE BYPRODUCTS	
NATURE	NONE
DISPOSITION	N/A
*** SLUDGE	
MOISTURE CONTENT - % TOTAL FREE WATER	27.5

ILITY FGD SURVEY: JANUARY - DECEMBER 1988

UESNE LIGHT: PHILLIPS 1-6 (CONT.)

% CASO3 - DRY	4.0
% CASO4 - DRY	10.0
% ASH - DRY	50.0
* TREATMENT	
METHOD	FIXATION
DEVICE	PUG MILL
PROPRIETARY PROCESS	CONVERSION SYSTEMS 'PC7-O-TEC'
INLET FLOW RATE - LITER/S	34.7 (550 GPM)
INLET QUALITY - %	50.0
* DISPOSAL	
NATURE	INTERIM
TYPE	CONCRETE PAD FOR ON-SITE CURING
LOCATION	ON-SITE
SITE TRANSPORTATION METHOD	PIPELINE
SITE TREATMENT	N/A
* DISPOSAL	
NATURE	FINAL
TYPE	LANDFILL
LOCATION	OFF-SITE
SITE TRANSPORTATION METHOD	TRUCK
SITE TREATMENT	CLAY LINING
SITE SERVICE LIFE - YRS	10
* PROCESS CONTROL AND INSTRUMENTATION	
PROCESS STREAM	SLURRY RECIRCULATION STREAM
CHEMICAL PARAMETERS	PH
PHYSICAL VARIABLES	FLOW
CONTROL LEVELS	PH SET 7.7
MONITOR TYPE	UNIVERSAL UNILOC
MONITOR LOCATION	TANGENTIAL NOZZLE AT INLET TO ABSORBER
PROCESS CONTROL MANNER	AUTOMATIC
PROCESS CHEMISTRY MODE	FEEDBACK
* WATER BALANCE	
WATER LOOP TYPE	OPEN
EVAPORATION WATER LOSS - LITER/S	13.9 (220 GPM)
SLUDGE HYDRATION WATER LOSS - LITER/S	1.9 (30 GPM)
SLUDGE INTERSTITIAL WATER LOSS - LITERS/S	3.2 (50 GPM)
POND SEEPAGE/RUNOFF WATER LOSS - LITERS/S	300
RECEIVING WATER STREAM	OHIO RIVER
MAKEUP WATER ADDITION - LITERS/S	22.1 (350 GPM)
SOURCE OF MAKEUP WATER	RIVER
* CHEMICALS AND CONSUMPTION	
FUNCTION	ABSORBENT
NAME	MAGNESIUM-MODIFIED LIME
PRINCIPAL CONSTITUENT	CAO, MGO
SOURCE/SUPPLIER	DRAVO
CONSUMPTION	120 TPD
UTILIZATION - %	85.0
POINT OF ADDITION	SLAKER
* FGD SPARE CAPACITY INDICES	
ABSORBER - %	0.0
MIST ELIMINATOR - %	0.0
FAN - %	0.0
SLAKER - %	0.0
EFFLUENT HOLD TANK - %	0.0
RECIRCULATION PUMP - %	0.0
THICKENER - %	50.0
VACUUM FILTER - %	100.0
* FGD SPARE COMPONENT INDICES	
ABSORBER	0.0
MIST ELIMINATOR	0.0
FAN	0.0
SLAKER	0.0
EFFLUENT HOLD TANK	0.0

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

DUQUESNE LIGHT: PHILLIPS 1-6 (CONT.)

RECIRCULATION PUMP	0.0
THICKENER	0.5
VACUUM FILTER	1.0

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

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

** PROBLEMS/SOLUTIONS/COMMENTS

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

7/73	SYSTEM		81.0	31.2			744		232	
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** PROBLEMS/SOLUTIONS/COMMENTS

SCRUBBING OPERATIONS BEGAN DURING JULY.

8/73	SYSTEM						744			
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9/73	SYSTEM						720			
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10/73	SYSTEM						744			
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11/73	SYSTEM						720			
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12/73	SYSTEM						744			
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1/74	SYSTEM						744			
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2/74	SYSTEM						672			
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3/74	SYSTEM						744			
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** PROBLEMS/SOLUTIONS/COMMENTS

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

4/74	SYSTEM						720			
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5/74	SYSTEM						744			
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6/74	SYSTEM						720			
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7/74	SYSTEM						744			
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LITY FGD SURVEY: JANUARY - DECEMBER 1988

UESNE LIGHT: PHILLIPS 1-6 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

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

'74 SYSTEM

744

** PROBLEMS/SOLUTIONS/COMMENTS

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

'74 SYSTEM

720

'74 SYSTEM

744

'74 SYSTEM

720

** PROBLEMS/SOLUTIONS/COMMENTS

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

DURING THE PERIOD REBRACING OF FAN BLADES WAS IN PROGRESS.

/74 SYSTEM

744

** PROBLEMS/SOLUTIONS/COMMENTS

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

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

THE UTILITY IS AWAITING THE DELIVERY OF SPARE RECYCLE PUMPS.

/75 SYSTEM

744

** PROBLEMS/SOLUTIONS/COMMENTS

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

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

DUE TO COLD WINTER WEATHER AND RELATED CONDITIONS THE SLUDGE STABILIZATION PROCESS REQUIRES A LONGER PERIOD OF TIME. THE SLUDGE PONDS HAVE BEEN FILLING IN 8 TO 9 DAYS. 6 TO 7 DAYS ARE REQUIRED TO EMPTY PONDS. THE CURRENT SLUDGE PRODUCT HAS BEEN A SOUPY CONSISTENCY REQUIRING A CLAMSHELL

DUQUESNE LIGHT: PHILLIPS 1-6 (CONT.)

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

TYPE DREDGE FOR THE POND. PLUGGING IN THE STABILIZING AGENT INJECTION LINES IS THOUGHT TO HAVE CONTRIBUTED TO THE POOR SLUDGE QUALITY.

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

THE REHEATERS HAVE NOT YET BEEN TESTED.

2/75 SYSTEM 672

3/75 SYSTEM 744

** PROBLEMS/SOLUTIONS/COMMENTS

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

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

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

THE UTILITY IS CURRENTLY LOOKING FOR NEW SLUDGE DISPOSAL SITES.

4/75 SYSTEM 720

** PROBLEMS/SOLUTIONS/COMMENTS

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

THE DAMPERS HAVE STILL BEEN SEIZING BECAUSE OF SOLIDS BUILDUP.

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

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

5/75 SYSTEM 744

** PROBLEMS/SOLUTIONS/COMMENTS

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

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

6/75 SYSTEM 720

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM OPERATED ON FLUE GAS FROM ALL SIX BOILERS DURING JUNE. THE TWO-STAGE SCRUBBING TRAIN HAS BEEN OUT OF SERVICE FOR GENERAL MAINTENANCE AND A LINER LEAK REPAIR IN THE FIRST-STAGE SCRUBBER SINCE JUNE 19.

SOME RECYCLE PUMP REPLACEMENTS WERE REQUIRED DURING JUNE.

THE SLUDGE STABILIZATION FACILITY HAS BEEN EXPERIENCING PROBLEMS.

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

QUESNE LIGHT: PHILLIPS 1-6 (CONT.)

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

UNBURNED CARBON FINES ARE CAUSING PLUGGING IN THE SCRUBBING SYSTEMS. THE
 UTILITY HAS BEEN TRYING A WETTING AGENT TO MINIMIZE THE PROBLEM.

PROBLEMS WERE EXPERIENCED WITH THE LIME HANDLING SYSTEM DURING JUNE.

75	101	79.1	53.8			
	201	35.5	24.2			
	301	100.0	71.4			
	401	100.0	97.2			
	SYSTEM	90.5	61.6	744	506	458

** PROBLEMS/SOLUTIONS/COMMENTS

GENERAL MECHANICAL PROBLEMS WERE EXPERIENCED IN JULY.

75	101	97.7	64.2			
	201	100.0	91.7			
	301	66.0	43.4			
	401	65.3	42.9			
	SYSTEM	82.3	60.5	744	489	453

** PROBLEMS/SOLUTIONS/COMMENTS

SCRUBBER UNAVAILABILITY FORCED BOILER NO.6 TO BE RETURNED TO THE SCRUBBER
 BYPASS PATH IN ORDER TO PREVENT LOSS OF BOILER CAPACITY.

PLUGGING AND MAINTENANCE PROBLEMS HAVE BEEN ENCOUNTERED.

EVALUATION OF VARIOUS RECYCLE PUMPS CONTINUED IN AUGUST.

75	101	8.5	7.9			
	201	83.5	77.9			
	301	100.0	95.1			
	401	79.8	74.4			
	SYSTEM	68.0	63.8	720	672	460

75	101	88.4	81.6			
	201	30.1	27.8			
	301	73.5	67.9			
	401	70.9	65.5			
	SYSTEM	65.7	60.7	744	687	451

** PROBLEMS/SOLUTIONS/COMMENTS

IN OCTOBER 1975, THIOSORBIC LIME SCRUBBING WAS INITIATED IN THE PHILLIPS
 SINGLE-STAGE SCRUBBING TRAINS ON AN EXPERIMENTAL BASIS. THE UTILITY IS
 STUDYING COMPLIANCE FEASIBILITY, SO2 REMOVAL EFFICIENCY, AND QUALITY OF
 THE SLUDGE GENERATED BY THE SINGLE-STAGE SCRUBBING TRAINS.

PRESENTLY ONLY 4 OF THE 6 BOILERS ARE TIED INTO THE FGD SYSTEM.

75	101	86.9	86.9			
	201	100.0	100.0			
	301	0.0	0.0			
	401	10.4	10.4			
	SYSTEM	49.3	49.3	720	720	355

75	101	50.8	48.4			
	201	93.2	88.8			
	301	25.7	24.5			
	401	54.4	51.9			
	SYSTEM	56.0	53.4	744	709	397

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

DUQUESNE LIGHT: PHILLIPS 1-6 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

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

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

** PROBLEMS/SOLUTIONS/COMMENTS

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

2/76	101	97.8	94.4			
	201	98.5	95.1			
	301	24.7	23.9			
	401	60.4	58.3			
	SYSTEM	70.4	67.9	696	672	472

3/76	101		93.4			
	201		47.5			
	301		88.6			
	401		62.0			
	SYSTEM		72.9	744		542

4/76	SYSTEM			720		
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** PROBLEMS/SOLUTIONS/COMMENTS

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

THE SLUDGE STABILIZATION PRACTICES ARE STILL CONTINUING AT THIS FACILITY.

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

5/76	SYSTEM			744		
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6/76	SYSTEM			720		
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** PROBLEMS/SOLUTIONS/COMMENTS

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

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

THE UTILITY IS PROCEEDING WITH THE INSTALLATION OF THREE ADDITIONAL LIME STORAGE SILOS AND A THIRD THICKENER.

THE SCRUBBING SYSTEM WAS SHUT DOWN ON JUNE 27 FOR A SCHEDULED FOUR WEEK REPAIR PERIOD. THE MAJORITY OF THE WORK WILL BE CONCENTRATED ON THE STAC ASSOCIATED DUCTWORK AND BOILER DAMPERS. THE ACID BRICK FLUE HAS BEEN LEAKING PARTICULARLY IN THE MORTAR JOINTS AND STEEL BANDS SUPPORTING THE BRICK HAVE BEEN CORRODING. CORROSION HAS OCCURRED IN THE DUCTWORK IN THE EXPANSION JOINT AREA WHERE THE DUCT ENTERS THE STACK.

THE SLUDGE IS CURRENTLY BEING STABILIZED WITH A CALCILOX ADDITION AT A RATE OF APPROXIMATELY 10% BY WEIGHT OF SLUDGE. THE UTILITY IS PLANNING T CONTRACT IUCS FOR SLUDGE STABILIZATION IN APPROXIMATELY A YEAR.

/76 SYSTEM 744
 /76 SYSTEM 744

** PROBLEMS/SOLUTIONS/COMMENTS

THE FOUR-WEEK SYSTEM OVERHAUL WAS COMPLETED JULY 25. THE THREE ADDITIONAL LIME STORAGE SILOS AND THE FOUNDATION FOR THE ADDITIONAL 75-FOOT DIAMETER THICKENER HAVE BEEN INSTALLED. WHEN THE NEW EQUIPMENT IS INSTALLED THE UTILITY WILL SWITCH FROM LIME TO MAGNESIUM PROMOTED (THIOSORBIC) LIME. THE UTILITY HAS SIGNED A LETTER OF INTENT WITH IUCS FOR A LONG-TERM SLUDG TREATMENT SYSTEM.

REPAIRS WERE MADE ON THE TURNING VANES TO THE SCRUBBER MIST ELIMINATORS. THE CEILCOTE COATING ON MODULE 401 FAILED (ORIGINAL COAT ERODED AWAY AND CORROSION HAD SET IN).

REPAIR WORK WAS COMPLETED ON THE EXPANSION JOINT SEAL WHERE THE DUCTWORK TIES INTO THE MAIN STACK.

THE STEEL BANDS AROUND THE INNER STACK STRUCTURE WERE REPAIRED.

THE SCRUBBERS ID FANS WERE OVERHAULED.

THE BOILER EXIT DAMPERS WERE REPAIRED.

REPAIRS WERE MADE TO STOP LEAKING IN THE ACID-BRICK FLUE OF THE MAIN STACK.

/76 SYSTEM 720
 /76 SYSTEM 744

** PROBLEMS/SOLUTIONS/COMMENTS

BOILER NUMBERS 2 THROUGH 6 WERE COUPLED INTO THE SCRUBBING SYSTEM. BOILE NO. 1 IS DOWN FOR OVERHAUL AND REPAIRS. THE IUCS INTERIM SLUDGE PROCESS- ING PLANT IS UNDER CONSTRUCTION AND WILL BE IN SERVICE BY DECEMBER 1976. THE TEMPORARY FACILITIES WILL PROCESS THE THICKENER UNDERFLOW AND PONDED SLUDGE UNTIL THE POND IS DEPLETED OF SLUDGE AND THE PERMANENT FACILITY HA BEEN INSTALLED. SCRUBBING OPERATIONS ARE STILL PROCEEDING IN AN OPEN WA- TER LOOP MODE WITH PART OF THE THICKENER OVERFLOW BEING DIVERTED TO THE ASH POND. BECAUSE BOTH THE BEAVER VALLEY AND BRUCE MANSFIELD STATIONS AR FULLY OPERATIONAL, THIS STATION HAS BEEN RELEGATED TO PEAK LOAD OPERA- TIONS. GENERAL LOAD OPERATIONS ARE FULL LOAD CAPACITY IN THE DAYTIME AND 50 TO 67% LOAD REDUCTION AT NIGHT.

TOTAL SCRUBBER HOURS: 23,274
 TOTAL BOILER HOURS: 83,642
 TOTAL SCRUBBER OUTAGE TIME: 5,500
 TOTAL SCRUBBER AVAILABLE

THE FIGURES AT THE LEFT WERE COMPILE BY THE UTILITY FOR SYSTEM OPERATIONS FOR THE PERIOD FOLLOWING START-UP IN JULY 1973 INCLUSIVE TO OCTOBER 1976.

DUQUESNE LIGHT: PHILLIPS 1-6 (CONT.)

-----PERFORMANCE DATA-----									
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER BOILER HOURS	FGD HOURS	CAP. FACTOR
HOURS: 23,274						THE TOTAL SCRUBBER HOURS VALUE IN-			
AVERAGE MW LOAD/SCRUBBER OPERATION						CLUDES OPERATION TIME WHEN ONE OR			
HOUR: 243						MORE OF THE MODULES WERE IN SERVICE.			
TOTAL OPERABILITY INDEX: 28%						TOTAL BOILER AND UNAVAILABILITY VAL-			
TOTAL RELIABILITY INDEX: 81%						UES APPLY FOR ALL THE CORRESPONDING			
						UNITS. THE TOTAL SCRUBBER AVAILAB-			
						ITY INDEX INCLUDES THE TIME WHEN ONE			
						OR MORE MODULES WERE AVAILABLE FOR			
						SERVICE.			

11/76 SYSTEM

720

12/76 SYSTEM

744

** PROBLEMS/SOLUTIONS/COMMENTS

THE IUCS SLUDGE STABILIZATION FACILITY AT PHILLIPS WAS INSTALLED AND STARTED UP IN DECEMBER. THE FACILITY INCLUDES EQUIPMENT FOR DEWATERING, ESP-COLLECTED FLYASH ADDITION AND TRANSPORT TO THE OFF-SITE LANDFILL.

THE RECYCLE PUMP EVALUATION IS CONTINUING. AFTER 2500 HOURS OF OPERATION THE PUMPS USING CARBORUNDUM WEAR RINGS AND CD4 MCU IMPELLERS WERE HOLDING UP WELL. THEY HAVE NOW ACCUMULATED 2800 HOURS OF OPERATION (THEY WERE INSPECTED AFTER 2500 HOURS). AFTER 2900 HOURS OF OPERATION PUMPS USING CARBORUNDUM WEAR RINGS AND TITANIUM IMPELLERS WERE PERFORMING WELL.

BOILERS 2 THROUGH 6 WERE COUPLED INTO THE SYSTEM THROUGHOUT THE PERIOD. BOILER 1 REMAINED SHUT DOWN.

THE FIRST NEW SLAKER (PASTE TYPE SLAKER), ONE OF FOUR NEW UNITS CAME ON LINE DURING THE PERIOD. HIGHER STOICHIOMETRIC RATIOS, HIGHER PH VALUES AND INCREASED SO2 REMOVAL EFFICIENCY RESULTED IN THE SYSTEMS.

IN ORDER TO ENHANCE SETTLING IN THE TWO 75-FOOT DIAMETER THICKENERS A POLYELECTROLYTE MATERIAL WILL BE ADDED ON A TEMPORARY BASIS. WHEN THE NEW 75-FOOT THICKENER IS BROUGHT ON LINE THE POLYELECTROLYTE ADDITION IS EXPECTED TO BE TERMINATED.

THE CONTRACT WITH DRAVO FOR THIOSORBIC LIME (MG-PROMOTED LIME) HAS BEEN FINALIZED. THE SWITCH TO MAGNESIUM PROMOTED LIME WILL TAKE PLACE WHEN THE LAST THICKENER IS COUPLED INTO THE SYSTEM.

THE VENTURIS ARE ENCOUNTERING A GREAT DEAL OF SCALING. PRESSURE DROPS ACROSS THE VENTURIS ARE REGISTERING TWICE THE NORMAL PRESSURE DROP AT 12 INCHES H2O(6 INCHES H2O IS DESIGN).

1/77 SYSTEM

744

2/77 SYSTEM

672

** PROBLEMS/SOLUTIONS/COMMENTS

1977 FULL COMPLIANCE OPERATIONS WILL INCLUDE 83% SO2 REMOVAL FOR 2% SULFU COAL UTILIZING THIOSORBIC LIME (6-12% MG) AND FIXATING THE SCRUBBER WASTE WITH THE IUCS POZ-O-TEC METHOD. THE FIXATED MATTER WILL BE HAULED AWAY T AN OFF-SITE DISPOSAL AND LANDFILL. IUCS HAS BEEN AWARDED A TEN YEAR CONTRACT FOR THE USE OF THIS METHOD.

3/77 SYSTEM

744

4/77 SYSTEM

720

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

**** PROBLEMS/SOLUTIONS/COMMENTS**

ALL SIX BOILERS ARE COUPLED INTO THE FGD SYSTEM.

THE RECYCLE PUMP EVALUATION IS CONTINUING. THE CARBORUNDUM IMPELLERS AND WEAR RINGS ARE PERFORMING WELL AFTER 4000 OPERATING HOURS.

CONSTRUCTION OF THE THICKENERS AND LIME FEEDERS IS STILL CONTINUING. FULL PLANT COMPLIANCE SHOULD OCCUR BY DECEMBER 1977 WHEN THE NEW THICKENERS AND SLAKERS COME ON LINE.

THE IUCS FACILITY IS JUST FILTERING OUT WATER. NO FIXATIVE IS BEING ADDED. THE WASTE ARE BEING HAULED AWAY TO AN OFF-SITE LANDFILL ONE MILE FROM THE STATION.

SO2 AND PARTICULATE MATTER REMOVAL EFFICIENCIES ARE 50 AND 99+% RESPECTIVELY.

1975 THIOSORBIC LIME TESTS SHOWS THAT 8% MGO IN THE LIME WAS OPTIMUM FOR SO2 REMOVAL BUT IT IS POSSIBLE TO GO AS HIGH AS 12% MGO. LIME ARRIVING AT PHILLIPS WILL HAVE A 6% MGO CONCENTRATION. IT WILL BE POSSIBLE TO BLEND THE LIME TO ACHIEVE HIGHER MGO AT THE STATION IF NECESSARY.

1/77 SYSTEM

720

**** PROBLEMS/SOLUTIONS/COMMENTS**

DAMPER AND MIST ELIMINATOR REPAIRS WILL BE CORRECTED DURING THE NEXT SCHEDULED OUTAGE. OVERALL SCRUBBER OPERABILITY IS ABOUT 75%.

THIOSORBIC LIME TESTS BEGAN IN LATE MAY BUT LASTED ONLY ABOUT ONE WEEK.

THE SCRUBBER SYSTEM WAS SHUT DOWN FOR THREE TO FOUR DAYS IN MAY DUE TO LEAKING IN THE WET DUCT HEADER THAT LEADS TO THE STACK. WHEN THE LEAK WAS REPAIRED SCRUBBING OPERATIONS BEGAN AGAIN ON FLUE GAS FROM FOUR BOILERS.

WHILE FIXING A DUCT LEAK INSPECTION OF OTHER COMPONENTS REVEALED THAT THE BOILER EXIT DAMPERS WERE ERODING.

ONE OF THE MODULE 201 EXTERNAL MIST ELIMINATORS WAS SEVERLY ERODED AND PLUGGED.

THE INTERIM SLUDGE DISPOSAL SYSTEM IS STILL OPERATIONAL. THE PERMANENT SLUDGE DISPOSAL FACILITY IS ON SCHEDULE FOR THE DECEMBER 1977 COMPLETION DATE.

THE CARBORUNDUM WEAR RINGS AND IMPELLERS WERE CONTINUING TO PERFORM WELL AFTER 5000 OPERATING HOURS.

5/77 SYSTEM

720

7/77 SYSTEM

744

**** PROBLEMS/SOLUTIONS/COMMENTS**

ALL SIX BOILERS ARE COUPLED INTO THE SCRUBBER PLANT. FLUE GAS FROM FIVE OF THESE UNITS IS BEING TREATED BY THE SCRUBBERS. ONLY FOUR OF THE SIX BOILERS ARE ACTUALLY OPERATING BECAUSE OF THE CURRENT TURBINE REPAIR OUTAGE. OPERATIONS ARE PROCEEDING WITH ONE SCRUBBING TRAIN OUT OF SERVICE AT ALL TIMES FOR MAINTENANCE AND CLEANOUT. SO2 REMOVAL EFFICIENCY IS APPROXIMATELY 50%.

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

DUQUESNE LIGHT: PHILLIPS 1-6 (CONT.)

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

BOILER 6 HAS BEEN OUT OF SERVICE WHILE TURBINE REPAIRS ARE BEING MADE.

THE RECYCLE PUMP EVALUATION STUDY CONTINUED DURING THE PERIOD. COMPONENT BEING EVALUATED INCLUDE: CARBORUNDUM IMPELLERS, CARBORUNDUM WEAR RINGS, TITANIUM IMPELLERS, 317SS WEAR RINGS AND STELLITE TIPPED IMPELLERS.

A THIOSORBIC LIME TEST WAS PREMATURELY TERMINATED BECAUSE OF SOME MINOR SLAKER/FEEDER PROBLEMS. HIGH CALCIUM VIRGIN LIME WAS UTILIZED DURING THE MAJORITY OF OPERATIONS THROUGHOUT THE PERIOD.

8/77 SYSTEM

744

9/77 SYSTEM

720

** PROBLEMS/SOLUTIONS/COMMENTS

LIME HANDLING AND SOLID WASTE DISPOSAL FACILITIES WERE BEING SCALED UP TO HANDLE FULL CAPACITY AND A THIRD THICKENER WAS INSTALLED AND BROUGHT INTO SERVICE DURING THIS REPORT PERIOD. THE IUCS SYSTEM IS STILL PERFORMING INTERIM PHASE OPERATIONS. WASTE WATER IS BEING MIXED WITH FLYASH AND DISPOSED WITHOUT FIXATIVE ADDITION. CURRENT CONSTRUCTION WORK IS EXPECTED TO BE COMPLETED BY THE END OF JANUARY WHEN ALL SIX BOILERS WILL BE BACK ON LINE FOR A TWO MONTH TEST PERIOD. THIOSORBIC LIME IS STILL BEING TESTED. RESULTS ARE NOT YET AVAILABLE. THE FGD SYSTEM WILL BE DOWN FOR THE FIRST WEEKEND OF NOVEMBER. THE SYSTEM WILL ALSO BE CHECKED FOR MAIN DUCT LEAKS AT THIS TIME. THE SCRUBBER AND STACK LININGS AND RECYCLE PUMPS WILL BE THOROUGHLY CHECKED AS WELL. NECESSARY REPLACEMENTS AND REPAIRS WILL BE CARRIED OUT. CURRENT SO2 REMOVAL EFFICIENCY IS 50%. BY EARLY APRIL 1978 THE SYSTEM IS EXPECTED TO REACH COMPLIANCE WITH AN SO2 REMOVAL EFFICIENCY OF 83%.

10/77 101
 201
 301
 401
 SYSTEM

92.6
 4.0
 88.3
 87.7

92.6
 4.0
 88.3
 87.7

744 744 507

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE 101 WAS DOWN A TOTAL OF 113 HOURS IN OCTOBER FOR REGULAR MAINTENANCE AND REPAIRS.

MODULE 201 WAS PUT IN SERVICE ON OCTOBER 26 AFTER EXTENSIVE CLEAN UP. ALSO REPAIRS TO THE ID FAN HOUSING RUBBER LINING WERE MADE AND THE FAN WAS BALANCED.

MODULE 301 WAS DOWN A TOTAL OF 57 HOURS IN OCTOBER FOR MAINTENANCE AND REPAIRS.

MODULE 401 WAS DOWN A TOTAL OF 36 HOURS IN OCTOBER FOR REPAIR OF HOLES IN THE ID FAN LINING AND FOR THE TIE-IN OF THE THICKENER BLEED LINE.

11/77 101
 201
 301
 401
 SYSTEM

92.1
 91.6
 28.1
 56.3
 67.0

92.1
 91.6
 28.1
 56.3
 67.0

720 720 483

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE SHUTDOWN OUTLET DUCT LEAKS WERE REPAIRED.

BOILER EXIT DAMPERS WERE REPLACED. THE OLD DAMPERS FAILED DUE TO FLYASH EROSION.

LITY FGD SURVEY: JANUARY - DECEMBER 1988

UESNE LIGHT: PHILLIPS 1-6 (CONT.)

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

CORROSION OF STEEL BANDS IN STACK WAS DISCOVERED DURING THE PERIOD. THE CORROSION IS A RESULT OF CONDENSED MOISTURE SEEPING THROUGH THE MORTAR.

SLUDGE HANDLING PROBLEMS HAVE OCCURRED BECAUSE DEWATERING OPERATIONS ARE NOT WORKING PROPERLY.

THE RESULTS FROM THIOSORBIC LIME USE CAN NOT YET BE QUANTIFIED DUE TO LIME FEED SYSTEM PROBLEMS.

LIME FEED SYSTEM PROBLEMS OCCURRED OVER THE PERIOD.

THE MIST ELIMINATORS WERE CLEANED DURING NOVEMBER.

1977	SYSTEM				744		
1978	101	84.3		84.3			
	201	77.2		77.2			
	301	0.0		0.0			
	401	65.1		65.1			
	SYSTEM	56.6		56.7	744	744	421

** PROBLEMS/SOLUTIONS/COMMENTS

CUMULATIVE HOURS FOR JANUARY 1, 1977 THROUGH JANUARY 8, 1978 WERE 22391 FOR MODULE 101, 20998 FOR MODULE 201, 22229 FOR MODULE 301 AND 22259 FOR MODULE 401.

SCRUBBER TRAIN 301 WAS DOWN FOR AN OVERHAUL FROM NOVEMBER 17 TO FEBRUARY 6, 1978 WHEN IT WAS RETURNED TO SERVICE.

SCRUBBER TRAIN 401 WAS REMOVED FROM SERVICE ON FEBRUARY 6.

THE IUCS INTERIM SLUDGE TREATMENT SYSTEM HAS SOME DEWATERING PROBLEMS. DURING DECEMBER PHILLIPS EXPERIENCED POOR SLUDGE REMOVAL. THE IUCS PLANT IS WORKING ON A PART TIME BASIS. FULL OPERATIONS ARE EXPECTED LATE THIS SPRING. THE POOR QUALITY SLUDGE IS SENT TO AN EMERGENCY POND AND THEN RE-CIRCULATED BACK TO THE THICKENER.

TESTING WITH THIOSORBIC LIME AT 5% MGO HAS SHOWN THAT THE MGO CONCENTRATION IS NOT GREAT ENOUGH TO EFFECT ADEQUATE SO2 REMOVAL ON A SINGLE STAGE SCRUBBER. THE UTILITY IS GOING TO TEST AT A GREATER MGO CONCENTRATION BY STARTING AT 10% AND THEN DROPPING BACK UNTIL THE CONCENTRATION IS SATISFACTORY. THIS TESTING, AS WELL AS SCRUBBER OPERATIONS, HAVE, HOWEVER, BEEN HAMPERED BY LOW LOADS AS A RESULT OF THE COAL STRIKE.

AN OUTAGE HAS BEEN SCHEDULED AT PHILLIPS TO REPLACE THE CARBON STEEL SUPPORT BANDS IN THE STACK WITH STAINLESS STEEL BANDS.

1978	101	43.5		31.1			
	201	58.5		41.8			
	301	3.8		2.7			
	401	31.7		22.6			
	SYSTEM	34.4		24.6	672	480	167
1978	SYSTEM	0.0		0.0	744	0	0

** PROBLEMS/SOLUTIONS/COMMENTS

AN OUTAGE OCCURRED BETWEEN JANUARY 6 AND JANUARY 8 WHEN THE STACK DRAIN LEAKS WERE REPAIRED BY SANDBLASTING THE OUTER WALL AND REPLACING THE CARBON STEEL BANDS WITH STAINLESS STEEL BANDS.

THE SYSTEM WAS SHUTDOWN ON FEBRUARY 11 DUE TO THE COAL SHORTAGE. THE OUTAGE CONTINUED THROUGH MARCH AND THE SYSTEM IS SCHEDULED TO BE ON LINE BY

DUQUESNE LIGHT: PHILLIPS 1-6 (CONT.)

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

APRIL 15. DURING THE OUTAGE A NUMBER OF REPAIRS AND MODIFICATIONS WERE MADE.

THE BOILER EXIT DAMPERS WERE LINED WITH 316 SS ON AREAS OF HIGH EROSION CAUSED BY FLYASH IMPINGEMENT.

EXPANSION JOINTS ON THE INLET DUCTWORK WERE SHIELDED BY METAL PLATES WHICH WERE WELDED AT ONE END.

NUMEROUS HOLES IN THE WET GAS DUCT WORK WERE REPAIRED AND THE DUCTS WERE RELINED WITH CEILCOTE.

THE VENTURI THROAT DAMPERS WERE CLEANED ON ALL THE SCRUBBERS.

INTERNAL MIST ELIMINATORS WERE CLEANED. THE EXTERNAL MIST ELIMINATORS, WHICH ARE BADLY DETERIORATED, MAY BE REPLACED.

THE STACK ACID BRICK FLUE WAS INSPECTED AND SOME BRICKS WERE REPLACED AT THE TOP OF THE STACK.

CONSTRUCTION WORK ON ADDITIONAL EQUIPMENT SUCH AS THE THICKENER AND SILOS IS ALMOST COMPLETE. IT WAS NOTED THAT THE CEILCOTE LINER COROLINE 505AR HAS HELD UP WELL OVER THREE YEARS ON THE CONICAL APEX OF MODULE 401.

4/78 SYSTEM

720 528

5/78 SYSTEM

744 744

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM CAME BACK ON LINE AFTER THE COAL STRIKE IN LATE MARCH. IT IS NOT OPERATING AT FULL LOAD BECAUSE THE NO. 6 BOILER IS STILL OUT AND SHOULD BE BACK ON LINE IN MID-JULY. COMPLIANCE TESTS WILL TAKE PLACE IN JULY, AFTER BOILER 6 IS BACK ON LINE, TO SEE IF THE SYSTEM IS MEETING THE 83% SO2 REMOVAL REQUIREMENT FOR 2% SULFUR COAL. THERE WERE NO HOURS REPORTED FOR THIS PERIOD BECAUSE OF PRELIMINARY TESTING BEING CONDUCTING IN PREPARATION FOR THE COMPLIANCE TESTS. SO FAR, TESTS INDICATE THAT THE SYSTEM WILL COMPLY WITH THE REQUIRED STANDARDS. THE OPERABILITY FOR ALL FOUR TRAINS WAS BETWEEN 65 AND 75%.

6/78 SYSTEM

720 720

7/78

101

48.3

48.3

48.3

201

43.9

43.9

43.9

301

85.7

78.7

78.7

401

82.5

76.0

76.0

SYSTEM

65.1

61.7

61.7

744

744

459

** PROBLEMS/SOLUTIONS/COMMENTS

THE INTERNAL MIST ELIMINATOR ON MODULE 201 WAS REPLACED AND THE MODULE 30 MIST ELIMINATORS WERE CLEANED OVER THE PERIOD.

THE FGD SYSTEM HAS ACCUMULATED APPROXIMATELY 24000 HOURS OF OPERATION ON ALL FOUR MODULES SINCE START-UP.

WATER BALANCE PROBLEMS HAVE CONTRIBUTED TO THE OCCURRENCE OF LOW PH, RESULTING IN MIST ELIMINATOR PLUGGING.

THE MIST ELIMINATOR PLUGGING IS ALSO RELATED TO LOW PH RESULTING FROM LIM HANDLING AND SLURRY PREPARATION SYSTEM FAILURE.

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

ILITY FGD SURVEY: JANUARY - DECEMBER 1988

QUESNE LIGHT: PHILLIPS 1-6 (CONT.)

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

THE MIST ELIMINATORS.

THE LIME HANDLING FACILITY DOES NOT INCLUDE A GRIT REMOVAL STAGE. GRIT IS CAUSING PLUGGING IN THE SLURRY HANDLING SYSTEM AND MIXING EQUIPMENT.

PROCESS CHEMISTRY CONTROL IS A CHRONIC PROBLEM AT PHILLIPS DUE IN PART TO TO WATER BALANCE AND LIME HANDLING EQUIPMENT.

WHEN WATER BALANCE IS ACHIEVED THE FGD SYSTEM EXPERIENCES A BUILD UP OF SALTS.

/78	101	100.0	97.3	97.3			
	201	73.2	71.9	71.9			
	301	100.0	88.8	88.8			
	401	92.4	85.0	85.0			
	SYSTEM	91.4	85.8	85.8	744	744	638

** PROBLEMS/SOLUTIONS/COMMENTS

THE RUBBER LINING IN MODULE 101 WAS REPAIRED.

HIGH PRESSURE WATER CLEANING WAS PERFORMED ON MODULES 101 AND 401.

/78	101	63.7	62.4	62.4			
	201	82.7	75.6	75.6			
	301	83.9	67.5	67.5			
	401	65.6	55.7	55.7			
	SYSTEM	74.0	65.3	65.3	720	720	470

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE AUGUST-SEPTEMBER PERIOD MIST ELIMINATOR CLEANING TOOK PLACE IN ORDER TO CORRECT THE PLUGGING PROBLEM.

IN AUGUST THE INTERNAL MIST ELIMINATOR ON MODULE 201 WAS REPLACED.

THE LIME MIXING BASIN HAD TO BE SHUT DOWN OVER A WEEKEND SO THAT EXCESSIVE GRIT AND SOLID PARTICLES THAT HAD BUILT UP COULD BE CLEANED OUT.

HIGH PRESSURE WATER CLEANING WAS PERFORMED ON MODULES 101 AND 401.

THE RUBBER LINING IN MODULE 101 WAS REPAIRED.

A MAJOR PROBLEM AREA DURING THE PERIOD WAS CAUSED BY INSUFFICIENT SUPPLIES OF DRY FLYASH TO MIX WITH THE SLUDGE. AS A RESULT THE SLUDGE HAS BEEN LEAKING OUT OF THE TRANSPORT TRUCKS WHILE IN TRANSIT TO THE FINAL DISPOSAL SITE. APPARENTLY NOT ENOUGH FLYASH IS BEING COLLECTED WITH THE PRESENT SYSTEM.

/78	101	100.0	96.1	96.1			
	201	97.7	87.5	87.5			
	301	95.3	87.9	87.9			
	401	4.8	2.2	2.2			
	SYSTEM	74.5	68.4	68.4	744	744	509
/78	101	44.0	41.1	41.1			
	201	100.0	100.0	100.0			
	301	91.7	88.9	88.9			
	401	71.3	69.0	69.0			
	SYSTEM	76.8	74.8	74.8	720	720	538

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

DUQUESNE LIGHT: PHILLIPS 1-6 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

SO2 AND PARTICULATE MATTER REMOVAL EFFICIENCY TESTS INDICATE THAT THE STATION NOW MEETS STATE STANDARDS.

THE FGD SYSTEM IS EXPERIENCING A LARGE AMOUNT OF SCALING BECAUSE OF THE HIGH EXCESS AIR ENTERING THE SYSTEM FROM THE BOILERS OXIDIZING THE SOFT SULFITE TO SULFATE ON THE SCRUBBER INTERNALS.

12/78	101	91.7	90.8	90.8			
	201	98.0	88.1	88.1			
	301	30.3	27.8	27.8			
	401	90.4	87.5	87.5			
	SYSTEM	77.6	73.6	73.6	744	744	547

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE PERIOD A LACK OF FLYASH FOR MIXING WITH SLUDGE RESULTED IN A WET SLUDGE PRODUCT THAT MUST BE LEFT ON SITE TO DRY BEFORE TRANSPORT TO THE LANDFILL.

1/79	101	89.0	86.8	86.8			
	201	77.9	69.2	69.2			
	301	50.1	50.0	50.0			
	401	86.1	83.7	83.7			
	SYSTEM	75.8	72.4	72.4	744	744	539

2/79	101	38.9	38.9	38.9			
	201	72.1	72.1	72.1			
	301	88.3	88.3	88.3			
	401	100.0	100.0	100.0			
	SYSTEM	74.8	74.8	74.8	672	672	503

** PROBLEMS/SOLUTIONS/COMMENTS

EXCESSIVE SCALING IN THE MODULE 101 EXIT DUCT CAUSED SUPPORT COLUMNS TO COLLAPSE. THE SCALE WAS REMOVED AND THE SUPPORT COLUMNS WERE SHORED UP.

3/79	101	0.0	0.0	0.0			
	201	96.6	96.3	96.3			
	301	97.6	88.0	88.0			
	401	100.0	100.0	100.0			
	SYSTEM	73.6	71.1	71.1	744	744	529

4/79	101	89.9	86.8	86.8			
	201	5.9	5.9	5.9			
	301	97.6	85.0	85.0			
	401	89.0	84.9	84.9			
	SYSTEM	70.6	65.7	65.7	720	720	473

5/79	101	100.0	100.0	100.0			
	201	0.0	0.0	0.0			
	301	99.3	96.6	96.6			
	401	99.4	99.2	99.2			
	SYSTEM	74.7	74.0	74.0	744	744	550

6/79	101	70.8	70.5	70.5			
	201	28.8	22.2	22.2			
	301	85.6	83.7	83.7			
	401	85.5	77.2	77.2			
	SYSTEM	67.7	63.4	63.4	720	720	457

7/79	101	100.0	98.6	98.6			
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UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

QUESNE LIGHT: PHILLIPS 1-6 (CONT.)

PERIOD	MODULE	PERFORMANCE DATA				% REMOVAL SO2	PART. HOURS	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
		AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION						
	201	98.5	95.8		95.8						
	301	72.7	71.4		71.4						
	401	29.9	25.5		25.5						
	SYSTEM	75.3	72.8		72.8			744	744	542	
/79	101	100.0	100.0		100.0						
	201	97.6	89.5		89.5						
	301	100.0	89.3		89.3						
	401	0.0	0.0		0.0						
	SYSTEM	74.4	69.7		69.7			744	744	519	
/79	101	88.8	81.8	88.8	81.8						
	201	94.4	80.3	93.9	80.3						
	301	99.6	85.5	99.6	85.5						
	401	0.0	0.0	0.0	0.0						
	SYSTEM	70.8	61.9	70.4	61.9			720	720	446	
/79	101	99.4	97.0	99.3	97.0						
	201	86.5	86.6	86.6	86.6						
	301	93.8	93.0	93.7	93.0						
	401	0.0	0.0	0.0	0.0						
	SYSTEM	69.9	69.2	69.9	69.2			744	696	515	
/79	101	53.0	50.7	51.9	50.7						
	201	99.0	99.0	99.0	99.0						
	301	83.6	83.6	83.6	83.6						
	401	11.5	11.5	11.6	11.5						
	SYSTEM	61.8	61.2	61.5	61.2			720	720	441	
/79	101	0.0	0.0	0.0	0.0						
	201	100.0	98.6	100.0	98.6						
	301	90.7	89.6	90.6	89.6						
	401	77.7	72.9	76.6	72.9						
	SYSTEM	67.1	65.3	66.8	65.3			744	744	486	

** PROBLEMS/SOLUTIONS/COMMENTS

PRESENTLY THE UTILITY HAS BEEN ADDING SODIUM THIOSULFATE TO THE LIME TO PREVENT SCALE FORMATION. THIS PROCESS HAS IMPROVED SO2 COLLECTION AS WELL.

THE SCRUBBER FAN HOUSING LINERS ARE BEING REPLACED.

THE MECHANICAL COLLECTORS ARE BEING UPGRADED TO IMPROVE THE QUALITY OF THE WET SLUDGE.

/80	101	0.0	0.0	0.0	0.0					
	201	98.1	93.3	98.0	93.3					
	301	100.0	99.0	100.0	99.0					
	401	97.6	95.8	97.5	95.8					
	SYSTEM	73.9	72.0	73.9	72.0		744	744	536	
/80	101	13.7	13.7	13.7	13.7					
	201	91.6	91.6	91.7	91.6					
	301	86.2	84.6	86.0	84.6					
	401	94.2	90.5	94.0	90.5					
	SYSTEM	71.4	70.1	71.4	70.1		696	696	488	

** PROBLEMS/SOLUTIONS/COMMENTS

SODIUM THIOSULFATE ADDITION CONTINUED THROUGH THE FIRST QUARTER RESULTING IN A INCIDENCE OF SIGNIFICANTLY REDUCED MIST ELIMINATOR SCALING. 2000-5000 HOURS OF OPERATION HAVE BEEN LOGGED WITHOUT MIST ELIMINATOR SCALE ACCUMULATION. THE UTILITY REPORTED THAT SO2 REMOVAL EFFICIENCY HAS

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

DUQUESNE LIGHT: PHILLIPS 1-6 (CONT.)

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

IMPROVED 3% DUE TO THE SODIUM THIOSULFATE ADDITION. THE UTILITY IS LOOKING INTO SODIUM THIOSULFATE ADDITION AT ELRAMA.

THE FAN RUBBER LINERS HAVE BEEN A CONTINUAL PROBLEM. TWO FANS WILL BE REPLACED WITH INCONEL THE NEXT TIME THE RUBBER LINERS FAIL.

THE PHILLIPS FGD SYSTEM HAD A SYSTEM AVAILABILITY OF 71.8% FOR THE YEAR 1979.

3/80	101	94.7	84.0	94.0	84.0			
	201	59.0	53.9	56.8	53.9			
	301	48.4	40.3	43.8	40.3			
	401	95.4	95.3	99.8	95.3			
	SYSTEM	60.3	54.7	73.6	54.7	744	744	407

** PROBLEMS/SOLUTIONS/COMMENTS

PROBLEMS WERE ENCOUNTERED WITH THE MODULE 101 ID FAN. THE MODULE WAS TAKEN OFF LINE SO THE ID FAN COULD BE BALANCED.

PROBLEMS WERE ENCOUNTERED WITH THE HUB BOLTS ON THE ID FAN OF MODULE 201, CAUSING THE MODULE TO COME OFF LINE FOR 11 DAYS.

THE RUBBER LINING ON THE ID FAN HOUSING OF MODULE 301 NEEDED REPAIR DURING MARCH.

MODULE 401 WAS TAKEN OFF LINE FOR APPROXIMATELY 2 HOURS SO REPAIRS COULD BE MADE ON THE SCRUBBER MAKE-UP VALVES.

4/80	101	92.6	89.4	92.4	89.4			
	201	14.2	10.0	10.5	10.0			
	301	99.2	99.0	99.8	99.0			
	401	95.8	94.6	98.6	94.6			
	SYSTEM	96.9	73.3	75.6	73.3	720	720	527

** PROBLEMS/SOLUTIONS/COMMENTS

ON APRIL 5 MODULE 101 WAS TAKEN OFF LINE DUE TO ID FAN BEARING PROBLEMS. LATER IN THE MONTH THE MODULE WAS SHUTDOWN DUE TO AN ID FAN INSTRUMENTATION PRESSURE SWITCH PROBLEM.

TOWARDS THE LATTER PART OF APRIL, MODULE 201 WAS SHUTDOWN DUE TO ID FAN BEARING PROBLEMS. THIS PROBLEM WAS CORRECTED BY BALANCING THE FAN.

MODULE 301 WAS REMOVED FROM OPERATION ON APRIL 11 DUE TO AN ID FAN MOTOR MALFUNCTION.

THE RECYCLE PUMP PACKING ON MODULE 401 NEEDED TO BE REPLACED DURING THE MONTH.

5/80	101	67.5	53.9	62.3	53.9			
	201	81.6	69.0	78.9	69.0			
	301	91.7	73.1	89.8	73.1			
	401	92.2	75.9	90.6	75.9			
	SYSTEM	83.2	68.0	80.2	68.0	744	744	506

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE 101 CAME OFF LINE IN MAY SO REPAIRS COULD BE MADE ON THE CONTROL DAMPER AND TO INSTRUMENTATION.

DURING MAY MODULE 201 EXPERIENCED PROBLEMS WITH THE MIST ELIMINATOR AND THE ID FAN. THE MODULE WAS TAKEN OFF LINE FOR APPROXIMATELY TWO DAYS TO WASH THE MISTELIMINATOR INTERNALS AND ONE DAY TO REPAIR THE ID FAN BEARING

LITY FGD SURVEY: JANUARY - DECEMBER 1988

UESNE LIGHT: PHILLIPS 1-6 (CONT.)

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

MODULE 301 EXPERIENCED ID FAN PROBLEMS AND WAS TAKEN OFF LINE WHILE THE ID FAN WAS BALANCED.

MODULE 401 WAS SHUTDOWN APPROXIMATELY 58 HOURS SO THAT THE ID FAN CONTROL DAMPERS COULD BE INSPECTED.

'80	101	97.1	86.3	96.5	80.5				
	201	100.0	81.7	100.0	76.2				
	301	75.5	69.4	72.6	64.8				
	401	100.0	76.5	100.0	71.4				
	SYSTEM	93.2	78.5	91.5	73.2	720	672	527	55.3

** PROBLEMS/SOLUTIONS/COMMENTS

THE MODULE 101 MIST ELIMINATOR WAS CLEANED DURING JUNE.

DURING JUNE MODULE 301 WAS DOWN FOR ID FAN HOUSING REPAIRS (RUBBER LINING) CAUSING APPROXIMATELY 176 HOURS DOWN TIME.

'80	101	94.0	86.2	93.5	86.2				
	201	100.0	94.7	100.0	94.7				
	301	94.7	84.1	94.0	84.1				
	401	91.1	83.5	90.3	83.5				
	SYSTEM	94.9	87.1	94.5	87.1	744	744	648	71.4

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JULY THE RECYCLE PUMP IMPELLERS WERE REPLACED ON ALL THE MODULES EXCEPT FOR MODULE 201.

'80	101	91.1	72.9	90.6	72.9				
	201	96.9	85.8	96.5	85.8				
	301	87.6	85.3	89.6	85.3				
	401	92.3	86.1	91.8	86.1				
	SYSTEM	92.0	82.5	91.5	82.5	744	744	614	58.5

** PROBLEMS/SOLUTIONS/COMMENTS

DURING AUGUST MODULE 401 EXPERIENCED PACKING PROBLEMS WITH THE RECYCLE PUMP.

DURING THE PERIOD OF JUNE THROUGH AUGUST THE RUBBER LININGS ON THE FAN HOUSINGS WERE REPAIRED.

'80	101	55.8	55.8	60.9	55.8				
	201	46.1	41.7	43.6	41.7				
	301	54.9	46.2	50.6	46.2				
	401	60.6	32.9	45.5	32.9				
	SYSTEM	54.4	47.3	47.0	44.2	720	720	318	30.1

** PROBLEMS/SOLUTIONS/COMMENTS

ON SEPTEMBER 20 THE ENTIRE PLANT WAS SHUTDOWN FOR A SCRUBBER INSPECTION. THE INSPECTION REVEALED THAT THERE IS EXTENSIVE MORTAR DETERIORATION IN THE STACK AND THAT REPAIRS WILL BE NECESSARY WITHIN THE NEXT TWO YEARS.

THE INSPECTION LASTED UNTIL OCTOBER 1 DUE TO THE NECESSARY REPAIR OF A DUCT EXPANSION JOINT AND THE REPAIR OF THE UPPER PORTION OF THE STACK JOINTS.

'80	101	94.2	94.2	94.2	94.2				
	201	93.9	90.1	93.5	90.1				
	301	4.0	4.0	4.0	4.0				

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

DUQUESNE LIGHT: PHILLIPS 1-6 (CONT.)

-----PERFORMANCE DATA-----										
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART. HOURS	PER BOILER HOURS	FGD HOURS	CAP. FACTOR
	401	93.8	92.6	93.6	92.6					
	SYSTEM	71.5	70.2	71.3	70.2		744	720	523	58.2
** PROBLEMS/SOLUTIONS/COMMENTS										
DURING OCTOBER SCRUBBER MODULES 301 AND 401 WERE RELINED WITH CEILCOTE CORALINE 505 AR LINERS.										
11/80	101	51.5	50.8	51.2	50.8					
	201	100.0	99.9	99.9	99.9					
	301	95.3	93.5	95.2	93.5					
	401	92.3	91.6	92.2	91.6					
	SYSTEM	84.8	84.0	84.6	84.0		720	720	604	72.1
** PROBLEMS/SOLUTIONS/COMMENTS										
DURING NOVEMBER MODULE 101 WAS RELINED WITH CEILCOTE CORALINE 505 AR LINER										
12/80	101	100.0	99.9	100.0	99.9					
	201	1.3	0.0	0.0	0.0					
	301	100.0	98.8	100.0	98.8					
	401	100.0	88.1	100.0	88.1					
	SYSTEM	75.3	71.7	75.0	71.7		744	744	534	62.2
1/81	101	100.0	100.0	100.0	100.0					
	201	0.0	0.0	0.0	0.0					
	301	87.8	85.5	87.5	85.5					
	401	98.8	91.2	98.7	91.2					
	SYSTEM	71.7	69.2	71.6	69.2		744	744	533	56.1
** PROBLEMS/SOLUTIONS/COMMENTS										
THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING DECEMBER AND JANUARY.										
2/81	101	95.3	86.6	94.8	86.6					
	201	74.9	73.6	74.6	73.6					
	301	28.4	23.8	24.9	23.8					
	401	100.0	93.1	100.0	93.1					
	SYSTEM	74.7	69.3	73.6	69.3		672	672	466	47.9
** PROBLEMS/SOLUTIONS/COMMENTS										
DURING FEBRUARY A ROUTINE INSPECTION OF THE STACK REVEALED DETERIORATION OF THE ACID-RESISTANT BRICK AND MORTAR, WHICH WILL NECESSITATE REPLACEMENT IN THE NEAR FUTURE.										
3/81	101	97.2	97.2	97.2	97.2					
	201	99.1	99.1	99.1	99.1					
	301	0.0	0.0	0.0	0.0					
	401	96.7	96.7	96.7	96.7					
	SYSTEM	73.3	73.3	73.3	73.3		744	744	545	72.8
4/81	101	93.9	81.0	92.9	81.0					
	201	98.5	97.2	98.5	97.2					
	301	18.5	18.5	18.5	18.5					
	401	82.3	82.3	82.3	82.3					
	SYSTEM	73.3	69.8	73.1	69.8		720	720	502	59.7
5/81	101	92.7	80.3	91.7	80.3					
	201	100.0	93.4	100.0	93.4					
	301	92.3	91.1	92.2	91.1					
	401	0.0	0.0	0.0	0.0					
	SYSTEM	71.3	66.2	71.0	66.2		744	744	493	60.0

LITY FGD SURVEY: JANUARY - DECEMBER 1988

JESNE LIGHT: PHILLIPS 1-6 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING MARCH, APRIL, AND MAY.

DURING THE MONTH OF MAY, REPLACEMENT OF THE RUBBER-LINED CARBON STEEL HOUSING WITH INCOLEY 825 ON NUMBER 401 ID FAN WAS INITIATED. HOUSING REPLACEMENTS ON FANS 201 AND 301 HAVE BEEN COMPLETED.

SODIUM THIOSULFATE ADDITION WAS UTILIZED THROUGHOUT THE MONTHS OF MARCH, APRIL, AND MAY TO REDUCE SCALING ENHANCED BY HIGH EXCESS AIR REQUIREMENTS OF THE BOILERS.

81	101	100.0	97.9	100.0	97.9				
	201	100.0	95.7	100.0	95.7				
	301	100.0	98.1	100.0	98.1				
	401	0.0	0.0	0.0	0.0				
	SYSTEM	75.0	72.9	75.0	72.9	720	720	525	68.0

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE 401 WAS OUT OF SERVICE DURING JUNE SO THAT THE FAN HOUSING COULD BE REPLACED WITH INCONEL.

'81	101	97.7	97.0	97.7	97.0				
	201	98.3	93.1	98.0	93.1				
	301	97.8	96.4	97.8	96.4				
	401	0.0	0.0	0.0	0.0				
	SYSTEM	73.5	71.6	73.4	71.6	744	744	533	69.8

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE 401 REMAINED OUT OF SERVICE DUE TO FAN REPAIRS AND GENERAL CLEANING

/81	101	87.0	75.0	83.9	67.7				
	201	90.2	74.1	87.1	66.9				
	301	87.0	87.9	85.9	79.4				
	401	35.5	18.9	20.9	17.1				
	SYSTEM	74.9	64.0	69.5	57.8	744	672	430	35.0

** PROBLEMS/SOLUTIONS/COMMENTS

PHILLIPS WAS SHUT DOWN FOR THREE DAYS IN AUGUST FOR A STACK AND FGD SYSTEM INSPECTION. THE PRELIMINARY REPORT INDICATED STACK DETERIORATION TO THE POINT OF DAMAGING THE STACK INTEGRITY. AS A RESULT, THE UTILITY PLANS TO PRESSURIZE THE ANNULUS.

/81	101	71.1	58.6	67.0	58.6				
	201	94.3	75.9	93.0	75.9				
	301	98.1	82.4	97.7	82.4				
	401	9.5	2.1	2.3	2.1				
	SYSTEM	68.2	54.7	65.0	54.7	720	720	394	30.0

** PROBLEMS/SOLUTIONS/COMMENTS

DURING SEPTEMBER MODULE 101 UNAVAILABLE TIME WAS DUE TO THE START OF AN OVERHAUL.

MODULE 401 WAS OUT OF SERVICE FOR MOST OF SEPTEMBER TO INSTALL A NEW EXTERNAL MIST ELIMINATOR (MUNTERS).

/81	101	51.6	51.6	51.6	51.6				
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UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

DUQUESNE LIGHT: PHILLIPS 1-6 (CONT.)

-----PERFORMANCE DATA-----									
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER BOILER HOURS	FGD HOURS	CAP. HOURS FACTOR
	201	96.0	52.0	92.8	52.0				
	301	95.4	34.0	88.1	34.0				
	401	97.7	97.7	97.7	97.7				
	SYSTEM	85.2	58.8	82.6	58.8		744	744	440 26.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE CEILCOTE LINERS IN MODULES 101 AND 201 WERE REPLACED WITH COROLINE 505 DURING OCTOBER.

DURING OCTOBER THE UTILITY INSTALLED SO2 MONITORS. TO DATE, THE MONITORS HAVE AN EXCELLENT PERFORMANCE RECORD.

11/81	101	0.0	0.0	0.0	0.0				
	201	98.3	27.8	95.7	37.8				
	301	97.7	25.4	91.8	25.4				
	401	100.0	100.0	100.0	100.0				
	SYSTEM	74.0	40.8	71.9	40.8		720	720	294 25.8

** PROBLEMS/SOLUTIONS/COMMENTS

DUE TO LOAD FLUCTUATIONS, MODULES 201 AND 301 WERE DOWN APPROXIMATELY 12 HOURS TO UNPLUG THE TANGENTIAL NOZZLES.

12/81	101	0.0	0.0	0.0	0.0				
	201	100.0	64.6	100.0	64.6				
	301	100.0	37.7	100.0	37.7				
	401	93.6	93.6	93.6	93.6				
	SYSTEM	73.4	49.0	73.4	49.0		744	744	365 33.0

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE 101 WAS OFF-LINE FOR THE ENTIRE PERIOD TO REPLACE THE RUBBER LINED FAN HOUSING WITH INCONEL 825 AND TO INSTALL NEW STUDS IN THE FAN ROTOR.

DURING NOVEMBER AND DECEMBER MODULE 101 WAS OFF-LINE FOR CLEANING. THE MODULE OPERATED 6,487 HOURS BEFORE BEING SHUT DOWN.

1/82	101	0.0	0.0	0.0	0.0				
	201	100.0	80.9	100.0	80.9				
	301	90.2	88.9	90.1	88.9				
	401	95.6	95.6	95.6	95.6				
	SYSTEM	71.5	66.3	69.9	66.3		744	744	494 64.0

2/82	101	0.0	0.0	0.0	0.0				
	201	99.2	64.0	98.8	64.0				
	301	100.0	80.4	100.0	80.4				
	401	100.0	100.0	100.0	100.0				
	SYSTEM	74.8	61.1	70.8	61.1		672	672	411 60.0

3/82	101	0.0	0.0	0.0	0.0				
	201	99.1	57.3	98.4	57.3				
	301	100.0	79.7	100.0	79.7				
	401	100.0	99.6	100.0	99.6				
	SYSTEM	74.8	59.1	70.1	59.1		744	744	440 46.0

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE 101 WAS OFF-LINE THE ENTIRE FIRST QUARTER OF 1982 FOR REPAIRS.

NEW SO2 MONITORS, INSTALLED IN JANUARY, WERE REPORTED TO HAVE WORKED WELL THROUGHOUT THE FIRST QUARTER. THE UTILITY IS ALSO PRESENTLY REQUESTING/ EVALUATING BIDS TO PRESSURIZE THE STACK ANNULUS.

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

QUESNE LIGHT: PHILLIPS 1-6 (CONT.)

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

/82	SYSTEM	720
/82	SYSTEM	744
/82	SYSTEM	720

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE SECOND QUARTER THE SO2 MONITORS WERE CERTIFIED.

THE MODULE 301 MIST ELIMINATOR WAS REPLACED DUE TO DETERIORATION.

THE MODULE 401 FAN HAD TO BE BALANCED DURING THE PERIOD CAUSING ADDITIONAL OUTAGE TIME.

DURING THE PERIOD THE UTILITY INITIATED ADDING THIOSULFATE WHEN THE EXCESS AIR RECORDED GREATER THAN 11. THIS HAS SOLVED SOME OF THERE PREVIOUS PROBLEMS.

/82	SYSTEM	744
/82	SYSTEM	744
/82	SYSTEM	720
/82	SYSTEM	744
/82	SYSTEM	720
/82	SYSTEM	744
/83	SYSTEM	744
/83	SYSTEM	672
/83	SYSTEM	744

** PROBLEMS/SOLUTIONS/COMMENTS

INFORMATION WAS UNAVAILABLE FOR THE PERIOD OF JULY 1982 THROUGH MARCH 1983

4/83	SYSTEM	720
5/83	SYSTEM	744
6/83	SYSTEM	720

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY INITIATED STACK PRESSURIZATION AT PHILLIPS DURING THE MONTH TO CONTROL SEEPAGE AND SUBSEQUENT CORROSION.

7/83	SYSTEM	744
8/83	SYSTEM	744
9/83	SYSTEM	720

** PROBLEMS/SOLUTIONS/COMMENTS

INFORMATION WAS UNAVAILABLE FOR THE THIRD QUARTER OF 1983.

10/83	SYSTEM	744
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UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

DUQUESNE LIGHT: PHILLIPS 1-6 (CONT.)

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

11/83 SYSTEM 720

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED INCREASING STACK PRESSURE BY TWO INCHES DURING THE MONTH FOR CONTROL OF SEEPAGE.

12/83 SYSTEM 744

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT ALTHOUGH THE UNIT HAS BEEN DOWN MONTHS AT A TIME DURING MOST OF 1983, THE FGD SYSTEM HAS BEEN AVAILABLE.

STAINLESS STEEL BANDS AROUND THE ABSORBER LINER WERE REPLACED WITH MARCOLITE DURING THE FOURTH QUARTER.

INSPECTIONS INDICATE THAT THE CEILCOTE LINING IN THE WET DUCT WILL HAVE TO BE REPLACED OVER THE NEXT THREE YEARS.

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 THAT OVERALL FGD SYSTEM AVAILABILITY FOR THE FIRST THREE QUARTERS OF 1984 WAS ABOVE 90%.

IT WAS REPORTED THAT LESS DETERIORATION HAS OCCURRED IN THE STACK NOW THAT IT IS PRESSURIZED.

AFTER 11 YEARS OF USAGE, THE CEILCOTE LINER IN THE WET DUCT TO THE STACK DETERIORATED. THE LINER WILL BE REPLACED OVER THE NEXT THREE YEARS DURING ANNUAL OUTAGES.

THE UTILITY IS NOW DIVERTING INDUCED DRAFT FAN SPRAY WATER TO AN ASH POND INSTEAD OF RECYCLING TO THE ABSORBERS. LIME CONSUMPTION HAS IMPROVED SINCE THE HIGHLY ACIDIC SPRAY WATER IS NO LONGER INTRODUCED IN THE SYSTEM.

THE UTILITY REPORTED A THREE WEEK SCHEDULED ANNUAL OUTAGE IN THE FIRST THREE QUARTERS OF 1984. DURING THIS TIME REPAIRS WERE MADE TO DUCTWORK AND DAMPERS. MIST ELIMINATOR TURN VANES WERE ALSO REPLACED.

DUE TO LOW POWER DEMAND IN THE FIRST THREE QUARTERS OF 1984, PHILLIPS DID NOT OPERATE STEADILY. AS A RESULT, BRIEF EPISODES OF HIGH EMISSIONS WERE REPORTED. HOWEVER, THE SYSTEM OPERATED EFFICIENTLY OVER 24 HOUR PERIODS.

10/84 SYSTEM 744

LITY FGD SURVEY: JANUARY - DECEMBER 1988

UESNE LIGHT: PHILLIPS 1-6 (CONT.)

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

'84 SYSTEM 720

'84 SYSTEM 744

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT DUE TO A SLOW DOWN IN THE STEEL INDUSTRY, UNIT LOAD HAS BEEN REDUCED.

NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE FOURTH QUARTER.

THE UTILITY REPORTED A FOURTH QUARTER AVAILABILITY OF 90% FOR THEIR CONTINUOUS EMISSION MONITORS(CEM). THE STATE OF PENNSYLVANIA HAS IMPLEMENTED NEW PENALTIES FOR CEM AVAILABILITY.

'85 SYSTEM 744

'85 SYSTEM 672

'85 SYSTEM 744

'85 SYSTEM 720

'85 SYSTEM 744

'85 SYSTEM 720

'85 SYSTEM 744

'85 SYSTEM 744

'85 SYSTEM 720

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE FIRST THREE QUARTERS OF 1985. THIS IS DUE IN PART TO THE FACT THAT THE COAL RECEIVED FROM THE MINE NOW CONTAINS 1.7% SULFUR VERSUS THE ORIGINAL AMOUNT OF 2.0%.

1/85 SYSTEM 744

/85 SYSTEM 720

2/85 SYSTEM 744

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT DUE TO CUTBACKS IN POWER DEMAND IN THE HEAVY METALS AND STEEL INDUSTRY, THEY HAVE LOST APPROXIMATELY 40% OF THEIR MARKET, OR APPROXIMATELY 400 MW OF CAPACITY. THE PHILLIPS FACILITY IS CURRENTLY RUNNING AT 18% OF CAPACITY AND IS NOW CONSIDERED TO BE A PEAKING UNIT. THE UNIT IS OPERATED PRIMARILY ON WEEK DAYS WITH SHUTDOWNS OCCURRING ON WEEKENDS AND EVENINGS.

THE UTILITY REPORTED THAT THE UNIT/FGD SYSTEM WAS OFF-LINE THE END OF OCTOBER AND EARLY NOVEMBER FOR A SCHEDULED MAINTENANCE OUTAGE. INSPECTION OF THE WET STACK LINERS SHOWED NO INDICATIONS OF LEAKING. THE UNIT/FGD OPERATED THE REMAINDER OF THE FOURTH QUARTER 1985 WITHOUT ANY MAJOR INCIDENTS.

1/86 SYSTEM 774

2/86 SYSTEM 672

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

DUQUESNE LIGHT: PHILLIPS 1-6 (CONT.)

-----PERFORMANCE DATA-----									
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD CAP. HOURS FACTOR
3/86	SYSTEM							774	
4/86	SYSTEM							720	
5/86	SYSTEM							774	
6/86	SYSTEM							720	
7/86	SYSTEM							774	
8/86	SYSTEM							774	
9/86	SYSTEM							720	
10/86	SYSTEM							774	
11/86	SYSTEM							720	
12/86	SYSTEM							774	

** PROBLEMS/SOLUTIONS/COMMENTS

THE PHILLIPS STATION HAD NO MAJOR SCHEDULED/FORCED OUTAGES IN 1986. DUE TO THE SHUTDOWN OF UNITS 1-5, THE UTILITY NOW ONLY NEEDS TO USE 2 OF THE SCRUBBER MODULES TO MEET COMPLIANCE.

THE UTILITY REPORTED THAT UNITS 1-5 HAVE BEEN PUT ON COLD STANDBY. UNIT 6 (145MW) IS CURRENTLY THE ONLY UNIT OPERATING. THE UTILITY COULD POSSIBLY BRING BACK THE OTHER BOILERS SOMETIME IN 1991 IF THERE ARE INCREASES IN PROJECTED CAPACITY. REDUCED LOAD AND THE STARTUP OF NUCLEAR CAPACITY ARE RESPONSIBLE FOR SHUTDOWN OF UNITS 1-5.

1/87	SYSTEM							744	
2/87	SYSTEM							672	
3/87	SYSTEM							744	
4/87	SYSTEM							720	
5/87	SYSTEM							744	
6/87	SYSTEM							720	
7/87	SYSTEM							744	
8/87	SYSTEM							744	
9/87	SYSTEM							720	
10/87	SYSTEM							744	

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED OUTAGES WERE ENCOUNTERED DURING THE PERIOD JANUARY THROUGH OCTOBER 1987. SCRUBBER OPERATIONS HAVE BEEN SCALED DOWN TO MEET REDUCED UNIT LOAD.

11/87	SYSTEM							720	
12/87	SYSTEM							744	

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

QUESNE LIGHT: PHILLIPS 1-6 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT AS OF NOVEMBER 1987 ALL 6 UNITS WERE SHUT DOWN AND PUT INTO COLD RESERVE FOR 5 YEARS BECAUSE OF THE STARTUP OF NUCLEAR UNITS AND BECAUSE OF REDUCED LOAD. UNIT 6 WAS THE LAST OF THE RETROFITTED UNITS TO BE SHUT DOWN AND WAS THE PRIMARY UNIT IN OPERATION DURING 1986 AND 1987.

/88	SYSTEM	774
/88	SYSTEM	672
/88	SYSTEM	774
/88	SYSTEM	720
/88	SYSTEM	774
/88	SYSTEM	720
/88	SYSTEM	774
/88	SYSTEM	774
/88	SYSTEM	720
/88	SYSTEM	774
/88	SYSTEM	720
/88	SYSTEM	774

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE ENTIRE PLANT WAS ON COLD RESERVE ALL OF 1988.

SECTION 13
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

PANY NAME	EAST KENTUCKY POWER
NT NAME	SPURLOCK
T NUMBER	2
Y	MAYSVILLE
TE	KENTUCKY
ULATORY CLASSIFICATION	C
ICULATE EMISSION LIMITATION - NG/J	43. (0.100 LB/MMBTU)
EMISSION LIMITATION - NG/J	516. (1.200 LB/MMBTU)
EMISSION LIMITATION - NG/J	***** (***** LB/MMBTU)
PLANT GENERATING CAPACITY - MW	800
SS UNIT GENERATING CAPACITY - MW	550
UNIT GENERATING CAPACITY W/FGD - MW	485
UNIT GENERATING CAPACITY WO/FGD - MW	500
IVALENT SCRUBBED CAPACITY - MW	550
* UNIT DATA - BOILER AND STACK	
BOILER SUPPLIER	COMBUSTION ENGINEERING
BOILER TYPE	PULVERIZED COAL
BOILER SERVICE LOAD	BASE
DESIGN BOILER FLUE GAS FLOW - CU.M/S	***** (***** ACFM)
BOILER FLUE GAS TEMPERATURE - C	148.9 (300 F)
STACK HEIGHT - M	244. (802 FT)
STACK SHELL	CONCRETE
STACK TOP DIAMETER - M	9.1 (30.0 FT)
* FUEL DATA	
FUEL TYPE	COAL
FUEL GRADE	BITUMINOUS
AVERAGE HEAT CONTENT - J/G	25586. (11000 BTU/LB)
RANGE HEAT CONTENT - BTU/LB	****
AVERAGE ASH CONTENT - %	16.00
RANGE ASH CONTENT - %	****
AVERAGE MOISTURE CONTENT - %	8.00
RANGE MOISTURE CONTENT - %	****
AVERAGE SULFUR CONTENT - %	3.50
RANGE SULFUR CONTENT - %	****
AVERAGE CHLORIDE CONTENT - %	*****
RANGE CHLORIDE CONTENT - %	0.02-0.11
* PARTICLE CONTROL	
* ESP	
TYPE	HOT SIDE
SUPPLIER	AMERICAN AIR FILTER
PARTICLE REMOVAL EFFICIENCY - %	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	LIME
SYSTEM SUPPLIER	THYSSEN/CEA
A-E FIRM	BLACK & VEATCH
DEVELOPMENT LEVEL	FULL SCALE
NEW/RETROFIT	NEW
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.50
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	79.40

EAST KENTUCKY POWER: SPURLOCK 2 (CONT.)

ENERGY CONSUMPTION - %	2.7	
CURRENT STATUS	1	
COMMERCIAL START-UP	4/1983	
INITIAL START-UP	12/1982	
CONTRACT AWARDED	0/1979	
** DESIGN AND OPERATING PARAMETERS		
DESIGN COAL SULFUR CONTENT - %	3.60	
DESIGN CHLORIDE CONTENT - %	*****	
OPER. & MAINT. REQUIREMENT - MANHR/DAY	120.0	
** QUENCHER/PRESATURATOR		
CONSTRUCTION MATERIAL GENERIC TYPE	NR	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR	
** ABSORBER		
NUMBER	4	
GENERIC TYPE	SPRAY TOWER	
SPECIFIC TYPE	OPEN COUNTERCURRENT SPRAY	
TRADE NAME/COMMON TYPE	N/A	
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	
NUMBER OF CONTACTING ZONES	1	
L/G RATIO - L/CU.M	1.3	(10.0 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	1.4	(5.8 IN-H2O)
SO2 REMOVAL EFFICIENCY - %	90.0	
** MIST ELIMINATOR		
PRE-MIST ELIMINATOR/MIST ELIMINATOR	PRIMARY COLLECTOR	
NUMBER PER SYSTEM	4	
GENERIC TYPE	IMPINGEMENT	
SPECIFIC TYPE	BAFFLE	
TRADE NAME/COMMON TYPE	CLOSED VANE	
NUMBER OF PASSES PER STAGE	4	
PRESSURE DROP - KPA	0.0	(0.1 IN-H2O)
SUPERFICIAL GAS VELOCITY - M/S	0.3	(1.0 FT/S)
CONSTRUCTION MATERIAL GENERIC TYPE	ORGANIC	
CONSTRUCTION MATERIAL SPECIFIC TYPE	POLYPHENYLENE	
WASH FREQUENCY	CONTINUOUS	
** FANS		
NUMBER	2	
DESIGN	CENTRIFUGAL	
FUNCTION	NR	
APPLICATION	FORCED DRAFT	
SERVICE	DRY	
CONSTRUCTION MATERIAL GENERIC TYPE	HIGH ALLOY	
** FANS		
NUMBER	6	
DESIGN	CENTRIFUGAL	
FUNCTION	NR	
APPLICATION	FORCED DRAFT	
SERVICE	DRY	
CONSTRUCTION MATERIAL GENERIC TYPE	HIGH ALLOY	
** 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	

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

ST KENTUCKY POWER: SPURLOCK 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	SLAKER
DEVICE	NR
DEVICE TYPE	NR
* TANKS	
SERVICE	NUMBER
-----	-----
ABSORBER RECYCLE	****
REAGENT PREP PRODUCT	****
* PUMPS	
SERVICE	NUMBER
-----	-----
SLURRY TRANSFER	2
* SOLIDS CONCENTRATING/DEWATERING	
DEVICE	THICKENER
NUMBER	2
DIMENSIONS - FT	115.0 DIA
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
SHELL SPECIFIC MATERIAL TYPE	AISI 1110
OUTLET STREAM CHARACTERISTICS	30% SOLIDS
* SALEABLE BYPRODUCTS	
NATURE	NONE
DISPOSITION	N/A
* SLUDGE	
* TREATMENT	
METHOD	FIXATION
DEVICE	PUG MILL
PROPRIETARY PROCESS	CONVERSION SYSTEMS 'POZ-O-TEC'
* DISPOSAL	
NATURE	FINAL
TYPE	LANDFILL
SITE TRANSPORTATION METHOD	RAIL
SITE TREATMENT	NR
* WATER BALANCE	
WATER LOOP TYPE	CLOSED

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

2/82 SYSTEM

744

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT INITIAL START-UP OCCURRED IN DECEMBER, 1982.

1/83 SYSTEM

744

2/83 SYSTEM

672

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

EAST KENTUCKY POWER: SPURLOCK 2 (CONT.)

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

3/83 SYSTEM 744

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT SO FAR THE FGD SYSTEM IS OPERATING AT ABOUT 90% EFFICIENCY WITH NO MAJOR PROBLEMS.

4/83 SYSTEM 720

5/83 SYSTEM 744

6/83 SYSTEM 720

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY ANNOUNCED THAT THE SPURLOCK 2 FGD SYSTEM INITIATED COMMERCIAL OPERATION IN APRIL. PERFORMANCE DATA FOR THE PERIOD OF APRIL THROUGH JUNE 1983, ARE NOT AVAILABLE AT THIS TIME.

7/83 SYSTEM 0.0 0.0 744 0

8/83 SYSTEM 0.0 0.0 744 0

9/83 SYSTEM 0.0 0.0 720 0

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE FGD SYSTEM WAS OUT OF SERVICE DURING THE THIRD QUARTER DUE TO DUCTWORK PROBLEMS.

STACK-RELATED PROBLEMS WERE ALSO REPORTED DURING THE PERIOD.

THE UTILITY HOPES TO RESUME OPERATION OF THE SPURLOCK 2 FGD SYSTEM DURING THE FIRST QUARTER OF 1984.

10/83 SYSTEM 744

11/83 SYSTEM 720

12/83 SYSTEM 744

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS REPORTED APPROXIMATELY 90 PERCENT AVAILABLE THROUGHOUT THE FOURTH QUARTER OF 1983.

THE UTILITY REPORTED THAT THE UNIT WAS DOWN FROM MID-NOVEMBER TO LATE DECEMBER DUE TO STACK AND DUCTWORK-RELATED PROBLEMS.

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

LITY FGD SURVEY: JANUARY - DECEMBER 1988

T KENTUCKY POWER: SPURLOCK 2 (CONT.)

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

84 SYSTEM 720

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE FGD SYSTEM WAS OUT OF SERVICE DURING THE FIRST THREE QUARTERS OF 1984 AND IS SCHEDULED TO GO BACK ON LINE BY LATE DECEMBER 1984. THE SYSTEM WAS DOWN DUE TO STACK LINER REPLACEMENT AND ABSORBER DUCTWORK REPAIRS.

'84 SYSTEM 744

'84 SYSTEM 720

'84 SYSTEM 744

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE FGD SYSTEM WAS BROUGHT BACK ON LINE THE END OF NOVEMBER. ABSORBER WAS ORIGINALLY DOWN TO REPLACE STACK LINER AND REPAIR ABSORBER OUTLET DUCT. THE FAILED FIBERGLASS STACK LINER WAS REPLACED WITH AN ACID RESISTANT BRICK MATERIAL. THE ABSORBER OUTLET DUCT REPAIRS INCLUDED DESIGN MODIFICATIONS (SPURLOCK BYPASS REHEAT DUCT FROM UNIT 1 TO UNIT 2 WAS REMOVED ALONG WITH SOME TURNING VANES) AND WAS RELINED WITH STEBBINS TILES.

/85 SYSTEM 744

/85 SYSTEM 672

/85 SYSTEM 744

/85 SYSTEM 720

/85 SYSTEM 744

/85 SYSTEM 720

/85 SYSTEM 744

/85 SYSTEM 744

/85 SYSTEM 720

/85 SYSTEM 744

/85 SYSTEM 720

/85 SYSTEM 744

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE FGD SYSTEM ONLY OPERATED THE FIRST HALF OF 1985. DURING THE REMAINDER OF THE YEAR THE UNIT BURNED LOW SULFUR COMPLIANCE COAL. DUE TO A DECREASE IN ELECTRIC DEMAND AND COAL CONSUMPTION, THE UTILITY WAS ABLE TO PURCHASE LOW PRICED LOW SULFUR COAL ON THE SPOT MARKET. THE SULFUR CONTENT OF THE SPOT MARKET COAL IS LESS THAN 0.7% VERSUS THE 1.7% SULFUR COAL THAT THEY NORMALLY USE. THE UTILITY EXPECTS TO BEGIN OPERATING THE FGD SYSTEM MID-1986 WHEN THE CHEAP LOW SULFUR COAL SPOT MARKET IS DEPLETED. NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE FIRST HALF OF 1985.

1/86 SYSTEM 774

2/86 SYSTEM 672

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

EAST KENTUCKY POWER: SPURLOCK 2 (CONT.)

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

3/86	SYSTEM						774
4/86	SYSTEM						720
5/86	SYSTEM						774
6/86	SYSTEM						720
7/86	SYSTEM						774
8/86	SYSTEM						774
9/86	SYSTEM						720
10/86	SYSTEM						774
11/86	SYSTEM						720
12/86	SYSTEM						774

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT SPURLOCK 2 BURNED COMPLIANCE COAL ALL OF 1986 AND WILL PROBABLY DO SO FOR ALL OF 1987. THE UNIT WAS TAKEN OFF-LINE IN APRIL AND OCTOBER FOR SCHEDULED BOILER/TURBINE OUTAGES. THE UTILITY IS ONLY PERIODICALLY OPERATING ROTATING TYPE FGD EQUIPMENT SUCH AS PUMPS TO MAINTAIN THEM IN WORKING ORDER.

1/87	SYSTEM						744
2/87	SYSTEM						672
3/87	SYSTEM						744
4/87	SYSTEM						720
5/87	SYSTEM						744
6/87	SYSTEM						720
7/87	SYSTEM						744
8/87	SYSTEM						744
9/87	SYSTEM						720
10/87	SYSTEM						744
11/87	SYSTEM						720
12/87	SYSTEM						744

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE UNIT BURNED COMPLIANCE COAL ALL OF 1987. THE UNIT IS EXPECTED TO OPERATE IN THIS MANNER UNTIL AT LEAST JULY 1989.

1/88	SYSTEM						774
2/88	SYSTEM						672
3/88	SYSTEM						774
4/88	SYSTEM						720

ILITY FGD SURVEY: JANUARY - DECEMBER 1988

ST KENTUCKY POWER: SPURLOCK 2 (CONT.)

-----PERFORMANCE DATA-----										
100	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
/88	SYSTEM							774		
/88	SYSTEM							720		
/88	SYSTEM							774		
/88	SYSTEM							774		
/88	SYSTEM							720		
/88	SYSTEM							774		
/88	SYSTEM							720		
/88	SYSTEM							774		

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE UNIT BURNED COMPLIANCE COAL ALL OF 1988.
THE UNIT IS CURRENTLY EXPECTED TO BURN COMPLIANCE COAL ALL OF 1989.
HOWEVER, THE UTILITY IS NOW INVESTIGATING THE POSSIBILITY OF USING NON-
COMPLIANCE COAL COUPLED WITH RESTARTING THE FGD SYSTEM IN 1990.

SECTION 13
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	GRAND HAVEN BRD OF LIGHT & PWR	
PLANT NAME	J.B. SIMS	
UNIT NUMBER	3	
CITY	GRAND HAVEN	
STATE	MICHIGAN	
POLLUTION CLASSIFICATION	B	
PERMIT EMISSION LIMITATION - NG/J	13.	(0.030 LB/MMBTU)
PERMIT EMISSION LIMITATION - NG/J	516.	(1.200 LB/MMBTU)
PERMIT EMISSION LIMITATION - NG/J	*****	(***** LB/MMBTU)
PLANT GENERATING CAPACITY - MW	78	
UNIT GENERATING CAPACITY - MW	65	
UNIT GENERATING CAPACITY W/FGD - MW	58	
UNIT GENERATING CAPACITY WO/FGD - MW	61	
DUAL VALVE SCRUBBED CAPACITY - MW	65	
* 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	122.69	(260000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	142.8	(289 F)
STACK HEIGHT - M	110.	(360 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	2.6	(8.5 FT)
* FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	BITUMINOUS	
AVERAGE HEAT CONTENT - J/G	25586.	(11000 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		10700-12265
AVERAGE ASH CONTENT - %	11.20	
RANGE ASH CONTENT - %	9.5-15.8	
AVERAGE MOISTURE CONTENT - %	9.60	
RANGE MOISTURE CONTENT - %	3.3-15.5	
AVERAGE SULFUR CONTENT - %	2.75	
RANGE SULFUR CONTENT - %	1.3-4.50	
AVERAGE CHLORIDE CONTENT - %	*****	
RANGE CHLORIDE CONTENT - %	****	
* PARTICLE CONTROL		
* ESP		
NUMBER	1	
TYPE	COLD SIDE	
SUPPLIER	BABCOCK & WILCOX	
INLET FLUE GAS CAPACITY - CU.M/S	127.4	(270000 ACFM)
INLET FLUE GAS TEMPERATURE - C	140.6	(285 F)
PRESSURE DROP - KPA	0.1	(0. IN-H2O)
* 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	
* FGD SYSTEM		
* GENERAL DATA		
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT	
SO2 REMOVAL MODE	WET SCRUBBING	
PROCESS TYPE	LIME	
SYSTEM SUPPLIER	BABCOCK & WILCOX	
A-E FIRM	BLACK & VEATCH	
DEVELOPMENT LEVEL	FULL SCALE	
NEW/RETROFIT	NEW	

GRAND HAVEN BRD OF LIGHT & PWR: J.B. SIMS 3 (CONT.)

UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	90.00	
ENERGY CONSUMPTION - %	4.6	
CURRENT STATUS	1	
COMMERCIAL START-UP	8/1983	
INITIAL START-UP	5/1983	
CONTRACT AWARDED	12/1979	
** DESIGN AND OPERATING PARAMETERS		
DESIGN COAL SULFUR CONTENT - %	2.80	
DESIGN CHLORIDE CONTENT - %	*****	
** QUENCHER/PRESATURATOR		
CONSTRUCTION MATERIAL GENERIC TYPE	NR	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR	
** ABSORBER		
NUMBER	2	
NUMBER OF SPARES	1	
GENERIC TYPE	SPRAY TOWER	
SPECIFIC TYPE	OPEN COUNTERCURRENT SPRAY	
TRADE NAME/COMMON TYPE	N/A	
SUPPLIER	BABCOCK & WILCOX	
DIMENSIONS - FT	25.0 DIA X 95.0	
SHELL GENERIC MATERIAL	STAINLESS STEEL	
SHELL SPECIFIC MATERIAL	AUSTENITIC	
SHELL MATERIAL TRADE NAME/COMMON TYPE	TYPE 316L	
LINER GENERIC MATERIAL	NONE	
LINER SPECIFIC MATERIAL	N/A	
LINER MATERIAL TRADE NAME/COMMON TYPE	N/A	
NUMBER OF CONTACTING ZONES	4	
LIQUID RECIRCULATION RATE - LITER/S	1180.	(18737 GPM)
L/G RATIO - L/CU.M	11.8	(88.0 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	1.4	(5.4 IN-H2O)
INLET GAS FLOW - CU. M/S	122.69	(260000 ACFM)
INLET GAS TEMPERATURE - C	140.6	(285 F)
SO2 REMOVAL EFFICIENCY - %	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	CLOSED VANE	
CONFIGURATION	VERTICAL	
NUMBER OF STAGES	2	
NUMBER OF PASSES PER STAGE	3	
CONSTRUCTION MATERIAL GENERIC TYPE	ORGANIC	
CONSTRUCTION MATERIAL SPECIFIC TYPE	FIBER-REINFORCED POLYESTER	
WASH WATER SOURCE	BLENDED	
WASH RATE - L/S	6.6	(104 GAL/MIN)
** REHEATER		
NUMBER	1	
GENERIC TYPE	IN-LINE	
SPECIFIC TYPE	HOT WATER	
TRADE NAME/COMMON TYPE	NR	
PERCENT GAS BYPASSED - AVG	0.0	
TEMPERATURE INCREASE - C	27.8	(50 F)
INLET FLUE GAS FLOW RATE - CU. M/S	122.69	(260000 ACFM)
INLET FLUE GAS TEMPERATURE - C	50.6	(123 F)
CONSTRUCTION MATERIAL GENERIC TYPE	NR	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR	
** FANS		
NUMBER	2	
NUMBER OF SPARES	0	
DESIGN	NR	
FUNCTION	BALANCED DRAFT	
APPLICATION	INDUCED DRAFT	
SERVICE	DRY	
FLUE GAS FLOW RATE - CU.M/S	69.37	(147000 ACFM)

ILITY FGD SURVEY: JANUARY - DECEMBER 1988

AND HAVEN BRD OF LIGHT & PWR: J.B. SIMS 3 (CONT.)

FLUE GAS TEMPERATURE - C	140.6	(285 F)
CONSTRUCTION MATERIAL GENERIC TYPE	NR	
* FANS		
NUMBER	2	
NUMBER OF SPARES	0	
DESIGN	NR	
FUNCTION	BALANCED DRAFT	
APPLICATION	FORCED DRAFT	
SERVICE	DRY	
FLUE GAS FLOW RATE - CU.M/S	49.08	(104000 ACFM)
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	SLAKER	
DEVICE	NR	
DEVICE TYPE	NR	
NUMBER	2	
* TANKS		
SERVICE	NUMBER	
-----	-----	
ABSORBER RECYCLE	1	
REAGENT PREP PRODUCT	1	
SPARGER/OXIDIZER	1	
** PUMPS		
SERVICE	NUMBER	
-----	-----	
LIME SLURRY TRANSFER	2	
SCRUBBER RECIRCULATION	6	
RECYCLE WATER	2	
** SOLIDS CONCENTRATING/DEWATERING		
DEVICE	THICKENER	
NUMBER	1	
NUMBER OF SPARES	0	
CONFIGURATION	CIRCULAR	
DIMENSIONS - FT	70.0 DIA X 14.0	
FEED STREAM CHARACTERISTICS	18% SOLIDS	
OUTLET STREAM CHARACTERISTICS	35% SOLIDS	
** SOLIDS CONCENTRATING/DEWATERING		
DEVICE	VACUUM FILTER	
NUMBER	2	
NUMBER OF SPARES	1	
FEED STREAM CHARACTERISTICS	35% SOLIDS	
OUTLET STREAM CHARACTERISTICS	63% SOLIDS	
** SALEABLE BYPRODUCTS		
NATURE	GYPSUM	
DISPOSITION	MARKETED	

GRAND HAVEN BRD OF LIGHT & PWR: J.B. SIMS 3 (CONT.)

*** SLUDGE

** TREATMENT	
METHOD	FORCED OXIDATION
DEVICE	PUG MILL
PROPRIETARY PROCESS	N/A
INLET FLOW RATE - LITER/S	1.0 (16 GPM)
** DISPOSAL	
NATURE	FINAL
TYPE	LANDFILL
LOCATION	OFF-SITE
** PROCESS CONTROL AND INSTRUMENTATION	
CHEMICAL PARAMETERS	PH, SLURRY DENSITY
PROCESS CHEMISTRY MODE	FEED FORWARD
** WATER BALANCE	
WATER LOOP TYPE	CLOSED

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

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PER PART.	BOILER HOURS	FGD HOURS	CAP. FACTOR
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5/83	SYSTEM							744		
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6/83	SYSTEM							720		
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** PROBLEMS/SOLUTIONS/COMMENTS

INITIAL START-UP AND SHAKEDOWN PROCEDURES OF THE FGD SYSTEM COMMENCED IN MAY. THE UNIT IS SCHEDULED TO BEGIN COMMERCIAL OPERATIONS BY JULY, 1983.

THE UTILITY REPORTED THAT NO MAJOR PROBLEMS WERE ENCOUNTERED DURING STARTUP WITH EITHER THE TURBINE OR FGD SYSTEM. INITIAL FGD PERFORMANCE TESTING SHOWED A 98 PERCENT SO2 REMOVAL EFFICIENCY.

SINCE STARTUP, THE UTILITY REPORTED THAT IT HAS ENCOUNTERED PROBLEMS WITH PROPER BOILER COMBUSTION.

7/83	SYSTEM							744		
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8/83	SYSTEM							744		
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9/83	SYSTEM							720		
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** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE FGD SYSTEM BEGAN COMMERCIAL OPERATIONS ON AUGUST 8, 1983. THE FGD SYSTEM HAS CONTINUED TO ACHIEVE HIGH SO2 REMOVAL EFFICIENCIES IN THE RANGE OF 90 TO 95%.

ALTHOUGH GAS SIDE OPERATION HAS BEEN EXCELLENT, THE UTILITY REPORTED THAT IT EXPERIENCED MINOR PROBLEMS WITH SYSTEM CHEMISTRY AND WASTE HANDLING.

THE FORCED OXIDATION SYSTEM HAS NOT OPERATED TO ITS DESIGNED CAPACITY. ALTHOUGH DESIGNED TO ACHIEVE BETWEEN 80 TO 90% OXIDATION, ACTUAL RATES HAVE BEEN IN THE RANGE OF 10 TO 35%. PLUGGED SPARGERS AND LOOSE DOWNCOMERS IN THE OXIDATION TANK ARE REPORTED TO BE THE CAUSE.

THE UTILITY REPORTED THAT THE SLUDGE HANDLING CONVEYORS WERE UNDERDESIGNED. THE UTILITY SOLVED THE PROBLEM BY INCREASING THE SPEED OF THE CONVEYORS.

MODULE A EXPERIENCED PLUGGED SPRAY NOZZLES DURING THE THIRD QUARTER. THE UTILITY REPORTED THAT MAINTENANCE WORKERS REMOVED HARD SCALE FROM THE INLET OF THE ABSORBER, AND CHUNKS OF SCALE DROPPED INTO THE

LITY FGD SURVEY: JANUARY - DECEMBER 1988

AND HAVEN BRD OF LIGHT & PWR: J.B. SIMS 3 (CONT.)

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

ABSORBER SUMP. SUBSEQUENTLY, THE PUMPS PICKED UP THE SCALE AND FED IT TO THE NOZZLES CAUSING THEM TO PLUG.

PUMP ALIGNMENT PROBLEMS HAVE CAUSED SEVERAL BEARING FAILURES ON THE MODULE B ABSORBER.

MINOR PLUGGING PROBLEMS WERE ENCOUNTERED WITH THE PUG MILL DURING THE THIRD QUARTER.

'83 SYSTEM

744

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE FGD SYSTEM WAS FORCED OFF-LINE FOR 1.5 WEEKS IN OCTOBER TO MAKE REPAIRS TO THE FORCED OXIDATION TANK. A LOOSE DOWN-COMER IN THE TANK CAUSED DAMAGE TO THE STIR PADDLE AND RUBBER LINING.

'83 SYSTEM

720

'83 SYSTEM

744

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD-RELATED OUTAGES WERE ENCOUNTERED DURING THE MONTHS OF NOVEMBER AND DECEMBER. FGD SYSTEM AVAILABILITY DURING THESE TWO MONTHS WAS APPROXIMATELY 99 PERCENT. THE SYSTEM WAS REPORTED TO BE ACHIEVING SO2 REMOVAL EFFICIENCIES IN THE RANGE OF 95 TO 98 PERCENT.

/84 SYSTEM

744

/84 SYSTEM

696

/84 SYSTEM

744

/84 SYSTEM

720

/84 SYSTEM

744

/84 SYSTEM

720

'84 SYSTEM

744

5/84 SYSTEM

744

7/84 SYSTEM

720

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT A SECTION OF MIST ELIMINATOR CHEVRON BAFFLES FELL DURING THE THIRD QUARTER 1984.

THIOSORBIC LIME TESTING WAS CONDUCTED DURING THE FIRST THREE QUARTERS OF 1984.

FGD SYSTEM AVAILABILITY DURING THE FIRST THREE QUARTERS OF 1984 WAS ESTIMATED AT 99%.

THE UTILITY REPORTED THAT SO2 REMOVAL EFFICIENCIES DURING THE FIRST THREE QUARTERS OF 1984 WERE APPROXIMATELY 92 TO 97 PERCENT.

BABCOCK AND WILCOX IS INSTALLING A DUST COLLECTION SYSTEM AT THE SLUDGE-FLYASH MIXING AREA. EXCESSIVE DUST LEVELS FROM THE PUG MILLS WARRANTED THE DECISION TO INSTALL THIS EQUIPMENT.

9/84 SYSTEM

744

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

GRAND HAVEN BRD OF LIGHT & PWR: J.B. SIMS 3 (CONT.)

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

11/84 SYSTEM 720
 12/84 SYSTEM 744

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE USE OF THIOSORBIC LIME ONLY SLIGHTLY IMPROVED THE SO2 REMOVAL EFFICIENCY. ALTHOUGH THEY FOUND THEY COULD SHUT DOWN ONE RECYCLE PUMP, IT WAS NOT GREAT ENOUGH TO JUSTIFY THE ADDED REAGENT COST. NO MAJOR FGD-RELATED OUTAGES WERE ENCOUNTERED DURING THE QUARTER.

THE NEW FORCED OXIDATION SYSTEM PRODUCED SUCH HIGH QUANTITIES OF HEAVY SLUDGE MATERIAL THAT IT PLUGGED THE THICKENER. THE UTILITY PLANS TO MAKE MODIFICATIONS TO THE SLURRY DISTRIBUTION FEED SYSTEM AND RAKE. THE OXIDATION RATE IS NOW REPORTED TO BE APPROXIMATELY 99.8%.

THE UTILITY ALSO REPORTED THAT THE MIST ELIMINATORS MUST BE MANUALLY CLEANED EVERY TWO MONTHS. B & W IS PRESENTLY INVESTIGATING THIS PROBLEM.

1/85 SYSTEM 744
 2/85 SYSTEM 672
 3/85 SYSTEM 744
 4/85 SYSTEM 720
 5/85 SYSTEM 744
 6/85 SYSTEM 720
 7/85 SYSTEM 744
 8/85 SYSTEM 744
 9/85 SYSTEM 720
 10/85 SYSTEM 744
 11/85 SYSTEM 720
 12/85 SYSTEM 744

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT DURING 1985 THERE WERE NO FORCED OUTAGES DUE TO THE FGD SYSTEM. THE SYSTEM WAS 100% AVAILABLE DURING THE ENTIRE YEAR AND MAINTAINED SO2 REMOVAL EFFICIENCIES IN THE RANGE OF 99.5% TO 99.8% BASED ON A ROLLING 30 DAY AVERAGE.

THE UTILITY REPORTED HAVING GREAT SUCCESS IN PRODUCING A HIGH QUALITY GYPSUM MATERIAL WHICH IS BEING PURCHASED BY A MAJOR U.S. WALLBOARD PRODUCER LOCATED APPROXIMATELY 50 MILES FROM THE PLANT. CURRENTLY, THE WALLBOARD COMPANY IS PURCHASING THE MATERIAL FASTER THAN THE UTILITY CAN PRODUCE IT, STATING THAT THEY PREFERRED THE UTILITY-PRODUCED MATERIAL OVER NATURALLY MINED GYPSUM. THE UTILITY AND WALLBOARD COMPANY ARE CURRENTLY TRYING TO NEGOTIATE A LONG TERM CONTRACT.

1/86 SYSTEM 774
 2/86 SYSTEM 672
 3/86 SYSTEM 774

LITY FGD SURVEY: JANUARY - DECEMBER 1988

AND HAVEN BRD OF LIGHT & PWR: J.B. SIMS 3 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR UNIT OR FGD-RELATED OUTAGES WERE ENCOUNTERED DURING THE FIRST
 QUARTER OF 1986.

'86 SYSTEM	720
'86 SYSTEM	774
'86 SYSTEM	720
'86 SYSTEM	774
'86 SYSTEM	774
'86 SYSTEM	720

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED A FORCED UNIT OUTAGE BEGINNING APRIL 23 DUE TO A
 FAILED GENERATOR. THE UNIT WAS DOWN APPROXIMATELY 5 MONTHS.

/86 SYSTEM	774
/86 SYSTEM	720
/86 SYSTEM	774

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT CAME BACK ON-LINE BY THE BEGINNING OF THE FOURTH QUARTER AND
 OPERATED FOR THE REMAINDER OF THE YEAR WITHOUT INCIDENT. THE FGD
 SYSTEM CONTINUED TO OPERATE FLAWLESSLY HAVING NEARLY A 100%
 SYSTEM AVAILABILITY AND A SO2 REMOVAL EFFICIENCY OF GREATER THAN 95%.

/87 SYSTEM	744
/87 SYSTEM	672
/87 SYSTEM	744
/87 SYSTEM	720
/87 SYSTEM	744
/87 SYSTEM	720
/87 SYSTEM	744
/87 SYSTEM	744
/87 SYSTEM	720
/87 SYSTEM	744
/87 SYSTEM	720
/87 SYSTEM	744

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

GRAND HAVEN BRD OF LIGHT & PWR: J.B. SIMS 3 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED OUTAGES OR SCHEDULED UNIT OUTAGES WERE ENCOUNTERED DURING THE YEAR 1987. THE NEXT SCHEDULED UNIT OUTAGE WILL OCCUR IN THE SPRING OF 1988.

1/88	SYSTEM	774
2/88	SYSTEM	672
3/88	SYSTEM	774
4/88	SYSTEM	720
5/88	SYSTEM	774
6/88	SYSTEM	720
7/88	SYSTEM	774
8/88	SYSTEM	774
9/88	SYSTEM	720
10/88	SYSTEM	774
11/88	SYSTEM	720
12/88	SYSTEM	774

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED OUTAGES WERE ENCOUNTERED DURING 1988. THE UNIT WAS OFF-LINE IN THE SPRING FOR THREE WEEKS DUE TO SCHEDULED MAINTENANCE OUTAGES. THE UNIT WAS ALSO FORCED OFF-LINE TWICE DURING THE YEAR FOR 4 TO 5 DAYS DUE TO BOILER TUBE LEAKS. THE UNIT/FGD SYSTEM AVAILABILITY FOR THE YEAR WAS ESTIMATED TO BE 90.4 PERCENT.

SECTION 13

DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	GRAND RIVER DAM AUTHORITY	
PLANT NAME	GRDA	
UNIT NUMBER	2	
CITY	PRYOR	
STATE	OKLAHOMA	
REGULATORY CLASSIFICATION	B	
PARTICULATE EMISSION LIMITATION - NG/J	13.	(0.030 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	258.	(0.600 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	215.	(0.500 LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	*****	
GROSS UNIT GENERATING CAPACITY - MW	575	
NET UNIT GENERATING CAPACITY W/FGD - MW	520	
NET UNIT GENERATING CAPACITY WO/FGD - MW	540	
EQUIVALENT SCRUBBED CAPACITY - MW	520	
*** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	FLAKT, INC.	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	873.01	(1850000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	135.0	(275 F)
STACK HEIGHT - M	154.	(505 FT)
STACK SHELL	*****	
STACK TOP DIAMETER - M	*****	(***** FT)
*** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	SUBBITUMINOUS	
AVERAGE HEAT CONTENT - J/G	20469.	(8800 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		8000-12000
AVERAGE ASH CONTENT - %	7.00	
RANGE ASH CONTENT - %	5.0-15.0	
AVERAGE MOISTURE CONTENT - %	*****	
RANGE MOISTURE CONTENT - %	7.7-31	
AVERAGE SULFUR CONTENT - %	0.95	
RANGE SULFUR CONTENT - %	.4-1.5	
AVERAGE CHLORIDE CONTENT - %	*****	
RANGE CHLORIDE CONTENT - %	****	
*** PARTICLE CONTROL		
** ESP		
NUMBER	2	
NUMBER OF SPARES	0	
TYPE	COLD SIDE	
SUPPLIER	FLAKT	
INLET FLUE GAS CAPACITY - CU.M/S	855.1	(1812000 ACFM)
INLET FLUE GAS TEMPERATURE - C	69.4	(157 F)
PARTICLE REMOVAL EFFICIENCY - %	99.8	
*** FGD SYSTEM		
** GENERAL DATA		
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT	
SO2 REMOVAL MODE	SPRAY DRYING	
PROCESS TYPE	LIME/SPRAY DRYING	
SYSTEM SUPPLIER	FLAKT	
A-E FIRM	FLAKT	
DEVELOPMENT LEVEL	FULL SCALE	
NEW/RETROFIT	NEW	
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.80	
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	85.00	
ENERGY CONSUMPTION - %	3.5	
CURRENT STATUS	1	
COMMERCIAL START-UP	10/1985	
INITIAL START-UP	10/1985	
CONTRACT AWARDED	5/1982	

LITY FGD SURVEY: JANUARY - DECEMBER 1988

ND RIVER DAM AUTHORITY: GRDA 2 (CONT.)

DESIGN AND OPERATING PARAMETERS		
DESIGN COAL SULFUR CONTENT - %	1.50	
DESIGN CHLORIDE CONTENT - %	*****	
ABSORBER		
NUMBER	4	
NUMBER OF SPARES	1	
GENERIC TYPE	SPRAY DRYER	
SPECIFIC TYPE	MIXED FLOW	
SUPPLIER	FLAKT	
SHELL GENERIC MATERIAL	CARBON STEEL	
LINER GENERIC MATERIAL	NONE	
LINER SPECIFIC MATERIAL	N/A	
LINER MATERIAL TRADE NAME/COMMON TYPE	N/A	
INLET GAS FLOW - CU. M/S	873.01	(1850000 ACFM)
INLET GAS TEMPERATURE - C	148.9	(300 F)
SO2 REMOVAL EFFICIENCY - %	8.5	

REHEATER	
NUMBER	0
GENERIC TYPE	NONE

REAGENT PREPARATION EQUIPMENT	
FUNCTION	SLAKER
DEVICE	BALL MILL
DEVICE TYPE	AGITATED TANK
NUMBER	2
FULL LOAD DRY FEED CAPACITY - M.TONS/HR	9.1 (10 TPH)
PRODUCT QUALITY - % SOLIDS	2.0

* SALEABLE BYPRODUCTS

* SLUDGE

* DISPOSAL	
NATURE	FINAL
TYPE	LANDFILL
LOCATION	ON-SITE
SITE TRANSPORTATION METHOD	TRUCK
SITE SERVICE LIFE - YRS	25

* CHEMICALS AND CONSUMPTION	
FUNCTION	ABSORBENT
NAME	PEBBLE LIME
CONSUMPTION	6.0 TPH

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

/85	SYSTEM						744		
/85	SYSTEM						720		
/85	SYSTEM						744		

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT INITIAL STARTUP OF THE FGD SYSTEM OCCURRED IN OCTOBER, 1985. THE ENTIRE PLANT IS SCHEDULED TO BE COMMERCIAL BY EARLY SPRING NEXT YEAR.

/86	SYSTEM						774		
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UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

GRAND RIVER DAM AUTHORITY: GRDA 2 (CONT.)

-----PERFORMANCE DATA-----							
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER BOILER FGD CAP. HOURS HOURS HOURS FACTOR
2/86	SYSTEM						672
3/86	SYSTEM						774
4/86	SYSTEM						720
** PROBLEMS/SOLUTIONS/COMMENTS							
THE UTILITY REPORTED THAT THE ENTIRE PLANT WAS DECLARED COMMERCIAL IN APRIL 1986.							
5/86	SYSTEM						774
6/86	SYSTEM						720
7/86	SYSTEM						774
8/86	SYSTEM						774
9/86	SYSTEM						720
** PROBLEMS/SOLUTIONS/COMMENTS							
DURING THE MONTHS OF MAY THROUGH SEPTEMBER, NO MAJOR FGD-RELATED OR UNIT OUTAGES WERE ENCOUNTERED							
10/86	SYSTEM						774
11/86	SYSTEM						720
12/86	SYSTEM						774
** PROBLEMS/SOLUTIONS/COMMENTS							
ON OCTOBER 1, THE UNIT AND FGD SYSTEM WERE SHUTDOWN FOR SCHEDULED MAINTENANCE. THE UNIT WAS TO COME BACK ON-LINE NOVEMBER 20 BUT WAS FORCED OFF-LINE DUE TO THE FGD SYSTEM. SINCE STARTUP, THE UTILITY HAS HAD PROBLEMS WITH GEAR BOX THRUST BEARING FAILURES ON THE ROTARY ATOMIZERS. TWO OUT OF FOURTEEN HAVE FAILED. THE SUPPLIER INSTRUCTED THE UTILITY TO KEEP THE SCRUBBERS OFF-LINE UNTIL THEY CAN SERVICE THE ATOMIZERS. CURRENTLY THE UTILITY IS BYPASSING THE SCRUBBERS AND IS NEGOTIATING A VARIANCE.							
1/87	SYSTEM						744
2/87	SYSTEM						672
** PROBLEMS/SOLUTIONS/COMMENTS							
THE UTILITY REPORTED THAT THE FGD SYSTEM REMAINED DOWN THE FIRST 2 MONTHS OF 1987 DUE TO ROTARY ATOMIZERS GEAR BOX BEARING PROBLEMS. THE UNIT CONTINUED TO OPERATE WITHOUT FGD UNTIL FEBRUARY 20 WHEN THE FGD SYSTEM WAS BROUGHT BACK ON-LINE. BEARINGS WERE REPLACED ON ALL 14 ATOMIZERS.							
3/87	SYSTEM						744
4/87	SYSTEM						720
5/87	SYSTEM						744
6/87	SYSTEM						720
7/87	SYSTEM						744

LITY FGD SURVEY: JANUARY - DECEMBER 1988

AND RIVER DAM AUTHORITY: GRDA 2 (CONT.)

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

'87 SYSTEM	744
'87 SYSTEM	720
'87 SYSTEM	744

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT AND FGD SYSTEM OPERATED SUCCESSFULLY DURING THE PERIOD MARCH THROUGH OCTOBER 1987. DURING THE MONTH OF OCTOBER, THE ENTIRE PLANT WAS OFF-LINE FOR 3 WEEKS FOR SCHEDULED MAINTENANCE.

'87 SYSTEM	720
'87 SYSTEM	744

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR UNIT OR FGD-RELATED OUTAGES WERE ENCOUNTERED DURING THE MONTHS OF NOVEMBER OR DECEMBER 1987.

/88 SYSTEM	774
/88 SYSTEM	672
/88 SYSTEM	774
/88 SYSTEM	720
/88 SYSTEM	774
/88 SYSTEM	720
/88 SYSTEM	774
/88 SYSTEM	774
/88 SYSTEM	720
/88 SYSTEM	774
/88 SYSTEM	720
/88 SYSTEM	774

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED OUTAGES WERE ENCOUNTERED DURING 1988. THE UNIT WAS OFF-LINE DURING THE MONTHS OF APRIL AND MAY FOR THREE WEEKS DUE TO A SCHEDULED MAINTENANCE OUTAGE. THE UNIT/FGD SYSTEM AVAILABILITY FOR THE YEAR WAS ESTIMATED TO BE 88.2 PERCENT.

SECTION 13
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	HOOSIER ENERGY	
PLANT NAME	MEROM	
PLANT NUMBER	1	
CITY	MEROM	
STATE	INDIANA	
POLLUTANT CLASSIFICATION	D	
PERMIT EMISSION LIMITATION - NG/J	43.	(0.100 LB/MMBTU)
PERMIT EMISSION LIMITATION - NG/J	516.	(1.200 LB/MMBTU)
PERMIT EMISSION LIMITATION - NG/J	*****	(***** LB/MMBTU)
PLANT GENERATING CAPACITY - MW	*****	
PERMIT UNIT GENERATING CAPACITY - MW	490	
UNIT GENERATING CAPACITY W/FGD - MW	460	
UNIT GENERATING CAPACITY WO/FGD - MW	466	
PERMIT EQUIVALENT SCRUBBED CAPACITY - MW	441	
* UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	RILEY STOKER	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	817.33	(1732000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	*****	(**** F)
STACK HEIGHT - M	214.	(702 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	5.8	(19.0 FT)
* FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	BITUMINOUS	
AVERAGE HEAT CONTENT - J/G	*****	(***** 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 - %		0.20
RANGE CHLORIDE CONTENT - %	****	
* PARTICLE CONTROL		
* MECHANICAL COLLECTOR		
NUMBER	0	
TYPE	NONE	
* FABRIC FILTER		
NUMBER	0	
TYPE	NONE	
* ESP		
NUMBER	1	
NUMBER OF SPARES	0	
TYPE	COLD SIDE	
SUPPLIER	BUELL DIVISION, ENVIROTECH	
INLET FLUE GAS CAPACITY - CU.M/S	873.0	(1850000 ACFM)
INLET FLUE GAS TEMPERATURE - C	137.8	(280 F)
PARTICLE REMOVAL EFFICIENCY - %	99.4	
* 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	

HOOSIER ENERGY: MEROM 1 (CONT.)

*** FGD SYSTEM

** GENERAL DATA		THROWAWAY PRODUCT
SALEABLE PRODUCT/THROWAWAY PRODUCT		WET SCRUBBING
SO2 REMOVAL MODE		LIMESTONE
PROCESS TYPE		ADIPIC ACID
PROCESS ADDITIVES		MITSUBISHI HEAVY INDUSTRIES
SYSTEM SUPPLIER		UNITED ENGINEERS & CONSTRUCTORS
A-E FIRM		FULL SCALE
DEVELOPMENT LEVEL		NEW
NEW/RETROFIT		
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.40	
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	90.00	
ENERGY CONSUMPTION - %	1.2	
CURRENT STATUS	1	
COMMERCIAL START-UP	8/1982	
INITIAL START-UP	8/1982	
CONTRACT AWARDED	3/1978	
** DESIGN AND OPERATING PARAMETERS		
DESIGN COAL SULFUR CONTENT - %	4.20	
DESIGN COAL HEAT CONTENT - J/G	24423.0	(10500 BTU/LB)
DESIGN COAL ASH CONTENT - %	16.00	
DESIGN CHLORIDE CONTENT - %	*****	
** QUENCHER/PRESATURATOR		
CONSTRUCTION MATERIAL GENERIC TYPE	NR	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR	
** ABSORBER		
NUMBER	4	
NUMBER OF SPARES	0	
GENERIC TYPE	PACKED TOWER	
SPECIFIC TYPE	GRID PACKING	
TRADE NAME/COMMON TYPE	COCURRENT	
SUPPLIER	MITSUBISHI	
SHELL GENERIC MATERIAL	CARBON STEEL	
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	FIXED GRIDS	
LIQUID RECIRCULATION RATE - LITER/S	1333.	(21160 GPM)
L/G RATIO - L/CU.M	5.7	(42.3 GAL/1000 ACF)
INLET GAS FLOW - CU. M/S	235.95	(500000 ACFM)
INLET GAS TEMPERATURE - C	137.8	(280 F)
SO2 REMOVAL EFFICIENCY - %	90.0	
** MIST ELIMINATOR		
PRE-MIST ELIMINATOR/MIST ELIMINATOR	MIST ELININATOR	
NUMBER PER SYSTEM	4	
NUMBER OF SPARES PER SYSTEM	0	
NUMBER PER MODULE	1	
GENERIC TYPE	NR	
SPECIFIC TYPE	NR	
TRADE NAME/COMMON TYPE	NR	
CONFIGURATION	HORIZONTAL	
CONSTRUCTION MATERIAL GENERIC TYPE	NR	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR	
** FANS		
NUMBER	2	
NUMBER OF SPARES	0	
DESIGN	CENTRIFUGAL	
SUPPLIER	WESTINGHOUSE	
FUNCTION	BOOSTER	
APPLICATION	FORCED DRAFT	
SERVICE	DRY	
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	

ILITY FGD SURVEY: JANUARY - DECEMBER 1988

OSIER ENERGY: MEROM 1 (CONT.)

* FANS	
NUMBER	2
NUMBER OF SPARES	0
DESIGN	AXIAL
SUPPLIER	NOVENCO
FUNCTION	UNIT
APPLICATION	FORCED DRAFT
SERVICE	DRY
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL
* DAMPERS	
NUMBER	4
FUNCTION	SHUT-OFF
GENERIC TYPE	GUILLOTINE
SPECIFIC TYPE	NR; SEAL AIR
MANUFACTURER	MOSSER
MODULATION	OPEN
* DAMPERS	
NUMBER	4
FUNCTION	SHUT-OFF
GENERIC TYPE	GUILLOTINE
SPECIFIC TYPE	NR; SEAL AIR
MANUFACTURER	MOSSER
MODULATION	OPEN
* DAMPERS	
NUMBER	1
FUNCTION	SHUT-OFF
GENERIC TYPE	NR
SPECIFIC TYPE	NR
MANUFACTURER	MOSSER
MODULATION	CLOSED
* DAMPERS	
NUMBER	1
FUNCTION	SHUT-OFF
GENERIC TYPE	NR
SPECIFIC TYPE	NR
MANUFACTURER	MOSSER
MODULATION	OPEN
* 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	TOWER MILL
DEVICE	N/A
DEVICE TYPE	N/A
MANUFACTURER	JAPAN TOWER MILL CO.
NUMBER	2
FULL LOAD DRY FEED CAPACITY - M.TONS/HR	25.4 (28 TPH)
* REAGENT PREPARATION EQUIPMENT	
FUNCTION	LIMESTONE PRECRUSHER
DEVICE	N/A
DEVICE TYPE	N/A
MANUFACTURER	PENNSYLVANIA CRUSHER CORP.
NUMBER	1
FULL LOAD DRY FEED CAPACITY - M.TONS/HR	25.4 (28 TPH)
* TANKS	
SERVICE	NUMBER
-----	-----
PROCESS SURGE	1
INTERMEDIATE	1

HOOSIER ENERGY: MEROM 1 (CONT.)

** PUMPS	
SERVICE	NUMBER
-----	-----
ABSORBER	12
ABSORBER COOLING	8
OXIDIZER FEED	2
THICKENER OVERFLOW	2
THICKENER UNDERFLOW	2
SURGE-TANK	3
SEED SLURRY	2
LIMESTONE SLURRY FEED `LOW HEAD!	2
LIMESTONE SLURRY FEED `HIGH HEAD!	2
 ** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	THICKENER
NUMBER	1
NUMBER OF SPARES	0
DIMENSIONS - FT	140 DIA
CAPACITY	1116000 GAL
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
SHELL SPECIFIC MATERIAL TYPE	AISI 1110
LINER GENERIC MATERIAL TYPE	ORGANIC
LINER SPECIFIC MATERIAL TYPE	NR
FEED STREAM SOURCE	ABSORBER BLOWDOWN & SEED CYCLONE OVERFLOW
FEED STREAM CHARACTERISTICS	18 % SOLIDS
OUTLET STREAM CHARACTERISTICS	35% SOLIDS
OUTLET STREAM DISPOSITION	VACUUM FILTERS
OVERFLOW STREAM DISPOSITION	FGD SYSTEM
 ** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	VACUUM FILTER
NUMBER	2
NUMBER OF SPARES	0
DIMENSIONS - FT	12.0 DIA X 24
FEED STREAM SOURCE	THICKENER
FEED STREAM CHARACTERISTICS	35 % SOLIDS
OUTLET STREAM CHARACTERISTICS	55 % SOLIDS
OUTLET STREAM DISPOSITION	IUCS
 *** SALEABLE BYPRODUCTS	
NATURE	NONE
DISPOSITION	N/A
 *** SLUDGE	
 ** TREATMENT	
METHOD	FORCED OXIDATION/FIXATION
DEVICE	PUG MILL
PROPRIETARY PROCESS	CONVERSION SYSTEMS `POZ-O-TEC!
INLET QUALITY - %	15.0
 ** DISPOSAL	
NATURE	FINAL
TYPE	LANDFILL
LOCATION	ON-SITE
SITE TRANSPORTATION METHOD	TRUCK
SITE TREATMENT	NONE
SITE DIMENSIONS	250 ACRES X 50 FT
SITE CAPACITY - CU.M	15360880 (12560.0 ACRE-FT)
SITE SERVICE LIFE - YRS	30
 ** WATER BALANCE	
WATER LOOP TYPE	CLOSED

ILITY FGD SURVEY: JANUARY - DECEMBER 1988

OSIER ENERGY: MEROM 1 (CONT.)

* CHEMICALS AND CONSUMPTION
 FUNCTION
 NAME
 PRINCIPAL CONSTITUENT
 POINT OF ADDITION

ABSORBENT
 LIMESTONE
 CaCO₃
 PRECRUSHER

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

/82 SYSTEM

744

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM COMMENCED OPERATION IN AUGUST AND IS CURRENTLY IN THE
 STARTUP PHASE OF OPERATION. TESTING FOR NSPS COMPLIANCE IS SCHEDULED
 FOR MARCH.

/82 SYSTEM

720

/82 SYSTEM

744

/82 SYSTEM

720

/82 SYSTEM

744

/83 SYSTEM

744

/83 SYSTEM

672

/83 A	53.1	54.1	54.1	51.3				
B	53.1	56.0	56.0	53.1				
C	53.1	54.2	54.2	51.4				
D	53.1	43.6	43.6	41.4				
SYSTEM	53.1	52.0	52.0	49.3	744	706	367	58.6

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM COMPLETED COMPLIANCE TESTING DURING THE MONTH OF MARCH.

/83 A	100.0	74.4	100.0	3.1				
B	100.0	74.4	100.0	3.1				
C	100.0	0.0		0.0				
D	100.0	74.4	100.0	3.1				
SYSTEM	100.0	55.8	75.0	2.3	720	30	23	35.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS TAKEN OUT OF SERVICE ON APRIL 2 FOR STACK REPAIRS.

5/83 A	0.0			0.0				
B	0.0			0.0				
C	0.0			0.0				
D	0.0			0.0				
SYSTEM	0.0			0.0	744	0	0	

5/83 A	0.0			0.0				
B	0.0			0.0				
C	0.0			0.0				
D	0.0			0.0				
SYSTEM	0.0			0.0	720	0	0	

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT REMAINED OUT OF SERVICE DURING MAY AND JUNE FOR CONTINUED STACK
 REPAIRS.

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

HOOSIER ENERGY: MEROM 1 (CONT.)

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

7/83	A	0.0			0.0				
	B	0.0			0.0				
	C	0.0			0.0				
	D	0.0			0.0				
	SYSTEM	0.0			0.0	744	0	0	

8/83	A	0.0			0.0				
	B	0.0			0.0				
	C	0.0			0.0				
	D	0.0			0.0				
	SYSTEM	0.0			0.0	744	0	0	

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS OUT OF SERVICE DURING JULY AND AUGUST FOR STACK LINER REPAIRS

9/83	A	15.6	16.9	17.8	12.2				
	B	45.1	56.7	59.5	40.7				
	C	45.1	58.1	61.0	41.7				
	D	45.1	55.6	58.4	39.9				
	SYSTEM	37.8	46.8	49.2	33.6	720	517	242	44.4

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED EXPERIENCING COMPUTER PROBLEMS DURING THE MONTH. THE PROBLEMS WERE RESOLVED, HOWEVER, BY REPLACING VARIOUS COMPUTER CONTROL CARDS.

THE UTILITY ATTRIBUTED START-UP PROBLEMS DURING SEPTEMBER TO THE PREVIOUS EXTENDED OUTAGE.

10/83	A	99.2	93.6	100.0	93.4				
	B	99.2	94.6	100.0	94.4				
	C	99.2	86.1	100.0	85.8				
	D	99.2	86.2	100.0	86.0				
	SYSTEM	99.2	90.1	100.0	89.9	744	742	669	75.3

11/83	A	98.3	98.3	98.3	98.3				
	B	98.3	98.3	98.3	98.3				
	C	98.3	98.3	98.3	98.3				
	D	98.3	98.3	98.3	98.3				
	SYSTEM	98.3	98.3	98.3	98.3	720	720	708	77.6

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD-RELATED OUTAGES WERE ENCOUNTERED DURING OCTOBER AND NOVEMBER 1983.

12/83	A	57.2	54.9	55.0	54.0				
	B	57.2	54.1	54.2	53.3				
	C	57.2	54.9	55.0	54.0				
	D	57.2	44.8	44.9	44.2				
	SYSTEM	57.2	52.2	52.3	51.4	744	733	382	80.3

** PROBLEMS/SOLUTIONS/COMMENTS

EXTREME COLD WEATHER CONDITIONS DURING DECEMBER RESULTED IN TORN EXPANSION JOINTS.

A MALFUNCTION ON THE SLUDGE STABILIZATION SYSTEM OCCURRED DURING DECEMBER RESULTING FROM EXTREME COLD WEATHER CONDITIONS.

1/84	A	75.3	63.0	63.0	63.0				
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ILITY FGD SURVEY: JANUARY - DECEMBER 1988

OSIER ENERGY: MEROM 1 (CONT.)

-----PERFORMANCE DATA-----									
MOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART. HOURS	PER BOILER HOURS	FGD CAP. HOURS FACTOR
	B	100.0	68.8	68.8	68.8				
	C	100.0	66.6	66.6	66.6				
	D	100.0	66.6	66.6	66.6				
	SYSTEM	93.8	66.2	66.2	66.2		744	744	493 74.0

** PROBLEMS/SOLUTIONS/COMMENTS

A MALFUNCTION IN THE SLUDGE HANDLING SYSTEM ACCOUNTED FOR A SYSTEM OUTAGE DURING JANUARY.

COMPUTER-RELATED PROBLEMS WERE ENCOUNTERED DURING THE MONTH.

FROZEN LIMESTONE ACCOUNTED FOR ADDITIONAL DOWN TIME IN JANUARY.

ADDITIONAL PROBLEMS DUE TO FREEZING WERE ENCOUNTERED DURING THE MONTH.

/84	A	90.2	88.4	91.9	85.6				
	B	89.9	88.0	91.5	85.3				
	C	90.6	88.8	92.4	86.0				
	D	90.1	88.3	91.8	85.5				
	SYSTEM	90.2	88.4	91.9	85.6		696	674	596 70.3
/84	A	96.7	86.8	92.8	85.0				
	B	94.3	85.8	91.7	84.0				
	C	96.7	89.3	95.5	87.5				
	D	96.7	87.3	93.3	85.5				
	SYSTEM	96.1	87.3	93.3	85.5		744	729	636 80.0

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD-RELATED PROBLEMS WERE REPORTED DURING FEBRUARY AND MARCH.

/84	A	68.2	49.3	49.9	48.8				
	B	66.9	48.0	48.6	47.5				
	C	67.6	48.7	49.3	48.2				
	D	69.6	50.7	51.3	50.2				
	SYSTEM	68.1	49.2	49.8	48.7		720	712	350 69.4

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT A PUMP FAILURE AND BUCKET ELEVATOR FAILURES LED TO PROBLEMS IN THE LIMESTONE PREPARATION SYSTEM.

/84	A	11.7	72.2	90.4	9.6				
	B	11.7	72.2	90.4	9.6				
	C	7.8	42.5	53.3	5.7				
	D	3.4	9.7	12.1	1.3				
	SYSTEM	8.6	49.1	61.5	6.6		744	99	49 6.9

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE UNIT AND FGD WERE DOWN MOST OF MAY DUE TO AN ANNUAL SCHEDULED OUTAGE.

/84	A	81.6	77.2	77.6	76.7				
	B	87.6	83.2	83.6	82.7				
	C	94.4	90.0	90.5	89.5				
	D	96.8	92.4	92.9	91.9				
	SYSTEM	90.1	85.7	86.2	85.2		720	716	613 83.4

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

HOOSIER ENERGY: MEROM 1 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE MONTH OF JUNE, THE UTILITY REPORTED EXPERIENCING BREAKDOWNS AND
 MALFUNCTIONS IN THE LIMESTONE SLURRY PREPARATION SYSTEM AND SLUDGE
 STABILIZATION SYSTEM.

7/84	A	95.4	92.8	94.7	87.2				
	B	95.2	92.6	94.5	87.1				
	C	78.5	74.8	76.3	70.3				
	D	99.1	96.7	98.7	90.9				
	SYSTEM	92.1	89.2	91.1	83.9	744	699	624	63.6

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED
 DURING THE MONTHS OF JULY THROUGH NOVEMBER, 1984.

8/84	A	91.0	94.0	94.8	90.1				
	B	92.1	95.1	96.0	91.2				
	C	93.0	96.1	96.9	92.1				
	D	94.1	97.2	98.0	93.2				
	SYSTEM	92.5	95.6	96.4	91.7	744	713	682	71.8
9/84	A	60.3	63.5	97.4	59.3				
	B	74.7	78.8	97.9	73.6				
	C	74.2	78.4	97.9	73.2				
	D	57.3	60.3	97.4	56.3				
	SYSTEM	66.6	70.3	97.7	65.6	720	672	472	63.8
10/84	A	13.2	15.2	100.0	13.2				
	B	99.9	98.7	99.7	85.7				
	C	93.5	80.3	87.7	69.7				
	D	25.6	29.5	100.0	25.6				
	SYSTEM	58.1	55.9	96.8	48.6	744	646	361	45.0
11/84	A	100.0	99.1	99.8	98.5				
	B	100.0	91.1	99.8	90.5				
	C	100.0	89.3	99.3	88.8				
	D	100.0	99.2	99.8	98.5				
	SYSTEM	100.0	94.7	99.7	94.1	720	715	677	73.8

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED
 DURING THE MONTHS OF JULY THROUGH NOVEMBER, 1984.

12/84	SYSTEM					744			
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** PROBLEMS/SOLUTIONS/COMMENTS

NO INFORMATION WAS AVAILABLE FOR THE MONTH OF DECEMBER.

1/85	A	99.9	98.3	99.9	91.9				
	B	99.9	98.1	99.9	91.8				
	C	99.7	89.6	99.7	83.8				
	SYSTEM	99.8	95.4	99.8	89.2	744	696	664	68.0
2/85	A	99.2	96.3	99.1	89.3				
	B	99.2	96.7	99.1	89.7				
	C	98.5	95.8	98.4	88.8				
	D	98.5	95.9	98.4	88.9				
	SYSTEM	98.9	96.2	98.7	89.2	672	623	599	68.0

ILITY FGD SURVEY: JANUARY - DECEMBER 1988

OSIER ENERGY: MEROM 1 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

NO FGD SYSTEM-RELATED PROBLEMS WERE REPORTED FOR THE MONTHS OF JANUARY THROUGH FEBRUARY.

'85	A	100.0	95.6	99.6	63.2				
	B	100.0	96.4	99.6	63.8				
	C	100.0	96.1	99.6	63.6				
	D	100.0	97.3	99.6	64.4				
	SYSTEM	100.0	96.3	99.6	63.7	744	492	474	44.1
'85	A	0.0			0.0				
	B	0.0			0.0				
	C	0.0			0.0				
	D	0.0			0.0				
	SYSTEM	0.0			0.0	720	0	0	0.0
'85	A	0.0			0.0				
	B	0.0			0.0				
	C	0.0			0.0				
	D	0.0			0.0				
	SYSTEM	0.0			0.0	744	0	0	0.0

** PROBLEMS/SOLUTIONS/COMMENTS

A SCHEDULED UNIT OUTAGE BEGAN IN MARCH AND CONTINUED THROUGH MAY.

'85	A	100.0	96.3	99.0	91.9				
	B	100.0	98.2	99.0	93.8				
	C	100.0	97.4	99.0	93.0				
	D	100.0	84.1	98.9	80.3				
	SYSTEM	100.0	94.0	99.0	89.7	720	687	646	62.5
'85	A	99.4	99.6	100.0	99.4				
	B	99.4	99.6	100.0	99.4				
	C	99.4	99.3	99.7	99.1				
	D	99.4	99.6	100.0	99.4				
	SYSTEM	99.4	99.5	99.9	99.3	744	743	739	59.4
'85	A	99.4	99.4	99.4	92.2				
	B	99.4	93.8	93.8	87.0				
	C	99.4	96.6	96.6	89.6				
	D	99.4	99.2	99.2	92.1				
	SYSTEM	99.4	97.3	97.3	90.2	744	690	671	54.5
'85	A	99.5	97.1	97.1	94.4				
	B	99.5	99.5	99.5	96.7				
	C	99.5	99.5	99.5	96.7				
	D	99.5	99.4	99.4	96.7				
	SYSTEM	99.5	98.8	98.8	96.1	720	700	692	57.1
'85	A	80.5	80.5	80.5	80.5				
	B	87.1	87.1	87.1	87.1				
	C	100.0	99.7	99.7	99.7				
	D	100.0	100.0	100.0	100.0				
	SYSTEM	91.9	91.8	91.8	91.8	744	744	683	54.2
'85	A	87.9	99.2	100.0	87.8				
	B	87.9	99.2	100.0	87.8				
	C	87.9	99.2	99.9	87.8				
	D	87.9	84.8	100.0	75.1				
	SYSTEM	87.9	95.6	100.0	84.6	720	637	609	52.6

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

HOOSIER ENERGY: MEROM 1 (CONT.)

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

12/85	A	81.2	85.1	86.1	81.2				
	B	95.4	98.7	99.8	94.2				
	C	95.4	97.6	98.7	93.1				
	D	95.4	98.7	99.8	94.2				
	SYSTEM	91.9	95.0	96.1	90.7	744	710	675	51.4

** PROBLEMS/SOLUTIONS/COMMENTS

NO FGD SYSTEM-RELATED PROBLEMS WERE REPORTED FOR THE MONTHS OF JUNE THROUGH DECEMBER.

1/86	A	99.9	99.1	99.5	91.0				
	B	99.9	99.5	99.9	91.3				
	C	99.9	75.4	75.7	69.2				
	D	99.9	99.5	99.9	91.3				
	SYSTEM	99.9	93.4	93.8	85.7	744	683	638	50.8

2/86	A	99.7	98.7	99.9	81.5				
	B	99.7	98.6	99.9	81.5				
	C	99.7	98.7	99.9	81.5				
	D	99.7	98.5	99.7	81.4				
	SYSTEM	99.7	98.6	99.9	81.5	672	555	548	50.6

** PROBLEMS/SOLUTIONS/COMMENTS

NO FGD SYSTEM-RELATED PROBLEMS WERE REPORTED FOR THE JANUARY-FEBRUARY 1986 PERIOD.

3/86	A	14.3	20.2	100.0	14.3				
	B	70.9	95.2	95.3	67.5				
	C	70.9	99.9	100.0	70.9				
	D	70.9	99.9	100.0	70.9				
	SYSTEM	56.8	78.8	98.8	55.9	744	528	416	35.9

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE A WAS TAKEN OFF-LINE PRIOR TO THE SCHEDULED UNIT OUTAGE TO REMOVE GRID PACKING.

4/86	A		45.7	95.4	21.1				
	B		96.0	99.5	44.4				
	C		96.0	99.5	44.4				
	D		95.3	98.8	44.1				
	SYSTEM		83.2	98.3	38.5	720	333	277	22.8

5/86	A		77.7	78.5	75.5				
	B		91.4	92.4	88.8				
	C		90.3	91.3	87.8				
	D		88.8	89.7	86.3				
	SYSTEM		87.1	88.0	84.6	744	723	629	55.6

6/86	A		89.5	96.7	87.8				
	B		99.2	99.5	97.3				
	C		99.5	99.8	97.5				
	D		98.6	99.0	96.7				
	SYSTEM		96.7	98.7	94.8	720	706	683	53.9

** PROBLEMS/SOLUTIONS/COMMENTS

THE SCHEDULED UNIT OUTAGE CONTINUED INTO THE FIRST PART OF THE APRIL PERIOD.

MODULE A WAS OUT OF SERVICE BEYOND THE SCHEDULED UNIT OUTAGE PERIOD

LITY FGD SURVEY: JANUARY - DECEMBER 1988

SIER ENERGY: MEROM 1 (CONT.)

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

WHILE GRID PACKING REPLACEMENT CONTINUED.

86	A		99.2	99.2	99.2				
	B		99.4	99.4	99.4				
	C		99.4	99.4	99.4				
	D		97.2	97.2	97.2				
	SYSTEM		98.8	98.8	98.8	744	744	735	55.4
86	A		99.0	99.1	98.8				
	B		91.1	98.8	90.9				
	C		97.1	97.2	96.9				
	D		97.8	97.9	97.6				
	SYSTEM		96.2	98.3	96.0	744	743	715	50.4
86	A		54.9	58.3	16.2				
	B		35.1	37.3	10.4				
	C		94.4	100.0	27.9				
	D		93.8	99.7	27.7				
	SYSTEM		69.5	73.9	20.6	720	213	148	13.7

** PROBLEMS/SOLUTIONS/COMMENTS

A SCHEDULED UNIT OUTAGE TOOK PLACE ON 9/5/86 THROUGH 9/27/86. NO FGD
 SYSTEM-RELATED PROBLEMS WERE REPORTED FOR THE THIRD QUARTER OF 1986.

'86	A		78.8	99.5	78.5				
	B		94.0	99.6	93.7				
	C		99.4	99.4	99.0				
	D		99.4	99.4	99.0				
	SYSTEM		92.9	99.5	92.5	744	741	688	50.1
'86	A		99.1	100.0	99.1				
	B		97.6	100.0	97.6				
	C		99.1	100.0	99.1				
	D		98.5	100.0	98.5				
	SYSTEM		98.6	100.0	98.6	720	720	710	48.3
'86	A		98.8	100.0	81.4				
	B		98.8	100.0	81.4				
	C		98.8	100.0	81.4				
	D		98.5	99.7	81.1				
	SYSTEM		98.8	99.9	81.3	744	613	605	39.4

** PROBLEMS/SOLUTIONS/COMMENTS

NO FGD SYSTEM-RELATED PROBLEMS WERE REPORTED BY THE UTILITY FOR THE
 FOURTH QUARTER OF 1986.

'87	A	100.0	100.0	100.0	100.0				
	B	100.0	100.0	100.0	100.0				
	C	100.0	100.0	100.0	100.0				
	D	100.0	100.0	100.0	100.0				
	SYSTEM	100.0	100.0	100.0	100.0	744	744	744	51.6
'87	A	99.6	99.3	99.5	99.0				
	B	99.6	99.2	99.4	98.9				
	C	99.6	99.3	99.5	99.0				
	D	98.9	98.5	99.4	98.2				
	SYSTEM	99.5	99.1	99.5	98.8	672	670	664	50.0
'87	A	100.0	96.9	96.9	96.9				
	B	100.0	96.6	96.6	96.6				
	C	100.0	99.7	99.7	99.7				

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

HOOSIER ENERGY: MEROM 1 (CONT.)

-----PERFORMANCE DATA-----										
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART. HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	D	100.0	100.0	100.0	100.0					
	SYSTEM	100.0	98.3	98.3	98.3		744	744	731	49.5

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD SYSTEM-RELATED PROBLEMS WERE REPORTED BY THE UTILITY FOR THE FIRST QUARTER OF 1987.

4/87	A	43.1	96.6	99.5	36.3					
	B	41.9	96.7	99.6	36.4					
	C	11.4	30.3	100.0	11.4					
	D	40.5	89.7	92.4	33.7					
	SYSTEM	34.2	78.3	97.9	29.5		720	271	212	17.8

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT UNIT 1 WAS OUT OF SERVICE FOR 449.3 HOURS FOR A SCHEDULED OUTAGE IN APRIL.

5/87	A	90.4	89.6	89.6	89.6					
	B	90.4	88.9	88.9	88.9					
	C	90.4	79.9	79.9	79.9					
	D	90.4	84.2	84.2	84.2					
	SYSTEM	90.4	85.6	85.6	85.6		744	744	637	52.0
6/87	A	100.0	100.0	100.0	100.0					
	B	95.8	95.8	95.8	95.8					
	C	99.8	99.8	99.8	99.8					
	D	100.0	100.0	100.0	100.0					
	SYSTEM	98.9	98.9	98.9	98.9		720	720	712	51.9
7/87	A	97.9	98.3	100.0	97.9					
	B	99.3	99.7	100.0	99.3					
	C	97.7	98.1	100.0	97.7					
	D	98.7	99.1	100.0	98.7					
	SYSTEM	98.4	98.8	100.0	98.4		744	741	732	53.5
8/87	A	98.3	98.6	98.6	98.2					
	B	98.9	99.1	99.1	98.7					
	C	99.2	99.4	99.5	99.0					
	D	99.1	99.3	99.4	98.9					
	SYSTEM	98.9	99.1	99.1	98.7		744	741	734	50.1
9/87	A	55.5	95.6	99.9	46.6					
	B	55.5	95.7	100.0	46.6					
	C	55.5	95.7	100.0	46.6					
	D	5.1	10.4	100.0	5.1					
	SYSTEM	42.9	74.4	100.0	36.2		720	351	261	23.1
10/87	A	98.3	98.3	98.5	95.2					
	B	98.3	99.3	99.5	96.2					
	C	99.3	99.3	99.5	96.2					
	D	91.0	90.7	90.9	87.8					
	SYSTEM	96.8	96.9	97.1	93.8		744	721	698	64.3
11/87	A	99.0	97.8	100.0	93.7					
	B	100.0	99.0	100.0	94.8					
	C	97.8	96.5	100.0	92.5					
	D	100.0	99.0	100.0	94.9					
	SYSTEM	99.2	98.1	100.0	94.0		720	690	677	50.3
12/87	A	98.8	98.1	99.8	93.7					
	B	98.8	99.4	100.0	94.9					

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

JSIER ENERGY: MEROM 1 (CONT.)

-----PERFORMANCE DATA-----										
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART. HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	C	99.9	99.2	99.8	94.7					
	D	98.8	98.1	100.0	93.7					
	SYSTEM	99.1	98.7	99.9	94.2		744	710	701	50.2

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD SYSTEM-RELATED PROBLEMS WERE REPORTED BY THE UTILITY FOR THE PERIOD MAY THROUGH DECEMBER 1987.

/88	A	99.9	95.3	95.8	90.1					
	B	99.9	96.7	97.3	91.5					
	C	99.9	97.2	97.8	92.0					
	D	99.9	97.9	98.5	92.6					
	SYSTEM	100.0	100.0	100.0	100.0		744	704	744	51.5

/88	A	94.5	94.2	94.2	94.0					
	B	99.3	99.1	99.1	98.8					
	C	99.6	99.4	99.4	99.1					
	D	95.7	95.5	95.5	95.2					
	SYSTEM	100.0	100.0	100.0	100.0		696	694	696	55.2

/88	A	99.3	99.3	99.3	99.3					
	B	97.4	97.4	97.4	97.4					
	C	96.4	96.4	96.4	96.4					
	D	98.1	98.1	98.1	98.1					
	SYSTEM	100.0	100.0	100.0	100.0		744	744	744	50.3

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD SYSTEM-RELATED PROBLEMS WERE REPORTED FOR THE FIRST QUARTER OF 1988.

/88	A	47.1	94.1	97.0	45.5					
	B	48.4	97.3	100.3	47.0					
	C	47.8	95.8	98.8	46.3					
	D	48.4	97.1	100.0	46.9					
	SYSTEM	63.9	100.0	100.0	61.9		720	348	446	24.1

** PROBLEMS/SOLUTIONS/COMMENTS

UNIT 1 WAS OUT OF SERVICE FOR 371.9 HOURS FOR REPAIRS.

5/88	A	100.0	99.1	99.8	95.3					
	B	100.0	99.1	99.8	95.3					
	C	100.0	99.1	99.8	95.3					
	D	100.0	97.5	98.1	93.7					
	SYSTEM	100.0	100.0	100.0	100.0		744	715	744	50.3

5/88	A	100.0	100.0	100.0	100.0					
	B	100.0	100.0	100.0	100.0					
	C	100.0	100.0	100.0	100.0					
	D	100.0	100.0	100.0	100.0					
	SYSTEM	100.0	100.0	100.0	100.0		720	720	720	65.0

7/88	A	96.4	96.4	96.4	96.4					
	B	97.8	97.8	97.8	97.8					
	C	98.4	98.4	98.4	98.4					
	D	98.3	98.3	98.3	98.3					
	SYSTEM	100.0	100.0	100.0	100.0		744	744	744	66.4

8/88	A	99.5	99.2	99.2	99.2					
	B	99.5	99.5	99.5	99.5					
	C	99.4	99.5	99.5	99.5					

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

HOOSIER ENERGY: MEROM 1 (CONT.)

-----PERFORMANCE DATA-----										
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	D	99.4	98.9	98.9	98.9					
	SYSTEM	100.0	100.0	100.0	100.0		744	744	744	56.4
9/88	A	99.9	100.0	100.0	99.9					
	B	99.9	100.0	100.0	99.9					
	C	99.9	100.0	100.0	99.9					
	D	99.9	100.0	100.0	99.9					
	SYSTEM	100.0	100.0	100.0	100.0		720	719	720	56.4

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD SYSTEM-RELATED PROBLEMS WERE REPORTED FOR THE PERIOD MAY THROUGH SEPTEMBER 1988.

10/88	A	28.8	82.9	100.0	3.0					
	B	28.8	82.1	100.0	2.9					
	C	28.8	100.0	100.0	28.8					
	D	27.5	77.2	95.4	2.8					
	SYSTEM	38.0	100.0	100.0	12.5		744	27	93	1.1

** PROBLEMS/SOLUTIONS/COMMENTS

UNIT 1 WAS OUT OF SERVICE FOR 717.4 HOURS DURING THE MONTH OF OCTOBER FOR AN ANNUAL OUTAGE.

11/88	A	100.0	98.7	100.0	92.7					
	B	100.0	98.7	100.0	92.6					
	C	100.0	98.6	100.0	92.5					
	D	100.0	98.3	100.0	92.2					
	SYSTEM	100.0	100.0	100.0	100.0		720	676	720	56.3
12/88	A	99.3	98.5	98.5	98.5					
	B	98.0	97.2	97.2	97.2					
	C	99.3	98.3	98.3	98.3					
	D	74.2	74.1	74.1	74.1					
	SYSTEM	100.0	100.0	100.0	100.0		744	744	744	60.7

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD SYSTEM-RELATED PROBLEMS WERE REPORTED FOR THE MONTHS OF NOVEMBER AND DECEMBER 1988.

SECTION 13
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	HOOSIER ENERGY	
PLANT NAME	MEROM	
UNIT NUMBER	2	
CITY	MEROM	
STATE	INDIANA	
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	*****	
GROSS UNIT GENERATING CAPACITY - MW	490	
NET UNIT GENERATING CAPACITY W/FGD - MW	460	
NET UNIT GENERATING CAPACITY WO/FGD - MW	466	
EQUIVALENT SCRUBBED CAPACITY - MW	441	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	RILEY STOKER	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	817.33	(1732000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	*****	(**** F)
STACK HEIGHT - M	214.	(702 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	5.8	(19.0 FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	BITUMINOUS	
AVERAGE HEAT CONTENT - J/G	*****	(***** 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 - %	0.20	
RANGE CHLORIDE CONTENT - %	****	
*** PARTICLE CONTROL		
** MECHANICAL COLLECTOR		
NUMBER	0	
TYPE	NONE	
** FABRIC FILTER		
NUMBER	0	
TYPE	NONE	
** ESP		
NUMBER	1	
NUMBER OF SPARES	0	
TYPE	COLD SIDE	
SUPPLIER	BUELL DIVISION, ENVIROTECH	
INLET FLUE GAS CAPACITY - CU.M/S	873.0	(1850000 ACFM)
INLET FLUE GAS TEMPERATURE - C	137.8	(280 F)
PARTICLE REMOVAL EFFICENCY - %	99.4	
** 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	

ILITY FGD SURVEY: JANUARY - DECEMBER 1988

OSIER ENERGY: MEROM 2 (CONT.)

* FGD SYSTEM

* GENERAL DATA

SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT
SO2 REMOVAL MODE	WET SCRUBBING
PROCESS TYPE	LIMESTONE
PROCESS ADDITIVES	ADIPIC ACID
SYSTEM SUPPLIER	MITSUBISHI HEAVY INDUSTRIES
A-E FIRM	UNITED ENGINEERS & CONSTRUCTORS
DEVELOPMENT LEVEL	FULL SCALE
NEW/RETROFIT	NEW
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.40
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	90.00
ENERGY CONSUMPTION - %	1.2
CURRENT STATUS	1
COMMERCIAL START-UP	2/1982
INITIAL START-UP	12/1981
CONTRACT AWARDED	3/1978

* DESIGN AND OPERATING PARAMETERS

DESIGN COAL SULFER CONTENT - %	4.20	
DESIGN COAL HEAT CONTENT - J/G	24423.0	(10500 BTU/LB)
DESIGN COAL ASH CONTENT - %	16.00	
DESIGN CHLORIDE CONTENT - %	*****	

* QUENCHER/PRESATURATOR

CONSTRUCTION MATERIAL GENERIC TYPE	NR
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR

* ABSORBER

NUMBER	4	
NUMBER OF SPARES	0	
GENERIC TYPE	PACKED TOWER	
SPECIFIC TYPE	GRID PACKING	
TRADE NAME/COMMON TYPE	COCURRENT	
SUPPLIER	MITSUBISHI	
SHELL GENERIC MATERIAL	CARBON STEEL	
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	FIXED GRIDS	
LIQUID RECIRCULATION RATE - LITER/S	1333.	(21160 GPM)
L/G RATIO - L/CU.M	5.7	(42.3 GAL/1000 ACF)
INLET GAS FLOW - CU. M/S	235.95	(500000 ACFM)
INLET GAS TEMPERATURE - C	137.8	(280 F)
SO2 REMOVAL EFFICIENCY - %	90.0	

** MIST ELIMINATOR

PRE-MIST ELIMINATOR/MIST ELIMINATOR	MIST ELININATOR
NUMBER PER SYSTEM	4
NUMBER OF SPARES PER SYSTEM	0
NUMBER PER MODULE	1
GENERIC TYPE	NR
SPECIFIC TYPE	NR
TRADE NAME/COMMON TYPE	NR
CONFIGURATION	HORIZONTAL
CONSTRUCTION MATERIAL GENERIC TYPE	NR
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR

** FANS

NUMBER	2
NUMBER OF SPARES	0
DESIGN	CENTRIFUGAL
SUPPLIER	WESTINGHOUSE
FUNCTION	BOOSTER
APPLICATION	FORCED DRAFT
SERVICE	DRY
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL

HOOSIER ENERGY: MEROM 2 (CONT.)

** FANS	
NUMBER	2
NUMBER OF SPARES	0
DESIGN	AXIAL
SUPPLIER	NOVENCO
FUNCTION	UNIT
APPLICATION	FORCED DRAFT
SERVICE	DRY
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL
** DAMPERS	
NUMBER	4
FUNCTION	SHUT-OFF
GENERIC TYPE	GUILLOTINE
SPECIFIC TYPE	NR; SEAL AIR
MANUFACTURER	MOSSER
MODULATION	OPEN
** DAMPERS	
NUMBER	4
FUNCTION	SHUT-OFF
GENERIC TYPE	GUILLOTINE
SPECIFIC TYPE	NR; SEAL AIR
MANUFACTURER	MOSSER
MODULATION	OPEN
** DAMPERS	
NUMBER	1
FUNCTION	SHUT-OFF
GENERIC TYPE	NR
SPECIFIC TYPE	NR
MANUFACTURER	MOSSER
MODULATION	CLOSED
** DAMPERS	
NUMBER	1
FUNCTION	SHUT-OFF
GENERIC TYPE	NR
SPECIFIC TYPE	NR
MANUFACTURER	MOSSER
MODULATION	OPEN
** 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	TOWER MILL
DEVICE	N/A
DEVICE TYPE	N/A
MANUFACTURER	JAPAN TOWER MILL CO.
NUMBER	2
FULL LOAD DRY FEED CAPACITY - M.TONS/HR	25.4 (28 TPH)
** REAGENT PREPARATION EQUIPMENT	
FUNCTION	LIMESTONE PRECRUSHER
DEVICE	N/A
DEVICE TYPE	N/A
MANUFACTURER	PENNSYLVANIA CRUSHER CORP.
NUMBER	1
FULL LOAD DRY FEED CAPACITY - M.TONS/HR	25.4 (28 TPH)
** TANKS	
SERVICE	NUMBER
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PROCESS SURGE	1
INTERMEDIATE	1

ILITY FGD SURVEY: JANUARY - DECEMBER 1988

OSIER ENERGY: MEROM 2 (CONT.)

* PUMPS	
SERVICE	NUMBER
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ABSORBER	12
ABSORBER COOLING	8
OXIDIZER FEED	2
THICKENER OVERFLOW	2
THICKENER UNDERFLOW	2
SURGE-TANK	3
SEED SLURRY	2
LIMESTONE SLURRY FEED `LOW HEAD!	2
LIMESTONE SLURRY FEED `HIGH HEAD!	2
* SOLIDS CONCENTRATING/DEWATERING	
DEVICE	THICKENER
NUMBER	1
NUMBER OF SPARES	0
DIMENSIONS - FT	40 DIA
CAPACITY	1116000 GAL
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
SHELL SPECIFIC MATERIAL TYPE	AISI 1110
LINER GENERIC MATERIAL TYPE	ORGANIC
LINER SPECIFIC MATERIAL TYPE	NR
FEED STREAM SOURCE	ABSORBER BLOWDOWN & SEED CYCLONE OVERFLOW
FEED STREAM CHARACTERISTICS	18 % SOLIDS
OUTLET STREAM CHARACTERISTICS	35% SOLIDS
OUTLET STREAM DISPOSITION	VACUUM FILTERS
OVERFLOW STREAM DISPOSITION	FGD SYSTEM
* SOLIDS CONCENTRATING/DEWATERING	
DEVICE	VACUUM FILTER
NUMBER	2
NUMBER OF SPARES	0
DIMENSIONS - FT	12.0 DIA X 24
FEED STREAM SOURCE	THICKENER
FEED STREAM CHARACTERISTICS	35 % SOLIDS
OUTLET STREAM CHARACTERISTICS	55 % SOLIDS
OUTLET STREAM DISPOSITION	IUCS
* SALEABLE BYPRODUCTS	
NATURE	NONE
DISPOSITION	N/A
* SLUDGE	
* TREATMENT	
METHOD	FORCED OXIDATION/FIXATION
DEVICE	PUG MILL
PROPRIETARY PROCESS	CONVERSION SYSTEMS `POZ-O-TEC!
INLET QUALITY - %	15.0
* DISPOSAL	
NATURE	FINAL
TYPE	LANDFILL
LOCATION	ON-SITE
SITE TRANSPORTATION METHOD	TRUCK
SITE TREATMENT	NONE
SITE DIMENSIONS	250 ACRES X 50 FT
SITE CAPACITY - CU.M	15360880 (12560.0 ACRE-FT)
SITE SERVICE LIFE - YRS	30
* WATER BALANCE	
WATER LOOP TYPE	CLOSED

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

HOOSIER ENERGY: MEROM 2 (CONT.)

** CHEMICALS AND CONSUMPTION

FUNCTION	ABSORBENT
NAME	LIMESTONE
PRINCIPAL CONSTITUENT	CACO3
POINT OF ADDITION	PRECRUSHER

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

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER BOILER HOURS	FGD HOURS	CAP. FACTOR
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12/81	SYSTEM						744		
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** PROBLEMS/SOLUTIONS/COMMENTS

ON DECEMBER 30, 1981 OPERATION OF THE FGD SYSTEM INSTALLED ON MEROM 2 COMMENCED. THE SYSTEM IS PRESENTLY IN THE START UP PHASE WITH COMMERCIAL OPERATION SCHEDULED FOR FEBRUARY.

1/82	SYSTEM						744		
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2/82	SYSTEM						672		
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3/82	SYSTEM						744		
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** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT COMMERCIAL OPERATION WAS INITIATED ON THE FIRST OF FEBRUARY. EXCEPT FOR SOME MINOR FREEZING PROBLEMS, NO MAJOR FGD-RELATE PROBLEMS WERE ENCOUNTERED DURING THE FIRST QUARTER PERIOD.

HOWEVER, THE UTILITY DID REPORT THAT HIGH FLYASH LOADINGS TO THE ABSORBER WERE ENCOUNTERED DUE TO ESP INABILITY TO REMOVE FLYASH FROM ITS HOPPERS. THE PROBLEM WAS PARTIALLY DUE TO THE HIGH MOISTURE CONTENT OF THE COAL (FL ASH STICKS IN THE HOPPERS AND EVENTUALLY TRIPS ESP) IN ADDITION TO FIRING WITH OIL DURING STARTUP (FLYASH STICKS TO OIL RESIDUE LEFT ON PLATES).

4/82	SYSTEM				19.8		720		
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5/82	SYSTEM				48.3		744		
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6/82	SYSTEM				30.0		720		
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** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED EXPERIENCING PROBLEMS WITH THE LINER CRACKING IN THE THICKENERS AND SETTLING IN THE SURGE TANKS DOWNSTREAM OF THE THICKENERS. FGD AVAILABILITY FOR THE FIRST SIX MONTHS OF OPERATION WAS APPROXIMATELY 25 PERCENT.

7/82	A	80.5	77.3	77.3	66.4				
	B	80.5	77.3	77.3	66.4				
	C	80.5	77.3	77.3	66.4				
	D	80.5	77.3	77.3	66.4				
	SYSTEM	80.5	77.3	77.3	66.4	744	640	494	48.7

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM EXPERIENCED A TOTAL OUTAGE TIME OF 145.2 HOURS DURING JULY. 104.5 HOURS OF THAT PERIOD WAS DUE TO A UNIT OUTAGE.

PART OF THE FGD SYSTEM OUTAGE WAS DUE TO AN INSPECTION OF THE PROCESS TANKS.

A THICKENER LINER FAILURE ALSO CONTRIBUTED TO THE OUTAGE DURING JULY.

A 13 HOUR OUTAGE DURING JULY WAS THE RESULT OF AN EFFORT TO UNPLUG THE THICKENER UNDERFLOW LINES.

ITY FGD SURVEY: JANUARY - DECEMBER 1988

IER ENERGY: MEROM 2 (CONT.)

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

PROBLEMS WITH A PRECIPITATOR LED TO A 13.5 HOUR OUTAGE DURING THE MONTH.

A 74 HOUR OUTAGE OCCURRED DURING THE MONTH DUE TO EXTENDED FGD MAINTENANCE FOLLOWING THE UNIT OUTAGE.

32	A	55.0	54.1	54.1	53.0				
	B	55.0	54.1	54.1	53.0				
	C	55.0	54.1	54.1	53.0				
	D	55.0	54.1	54.1	53.0				
	SYSTEM	55.0	54.1	54.1	53.0	744	729	394	46.0

** PROBLEMS/SOLUTIONS/COMMENTS

A BREAKDOWN OF THE LIMESTONE PREPARATION SYSTEM LED TO A 334 HOUR OUTAGE DURING AUGUST. THE BUCKET ELEVATOR CHAINS HAD TO BE REPLACED DUE TO CRACKED LINKS IN THE CHAINS. THE UTILITY REPORTED THAT DUE TO THE NATURE OF THE FAILURE, IT APPEARED THAT THE LINKS WERE DEFECTIVE.

32	A	76.4	22.9	22.9	7.0				
	B	76.4	22.9	22.9	7.0				
	C	76.4	22.9	22.9	7.0				
	D	76.4	22.9	22.9	7.0				
	SYSTEM	76.4	22.9	22.9	7.0	720	221	51	46.0

** PROBLEMS/SOLUTIONS/COMMENTS

A FAILURE OF THE LIMESTONE PREPARATION SYSTEM RESULTED FROM A PLUGGING PROBLEM AND CAUSED A 6.5 HOUR OUTAGE DURING SEPTEMBER.

A 163.5 HOUR OUTAGE DURING THE MONTH WAS DUE TO PLUGGED WALL WASH LINES IN THE QUENCHER SECTION. ALL LINES IN ALL FOUR MODULES WERE PLUGGED AND THE CAUSE WAS SUSPECTED OF BEING A DESIGN DEFICIENCY IN THE SYSTEM. THE LINES WERE UNPLUGGED WITHIN A MATTER OF DAYS AND THE SYSTEM WAS ALLOWED TO CONTINUE OPERATING WITHOUT THE WALL WASH.

82	A	87.3	49.7	52.4	49.3				
	B	87.3	57.3	60.5	56.9				
	C	87.3	65.7	69.4	65.2				
	D	87.3	76.4	80.7	75.8				
	SYSTEM	87.3	62.3	65.8	61.8	744	738	460	47.7

** PROBLEMS/SOLUTIONS/COMMENTS

DURING OCTOBER PROBLEMS WITH A PRECIPITATOR LED TO A 39 HOUR OUTAGE.

A 21 HOUR OUTAGE OCCURRED DURING THE MONTH AS A RESULT OF A COMPUTER MALFUNCTION.

A FAILURE IN THE LIMESTONE SLURRY PREPARATION SYSTEM PRODUCED A 19.5 HOUR OUTAGE DURING OCTOBER.

DURING THE MONTH THE UNIT OPERATED TYPICALLY WITH THREE MODULES ONLY DUE T LOW BOILER LOADS.

/82	A	47.4	46.2	46.3	45.6				
	B	47.4	46.2	46.3	45.6				
	C	47.4	37.3	37.3	36.8				
	D	47.4	13.6	13.6	13.4				
	SYSTEM	47.4	35.8	35.9	35.3	720	711	254	48.4

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

HOOSIER ENERGY: MEROM 2 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

DURING NOVEMBER PROBLEMS WITH A PRECIPITATOR LED TO A 13 HOUR OUTAGE.

A FAILURE IN THE LIMESTONE SLURRY PREPARATION SYSTEM PRODUCED A 51.5 HOUR OUTAGE DURING NOVEMBER.

BYPASS DAMPER PROBLEMS CREATED A BRIEF 1 HOUR OUTAGE DURING THE MONTH.

A TOTAL FAILURE OF THE EXPANSION JOINTS THROUGHOUT THE FGD SYSTEM RESULTED IN A 326.5 HOUR OUTAGE DURING NOVEMBER.

THE UNIT CONTINUED OPERATING WITH THREE MODULES ONLY DURING THE MONTH DUE TO LOW LOADS.

12/82	A	0.0	0.0	0.0	0.0				
	B	0.0	0.0	0.0	0.0				
	C	0.0	0.0	0.0	0.0				
	D	0.0	0.0	0.0	0.0				
	SYSTEM	0.0	0.0	0.0	0.0	744	269	0	44.6

** PROBLEMS/SOLUTIONS/COMMENTS

THE EXPANSION JOINT FAILURE PROBLEM WITHIN THE FGD SYSTEM CONTINUED DURING DECEMBER. REPLACEMENT OF THE JOINTS WAS IN PROGRESS.

1/83	A	0.0	0.0	0.0	0.0				
	B	0.0	0.0	0.0	0.0				
	C	0.0	0.0	0.0	0.0				
	D	0.0	0.0	0.0	0.0				
	SYSTEM	0.0	0.0	0.0	0.0	744	744	0	47.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE EXPANSION JOINT FAILURE PROBLEM CONTINUED DURING JANUARY AND REPLACEMENT OF THE JOINTS WAS STILL IN PROGRESS.

2/83	A	0.0	0.0	0.0	0.0				
	B	0.0	0.0	0.0	0.0				
	C	0.0	0.0	0.0	0.0				
	D	0.0	0.0	0.0	0.0				
	SYSTEM	0.0	0.0	0.0	0.0	672	667		50.2

** PROBLEMS/SOLUTIONS/COMMENTS

THE EXPANSION JOINT FAILURE PROBLEM CONTINUED DURING FEBRUARY AND REPLACEMENT OF THE JOINTS WAS STILL IN PROGRESS.

3/83	A	64.5	0.0		0.0				
	B	64.5	0.0		0.0				
	C	64.5	0.0		0.0				
	D	64.5	0.0		0.0				
	SYSTEM	64.5	0.0		0.0	744	40	0	44.3

** PROBLEMS/SOLUTIONS/COMMENTS

THE CONTINUATION OF EXPANSION JOINT REPAIRS OCCURRED DURING MARCH.

4/83	A	59.0	35.4	37.9	29.4				
	B	75.7	84.7	90.7	70.3				
	C	75.7	74.7	79.9	62.0				
	D	67.8	45.9	49.2	38.1				
	SYSTEM	69.5	60.2	64.4	49.9	720	597	360	57.8

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

SIER ENERGY: MEROM 2 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT MODIFICATIONS WERE MADE TO MODULES A AND D DURING APRIL.

COMPUTER MALFUNCTIONS WERE ATTRIBUTED TO PART OF THE 175 HOUR OUTAGES DURING THE MONTH.

PLUGGED SPRAY HEADER LINES ALSO CONTRIBUTED TO THE 175 HOUR OUTAGES IN APRIL.

ESP MALFUNCTIONS CONTRIBUTED TO 39 HOURS OF FGD OUTAGE IN APRIL.

33	A	95.8	88.6	88.6	88.6				
	B	95.8	85.0	85.0	85.0				
	C	76.4	61.2	61.2	61.2				
	D	95.8	95.5	95.5	95.5				
	SYSTEM	90.9	82.6	82.6	82.6	744	744	61%	60.3

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING MAY.

83	A	21.9	86.9	86.9	21.9				
	B	1.3	5.2	5.2	1.3				
	C	21.9	82.0	82.0	20.7				
	D	21.9	86.2	86.2	21.7				
	SYSTEM	16.8	65.1	65.1	16.4	720	182	118	53.6

** PROBLEMS/SOLUTIONS/COMMENTS

EXTENSIVE SCHEDULED MAINTENANCE WAS PERFORMED ON THE FGD SYSTEM DURING A BOILER OUTAGE IN JUNE.

83	A	100.0	73.2	72.9	72.6				
	B	100.0	99.9	99.5	99.1				
	C	100.0	100.0	100.0	99.6				
	D	100.0	61.0	60.7	60.5				
	SYSTEM	100.0	83.5	83.3	82.9	744	738	617	71.5

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS PARTIALLY BYPASSED DURING JULY TO MINIMIZE STACK LINER CRACKING BY MAINTAINING A SPECIFIC TEMPERATURE RANGE WITHIN THE STACK. THE UTILITY ATTRIBUTED LOWER SO2 REMOVAL EFFICIENCIES TO THE BYPASS INCIDENT.

LINER REPAIRS ARE SCHEDULED FOR THE FALL OF 1983.

THE UNIT EXPERIENCED AN AIR HEATER FAILURE DURING JULY AND THE FGD SYSTEM WAS CONSEQUENTLY USED TO COOL GAS, PROTECTING THE STACK LINER.

83	A	99.7	98.8	99.5	85.8				
	B	99.7	98.9	99.6	85.9				
	C	99.7	99.2	100.0	86.2				
	D	99.7	97.9	98.6	85.0				
	SYSTEM	99.7	98.7	99.4	85.7	744	646	638	65.4

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS AGAIN PARTIALLY BYPASSED DURING AUGUST TO MINIMIZE STACK LINER CRACKING BY MAINTAINING A SPECIFIC TEMPERATURE WITHIN THE STACK.

83	A	97.2	88.3	90.4	38.1				
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UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

HOOSIER ENERGY: MEROM 2 (CONT.)

-----PERFORMANCE DATA-----										
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	B	97.9	90.0	92.2	38.9					
	C	97.9	90.0	92.2	38.9					
	D	98.6	90.0	92.2	38.9					
	SYSTEM	97.9	89.6	91.7	38.7		720	311	278	28.6

** PROBLEMS/SOLUTIONS/COMMENTS

THE FALL SCHEDULED OUTAGE FOR STACK LINER REPAIRS COMMENCED IN SEPTEMBER.

10/83	A	100.0			0.0					
	B	100.0			0.0					
	C	100.0			0.0					
	D	100.0			0.0					
	SYSTEM	100.0			0.0		744	0	0	
11/83	A	100.0			0.0					
	B	100.0			0.0					
	C	100.0			0.0					
	D	100.0			0.0					
	SYSTEM	100.0			0.0		720	0	0	0.0
12/83	A									
	B									
	C									
	D									
	SYSTEM						744	0		

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE UNIT WAS OUT OF SERVICE DURING THE FOURTH QUARTER OF 1983.

1/84	A	0.0			0.0					
	B	0.0			0.0					
	C	0.0			0.0					
	D	0.0			0.0					
	SYSTEM	0.0			0.0		744	0	0	0.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS OUT OF SERVICE THROUGHOUT JANUARY.

2/84	A	0.0	0.0		0.0					
	B	0.0	0.0		0.0					
	C	0.0	0.0		0.0					
	D	0.0	0.0		0.0					
	SYSTEM	0.0	0.0		0.0		696	54	0	2.6

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT STACKLINER REPAIR WAS COMPLETED AND THE UNIT WAS IN INITIAL START UP AT THE END OF THE MONTH.

3/84	A	0.0	0.0		0.0					
	B	0.0	0.0		0.0					
	C	0.0	0.0		0.0					
	D	0.0	0.0		0.0					
	SYSTEM	0.0	0.0		0.0		744	66	0	

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS SHUT DOWN ON MARCH 3 FOR TURBINE REPAIRS. THE REPAIRS WERE COMPLETED ON MARCH 31.

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

OSIER ENERGY: MEROM 2 (CONT.)

-----PERFORMANCE DATA-----									
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER BOILER HOURS	FGD HOURS	CAP. HOURS FACTOR
'84	A	82.3	74.5	74.9	74.1				
	B	81.8	74.1	74.5	73.7				
	C	83.0	75.2	75.6	74.9				
	D	75.1	67.3	67.6	67.0				
	SYSTEM	80.5	72.8	73.1	72.4		720	717	522 77.6

** PROBLEMS/SOLUTIONS/COMMENTS

A BUCKET ELEVATOR FAILURE LED TO PROBLEMS IN THE LIMESTONE PREPARATION SYSTEM.

'84	A	34.9	35.3	36.1	34.9				
	B	34.9	35.3	36.1	34.9				
	C	34.9	35.3	36.1	34.9				
	D	34.9	34.1	34.9	33.7				
	SYSTEM	34.9	35.0	35.8	34.6		744	735	257 79.8

** PROBLEMS/SOLUTIONS/COMMENTS

FGD SYSTEM WAS OUT OF SERVICE MOST OF MAY TO REPAIR COMMON SURGE TANK. TANK DAMAGE WAS DUE TO REAGENT DEPOSITION.

'84	A	61.6	45.6	52.9	45.5				
	B	63.8	47.8	55.4	47.6				
	C	56.7	40.7	47.2	40.6				
	D	62.3	46.3	53.7	46.2				
	SYSTEM	61.1	45.1	52.3	45.0		720	718	324 79.4

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE MONTH OF JUNE, THE UTILITY REPORTED EXPERIENCING BREAKDOWNS AND MALFUNCTIONS IN THE LIMESTONE SLURRY PREPARATION SYSTEM AND SLUDGE STABILIZATION SYSTEM.

'84	A	97.2	94.1	97.4	88.3				
	B	55.5	49.7	79.9	46.6				
	C	96.8	93.7	97.0	87.9				
	D	99.5	96.6	100.0	90.6				
	SYSTEM	87.2	83.5	93.6	78.3		744	698	583 66.4

'84	A	99.7	97.3	97.7	99.2				
	B	41.4	40.2	96.0	40.9				
	C	61.1	59.5	100.0	60.7				
	D	100.0	98.0	98.4	99.9				
	SYSTEM	75.6	73.7	98.0	75.2		720	734	541 64.5

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE MONTHS OF JULY AND AUGUST, 1984.

'84	A	13.6	80.9	98.8	11.0				
	B	13.6	80.4	98.2	10.9				
	C	7.6	36.4	44.4	4.9				
	D	3.7	27.0	100.0	3.7				
	SYSTEM	9.6	56.1	85.4	7.6		744	101	57 52.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE UNIT AND FGD WERE DOWN MOST OF SEPTEMBER DUE TO AN ANNUAL SCHEDULED OUTAGE.

'84	A	99.9	97.4	98.0	96.9				
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UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

HOOSIER ENERGY: MEROM 2 (CONT.)

-----PERFORMANCE DATA-----											
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
11/84	B	99.9	88.2	95.0	87.7						
	C	99.9	97.9	98.6	97.4						
	D	99.9	86.0	96.6	85.6						
	SYSTEM	99.9	92.4	97.0	91.9			744	740	684	75.0
	A	99.8	98.3	99.1	83.4						
	B	99.8	97.5	99.1	82.8						
	C	99.8	96.7	99.0	82.1						
	D	99.8	87.8	98.9	74.5						
	SYSTEM	99.8	95.1	99.0	80.7			720	611	581	57.4

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING OCTOBER AND NOVEMBER, 1984.

12/84 SYSTEM 744

** PROBLEMS/SOLUTIONS/COMMENTS

NO INFORMATION WAS AVAILABLE FOR THE MONTH OF DECEMBER.

1/85	A	99.1	94.1	98.9	82.3					
	B	99.7	96.0	99.6	83.9					
	C	99.6	94.9	99.5	82.9					
	D	99.7	88.6	99.6	77.4					
	SYSTEM	99.5	93.4	99.4	81.6		744	650	607	63.0
2/85	A	99.3	93.7	99.1	77.8					
	B	99.3	94.8	99.2	78.7					
	C	99.3	93.5	99.1	77.7					
	D	99.3	93.6	99.1	77.7					
	SYSTEM	99.3	93.9	99.1	78.0		672	558	524	57.0
3/85	A	100.0	86.6	99.9	85.1					
	B	100.0	92.1	99.9	90.6					
	C	100.0	82.6	99.9	81.2					
	D	99.7	95.6	99.6	94.0					
	SYSTEM	99.9	89.2	99.9	87.7		744	731	653	67.4

** PROBLEMS/SOLUTIONS/COMMENTS

NO FGD SYSTEM-RELATED PROBLEMS WERE REPORTED FOR THE MONTHS OF JANUARY THROUGH MARCH.

4/85	A	85.4	95.1	96.4	84.2					
	B	84.0	93.6	96.3	82.9					
	C	85.3	95.0	96.4	84.1					
	D	85.5	95.2	96.4	84.4					
	SYSTEM	85.1	94.7	96.4	83.9		720	638	604	64.7

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT A FALSE TRIP OF THE FGD OVERPRESSURIZED SYSTEM OCCURRED WHEN A BY-PASS DAMPER JAMMED. SEVEN EXPANSION JOINTS WERE DAMAGED. THE FGD SYSTEM WAS OUT OF SERVICE FOR A TOTAL OF 94.4 HOURS FOR EXPANSION JOINT REPLACEMENT. THE BOILER WAS TAKEN OUT OF SERVICE FOR 74.8 HOURS WHILE THESE REPAIRS WERE BEING MADE.

5/85	A	99.7	99.6	99.6	99.6					
	B	99.7	99.4	99.7	99.4					
	C	99.7	99.7	99.7	99.7					
	D	99.7	94.7	99.7	94.7					
	SYSTEM	99.7	98.4	99.7	98.4		744	744	732	77.8

LITY FGD SURVEY: JANUARY - DECEMBER 1988

SIER ENERGY: MEROM 2 (CONT.)

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

85	A		99.1	94.9	97.7	75.2						
	B		99.1	95.6	97.7	75.8						
	C		99.1	72.8	97.1	57.7						
	D		99.1	79.8	100.0	63.3						
	SYSTEM		99.1	85.8	100.0	68.0			720	571	490	50.1
85	A		100.0	99.1	99.1	99.1						
	B		100.0	100.0	100.0	100.0						
	C		100.0	99.7	99.7	99.7						
	D		100.0	74.9	74.9	74.9						
	SYSTEM		100.0	93.4	93.4	93.4			744	744	695	59.6
85	A		97.8	97.8	97.8	97.4						
	B		99.5	99.5	99.5	99.1						
	C		99.0	99.0	99.0	98.6						
	D		99.5	99.5	99.5	99.1						
	SYSTEM		99.0	99.0	99.0	98.5			744	741	733	55.6

** PROBLEMS/SOLUTIONS/COMMENTS

NO FGD SYSTEM-RELATED PROBLEMS WERE REPORTED FOR THE MONTHS OF MAY THROUGH AUGUST.

'85	A	23.0	92.5	92.5	21.3					
	B	23.0	99.8	99.8	23.0					
	C	23.0	99.9	99.9	23.0					
	D	23.0	99.9	99.9	23.0					
	SYSTEM	23.0	98.0	98.0	22.6		720	166	162	13.9

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT A SCHEDULED ANNUAL UNIT OUTAGE BEGAN ON SEPTEMBER 7 AND CONTINUED THROUGH THE END OF THE MONTH.

'85	A	82.0	98.1	99.2	81.4					
	B	82.0	98.1	99.3	81.4					
	C	82.0	98.1	99.2	81.4					
	D	82.0	98.2	99.3	81.5					
	SYSTEM	82.0	98.1	99.3	81.4		744	618	606	47.0
/85	A	99.3	99.5	99.8	98.8					
	B	99.3	99.5	99.8	98.8					
	C	99.3	99.5	99.9	98.8					
	D	99.3	99.5	99.9	98.9					
	SYSTEM	99.3	99.5	99.8	98.8		720	715	712	56.0
/85	A	99.7	99.6	100.0	99.3					
	B	99.7	99.6	100.0	99.3					
	C	99.7	99.6	100.0	99.3					
	D	99.7	99.4	99.8	99.1					
	SYSTEM	99.7	99.6	99.9	99.3		744	742	739	70.3

** PROBLEMS/SOLUTIONS/COMMENTS

NO FGD SYSTEM-RELATED PROBLEMS WERE REPORTED FOR THE MONTHS OF OCTOBER THROUGH DECEMBER.

/86	A	99.7	99.7	99.7	99.7					
	B	99.7	99.7	99.7	99.7					
	C	99.7	99.7	99.7	99.7					
	D	99.7	99.7	99.7	99.7					
	SYSTEM	99.7	99.7	99.7	99.7		744	744	742	64.5

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

HOOSIER ENERGY: MEROM 2 (CONT.)

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

2/86	A	89.0	90.5	91.3	89.0				
	B	91.8	93.4	94.2	91.8				
	C	90.6	92.1	93.0	90.6				
	D	95.2	96.9	97.8	95.2				
	SYSTEM	91.6	93.2	94.1	91.6	672	661	616	62.4

** PROBLEMS/SOLUTIONS/COMMENTS

MODULAR AVAILABILITIES WERE LOWER DURING FEBRUARY AS INDIVIDUAL MODULE SHUT DOWNS WERE INVOKED ON A ROTATING BASIS FOR A PRE-OUTAGE INSPECTION

3/86	A	99.7	99.6	100.0	99.0				
	B	99.7	99.5	100.0	99.0				
	C	99.7	99.5	100.0	99.0				
	D	93.7	93.5	94.0	93.1				
	SYSTEM	98.2	98.0	98.5	97.5	744	740	726	54.2

** PROBLEMS/SOLUTIONS/COMMENTS

THE D MODULE WAS INSPECTED DURING THE MONTH IN ANTICIPATION OF THE UPCOMING SCHEDULED UNIT OUTAGE.

4/86	A		99.0	99.5	98.6				
	B		68.1	97.4	67.8				
	C		98.9	99.4	98.5				
	D		98.9	99.4	98.5				
	SYSTEM		91.2	98.9	90.8	720	717	654	56.4

5/86	A		91.7	100.0	3.4				
	B								
	C		92.1	100.0	3.4				
	D		92.4	100.0	3.4				
	SYSTEM		92.1	100.0	3.4	744	27	25	1.8

6/86	A		95.8	97.6	90.1				
	B		61.8	87.1	58.1				
	C		85.9	100.0	80.8				
	D		97.2	99.0	91.4				
	SYSTEM		85.2	95.9	80.1	720	677	577	51.5

** PROBLEMS/SOLUTIONS/COMMENTS

THE B MODULE WAS OUT OF SERVICE FOR GRID PACKING REPLACEMENT. THE REDUCED AVAILABILITY FOR THE SYSTEM AS A WHOLE OVER THE APRIL-JUNE PERIOD WAS PARTLY ATTRIBUTED TO A PLANNED UNIT OUTAGE.

7/86	A		68.3	98.7	68.3				
	B		97.6	99.1	97.6				
	C		99.1	99.1	99.1				
	D		97.4	99.1	97.4				
	SYSTEM		90.6	99.0	90.6	744	744	674	58.9

8/86	A		97.4	97.4	97.4				
	B		98.3	98.3	98.3				
	C		98.5	98.5	98.5				
	D		98.2	98.2	98.2				
	SYSTEM		98.1	98.1	98.1	744	744	730	48.8

9/86	A		92.2	92.5	92.2				
	B		88.4	88.4	88.4				
	C		92.9	92.9	92.9				
	D		92.6	92.6	92.6				
	SYSTEM		91.5	91.6	91.5	720	720	659	52.3

LITY FGD SURVEY: JANUARY - DECEMBER 1988

SIER ENERGY: MEROM 2 (CONT.)

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

36	A		32.7	97.8	17.9						
	B		99.8	100.0	54.7						
	C		99.7	100.0	54.6						
	D		99.0	99.2	54.2						
	SYSTEM		82.8	99.2	45.4			744	408	338	28.1
36	A		95.7	100.0	74.9						
	B		94.6	100.0	74.0						
	C		2.9	100.0	2.2						
	D		97.4	100.0	76.3						
	SYSTEM		72.7	100.0	56.9			720	564	409	36.2
36	A		98.4	99.7	94.1						
	B		97.1	98.4	92.8						
	C		96.2	97.5	92.0						
	D		98.5	99.8	94.2						
	SYSTEM		97.5	98.9	93.3			744	712	694	46.3

** PROBLEMS/SOLUTIONS/COMMENTS

A THREE WEEK SCHEDULED UNIT OUTAGE OCCURRED DURING THE FOURTH QUARTER DURING WHICH TIME WORK ON THE FGD SYSTEM WAS PERFORMED.

87	A	95.6	95.6	95.6	95.6				
	B	96.1	96.1	96.1	96.1				
	C	71.9	71.9	71.9	71.9				
	D	100.0	0.0	0.0	0.0				
	SYSTEM	100.0	87.9	87.9	87.9	744	744	654	49.0
87	A	99.5	99.0	99.5	87.6				
	B	99.5	98.9	99.5	87.6				
	C	21.5	24.3	24.5	21.5				
	D	99.5	98.9	99.5	87.6				
	SYSTEM	100.0	100.0	100.0	94.8	672	595	637	41.7
87	A	97.7	97.1	97.6	95.9				
	B	99.5	98.9	99.5	97.7				
	C	100.0	99.4	99.9	98.1				
	D	100.0	99.5	100.0	98.2				
	SYSTEM	100.0	100.0	100.0	100.0	744	735	744	47.2
87	A	44.5	97.0	97.0	97.0				
	B	97.0	97.0	97.0	97.0				
	C	97.2	97.2	97.2	97.2				
	D	96.1	96.1	96.1	96.1				
	SYSTEM	100.0	100.0	100.0	100.0	720	720	720	49.8

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD SYSTEM-RELATED PROBLEMS WERE REPORTED BY THE UTILITY FOR THE PERIOD JANUARY THROUGH APRIL 1987.

87	A	43.1	94.5	100.0	31.7				
	B	43.1	94.6	100.0	31.8				
	C	43.1	94.7	100.0	31.8				
	D	2.2	6.6	100.0	2.2				
	SYSTEM	43.9	96.8	100.0	32.5	744	250	242	16.2

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT UNIT 2 WAS OUT OF SERVICE FOR 494.2 HOURS FOR A SCHEDULED OUTAGE IN MAY.

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

HOOSIER ENERGY: MEROM 2 (CONT.)

-----PERFORMANCE DATA-----										
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART. HOURS	PER BOILER HOURS	FGD HOURS	CAP. FACTOR
6/87	A	99.6	99.6	99.6	99.6					
	B	97.4	97.4	97.4	97.4					
	C	98.8	98.8	98.8	98.8					
	D	77.6	77.6	77.6	77.6					
	SYSTEM	100.0	100.0	100.0	100.0		720	720	720	52.8
7/87	A	97.6	97.5	99.2	97.4					
	B	98.5	98.4	99.2	98.3					
	C	96.8	96.8	99.2	96.6					
	D	93.4	93.6	99.4	93.4					
	SYSTEM	100.0	100.0	100.0	100.0		744	743	744	52.6
8/87	A	98.8	98.8	99.0	97.6					
	B	93.3	93.2	93.5	92.1					
	C	99.4	99.4	99.7	98.2					
	D	99.4	99.4	99.6	98.2					
	SYSTEM	100.0	100.0	100.0	100.0		744	735	744	47.5
9/87	A	99.9	99.7	99.9	94.0					
	B	99.9	99.4	100.0	93.7					
	C	99.9	99.8	100.0	94.1					
	D	99.9	100.0	100.0	94.3					
	SYSTEM	100.0	100.0	100.0	100.0		720	679	720	54.2
10/87	A	96.7	99.9	100.0	51.3					
	B	43.7	85.0	100.0	43.7					
	C	55.9	99.9	100.0	51.3					
	D	55.9	99.9	100.0	51.3					
	SYSTEM	84.1	100.0	100.0	65.9		744	382	490	27.3
11/87	A	99.9	98.7	100.0	97.6					
	B	99.9	98.7	100.0	97.5					
	C	99.9	98.6	100.0	97.5					
	D	97.1	97.3	100.0	96.3					
	SYSTEM	100.0	100.0	100.0	100.0		720	712	720	57.1
12/87	A	97.8	97.6	99.7	97.5					
	B	98.7	98.6	99.7	98.4					
	C	98.7	98.5	99.7	98.3					
	D	97.8	97.6	99.7	97.4					
	SYSTEM	100.0	100.0	100.0	100.0		744	743	744	54.4

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD SYSTEM-RELATED PROBLEMS WERE REPORTED BY THE UTILITY FOR THE PERIOD JUNE THROUGH DECEMBER 1987.

1/88	A	99.8	99.7	99.7	99.7					
	B	99.8	99.7	99.7	99.7					
	C	99.8	99.8	99.8	99.8					
	D	99.8	99.8	99.8	99.8					
	SYSTEM	100.0	100.0	100.0	100.0		744	744	744	62.8
2/88	A	99.9	99.9	99.9	99.9					
	B	99.9	99.9	99.9	99.9					
	C	100.0	99.9	99.9	99.9					
	D	99.9	99.9	99.9	99.9					
	SYSTEM	100.0	100.0	100.0	100.0		696	696	696	57.1
3/88	A	99.7	99.7	100.0	99.7					
	B	100.0	100.0	100.0	100.0					
	C	98.8	98.8	98.8	98.8					

LITY FGD SURVEY: JANUARY - DECEMBER 1988

STER ENERGY: MEROM 2 (CONT.)

-----PERFORMANCE DATA-----						% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
100	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION					
88	D	99.9	99.9	99.9	99.9					
	SYSTEM	100.0	100.0	100.0	100.0		744	744	744	52.3
	A	99.5	99.2	99.4	94.3					
	B	99.5	99.1	99.2	94.2					
	C	99.5	99.0	99.2	94.1					
	D	99.5	98.9	99.1	94.1					
	SYSTEM	100.0	100.0	100.0	100.0		720	685	720	57.7

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD SYSTEM-RELATED PROBLEMS WERE REPORTED FOR THE PERIOD JANUARY THROUGH APRIL 1988.

88	A	62.8	97.0	99.3	58.6					
	B	62.8	97.6	100.0	59.0					
	C	25.8	42.5	100.0	25.7					
	D	62.8	97.3	99.7	58.8					
	SYSTEM	71.4	100.0	100.0	67.4		744	450	501	32.6

** PROBLEMS/SOLUTIONS/COMMENTS

UNIT 2 WAS OUT OF SERVICE FOR 352 HOURS DURING THE MONTH OF MAY FOR REPAIRS. NO MAJOR FGD-RELATED PROBLEMS WERE REPORTED.

'88	A	100.0	99.2	100.0	95.6					
	B	100.0	99.2	100.0	95.6					
	C	99.9	99.2	99.9	95.5					
	D	99.9	99.2	99.9	95.5					
	SYSTEM	100.0	100.0	100.0	100.0		720	694	720	57.9
'88	A	99.6	98.3	99.9	90.7					
	B	99.5	98.2	99.9	90.7					
	C	99.0	97.6	99.9	90.1					
	D	99.0	97.7	99.9	90.2					
	SYSTEM	100.0	100.0	100.0	100.0		744	687	744	60.1
/88	A	99.5	98.2	98.2	98.2					
	B	99.5	95.9	95.9	95.9					
	C	99.8	96.0	96.0	96.0					
	D	99.8	99.8	99.8	99.8					
	SYSTEM	100.0	100.0	100.0	100.0		744	744	744	62.3
/88	A	99.3	99.3	99.5	99.3					
	B	99.3	99.3	99.6	99.3					
	C	98.8	98.8	99.5	98.8					
	D	99.5	99.5	99.6	99.5					
	SYSTEM	100.0	100.0	100.0	100.0		720	720	720	52.3
/88	A	98.3	97.9	98.4	95.0					
	B	98.4	98.6	99.1	95.6					
	C	98.4	98.6	99.1	95.6					
	D	96.0	99.0	99.5	96.0					
	SYSTEM	100.0	100.0	100.0	100.0		744	722	744	81.8

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD SYSTEM-RELATED PROBLEMS WERE REPORTED FOR THE PERIOD JUNE THROUGH OCTOBER 1988.

/88	A	22.5	98.4	100.0	22.3					
	B	14.7	65.1	100.0	14.7					
	C	22.4	99.0	100.0	22.4					

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

HOOSIER ENERGY: MEROM 2 (CONT.)

-----PERFORMANCE DATA-----										
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	D	22.4	99.0	100.0	22.4					
	SYSTEM	27.4	100.0	100.0	27.3		720	163	196	14.8

** PROBLEMS/SOLUTIONS/COMMENTS

UNIT 2 WAS SHUT DOWN FOR 557.1 HOURS DURING THE MONTH OF NOVEMBER DUE TO AN ANNUAL OUTAGE.

12/88	A	68.8	62.7	99.9	56.1					
	B	92.2	98.2	99.2	87.9					
	C	92.2	98.8	99.8	88.5					
	D	88.6	93.0	94.0	83.3					
	SYSTEM	100.0	100.0	100.0	100.0		744	666	744	55.2

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD SYSTEM-RELATED PROBLEMS WERE REPORTED FOR THE MONTH OF DECEMBER.

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SECTION 13

DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	HOUSTON LIGHTING & POWER
PLANT NAME	LIMESTONE
UNIT NUMBER	1
CITY	JEWITT
STATE	TEXAS
REGULATORY CLASSIFICATION	B
PARTICULATE EMISSION LIMITATION - NG/J	13. (0.030 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	353. (0.820 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	258. (0.600 LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	*****
GROSS UNIT GENERATING CAPACITY - MW	780
NET UNIT GENERATING CAPACITY W/FGD - MW	720
NET UNIT GENERATING CAPACITY WO/FGD - MW	736
EQUIVALENT SCRUBBED CAPACITY - MW	780
*** 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	1604.46 (3400000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	146.1 (295 F)
STACK HEIGHT - M	172. (563 FT)
STACK SHELL	CONCRETE
STACK TOP DIAMETER - M	0.8 (2.7 FT)
*** FUEL DATA	
FUEL TYPE	COAL
FUEL GRADE	LIGNITE
AVERAGE HEAT CONTENT - J/G	14368. (6177 BTU/LB)
RANGE HEAT CONTENT - BTU/LB	4500-7250
AVERAGE ASH CONTENT - %	18.54
RANGE ASH CONTENT - %	10.0-37.0
AVERAGE MOISTURE CONTENT - %	31.95
RANGE MOISTURE CONTENT - %	25.0-38.0
AVERAGE SULFUR CONTENT - %	1.08
RANGE SULFUR CONTENT - %	0.3-3.1
AVERAGE CHLORIDE CONTENT - %	0.03
RANGE CHLORIDE CONTENT - %	0.00-0.06
*** PARTICLE CONTROL	
** ESP	
NUMBER	4
TYPE	COLD SIDE
SUPPLIER	LODGE-COTTRELL
INLET FLUE GAS CAPACITY - CU.M/S	1604.5 (3400000 ACFM)
INLET FLUE GAS TEMPERATURE - C	146.1 (295 F)
PARTICLE REMOVAL EFFICIENCY - %	99.9
** 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
PROCESS ADDITIVES	MAGNESIUM OXIDE; DIBASIC
SYSTEM SUPPLIER	COMBUSTION ENGINEERING
A-E FIRM	EBASCO

LITY FGD SURVEY: JANUARY - DECEMBER 1988

STON LIGHTING & POWER: LIMESTONE 1 (CONT.)

DEVELOPMENT LEVEL	FULL SCALE
NEW/RETROFIT	NEW
UNIT DESIGN SO ₂ REMOVAL EFFICIENCY - %	90.00
ENERGY CONSUMPTION - %	2.1
CURRENT STATUS	1
COMMERCIAL START-UP	12/1986
INITIAL START-UP	10/1985
CONTRACT AWARDED	10/1980
DESIGN AND OPERATING PARAMETERS	
DESIGN COAL SULFUR CONTENT - %	3.10
DESIGN CHLORIDE CONTENT - %	*****
QUENCHER/PRESATURATOR	
CONSTRUCTION MATERIAL GENERIC TYPE	NR
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR
ABSORBER	
NUMBER	5
NUMBER OF SPARES	1
GENERIC TYPE	SPRAY TOWER
SPECIFIC TYPE	OPEN COUNTERCURRENT SPRAY
TRADE NAME/COMMON TYPE	N/A
SHELL GENERIC MATERIAL	HIGH ALLOY
SHELL SPECIFIC MATERIAL	NICKEL BASE/CHROMIUM-IRON-COPPER-MOLYBDENUM
SHELL MATERIAL TRADE NAME/COMMON TYPE	HASTELLOY G
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	12.7 (95.0 GAL/1000 ACF)
INLET GAS FLOW - CU. M/S	1604.46 (3400000 ACFM)
INLET GAS TEMPERATURE - C	146.1 (295 F)
* MIST ELIMINATOR	
PRE-MIST ELIMINATOR/MIST ELIMINATOR	PRIMARY COLLECTOR
GENERIC TYPE	IMPINGEMENT
SPECIFIC TYPE	BAFFLE
TRADE NAME/COMMON TYPE	CLOSED VALVE
CONFIGURATION	HORIZONTAL
SUPERFICAL GAS VELOCITY - M/S	3.0 (10.0 FT/S)
CONSTRUCTION MATERIAL GENERIC TYPE	ORGANIC
CONSTRUCTION MATERIAL SPECIFIC TYPE	FIBER-REINFORCED POLYESTER
WASH WATER SOURCE	RECLAIM/MAKEUP
* REHEATER	
GENERIC TYPE	BYPASS
SPECIFIC TYPE	COLD SIDE
TRADE NAME/COMMON TYPE	N/A
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL
CONSTRUCTION MATERIAL SPECIFIC TYPE	AISI 1110
* FANS	
NUMBER	8
DESIGN	CENTRIFUGAL
FUNCTION	UNIT
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

HOUSTON LIGHTING & POWER: LIMESTONE 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	COMPARTMENTED
DEVICE TYPE	NR
NUMBER	3
** PUMPS	
SERVICE	NUMBER
-----	-----
NR	****
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	THICKENER
NUMBER	3
NUMBER OF SPARES	1
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	VACUUM FILTER
*** SALEABLE BYPRODUCTS	
NATURE	NONE
DISPOSITION	N/A
*** SLUDGE	
** TREATMENT	
METHOD	FIXATION
DEVICE	NR
PROPRIETARY PROCESS	NR
** DISPOSAL	
NATURE	FINAL
TYPE	LANDFILL
LOCATION	ON-SITE
SITE TRANSPORTATION METHOD	TRUCK/RAIL
SITE TREATMENT	NONE
** PROCESS CONTROL AND INSTRUMENTATION	
CHEMICAL PARAMETERS	INLET SO2, PH
MONITOR LOCATION	ABSORBER INLET, OUTLET & STACK
PROCESS CONTROL MANNER	AUTOMATIC
PROCESS CHEMISTRY MODE	FEED FORWARD
** WATER BALANCE	
WATER LOOP TYPE	CLOSED
SOURCE OF MAKEUP WATER	COOLING TOWER BLOWDOWN

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

10/85	SYSTEM							744	
11/85	SYSTEM							720	
12/85	SYSTEM							744	

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988
 STON LIGHTING & POWER: LIMESTONE 1 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT INITIAL STARTUP OF THE FGD SYSTEM OCCURRED IN OCTOBER, 1985.

36	SYSTEM	774
36	SYSTEM	672
36	SYSTEM	774
36	SYSTEM	720
36	SYSTEM	774
36	SYSTEM	720
36	SYSTEM	774
36	SYSTEM	774
36	SYSTEM	720
36	SYSTEM	774
36	SYSTEM	720
36	SYSTEM	774

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY HAS HAD TO ADD DIBASIC ACID IN ORDER TO MEET SO2 COMPLIANCE. THE SYSTEM IS CURRENTLY ACHIEVING 93% REMOVAL WITH THE ADDITIVE. THE ACID IS PURCHASED IN HEATED TANK TRUCKS WHICH ALSO ACT AS THE STORAGE FACILITY.

THE UTILITY REPORTED THAT THE UNIT WAS DECLARED COMMERCIAL IN DECEMBER. NO MAJOR FGD-RELATED OUTAGES WERE ENCOUNTERED DURING THE YEAR.

87	SYSTEM	744
87	SYSTEM	672
87	SYSTEM	744
87	SYSTEM	720
87	SYSTEM	744

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE UNIT WAS OFF-LINE FROM MID-MARCH UNTIL MID-MAY FOR A SCHEDULED SPRING BOILER/TURBINE OUTAGE. NO FGD-RELATED OUTAGES WERE ENCOUNTERED DURING THE PERIOD.

87	SYSTEM	720
87	SYSTEM	744
87	SYSTEM	744
87	SYSTEM	720
87	SYSTEM	744

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

HOUSTON LIGHTING & POWER: LIMESTONE 1 (CONT.)

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

11/87	SYSTEM							720	
12/87	SYSTEM							744	

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED TANK LINER FAILURES ON BOTH LIMESTONE 1 AND 2. THE FAILURES HAVE NOT CAUSED ANY UNIT DOWNTIME BUT HAVE BEEN A CONSTANT MAINTENANCE PROBLEM. THE LINER FALLS AWAY FROM THE WALLS OF THE TANKS AND IS PUMPED THROUGHOUT THE SLURRY CIRCUIT. THIS HAS RESULTED IN NOZZLE PLUGGING AND EVENTUALLY SOME ABSORBER VESSEL DOWNTIME FOR NOZZLE CLEANING AND TANK REPAIRS. MIST ELIMINATOR PLUGGING WAS ANOTHER MAINTENANCE PROBLEM REPORTED BY THE UTILITY.

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED OUTAGES WERE ENCOUNTERED DURING THE PERIOD JUNE THROUGH DECEMBER 1987. THE HOURS THE UNIT OPERATED IN 1987 WERE APPROXIMATELY 6540.

1/88	SYSTEM							774	
2/88	SYSTEM							672	
3/88	SYSTEM							774	
4/88	SYSTEM							720	
5/88	SYSTEM							774	
6/88	SYSTEM							720	
7/88	SYSTEM							774	
8/88	SYSTEM							774	
9/88	SYSTEM							720	
10/88	SYSTEM							774	
11/88	SYSTEM							720	
12/88	SYSTEM							774	

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY STATED THAT REACTION TANK LINER FAILURES MENTIONED PREVIOUSLY WERE DUE TO POOR APPLICATION OF THE FIBER REINFORCED PLASTIC RESIN AND NOT THE MATERIAL ITSELF. THE UTILITY ALSO REPORTED EXPERIENCEING ABSORBER OUTLET DUCTWORK LINER FAILURE PROBLEMS. THE EPOXY MATERIAL IN THE ABSORBER DUCTWORK DOWNSTREAM OF THE BYPASS WAS ALSO FAILING. THIS FAILURE WAS DUE TO GALVONIC CORROSION OF THE FASTENERS HOLDING THE WIRE MESH TO THE CARBON STEEL DUCTWORK. THE GUNITE MATERIAL ITSELF WAS NOT FAILING. THE UTILITY IS CURRENTLY MAKING REPAIRS AS NEEDED.

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED OUTAGES WERE ENCOUNTERED DURING THE YEAR. THE UNIT WAS OFF-LINE MID DECEMBER THROUGH JANUARY 1989 FOR A SCHEDULED MAINTENANCE OUTAGE.

SECTION 13
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	HOUSTON LIGHTING & POWER
PLANT NAME	LIMESTONE
UNIT NUMBER	2
CITY	JEWITT
STATE	TEXAS
REGULATORY CLASSIFICATION	B
PARTICULATE EMISSION LIMITATION - NG/J	13. (0.030 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	353. (0.820 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	258. (0.600 LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	*****
GROSS UNIT GENERATING CAPACITY - MW	780
NET UNIT GENERATING CAPACITY W/FGD - MW	720
NET UNIT GENERATING CAPACITY WO/FGD - MW	736
EQUIVALENT SCRUBBED CAPACITY - MW	780
** 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	1604.46 (3400000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	146.1 (295 F)
STACK HEIGHT - M	172. (563 FT)
STACK SHELL	CONCRETE
STACK TOP DIAMETER - M	8.2 (27.0 FT)
** FUEL DATA	
FUEL TYPE	COAL
FUEL GRADE	LIGNITE
AVERAGE HEAT CONTENT - J/G	14368. (6177 BTU/LB)
RANGE HEAT CONTENT - BTU/LB	4500-7250
AVERAGE ASH CONTENT - %	18.54
RANGE ASH CONTENT - %	10.0-37.0
AVERAGE MOISTURE CONTENT - %	31.95
RANGE MOISTURE CONTENT - %	25.0-38.0
AVERAGE SULFUR CONTENT - %	1.08
RANGE SULFUR CONTENT - %	0.3-3.1
AVERAGE CHLORIDE CONTENT - %	0.03
RANGE CHLORIDE CONTENT - %	0.00-0.06
*** PARTICLE CONTROL	
** ESP	
NUMBER	4
TYPE	COLD SIDE
SUPPLIER	LODGE-COTTRELL
INLET FLUE GAS CAPACITY - CU.M/S	1604.5 (3400000 ACFM)
INLET FLUE GAS TEMPERATURE - C	146.1 (295 F)
PARTICLE REMOVAL EFFICIENCY - %	99.9
** 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
PROCESS ADDITIVES	MAGNESIUM OXIDE; DIBASIC
SYSTEM SUPPLIER	COMBUSTION ENGINEERING
A-E FIRM	EBASCO

LITY FGD SURVEY: JANUARY - DECEMBER 1988

STON LIGHTING & POWER: LIMESTONE 2 (CONT.)

DEVELOPMENT LEVEL	FULL SCALE	
NEW/RETROFIT	NEW	
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	90.00	
ENERGY CONSUMPTION - %	2.1	
CURRENT STATUS	1	
COMMERCIAL START-UP	12/1986	
INITIAL START-UP	10/1986	
CONTRACT AWARDED	10/1980	
DESIGN AND OPERATING PARAMETERS		
DESIGN COAL SULFUR CONTENT - %	3.10	
DESIGN CHLORIDE CONTENT - %	*****	
QUENCHER/PRESATURATOR		
CONSTRUCTION MATERIAL GENERIC TYPE	NR	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR	
ABSORBER		
NUMBER	5	
NUMBER OF SPARES	1	
GENERIC TYPE	SPRAY TOWER	
SPECIFIC TYPE	OPEN COUNTERCURRENT SPRAY	
TRADE NAME/COMMON TYPE	N/A	
SHELL GENERIC MATERIAL	HIGH ALLOY	
SHELL SPECIFIC MATERIAL	NICKEL BASE/CHROMIUM-IRON-COPPER-MOLYBDENUM	
SHELL MATERIAL TRADE NAME/COMMON TYPE	HASTELLOY G	
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	12.7	(95.0 GAL/1000 ACF)
INLET GAS FLOW - CU. M/S	1604.46	(3400000 ACFM)
INLET GAS TEMPERATURE - C	146.1	(295 F)
SO2 REMOVAL EFFICIENCY - %	90.0	
* MIST ELIMINATOR		
PRE-MIST ELIMINATOR/MIST ELIMINATOR	PRIMARY COLLECTOR	
GENERIC TYPE	IMPINGEMENT	
SPECIFIC TYPE	BAFFLE	
TRADE NAME/COMMON TYPE	CLOSED VALVE	
CONFIGURATION	HORIZONTAL	
SUPERFICIAL GAS VELOCITY - M/S	3.0	(10.0 FT/S)
CONSTRUCTION MATERIAL GENERIC TYPE	ORGANIC	
CONSTRUCTION MATERIAL SPECIFIC TYPE	FIBER-REINFORCED POLYESTER	
WASH WATER SOURCE	RECLAIM/MAKEUP	
* REHEATER		
GENERIC TYPE	BYPASS	
SPECIFIC TYPE	COLD SIDE	
TRADE NAME/COMMON TYPE	N/A	
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	
CONSTRUCTION MATERIAL SPECIFIC TYPE	AISI 1110	
* FANS		
NUMBER	8	
DESIGN	CENTRIFUGAL	
FUNCTION	UNIT	
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	

HOUSTON LIGHTING & POWER: LIMESTONE 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
NUMBER	3
** PUMPS	
SERVICE	NUMBER
-----	-----
NR	****
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	THICKENER
NUMBER OF SPARES	1
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	VACUUM FILTER
NUMBER	4
*** SALEABLE BYPRODUCTS	
NATURE	NONE
DISPOSITION	N/A
*** SLUDGE	
** TREATMENT	
METHOD	FIXATION
DEVICE	NR
PROPRIETARY PROCESS	NR
** DISPOSAL	
NATURE	FINAL
TYPE	LANDFILL
LOCATION	ON-SITE
SITE TRANSPORTATION METHOD	TRUCK/RAIL
SITE TREATMENT	NONE
** PROCESS CONTROL AND INSTRUMENTATION	
CHEMICAL PARAMETERS	INLET SO ₂ ,PH
MONITOR LOCATION	ABSORBER INLET, OUTLET & STACK
PROCESS CONTROL MANNER	AUTOMATIC
PROCESS CHEMISTRY MODE	FEED FORWARD
** WATER BALANCE	
WATER LOOP TYPE	CLOSED
SOURCE OF MAKEUP WATER	COOLING TOWER BLOWDOWN

-----PERFORMANCE DATA-----									
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL	PER BOILER	FGD	CAP.
						SO ₂ PART.	HOURS	HOURS	FACTOR
10/86	SYSTEM						774		
11/86	SYSTEM						720		
12/86	SYSTEM						774		

ILITY FGD SURVEY: JANUARY - DECEMBER 1988

USTON LIGHTING & POWER: LIMESTONE 2 (CONT.)

-----PERFORMANCE DATA-----					
RIOD MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL
					SO2 PART.
					HOURS
					HOURS
					HOURS
					FACTOR

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY HAS HAD TO ADD DIBASIC ACID IN ORDER TO MEET SO2 COMPLIANCE. THE SYSTEM IS CURRENTLY ACHIEVING 93% REMOVAL WITH THE ADDITIVE. THE ACID IS PURCHASED IN HEATED TANK TRUCKS WHICH ALSO ACT AS THE STORAGE FACILITY.

INITIAL START-UP AND DEBUGGING OPERATIONS OF THE FGD SYSTEM ON LIMESTONE 2 BEGAN IN OCTOBER 1986 WITH THE ENTIRE PLANT BEING DECLARED COMMERCIAL IN DECEMBER 1986.

/87	SYSTEM	744
/87	SYSTEM	672
/87	SYSTEM	744
/87	SYSTEM	720
/87	SYSTEM	744
/87	SYSTEM	720
/87	SYSTEM	744
/87	SYSTEM	744
/87	SYSTEM	720
/87	SYSTEM	744
/87	SYSTEM	720
/87	SYSTEM	744

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED TANK LINER FAILURES ON BOTH LIMESTONE 1 AND 2. THE FAILURES HAVE NOT CAUSED ANY UNIT DOWNTIME BUT HAVE BEEN A CONSTANT MAINTENANCE PROBLEM. THE LINER FALLS AWAY FROM THE WALLS OF THE TANKS AND IS PUMPED THROUGHOUT THE SLURRY CIRCUIT. THIS HAS RESULTED IN NOZZLE PLUGGING AND EVENTUALLY ABSORBER VESSEL DOWNTIME FOR NOZZLE CLEANING AND TANK REPAIRS. MIST ELIMINATOR PLUGGING WAS ANOTHER MAINTENANCE PROBLEM REPORTED BY THE UTILITY.

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED OR SCHEDULED UNIT OUTAGES WERE ENCOUNTERED DURING THE YEAR. THE UNIT OPERATED APPROXIMATELY 8077 HOURS IN 1987.

/88	SYSTEM	774
/88	SYSTEM	672
/88	SYSTEM	774
/88	SYSTEM	720
/88	SYSTEM	774
/88	SYSTEM	720
/88	SYSTEM	774
/88	SYSTEM	774

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

HOUSTON LIGHTING & POWER: LIMESTONE 2 (CONT.)

-----PERFORMANCE DATA-----										
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PER PART. HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
9/88	SYSTEM								720	
10/88	SYSTEM								774	
11/88	SYSTEM								720	
12/88	SYSTEM								774	

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY STATED THAT REACTION TANK LINER FAILURES MENTIONED PREVIOUSLY WERE DUE TO POOR APPLICATION OF THE FIBER REINFORCED PLASTIC RESIN AND NOT THE MATERIAL ITSELF. THE UTILITY ALSO REPORTED EXPERIENCEING ABSORBER OUTLET DUCTWORK LINER FAILURE PROBLEMS. THE EPOXY MATERIAL IN THE ABSORBER DUCTWORK DOWNSTREAM OF THE BYPASS WAS ALSO FAILING. THIS FAILURE WAS DUE TO GALVONIC CORROSION OF THE FASTENERS HOLDING THE WIRE MESH TO THE CARBON STEEL DUCTWORK. THE GUNITE MATERIAL ITSELF WAS NOT FAILING. THE UTILITY IS CURRENTLY MAKING REPAIRS AS NEEDED.

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED OUTAGES WERE ENCOUNTERED DURING THE YEAR.

SECTION 13
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	HOUSTON LIGHTING & POWER	
PLANT NAME	W.A. PARISH	
UNIT NUMBER	8	
CITY	THOMPSONS	
STATE	TEXAS	
REGULATORY CLASSIFICATION	B	
PARTICULATE EMISSION LIMITATION - NG/J	13.	(0.030 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	155.	(0.360 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	215.	(0.500 LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	3670	
GROSS UNIT GENERATING CAPACITY - MW	570	
NET UNIT GENERATING CAPACITY W/FGD - MW	535	
NET UNIT GENERATING CAPACITY WO/FGD - MW	541	
EQUIVALENT SCRUBBED CAPACITY - MW	467	
*** 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	1038.18	(2200000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	148.9	(300 F)
STACK HEIGHT - M	152.	(500 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	6.7	(22.0 FT)
*** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	SUBBITUMINOUS	
AVERAGE HEAT CONTENT - J/G	20799.	(8942 BTU/LB)
RANGE HEAT CONTENT - BTU/LB	8000-8785/8800-9636	
AVERAGE ASH CONTENT - %	4.75	
RANGE ASH CONTENT - %	4.77-10.00/2.26-6.00	
AVERAGE MOISTURE CONTENT - %	26.69	
RANGE MOISTURE CONTENT - %	25.98-31.30/21.17-27.67	
AVERAGE SULFUR CONTENT - %	0.41	
RANGE SULFUR CONTENT - %	.34-.79/.08-.60	
AVERAGE CHLORIDE CONTENT - %	0.01	
RANGE CHLORIDE CONTENT - %	.01	
*** PARTICLE CONTROL		
** FABRIC FILTER		
NUMBER	4	
TYPE	REVERSE FLOW	
SUPPLIER	RESEARCH-COTTRELL	
NUMBER OF COMPARTMENTS	40	
NUMBER OF SPARE COMPARTMENTS	4	
INLET FLUE GAS CAPACITY - CU.M/S	259.5	(550000 ACFM)
INLET FLUE GAS TEMPERATURE - C	148.9	(300 F)
PRESSURE DROP - KPA	1.9	(7.5 IN-H2O)
PARTICLE REMOVAL EFFICIENCY - %	99.8	
TYPICAL GAS/CLOTH RATIO - M/MIN	0.6	(1.9 FT/MIN)
** 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	

LITY FGD SURVEY: JANUARY - DECEMBER 1988

STON LIGHTING & POWER: W.A. PARISH 8 (CONT.)

PROCESS TYPE	LIMESTONE
PROCESS ADDITIVES	NONE
SYSTEM SUPPLIER	GE ENVIRONMENTAL SERVICES
A-E FIRM	BECHTEL
DEVELOPMENT LEVEL	FULL SCALE
NEW/RETROFIT	NEW
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.80
UNIT DESIGN SO ₂ REMOVAL EFFICIENCY - %	70.00
ENERGY CONSUMPTION - %	1.1
CURRENT STATUS	1
COMMERCIAL START-UP	12/1982
INITIAL START-UP	10/1982
CONTRACT AWARDED	8/1979

DESIGN AND OPERATING PARAMETERS	
DESIGN COAL SULFUR CONTENT - %	0.44
DESIGN COAL HEAT CONTENT - J/G	20510.7 (8818 BTU/LB)
DESIGN COAL ASH CONTENT - %	6.13
DESIGN MOISTURE CONTENT - %	26.24
DESIGN CHLORIDE CONTENT - %	0.02
SPACE REQUIREMENTS - SQ M	9673.2 (104125 SQ FT)

QUENCHER/PRESATURATOR	
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL; INORGANIC
CONSTRUCTION MATERIAL SPECIFIC TYPE	AISI 1110; HYDRAULICALLY-BONDED MORTAR

ABSORBER	
NUMBER	3
NUMBER OF SPARES	1
GENERIC TYPE	SPRAY TOWER
SPECIFIC TYPE	OPEN COUNTERCURRENT SPRAY
TRADE NAME/COMMON TYPE	N/A
SUPPLIER	GE ENVIRONMENTAL SERVICES
DIMENSIONS - FT	40.0 DIA X 90.3
SHELL GENERIC MATERIAL	STAINLESS STEEL
SHELL SPECIFIC MATERIAL	AUSTENITIC
SHELL MATERIAL TRADE NAME/COMMON TYPE	TYPE 316L
LINER GENERIC MATERIAL	ORGANIC
LINER SPECIFIC MATERIAL	FIBERGLASS REINFORCED
LINER MATERIAL TRADE NAME/COMMON TYPE	CEILCOTE 2500AR
GAS CONTACTING DEVICE TYPE	NONE
NUMBER OF CONTACTING ZONES	3
DISTANCE BETWEEN GAS CONTACTING ZONES - CM	152.4 (60.0IN)
LIQUID RECIRCULATION RATE - LITER/S	2142. (34000 GPM)
L/G RATIO - L/CU.M	5.6 (42.0 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	0.7 (2.7 IN-H ₂ O)
SUPERFICAL GAS VELOCITY - M/SEC	3.0 (9.9 FT/S)
INLET GAS FLOW - CU. M/S	422.03 (894328 ACFM)
INLET GAS TEMPERATURE - C	148.9 (300 F)
SO ₂ REMOVAL EFFICIENCY - %	85.0

MIST ELIMINATOR	
PRE-MIST ELIMINATOR/MIST ELIMINATOR	PRIMARY COLLECTOR
NUMBER PER SYSTEM	3
NUMBER OF SPARES PER SYSTEM	0
NUMBER PER MODULE	1
GENERIC TYPE	IMPINGEMENT
SPECIFIC TYPE	BAFFLE
TRADE NAME/COMMON TYPE	CLOSED VANE
MANUFACTURER	GE ENVIRONMENTAL SERVICES
CONFIGURATION	HORIZONTAL
NUMBER OF STAGES	1
NUMBER OF PASSES PER STAGE	4
FREEBOARD DISTANCE - M	3.66 (12.0 FT)
DISTANCE BETWEEN STAGES - CM	0.51 (0.2 IN)
DISTANCE BETWEEN VANES - CM	7.6 (3.00 IN)
VANE ANGLES - DEGREES	56
PRESSURE DROP - KPA	0.1 (0.3 IN-H ₂ O)
SUPERFICAL GAS VELOCITY - M/S	3.0 (9.9 FT/S)
CONSTRUCTION MATERIAL GENERIC TYPE	ORGANIC
CONSTRUCTION MATERIAL SPECIFIC TYPE	POLYPROPYLENE

HOUSTON LIGHTING & POWER: W.A. PARISH 8 (CONT.)

WASH WATER SOURCE	FRESH	
WASH RATE - L/S	12.6	(200 GAL/MIN)
** REHEATER		
NUMBER	0	
GENERIC TYPE	BYPASS	
SPECIFIC TYPE	COLD SIDE	
TRADE NAME/COMMON TYPE	N/A	
PERCENT GAS BYPASSED - AVG	18.0	
TEMPERATURE INCREASE - C	17.8	(32 F)
CONSTRUCTION MATERIAL GENERIC TYPE	NR	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR	
** FANS		
NUMBER	4	
NUMBER OF SPARES	0	
DESIGN	CENTRIFUGAL	
SUPPLIER	GREEN FAN	
FUNCTION	UNIT	
APPLICATION	FORCED DRAFT	
SERVICE	DRY	
FLUE GAS FLOW RATE - CU.M/S	259.54	(550000 ACFM)
FLUE GAS TEMPERATURE - C	148.9	(300 F)
PRESSURE DROP - KPA	13.4	(44.0 IN-H2O)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	
** DAMPERS		
NUMBER	1	
FUNCTION	CONTROL	
GENERIC TYPE	LGUVER	
SPECIFIC TYPE	OPPOSED BLADE	
MANUFACTURER	ANDCO	
MODULATION	NR	
SEAL AIR FLOW - CU. M/S	1.51	(3200 ACFM)
SERVICE CONDITIONS	300	
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	
CONSTRUCTION MATERIAL SPECIFIC TYPE	CORTEN	
LINER GENERIC MATERIAL TYPE	NR	
LINER SPECIFIC MATERIAL TYPE	NR	
** DAMPERS		
NUMBER	1	
FUNCTION	SHUT-OFF	
GENERIC TYPE	GUILLOTINE	
SPECIFIC TYPE	SINGLE BLADE	
MANUFACTURER	ANDCO	
MODULATION	NR	
SEAL AIR FLOW - CU. M/S	1.51	(3200 ACFM)
SERVICE CONDITIONS	300	
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	
CONSTRUCTION MATERIAL SPECIFIC TYPE	CORTEN	
LINER GENERIC MATERIAL TYPE	NR	
LINER SPECIFIC MATERIAL TYPE	NR	
** DAMPERS		
NUMBER	1	
FUNCTION	SHUT-OFF	
GENERIC TYPE	GUILLOTINE	
SPECIFIC TYPE	SINGLE BLADE	
MANUFACTURER	ANDCO	
MODULATION	NR	
SEAL AIR FLOW - CU. M/S	1.51	(3200 ACFM)
SERVICE CONDITIONS	300	
CONSTRUCTION MATERIAL GENERIC TYPE	STAINLESS STEEL	
CONSTRUCTION MATERIAL SPECIFIC TYPE	317L	
LINER GENERIC MATERIAL TYPE	NR	
LINER SPECIFIC MATERIAL TYPE	NR	
** DUCTWORK		
LOCATION	UPSTREAM	
CONFIGURATION	RECTANGULAR	

LITY FGD SURVEY: JANUARY - DECEMBER 1988

STON LIGHTING & POWER: W.A. PARISH 8 (CONT.)

DIMENSIONS	22X15.6
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
SHELL SPECIFIC MATERIAL TYPE	ASTM A-36
LINER GENERIC MATERIAL TYPE	NONE
LINER SPECIFIC MATERIAL TYPE	NONE
DUCTWORK	
LOCATION	DOWNSTREAM
CONFIGURATION	RECTANGULAR
DIMENSIONS	16.1X16.1
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
SHELL SPECIFIC MATERIAL TYPE	ASTM A-36
LINER GENERIC MATERIAL TYPE	INORGANIC
LINER SPECIFIC MATERIAL TYPE	HYDRAULICALLY-BONDED MORTAR
REAGENT PREPARATION EQUIPMENT	
FUNCTION	WET BALL MILL
DEVICE	COMPARTMENTED
DEVICE TYPE	NR
MANUFACTURER	K.V.S.
NUMBER	2
NUMBER OF SPARES	1
FULL LOAD DRY FEED CAPACITY - M.TONS/HR	3.6 (4 TPH)
PRODUCT QUALITY - % SOLIDS	40.0
TANKS	
SERVICE	NUMBER
-----	-----
REAGENT PREP PRODUCT	1
THICKENER OVERFLOW	1
THICKENER UNDERFLOW	1
THICKENER	1
PUMPS	
SERVICE	NUMBER
-----	-----
LIMESTONE SLURRY	1
OVERFLOW	2
THICKENER UNDERFLOW	2
ABSORBER BLEED	2
THICKENER TUNNEL SUMP	2
LIMESTONE AREA SUMP	2
ABSORBER RECIRCULATION	9
SOLIDS CONCENTRATING/DEWATERING	
DEVICE	VACUUM FILTER
NUMBER	2
NUMBER OF SPARES	0
CONFIGURATION	PARALLEL
DIMENSIONS - FT	12X20
CAPACITY	63 TON/HOUR
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
LINER GENERIC MATERIAL TYPE	ORGANIC
LINER SPECIFIC MATERIAL TYPE	NATURAL RUBBER
BELT GENERIC MATERIAL TYPE	CLOTH
FEED STREAM SOURCE	THICKENER UNDERFLOW
FEED STREAM CHARACTERISTICS	600 GPM, 25% SOLIDS
OUTLET STREAM CHARACTERISTICS	60% SOLIDS
OVERFLOW STREAM CHARACTERISTICS	400 GPM, 0% SOLIDS
OVERFLOW STREAM DISPOSITION	MAKEUP
SOLIDS CONCENTRATING/DEWATERING	
DEVICE	THICKENER
NUMBER	1
NUMBER OF SPARES	0
CONFIGURATION	ROUND
DIMENSIONS - FT	60.0 DIA X 15.0
CAPACITY	416300
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
SHELL SPECIFIC MATERIAL TYPE	ASTM A-283
LINER GENERIC MATERIAL TYPE	ASPHALTIC MEMBRANE

HOUSTON LIGHTING & POWER: W.A. PARISH 8 (CONT.)

LINER SPECIFIC MATERIAL TYPE	FABRIC REINFORCED
FEED STREAM SOURCE	ABSORBER BLEED
FEED STREAM CHARACTERISTICS	328 GPM, 7% SOLIDS
OUTLET STREAM CHARACTERISTICS	66 GPM, 30% SOLIDS
OVERFLOW STREAM CHARACTERISTICS	298 GPM, 2.5% SOLIDS
OUTLET STREAM DISPOSITION	FILTRATION
OVERFLOW STREAM DISPOSITION	MAKEUP
*** SALEABLE BYPRODUCTS	
NATURE	NONE
DISPOSITION	N/A
*** SLUDGE	
FULL LOAD SLUDGE QUANTITY - M.TONS/HR (DRY)	39.9 (44.0 TPH)
MOISTURE CONTENT - % TOTAL FREE WATER	70.0
** TREATMENT	
METHOD	STABILIZATION
DEVICE	PUG MILL
PROPRIETARY PROCESS	RESEARCH-COTTRELL
INLET QUALITY - %	60.0
** DISPOSAL	
NATURE	FINAL
TYPE	LANDFILL
LOCATION	ON-SITE
SITE TRANSPORTATION METHOD	TRUCK
SITE TREATMENT	CLAY LINING
SITE DIMENSIONS	25 ACRES
SITE SERVICE LIFE - YRS	3
** PROCESS CONTROL AND INSTRUMENTATION	
CHEMICAL PARAMETERS	PH
PHYSICAL VARIABLES	FLOW, DENSITY
PROCESS CONTROL MANNER	AUTOMATIC
PROCESS CHEMISTRY MODE	FEED FORWARD
** WATER BALANCE	
WATER LOOP TYPE	CLOSED
** CHEMICALS AND CONSUMPTION	
FUNCTION	ABSORBENT
NAME	LIMESTONE
PRINCIPAL CONSTITUENT	CALCIUM
CONSUMPTION	130 TON/DAY
POINT OF ADDITION	BALL MILL
** FGD SPARE CAPACITY INDICES	
ABSORBER - %	50.0
MIST ELIMINATOR - %	0.0
FAN - %	50.0
BALL MILL - %	100.0
RECIRCULATION PUMP - %	50.0
THICKENER - %	0.0
VACUUM FILTER - %	0.0
** FGD SPARE COMPONENT INDICES	
ABSORBER	1.0
MIST ELIMINATOR	0.0
FAN	0.0
BALL MILL	1.0
RECIRCULATION PUMP	1.0
THICKENER	0.0
VACUUM FILTER	0.0

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988
 JUSTON LIGHTING & POWER: W.A. PARISH 8 (CONT.)

-----PERFORMANCE DATA-----							
RIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER BOILER FGD CAP. HOURS HOURS HOURS FACTOR
/82	SYSTEM						744
	** PROBLEMS/SOLUTIONS/COMMENTS						
	THE UTILITY REPORTED THAT INITIAL START-UP OF THE FGD SYSTEM OCCURRED DURING OCTOBER, 1982.						
/82	SYSTEM						720
/82	SYSTEM						744
/83	SYSTEM						744
/83	SYSTEM						672
/83	SYSTEM						744
	** PROBLEMS/SOLUTIONS/COMMENTS						
	THE UNIT IS PRESENTLY IN THE SHAKEDOWN/DEBUGGING PHASE OF OPERATION.						
/83	SYSTEM						720
/83	SYSTEM						744
/83	SYSTEM						720
	** PROBLEMS/SOLUTIONS/COMMENTS						
	THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE SECOND QUARTER OF 1983.						
/83	SYSTEM						744
/83	SYSTEM						744
/83	SYSTEM						720
	** PROBLEMS/SOLUTIONS/COMMENTS						
	THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE THIRD QUARTER OF 1983.						
/83	SYSTEM						744
/83	SYSTEM						720
/83	SYSTEM						744
	** PROBLEMS/SOLUTIONS/COMMENTS						
	THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE FOURTH QUARTER OF 1983.						
/84	SYSTEM						744
/84	SYSTEM						696
/84	SYSTEM						744
/84	SYSTEM						720
/84	SYSTEM						744

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

HOUSTON LIGHTING & POWER: W.A. PARISH 8 (CONT.)

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

6/84	SYSTEM								720	
7/84	SYSTEM								744	
8/84	SYSTEM								744	
9/84	SYSTEM								720	

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT DURING THE PERIOD OF JANUARY THROUGH SEPTEMBER 1984, EIGHT MIST ELIMINATORS WERE REPLACED. A UNIT TRIP OCCURRED CAUSING A LOSS OF AUXILIARY POWER AND A SUBSEQUENT INABILITY TO BYPASS THE FGD SYSTEM. AS A RESULT, THE EXTREME HIGH TEMPERATURE FLUE GAS ENTERED THE MIST ELIMINATORS AND BURNED THEM OUT. NO DAMAGE WAS REPORTED TO OTHER EQUIPMENT DOWSTREAM.

10/84	SYSTEM								744	
11/84	SYSTEM								720	
12/84	SYSTEM								744	

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS DOWN FROM NOVEMBER 1 THRU THE END OF THE QUARTER FOR AN ANNUAL SCHEDULED MAINTAINENCE. UTILITY REPORTED HAVING NO PROBLEMS MEETING FGD PERFORMANCE REQUIREMENTS.

1/85	SYSTEM								744	
2/85	SYSTEM								672	
3/85	SYSTEM								744	
4/85	SYSTEM								720	
5/85	SYSTEM								744	
6/85	SYSTEM								720	
7/85	SYSTEM								744	
8/85	SYSTEM								744	
9/85	SYSTEM								720	
10/85	SYSTEM								744	
11/85	SYSTEM								720	
12/85	SYSTEM								744	

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THERE WERE NO MAJOR UNIT OR FGD-RELATED OUTAGES DURING THE YEAR 1985.

1/86	SYSTEM								774	
2/86	SYSTEM								672	
3/86	SYSTEM								774	

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

JSTON LIGHTING & POWER: W.A. PARISH 8 (CONT.)

-----PERFORMANCE DATA-----				
3100 MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION
				% REMOVAL SO2 PART.
				PER BOILER HOURS
				FGD HOURS
				CAP. FACTOR

/86	SYSTEM			720
/86	SYSTEM			774
/86	SYSTEM			720
/86	SYSTEM			774
/86	SYSTEM			774
/86	SYSTEM			720
/86	SYSTEM			774
/86	SYSTEM			720
/86	SYSTEM			774

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THERE WERE NO MAJOR FGD-RELATED PROBLEMS DURING THE YEAR 1986.

/87	SYSTEM			744
/87	SYSTEM			672
/87	SYSTEM			744
/87	SYSTEM			720
/87	SYSTEM			744
/87	SYSTEM			720
/87	SYSTEM			744
/87	SYSTEM			744
/87	SYSTEM			720

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR OUTAGES EITHER FORCED OR SCHEDULED WERE ENCOUNTERED DURING THE FIRST THREE QUARTERS OF 1987.

/87	SYSTEM			744
/87	SYSTEM			720
/87	SYSTEM			744

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE UNIT WAS OFF-LINE FROM OCTOBER 16 THROUGH DECEMBER 11 FOR A SCHEDULED MAJOR BOILER/TURBINE OUTAGE. NO MAJOR FGD-RELATED PROBLEMS WERE REPORTED. THE UNIT OPERATED APPROXIMATELY 6460 HOURS IN 1987.

/88	SYSTEM			774
/88	SYSTEM			672
/88	SYSTEM			774

UTILITY FGD SURVEY: JANUARY - DECEMBER 1988

HOUSTON LIGHTING & POWER: W.A. PARISH 8 (CONT.)

-----PERFORMANCE DATA-----									
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART. HOURS	PER BOILER HOURS	FGD CAP. HOURS FACTOR
4/88	SYSTEM							720	
5/88	SYSTEM							774	
6/88	SYSTEM							720	
7/88	SYSTEM							774	
8/88	SYSTEM							774	
9/88	SYSTEM							720	
10/88	SYSTEM							774	
11/88	SYSTEM							720	
12/88	SYSTEM							774	

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO FGD-RELATED OUTAGES WERE ENCOUNTERED DURING THE YEAR. THE NEXT MAJOR UNIT OUTAGE IS EXPECTED TO TAKE PLACE IN MAY AND WILL LAST APPROXIMATELY THREE WEEKS.

**UTILITY FLUE GAS DESULFURIZATION SURVEY
INTERNAL DISTRIBUTION**

1. J. B. Cannon
2. Central Research Library
- 3-5. Document Reference Section
6. W. Fulkerson
- 7-8. Laboratory Records
9. Laboratory Records - RC
10. E. G. Llewellyn
11. ORNL Patent Section
12. J. H. Reed
13. R. M. Reed
14. D. E. Reichle
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76. Tony Whalen, c/o P. J. Whalen Consulting, 92 Regent Street, Fredericton, New Brunswick, E3B-3W4, CANADA
77. E. R. Williams, U.S. Department of Energy, PE-50, Office of Environmental Analysis, 4G-036 Forrrestal Building, 1000 Independence Avenue, SW., Washington, D.C. 20585
78. J. L. Zieleniewski, IT Corporation, 11499 Chester Road, Cincinnati, Ohio 45246-0100

END

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